

FUEL SYSTEM

Return To Main Table of Contents

GENERAL	2
SERVICE ADJUSTMENT PROCEDURES	22
MPI COMPONENTS INSPECTION	32
INJECTOR AND THROTTLE BODY	87
THROTTLE BODY	89
FUEL TANK	90
FUEL LINE AND VAPOR LINE..	94
ENGINE CONTROL	96

GENERAL

SPECIFICATIONS

Fuel tank	
Capacity	52 lit. (13.8 U.S. gal., 11.4 Imp.gal.)
Fuel filter	
Type	High pressure type
Fuel pump	
Type	Electrical, in-tank type
Driven by	Electric motor
Throttle body	
Throttle position sensor (TPS)	
Type	Variable resistor type
Resistance	3.5-6.5 KΩ
Output voltage at curb idle	0.48-0.52 V
Idle speed control (ISC) servo motor	
Type	Stepper motor
Resistance	28-33 Ω at 20°C (68°F)
Idle position switch	
Type	Contact type
Input sensor	
Air flow sensor (AFS)	
Type	Karman vortex type
Intake air temperature sensor	
Type	Thermistor type
Resistance	2.33-2.97 k Ω at 20°C (68°F)
Coolant temperature sensor	
Type	Thermistor type
Resistance	2.5 kΩ at 20°C (68°F) 0.3 kΩ at 80°C (176°F)
Oxygen sensor	
Type	Zirconia sensor
Vehicle speed sensor	
Type	Reed switch type
TDC sensor	
Type	Photo diode sensor
Crank angle sensor	
Type	Photo diode sensor
Output actuator	
Injector	
Type	Electromagnetic type
Number	4
Coil resistance	13-16 Ω at 20°C (68°F)
Fuel pressure regulator	
Regulated pressure	330 KPa (3.35 kg/cm ² , 48 psi)

SEALANT

Water temperature sensor assy	LOCTITE 962T or equivalent
Water temperature gauge unit	Three bond No.2310 or equivalent

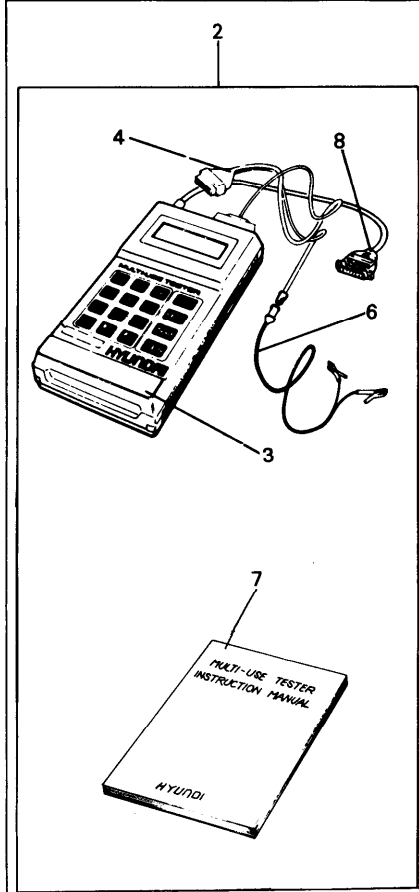
SERVICE STANDARD

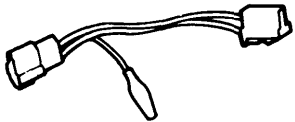
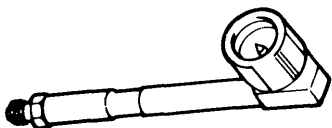
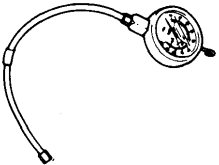
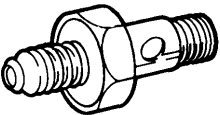
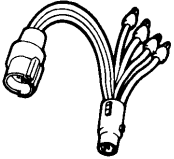
Basic ignition timing	BTDC $5^{\circ} \pm 2^{\circ}$ at curb idle
Curb idle speed	750 \pm 100 rpm [For 1.6L Engine] 700 \pm 100 rpm [For 1.8L Engine]
Throttle-position sensor (TPS) adjustment voltage	0.4&-0.52V at curb idle

TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Delivery pipe installation bolts	10-13	100-130	7-9
Coolant temperature sensor	20-40	200-400	14-29
Oxygen sensor	40-50	400-500	29-36
Throttle position sensor (TPS) installation screw	1.5-2.5	15-25	1.1-1.8
Fuel pressure regulator bolts	8-10	80-100	6-7
High pressure hose and fuel filter	25-35	250-350	18-25
High pressure hose and fuel tank	30-40	300-400	22-29
Throttle body to intake manifold bolts	15-22	150-220	11-16
Fuel tank drain plug	15-25	150-250	11-18
Fuel filter mounting bolts	9-14	90-140	7-10
Accelerator arm bracket bolts	9-14	90-140	7-10

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09391-33002 1. Multi-use tester assy (Without adapter ass'y)		
09391-33100 2. Multi-use tester sub assy		Diagnostic tester for MPI, automatic transaxle and cruise control systems
09391-33200 3. Multi-use tester main body		
09391-33300 4. Wiring harness		
09391-33402 5. ROM-pack (HMC-3)		
09391-33500 6. Battery harness		
09391-33600 7. Instruction manual		
09391-33700 8. P/C connector (RS-232C)		For connection to the external commu- nication device such as personal com- puter etc. in using Multi-Use Tester.

Tool (Number and name)	illustration	Use
09273-24000 Test harness connector		Engine r.p.m. check
09353-24000 Fuel pressure gauge connector		Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-24100 Fuel pressure gauge & hose		
09353-24200 Fuel pressure gauge adapter		
09392-33000 Test harness test		Oxygen sensor inspection
J-38228 Fuel pressure gauge kit Includes-1 each 09353-24000 09353-24100 09353-24200		

TROUBLESHOOTING

When checking engine troubles, 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.

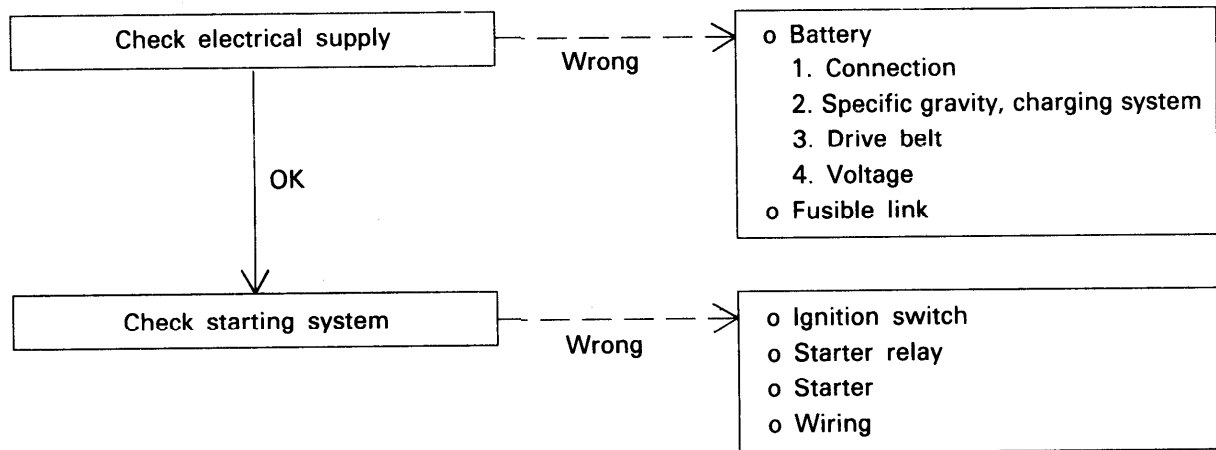
1. Power supply
 - 1) Battery
 - 2) Fusible link
 - 3) Fuse
2. Body ground
3. Fuel supply
 - 1) Fuel line
 - 2) Fuel filter
 - 3) Fuel pump
4. Ignition system
 - 1) Spark plug
 - 2) High-tension cable
 - 3) Ignition coil
5. Emission control system
 - 1) PCV system
 - 2) EGR system
 - 3) Vacuum leak
6.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

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

MPI TROUBLESHOOTING PROCEDURES

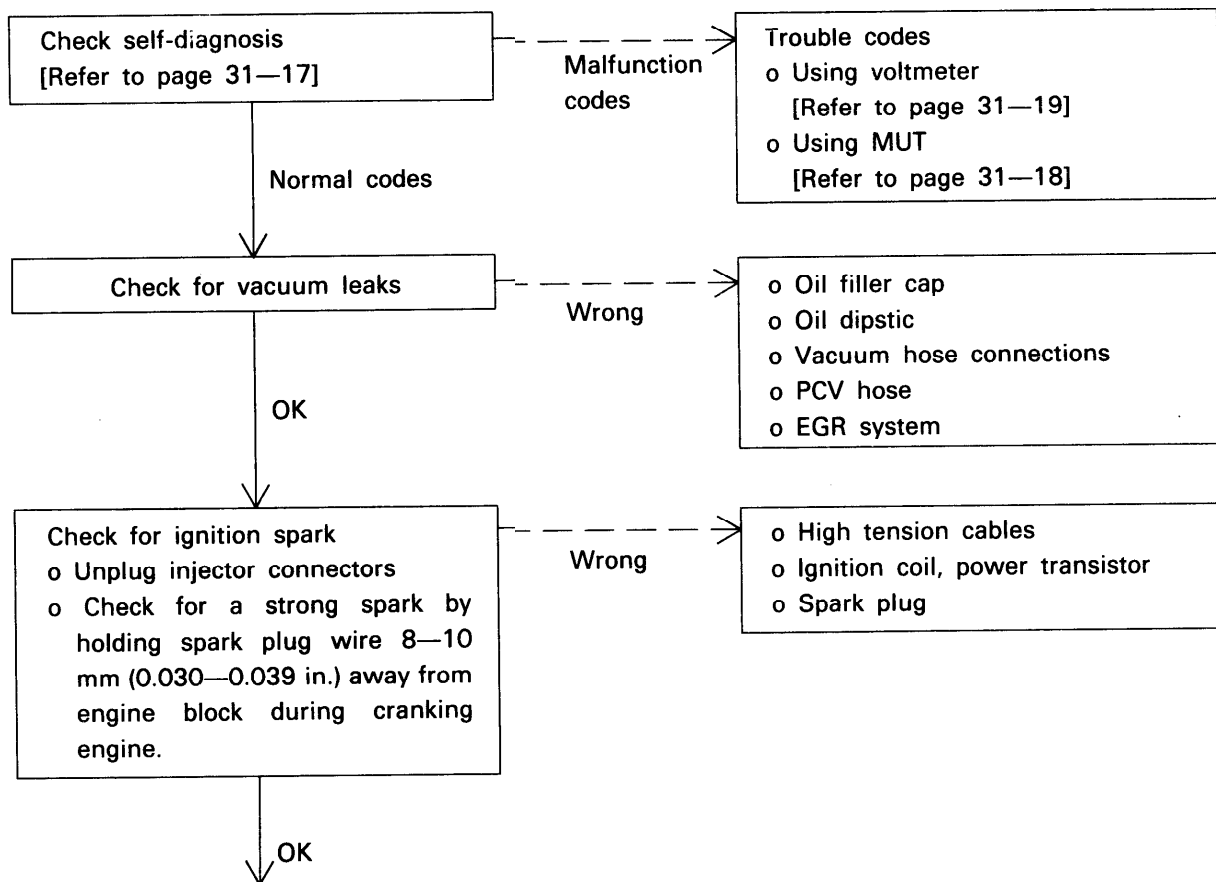
PROBLEM

Engine will not start

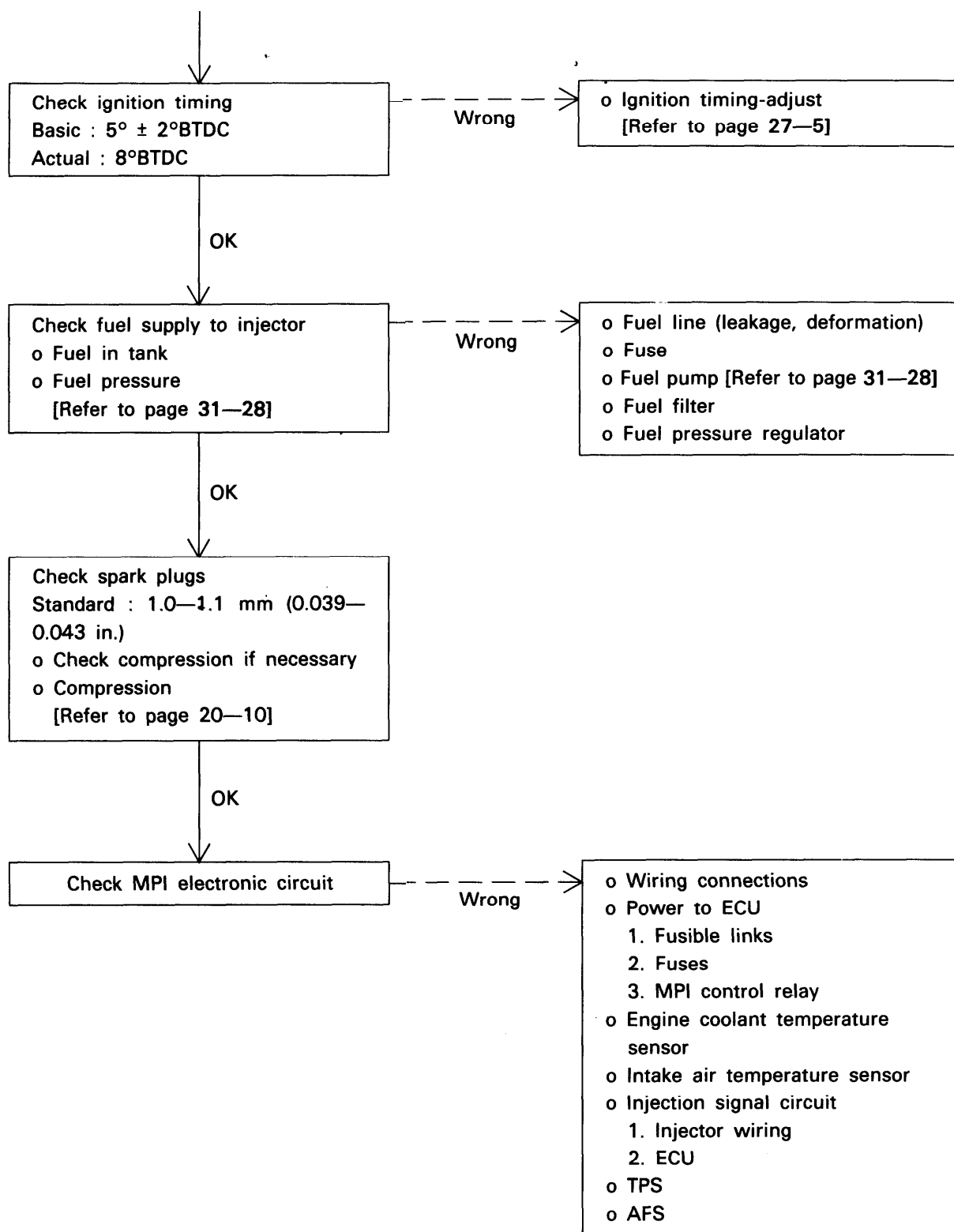


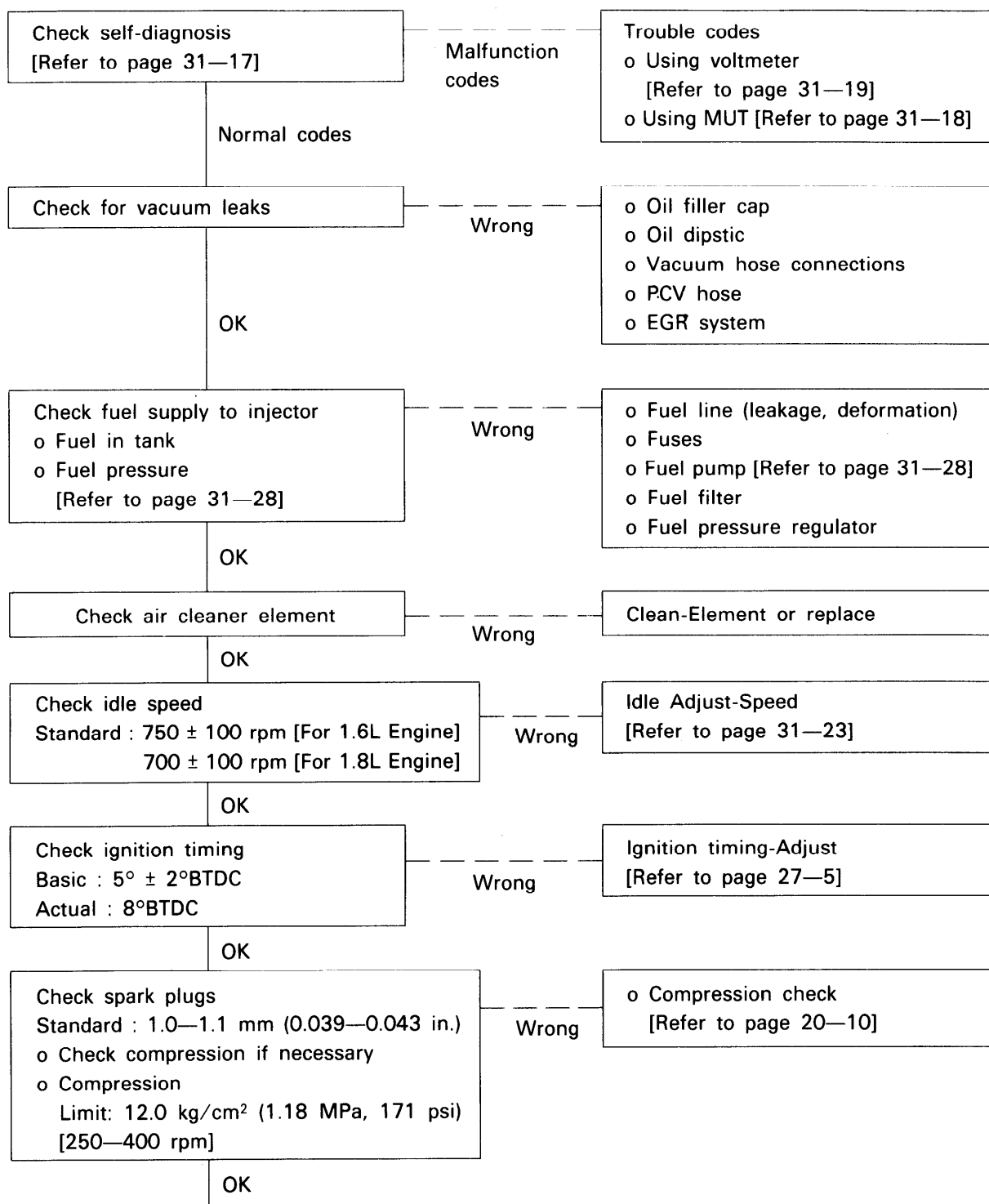
PROBLEM

Hard to start (Crank OK)

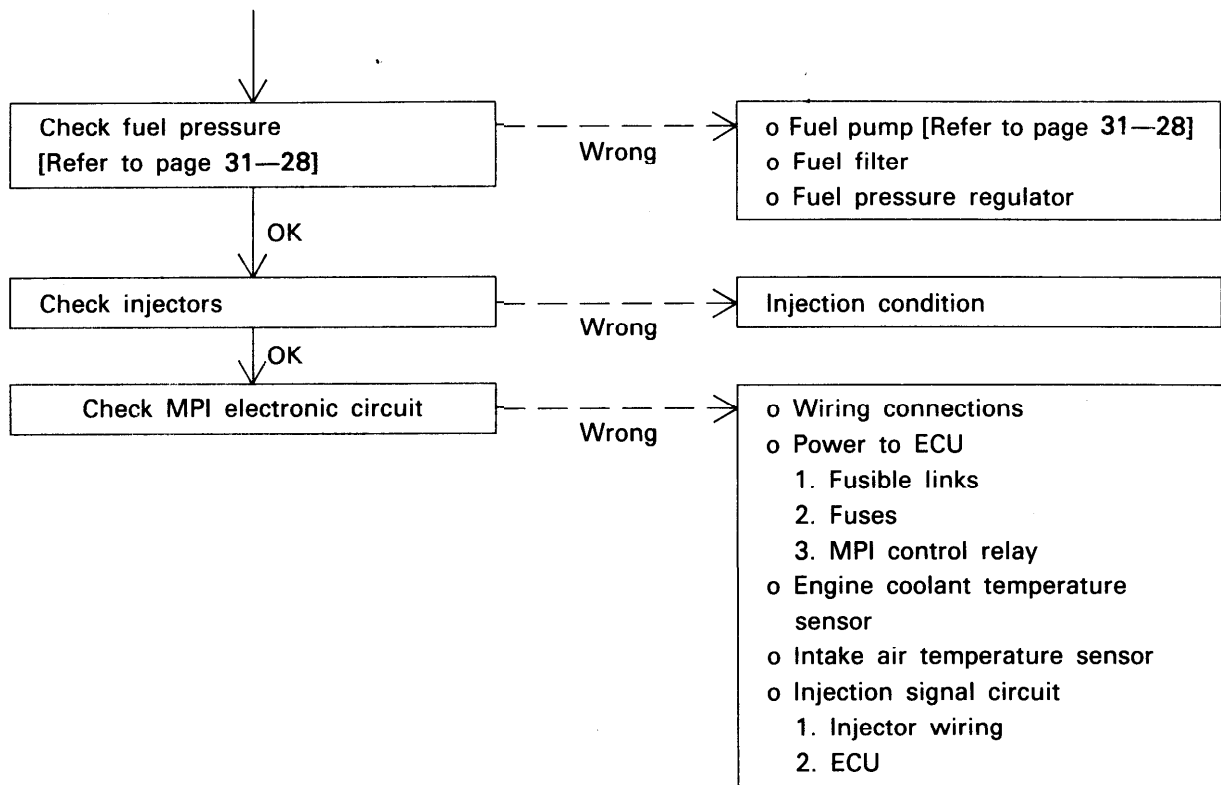


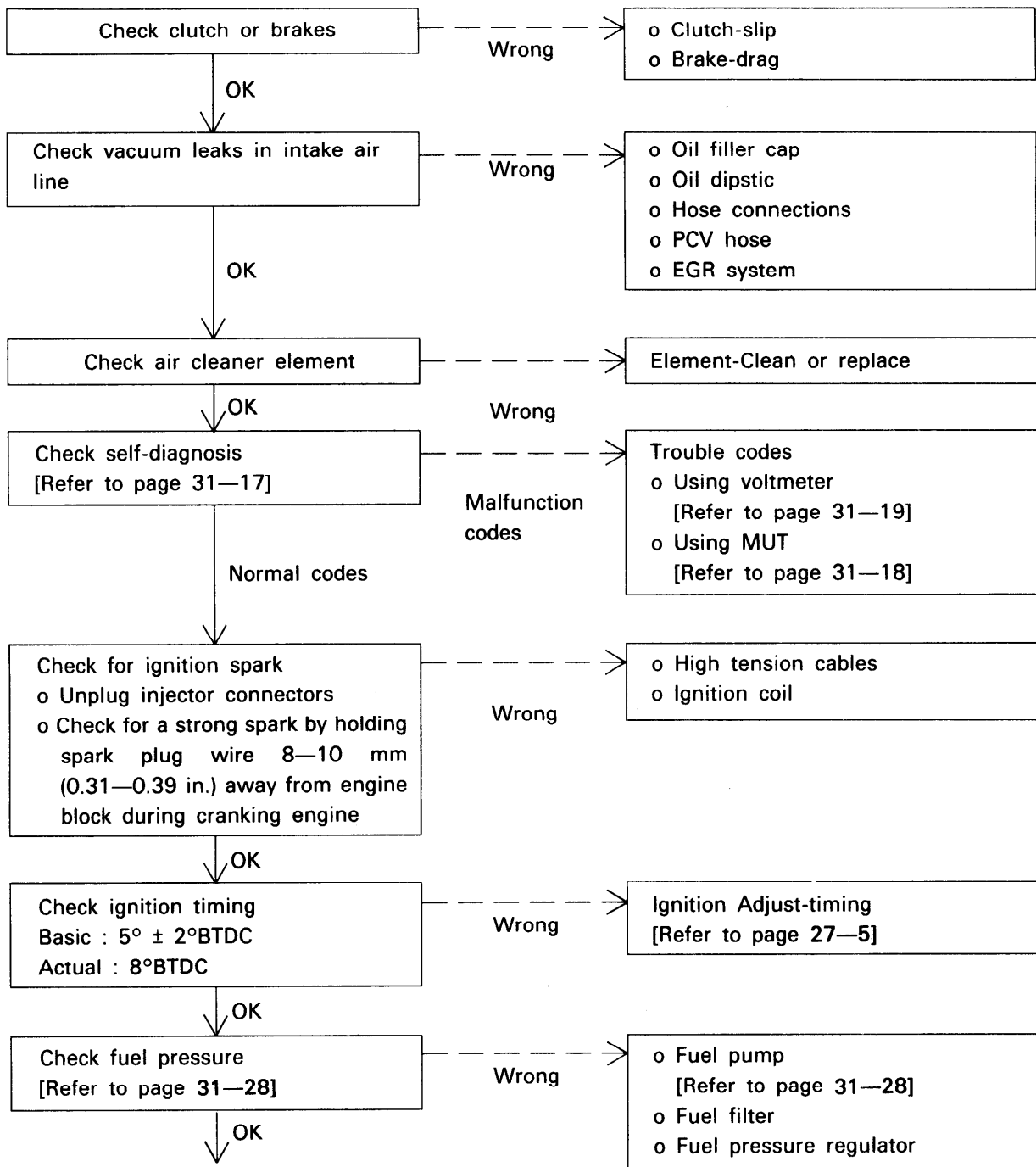
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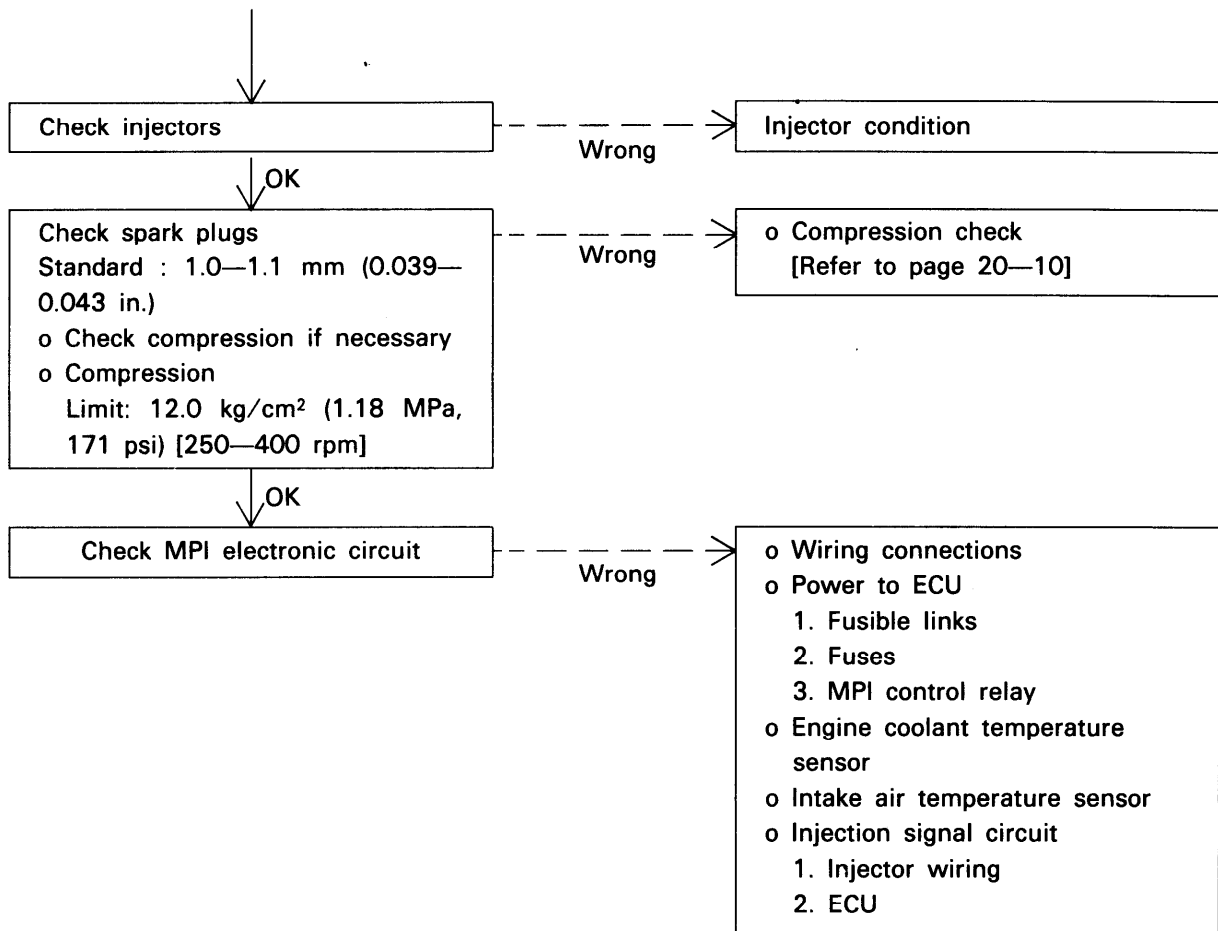
PROBLEM**Rough idle or engine stalls**

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PROBLEM**Engine hesitates or accelerates poorly**

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FUEL TANK AND FUEL LINE

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

<div> <div>Main Symptoms</div> <div>Sub-Symptoms</div> <div>Check points</div> </div>	STARTING							Poor Idling					Poor Driving	
	Does not start			Hard to start										
	Does not crank	Starter runs but engine does not crank	Incomplete combustion	Cranks slowly	Usually	When cold engine	When hot engine	Incorrect first idle	High idle speed	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1													
Starter	2	1		1										
inhibitor SW [A/T] or Clutch start SW [M/T]	3													
Flywheel [M/T] or Drive plate [A/T]		2												
Air flow sensor circuit			1							4	11	8		
Idle speed control servo			2		3	3	3	3	3	2	8			2
Fuel pressure regulator			3		6	5	5				5	12	1	
Water temp. sensor circuit			4		4	1	1	2	2	1	2	9	6	
Compression			5		9						9	6		
Piston ring			6		10						10			
Ignition timing			7		11						12	15		
Timing belt			8								13			
Injectors			9		14	8	8		7	5	14	16	4	
ECU			10		15	9	9	4	8	6	16	17	5	
A/Con circuit				2					6					
Connecting rod bearing				3										
Crankshaft bearing				4										
Fuel quality					1	2	2				1	3	3	
Spark plug					2						4	5	2	
EGR system					5					3	3	4		
Fuel pump					7	6	6				6	13		
Fuel lines					8	7	7				7	14		
Ignition circuit					12						15			3
Intake air temp sensor circuit					13	4	4		4			10		1
Accelerator pedal link								1	1					
TPS circuit									5			7		
Cylinder head											17			
Clutch [M/T]												1		
Brakes drag when released												2		
O ₂ Sensor circuit												11		

Main Symptoms Sub-Symptoms Check points	Engine Stalls				Others		
	Soon after starting	After accelerator pedal depressed	After accelerator pedal released	During A/Con ON	Excessive fuel	Engine overheats	Engine over cools
Fuel quality	1				2		
Fuel pressure regulator	2	5					
Fuel pump	3						
Fuel lines	4	6					
EGR system	5	2	2		6		
ISC servo	6		1	2			
AFS circuit	7	1	3		14		
Water temp sensor circuit	8				12		
Injectors	9	7			11		
ECU	10	8	4	3	18		
TPS circuit		3			13		
Spark plug		4			7	8	
A/Con circuit				1	15		
Fuel leakage					1		
Accelerator pedal link					3		
Clutch [M/T]					4		
Brakes drag when released					5		
Compression					8		
Piston ring					9		
Ignition timing					10		
O ₂ sensor circuit					16		
Intake air temp sensor circuit					17		
Coolant leakage						1	
Cooling fan						2	1
Thermo switch						3	
Radiator and radiator cap						4	
Thermostat						5	2
Timing belt						6	
Water pump						7	
Oil pump						9	
Cylinder head						10	
Cylinder block						11	
Water temp sensor gauge						12	3

NOTE

The number herein means the check order.

MPI SYSTEM INSPECTION

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

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

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

NOTES

- 1) Before removing or installing any part, read the diagnosis code and then disconnect the battery negative (-) terminal.
- 2) Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of battery cable during engine operation or while the ignition switch is ON could cause damage to the ECU.
- 3) The control harnesses between the ECU and oxygen sensor are shielded wires with the shield grounded to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty the control harness must be replaced.

Malfunction Indicator Light

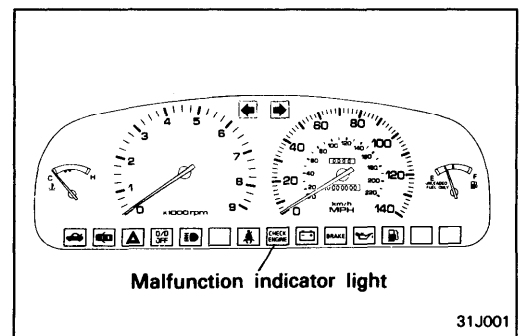
A malfunction indicator light comes on to notify the driver of the emission control items when an irregularity is detected.

However, when an irregular signal returns to normal, the malfunction indicator light will go out.

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

Item Indicated By The MIL

- o Electronic Control Unit
- o Oxygen sensor
- o Air-flow sensor
- o Intake air temperature sensor
- o Throttle position sensor
- o Engine coolant temperature sensor



- o Crank angle sensor
- o Top dead center sensor
- o Injector
- o Fuel pump
- o EGR temperature sensor (Only California Vehicles)

MIL (Malfunction Indicator Light) Inspection

1. Check that when the ignition switch is turned on, the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for open circuit in harness, blown fuse and blown bulb.

SELF-DIAGNOSIS

The ECU monitors the input/output signals (some signals at all times and the others under specified conditions).

When the ECU detects an irregularity the ECU will memorize the trouble code, and outputs the signal to the self-diagnosis output terminal.

There are 14 diagnosis items, including the normal state, and the diagnosis results can be read out with voltmeter or Multi-Use Tester.

Trouble codes will remain in the ECU as long as battery power is maintained. The trouble codes will, however, be erased when the battery terminal or the engine control unit connector is disconnected.

NOTE

If the sensor connector is disconnected with the ignition switch turned on, the diagnosis code is memorized. In this case, disconnect the battery negative terminal (-) for 15 seconds or more, and the diagnosis memory will be erased.

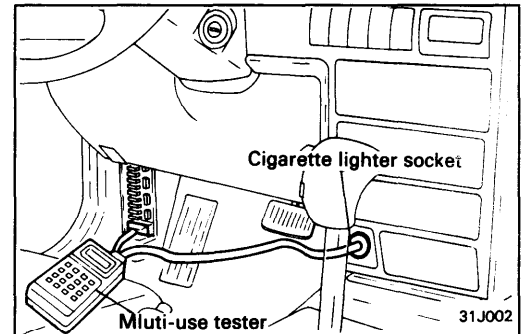
CHECKING PROCEDURE (SELF-DIAGNOSIS)

NOTE

- 1) When battery voltage is low, trouble codes can not be read. Be sure to check the battery for voltage and other conditions before starting the test.
- 2) Diagnosis memory is erased if the battery or the ECU connector is disconnected. Do not disconnect the battery before the trouble codes are completely read.

Inspection Procedure (Using Multi-Use Tester)

1. Turn OFF the ignition switch.
2. Connect the the multi-use tester to the diagnosis connector in the fuse box.
3. Connect the power-source terminal of the multi-use tester to the cigarette lighter socket.
4. Turn ON the ignition switch.
5. Use the multi-use tester to check the self-diagnosis codes.
6. Repair the faulty part from the diagnosis chart.
7. Erase the malfunction code.



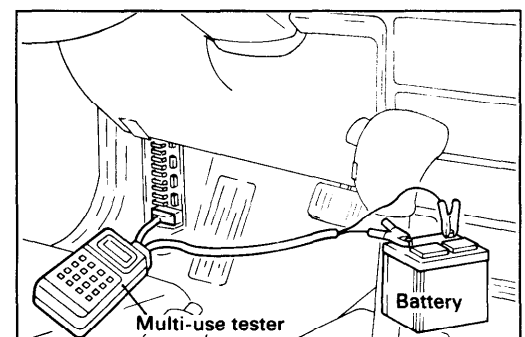
NOTE

- 1) Select 4. "SPECIAL TEST" from the function selection menu of the multi-use tester.
- 2) Then select Item No.5 "ERASE DIAG".
- 3) Press the YES key when "ERASE DIAG. CODE ?" is displayed.
- 4) Enter ID code "19".
- 5) Press the CLEAR key when "FINISHED ERASING DIAG. CODE" is displayed.
- 6) Read the self-diagnosis output and check output of correct code.

8. Disconnect the multi-use tester.

NOTE

When the ignition key is in the ST position, the cigarette lighter power is OFF. If a test needs to be made during cranking, use the battery clamp harness provided.

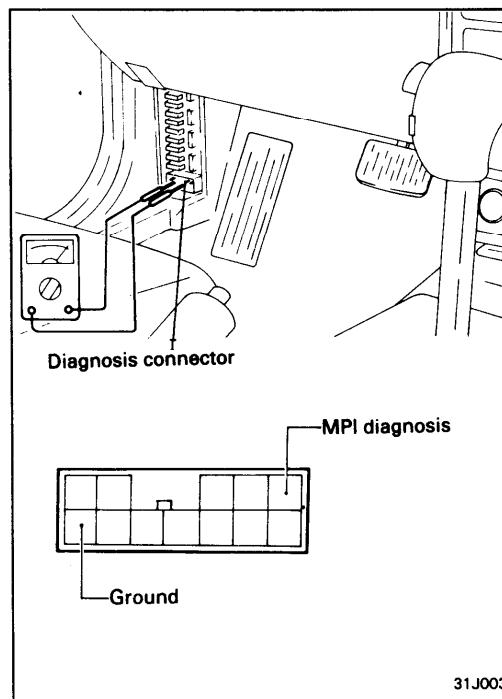


Inspection Procedure (Using Voltmeter)

1. Connect the voltmeter to the self diagnosis terminal.
2. Turn the ignition switch, and the engine control unit memory contents will immediately start.

After recording the abnormal item, check and repair each part according to the check items in "Diagnosis Chart".



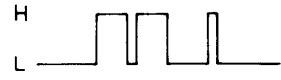




3. When the defective parts have been repaired, disconnect the negative terminal of the battery cable for 15 seconds or more and connect it again to make sure that the trouble code has been erased.








Diagnosis Chart

The 14 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

output preference order	Diagnosis item	Trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control unit		—	—	(Replace engine control unit)
2	Oxygen sensor		11	Retained	<ul style="list-style-type: none"> o Harness and connector o Fuel pressure o Injectors (Replace if defective.) o Intake air leaks o Oxygen sensor
3	Air flow sensor		12	Retained	<ul style="list-style-type: none"> o Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)

output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
4	Air temperature sensor		13	Retained	<ul style="list-style-type: none"> o Harness and connector o Air temperature sensor
5	Throttle position sensor		14	Retained	<ul style="list-style-type: none"> o Harness and connector o Throttle position sensor o Idle position switch
6	Engine coolant temperature sensor		21	Retained	<ul style="list-style-type: none"> o Harness and connector o Engine coolant temperature sensor
7	Crank angle sensor		22	Retained	<ul style="list-style-type: none"> o Harness and connector If harness and connector are normal, replace crank angle sensor assembly.)
8	Top dead center sensor		23	Retained	<ul style="list-style-type: none"> o Harness and connector If harness and connector are normal, replace crank angle sensor assembly.)
9	Vehicle-speed sensor (reed switch)		24	Retained	<ul style="list-style-type: none"> o Harness and connector o Vehicle-speed sensor (reed switch)
10	Barometric pressure sensor		25	Retained	<ul style="list-style-type: none"> o Harness and connector If harness and connector are normal, replace barometric pressure sensor assembly.)

output preference order	Diagnosis item	Trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
11	Injector		41	Retained	<ul style="list-style-type: none"> o Harness and connector o Injector coil resistance
12	Fuel pump		42	Retained	<ul style="list-style-type: none"> o Harness and connector o Control relay
13	EGR*		43	Retained	<ul style="list-style-type: none"> o Harness and connector o EGR temperature sensor o EGR valve o EGR control solenoid valve o EGR valve control vacuum.
14	Ignition coil		44	Retained	<ul style="list-style-type: none"> o Harness and connector o Ignition coil o Power transistor
15	Normal state		—	—	—

NOTE

1. Replace the engine control unit if a trouble code is read although the inspection reveals that there are no problems with the diagnosis item.
2. The diagnosis item marked* is applicable to California vehicles only.

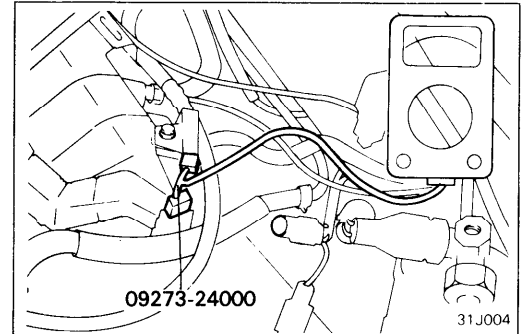
SERVICE ADJUSTMENT PROCEDURES

Idle Speed Check Procedures

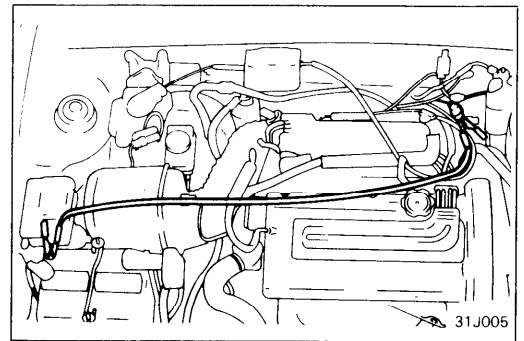
Checking conditions;

- o Engine coolant temperature is 80 to 95°C (176 to 205°F).
- o Lights, electric cooling fan and all accessories are off.
- o Transaxle is in neutral ["P" or "N" range for A/T vehicles].
- o Steering wheel is straight forward position (Vehicles with power steering)

1. Install a tachometer and a timing light.



2. Ground the igniting timing adjustment terminal



3. Run the engine and let it idle.
4. Check the basic ignition timing and adjust if necessary.

Basic ignition timing $5^{\circ} \pm 2^{\circ}$ BTDC (At idle)

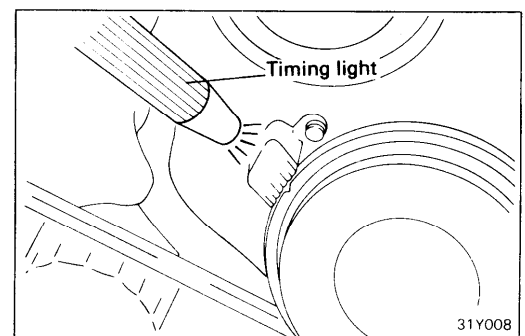
Refer to 27 GROUP-Ignition Timing section.

5. Remove the lead wire connected at step 2.
6. Let the engine idle for 2 minutes.
7. Check the idle speed.

Idle speed. 750 ± 100 rpm [For 1.6L Engine]
 700 ± 100 rpm [For 1.8L Engine]

NOTE

Adjustment of the idling speed is usually unnecessary, because this system controls the idle speed.



Basic Idle Speed Adjustment

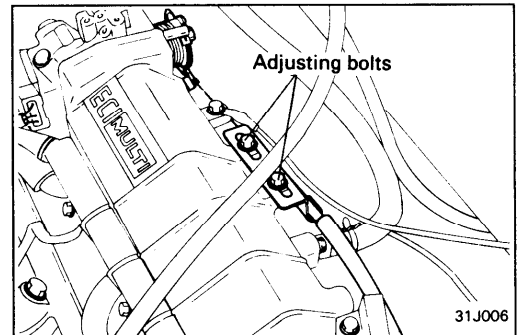
NOTE

1. Before adjusting, check that the spark plugs, injectors, ISC servo, compression, etc. are normal.
2. Clean the throttle valve area.

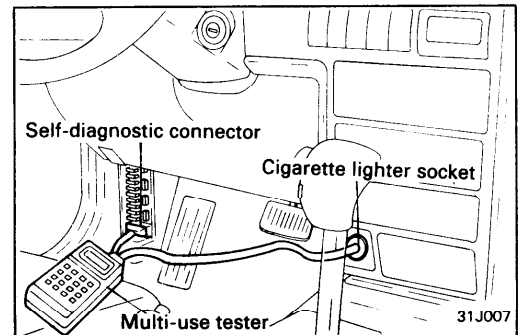
Adjustment conditions:

- o Engine coolant temperature is 80 to 95°C (176 to 205°F).
- o Lights, electric cooling fan and all accessories are off.
- o Transaxle is in neutral ["P" or "N" range for A/T vehicles].
- o Steering wheel is a straight forward position (Vehicles with power steering).

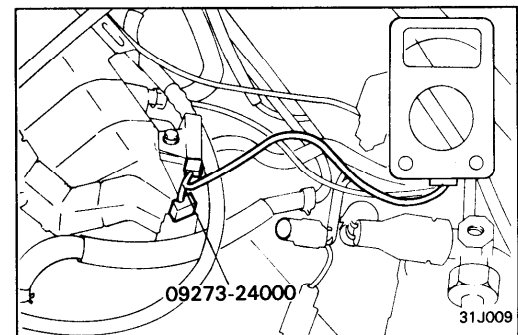
1. Loosen the accelerator cable.



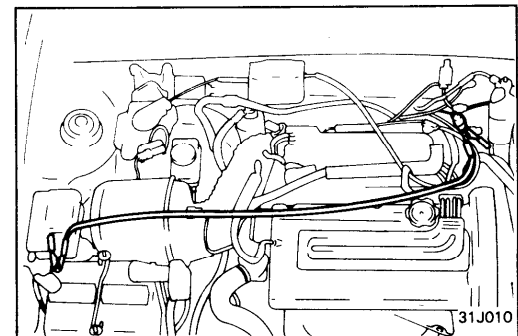
2. Connect the multi-use tester to the diagnostic connector in the fuse box.



3. If the multi-use tester is not used, connect a tachometer. And ground the self diagnostic terminal.



4. Ground the ignition timing adjustment terminal.



5. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
6. Run the engine at idle for 2 minutes.
7. Check that the engine rpm is within the standard value.
If the multi-use tester is used, press code No.22 and read the engine rpm.

Basic idle speed 750 \pm 100 rpm [For 1.6L Engine]
700 \pm 100 rpm [For 1.8L Engine]

NOTE

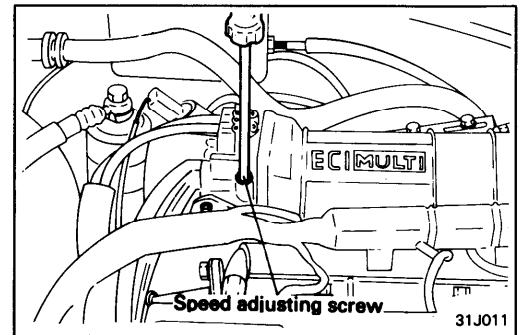
- 1: The engine speed on a new vehicle driven less than 500 Km (300 miles) may be 20 to 100 rpm lower than specification, but no adjustment is necessary.
2. If the engine stalls or the engine speed is low after the vehicle has been driven a distance of 500 km (300 miles) or more, a deposit on the throttle valve area is suspected.

8. If the basic idle speed is out of specification, adjust by the speed adjusting screw (SAS) for the standard rpm. In adjusting use a tachometer.

NOTE

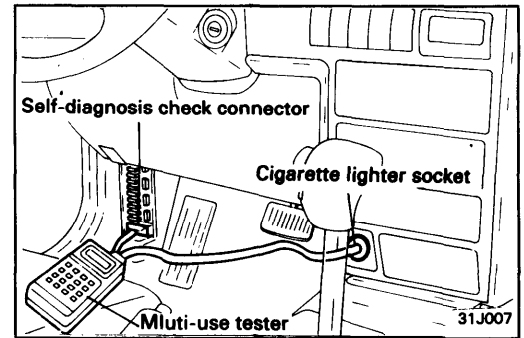
If the idle speed is higher than specified, even with the speed adjusting screw (SAS) fully closed, check whether the idle switch (fixed SAS) moving mark exists or not. If it is found that the switch has moved, adjust the idle switch (fixed SAS) has been mis-adjusted.

9. Turn the ignition switch to the OFF position.
10. If the multi-use tester was not used, disconnect the self diagnostic terminal.
11. Disconnect the lead wire from the ignition timing adjusting terminal.
12. Run the engine again and let it idle for about 10 minutes.
Check that the engine is in normal idling condition.



Throttle Position Sensor (TPS) Adjustment

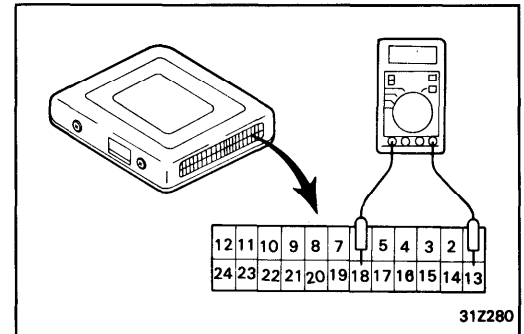
1. Connect a multi-use tester to the diagnostic connector.



2. If a multi-use tester is not used, connect a digital-type voltmeter between terminal 13 and terminal 18 of the ECU.

NOTE

1. Do not disconnect the ECU connector from the ECU.
2. Use an accurate digital voltmeter.



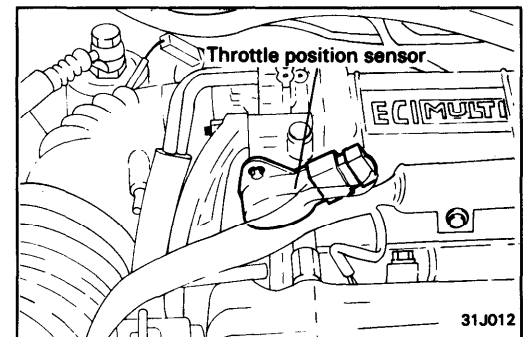
3. Turn the ignition switch to the ON position (do not start engine) and check that the TPS output voltage is as specified. If a multi-use tester is used, press code No. 14 and read the voltage.

Standard value 480-520 mV

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

NOTE

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



5. Turn the ignition switch to the OFF position.

Idle Position Switch (Fixed SAS) Adjustment

NOTE

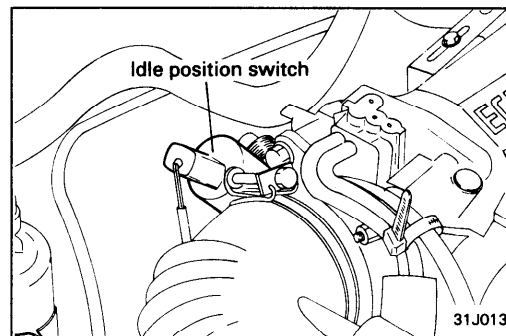
Since the idle switch (Fixed SAS) is adjusted at the factory, it is not necessary to adjust the idle switch in normal cases except during replacement.

1. Loosen the tension of the acceleration cable.
2. Disconnect the idle switch (fixed SAS) connector.
3. Loosen the idle switch (fixed SAS) lock nut.
4. Turn the idle switch (fixed SAS) counterclockwise until the throttle valve closes.
5. Connect an ohmmeter between the terminal of the switch and the body.
6. Screw in the idle switch (fixed SAS) until continuity is found between the switch terminal and the body, and screw in the idle switch 15/16 turn from that point.
Tighten the lock nut and connect the idle switch connector.

NOTE

Keep the idle switch (fixed SAS) from moving when tightening the lock nut.

7. Adjust the acceleration cable.
8. Adjust the curb idle speed.
9. Adjust the TPS (Throttle position sensor).



Throttle Body (Throttle Valve Area) Cleaning

NOTE

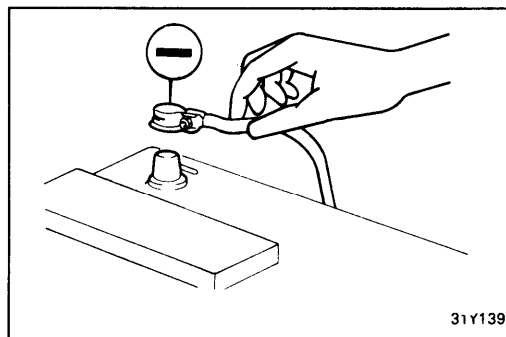
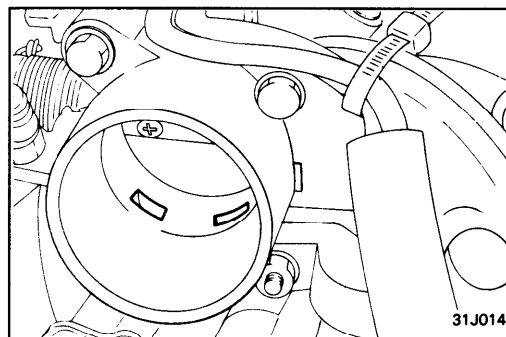
Disconnect the air intake hose from the throttle body, and check the throttle valve surface for carbon deposits. Spray cleaning solvent on the valve to remove carbon deposits.

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

NOTE

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

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



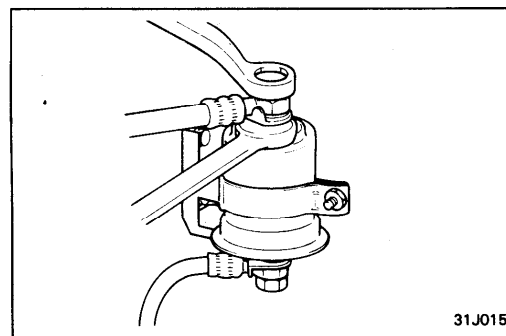
Fuel Filter Replacement

1. Remove the upper eye bolt while holding the fuel filter nut securely and remove the high pressure fuel hose.

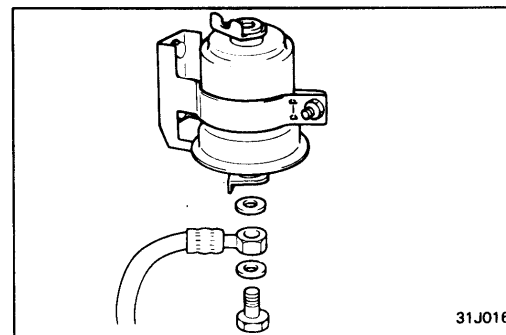
CAUTION

- 1) Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.
 - 2) Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.
2. Remove the lower eye bolt while holding the fuel filter nut assembly.
 3. Remove the fuel filter mounting bolts, and then remove the fuel filter from the bracket.

Tightening torque
25-35 Nm (250-350 kg.cm, 18-25 lb.ft)



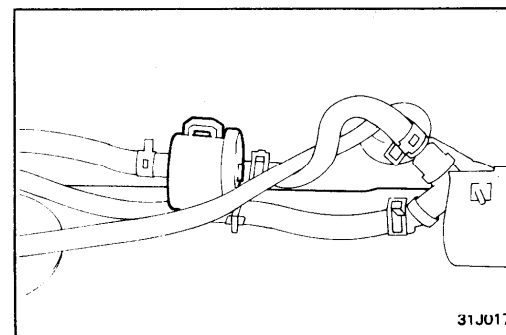
31J015



31J016

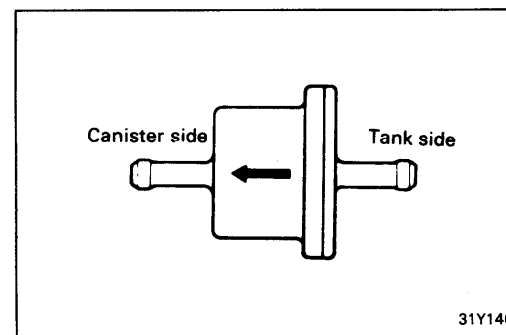
Overfill Limiter (Two-way Valve) Replacement

1. Disconnect the vapor hoses, and then remove the overfill limiter.



31J017

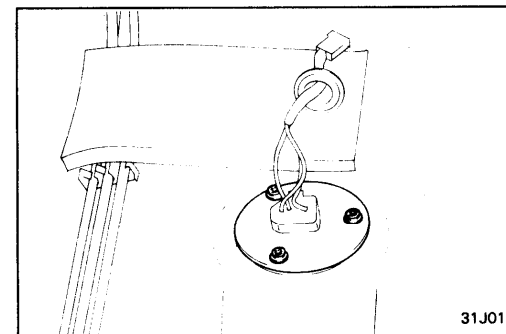
2. Connect the overfill limiter in the correct direction



31Y146

Fuel Sender Replacement

1. Remove the fuel tank cap to lower the fuel tank's internal pressure.
2. Remove the fuel sender installation screws, then remove the fuel sender from the fuel tank.



31J018

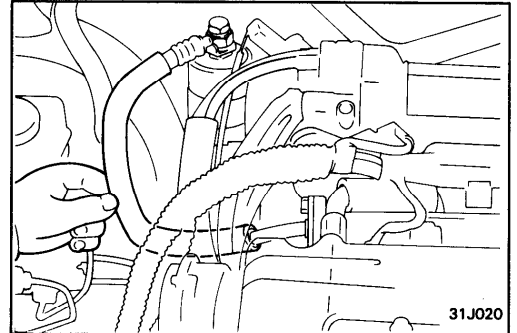
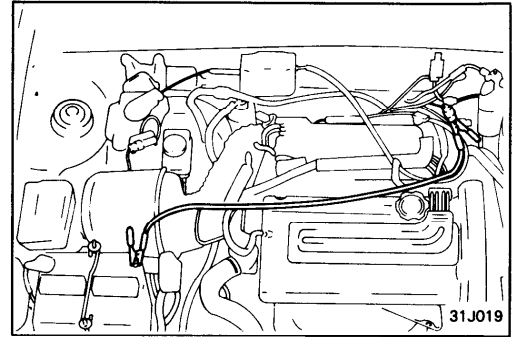
Fuel Pump Operation Check

1. Turn the ignition switch to the OFF position.
2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.

NOTE

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

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



Fuel Pressure Test

1. Reduce the internal pressure of the fuel pipes and hoses by the following procedures.
 - o Disconnect the fuel pump harness connector in the rear seat side.
 - o Start the engine and after it stops by itself, turn the ignition switch to the OFF position.
 - o Disconnect the battery negative (-) terminal.
 - o Connect the fuel pump harness connector.
2. Remove the upper eye bolt while holding the fuel filter nut securely.

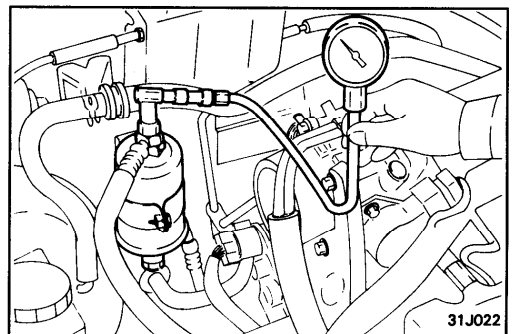
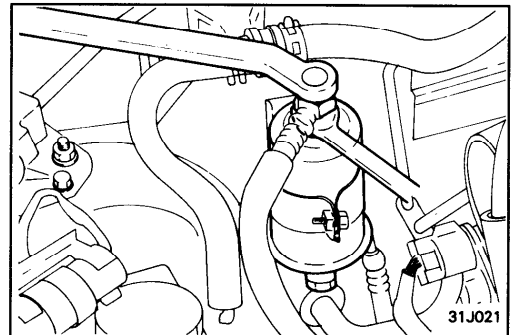
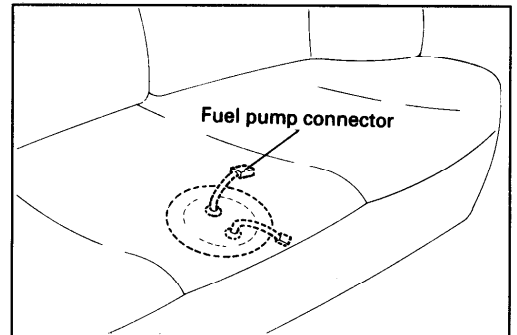
CAUTION

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

3. Using the fuel pressure gauge adapter (09353-24000, 09353-24100, 09353-24200), install the fuel-pressure gauge to the fuel filter. Tighten the bolt to the specified torque.

Tightening torque

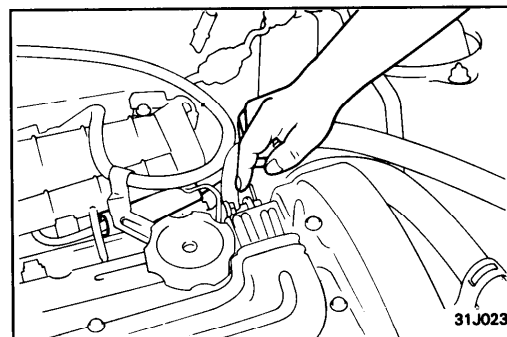
Fuel pressure gauge to fuel filter
25-35 Nm (250-350 kg.cm, 18-25 lb.ft)



4. Connect the battery's negative (-) terminal.
5. Apply battery voltage to the terminal for the pump drive and activate the fuel pump; then, with fuel pressure applied, check that there is no fuel leakage from the pressure gauge or connection part.

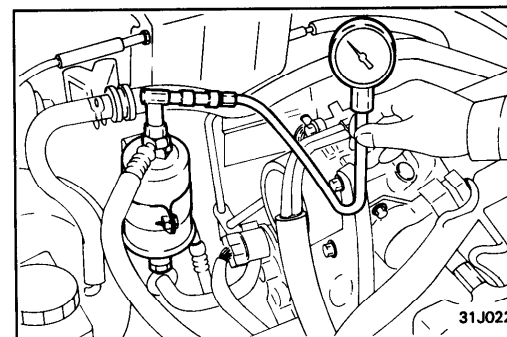
6. Disconnect the vacuum hose from the pressure regulator, and plug the hose end. Measure the fuel pressure at idle.

Standard value
320-340 kPa (3.26-3.47 kg/cm², 46-49 psi)



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

Standard value
Approx. 270 kPa (2.75 kg/cm², 39 psi)



8. If the results of the measurements made in steps (6) and (7) are not within the standard value, use the table next page to determine the probable cause, and make the necessary repairs.

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

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

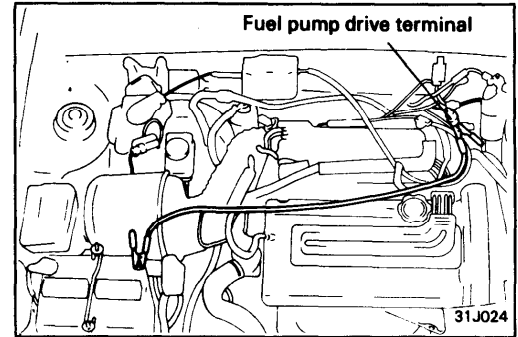
Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	a. Injector leakage	a. Replace injector
Fuel pressure drops immediately after engine is stopped	a. The check valve within the fuel pump is open	a. Replace fuel pump

10. Reduce the fuel pressure in the fuel line.
 11. Disconnect the high pressure hose and remove the fuel pressure gauge from the fuel filter.

CAUTION

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

12. Install a new O-ring in the groove at the end of the high-pressure hose.
13. Connect the high pressure fuel nose to the fuel filter, and tighten the screws to the specified torque.
14. Check for fuel leaks.
 - o Apply battery voltage to the fuel pump drive terminal to operate the fuel pump.
 - o With pressure, check the fuel line for leaks.



EGR Valve Control Vacuum Check

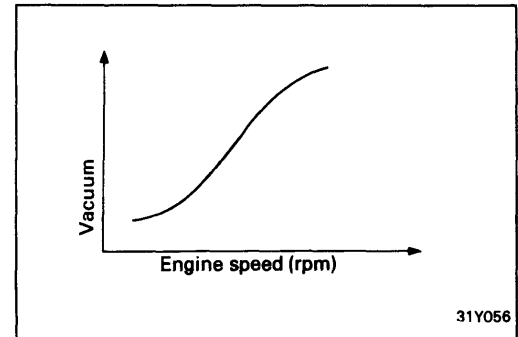
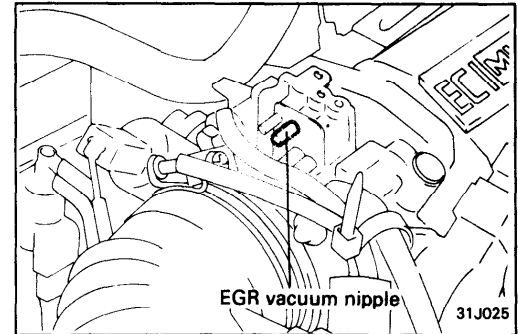
Checking Condition

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

1. Disconnect the vacuum hose from the throttle body EGR vacuum fitting and connect a hand vacuum pump to the fitting.
2. Start the engine and check to see that, after increasing the engine speed, vacuum raises proportionately to engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body port may be restricted and require cleaning.



Purge Port Vacuum Check

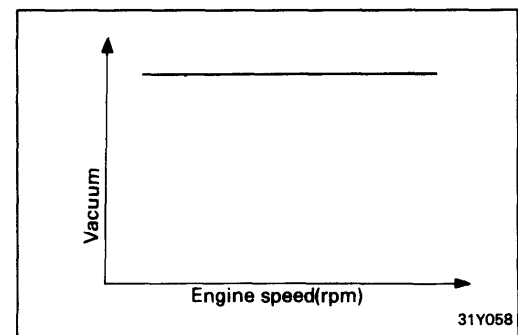
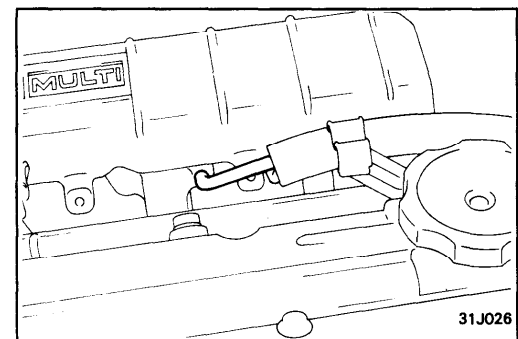
Checking Condition

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

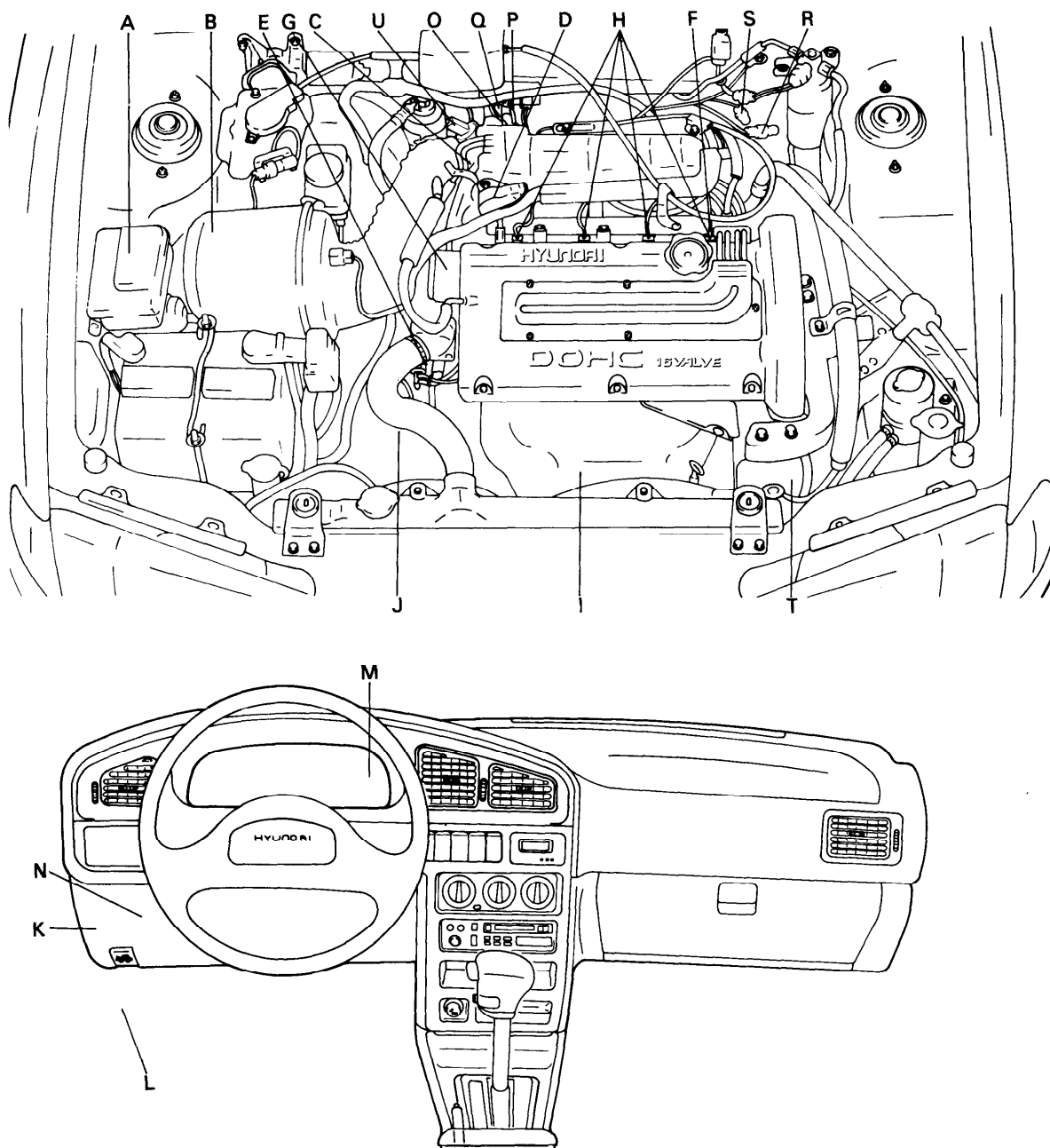
1. Disconnect the vacuum hose from the throttle body purge hose fitting and connect a vacuum pump.
2. Start the engine and check to see that, after increasing the engine speed, vacuum remains fairly constant.

NOTE

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

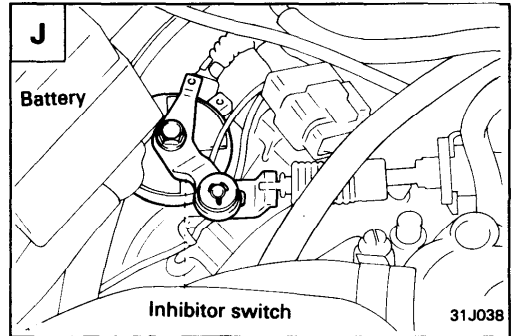
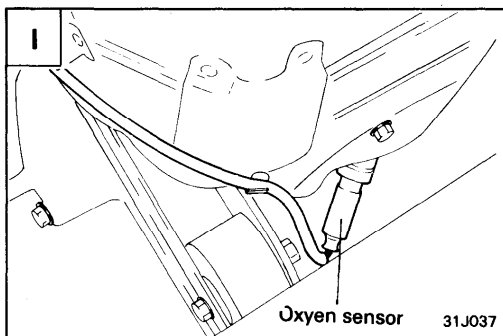
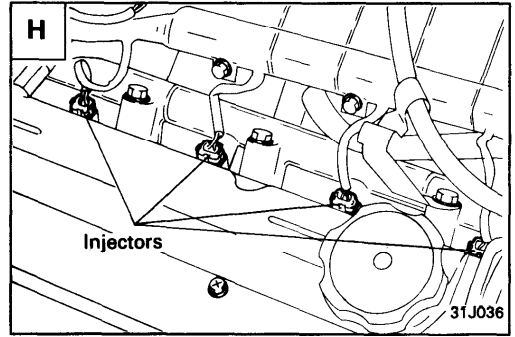
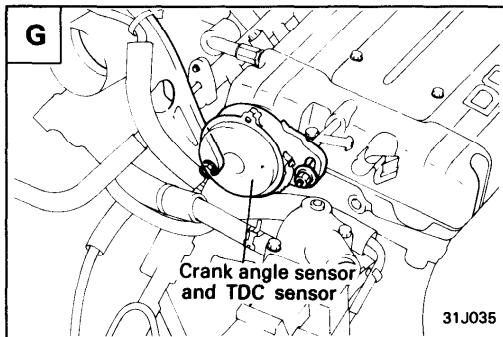
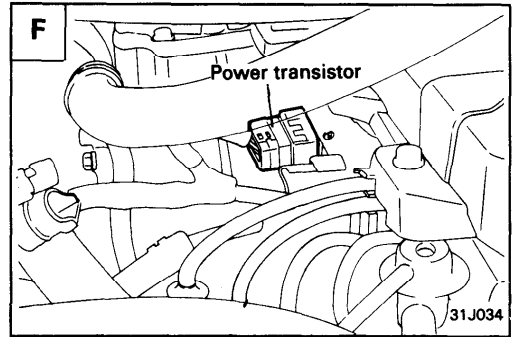
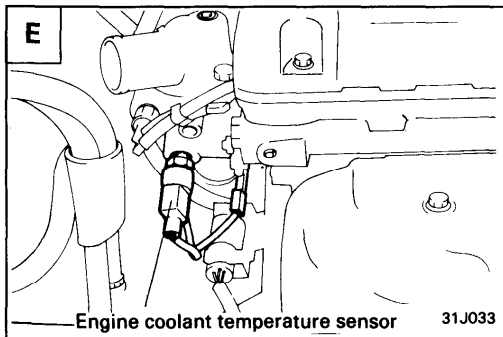
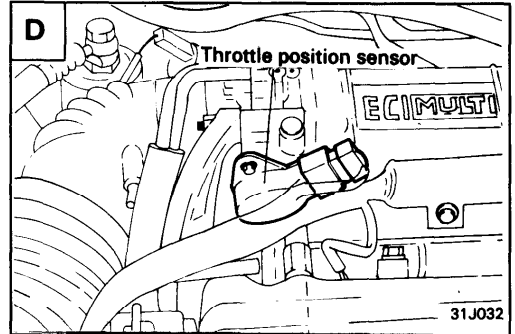
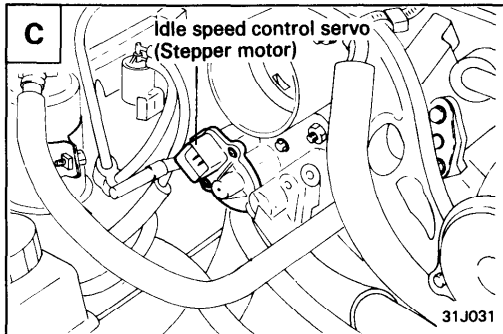
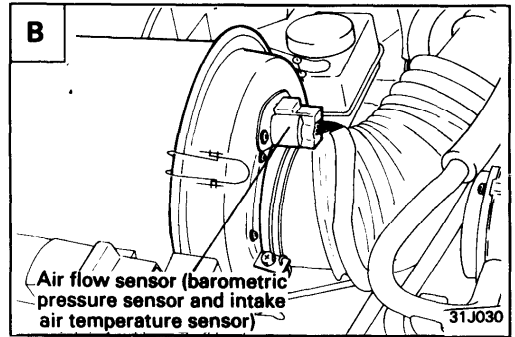
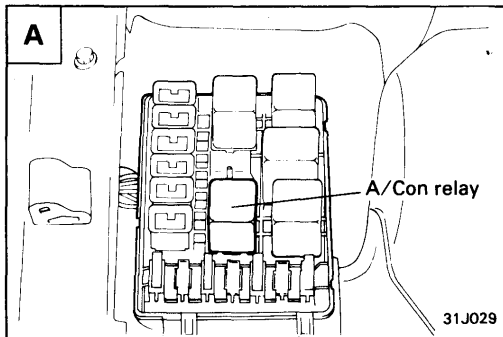


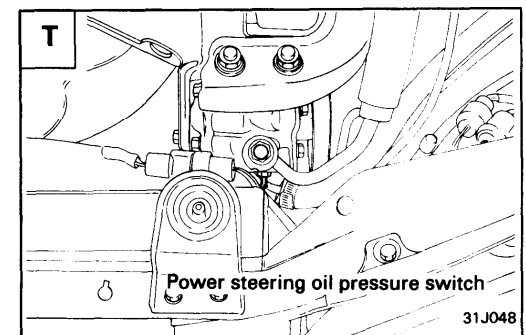
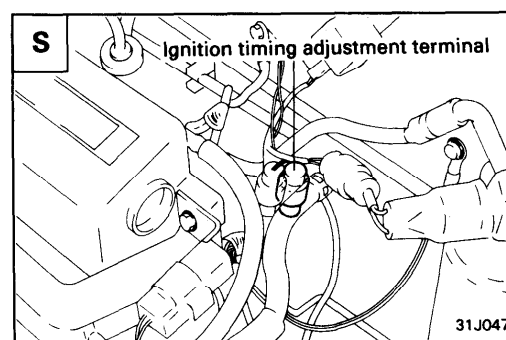
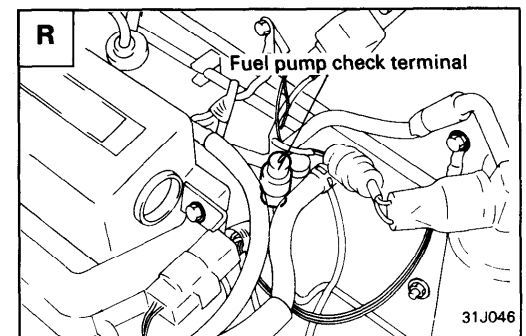
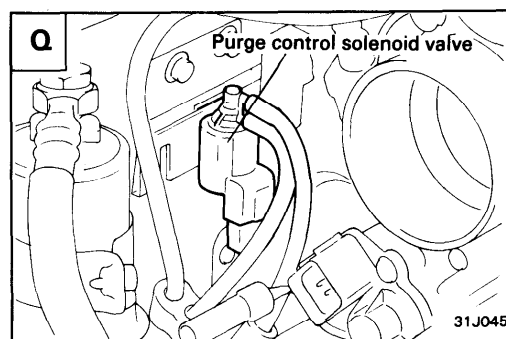
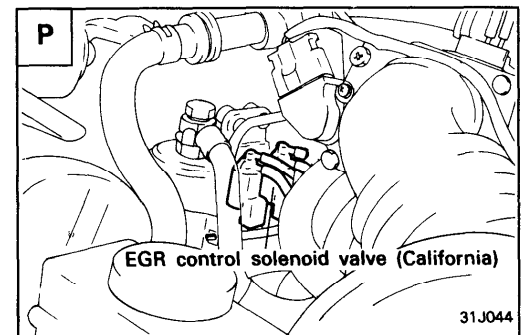
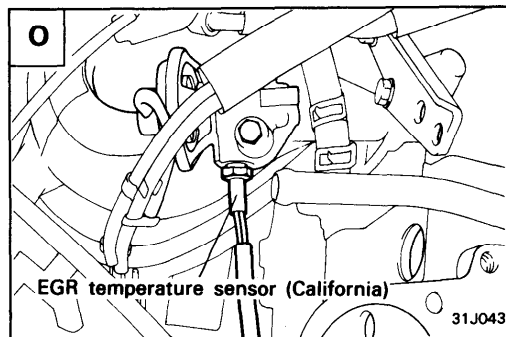
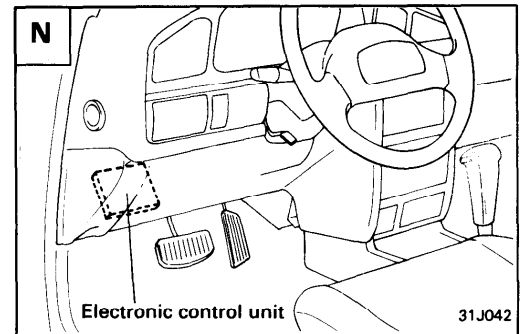
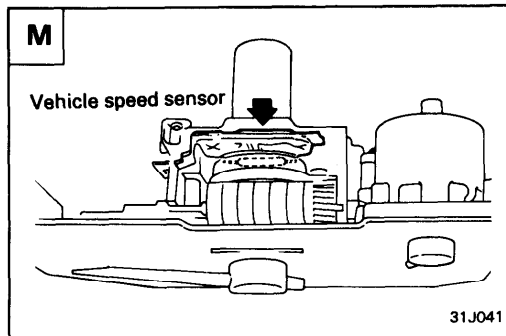
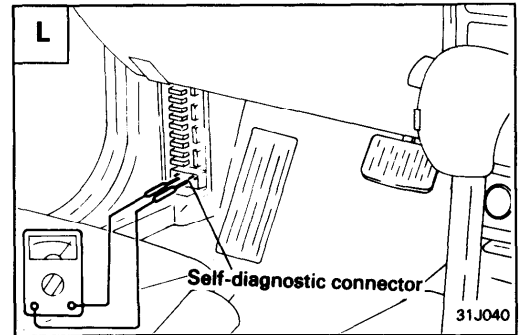
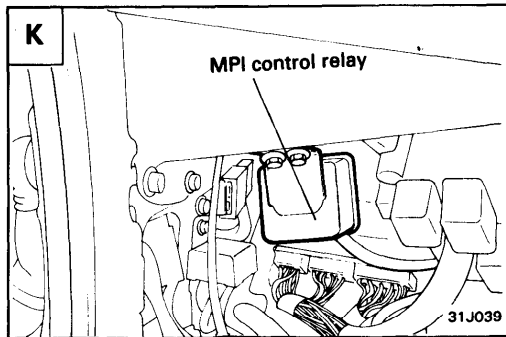
LOCATION OF MPI COMPONENTS

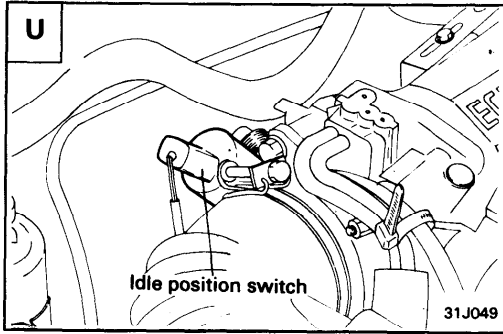


- A. Air conditioner relay
- B. Air flow sensor (Including intake air temp sensor and barometric pressure sensor)
- C. ISC servo (Stepper motor)
- D. Throttle position sensor (TPS)
- E. Coolant temperature sensor
- F. Power transistor
- G. Crank angle sensor and TDC sensor
- H. Injectors
- I. Oxygen sensor
- J. Inhibitor (A/T)

- K. MPI control relay
- L. Self diagnostic connector
- M. Vehicle speed sensor
- N. Electronic control unit (ECU)
- O. EGR temperature sensor (California)
- P. EGR control solenoid valve (California)
- Q. Purge control solenoid valve
- R. Fuel pump check terminal
- S. Ignition timing adjustment terminal
- T. Power steering oil pressure switch
- U. Idle position switch





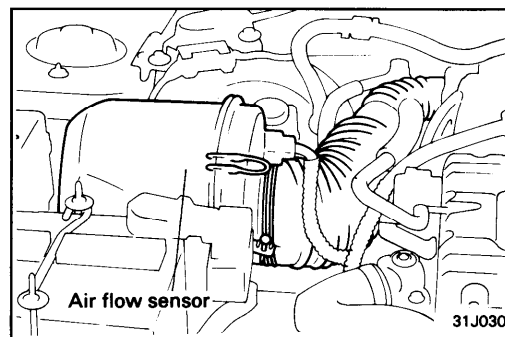


MPI COMPONENTS INSPECTION

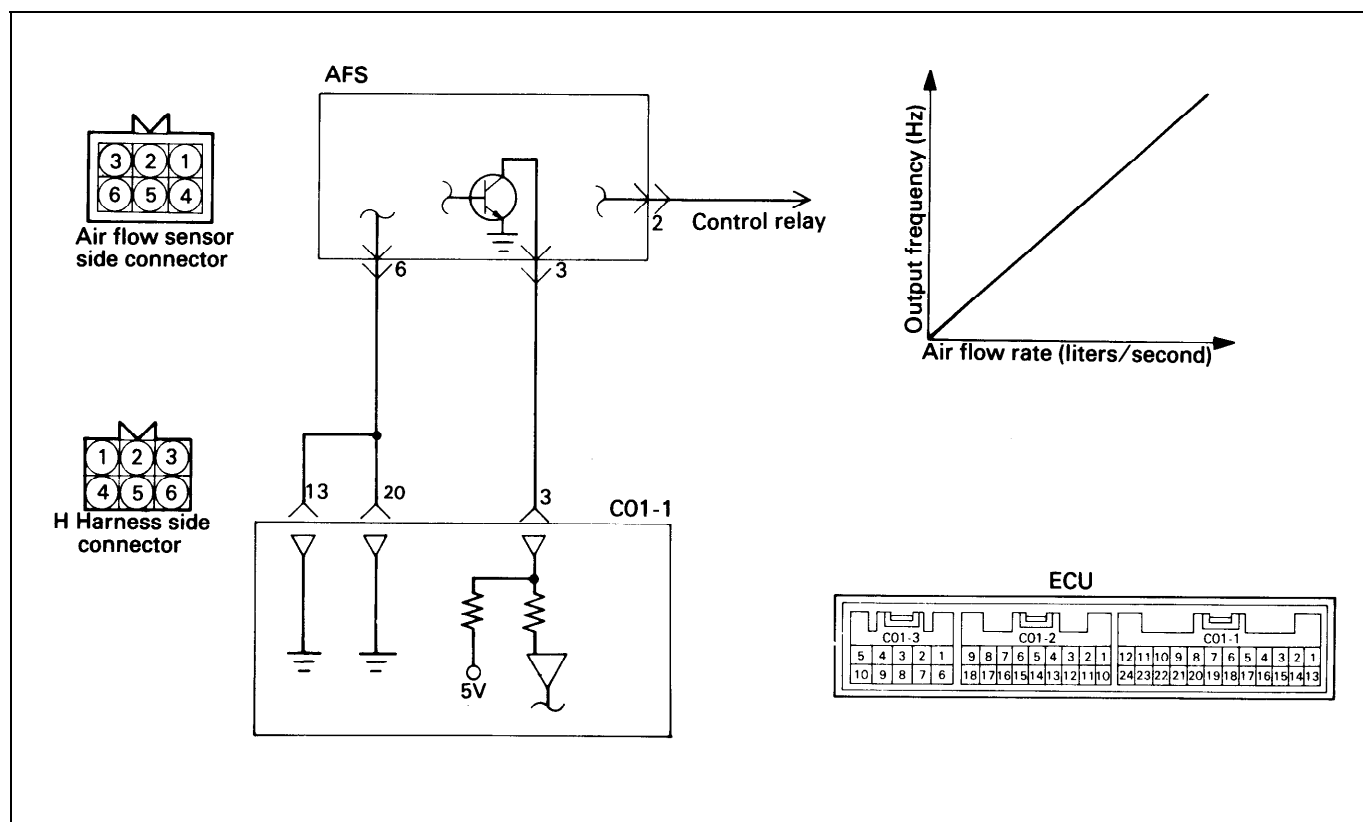
AIR FLOW SENSOR (AFS)

The AFS measures the intake air volume. It makes use of a Karman vortex to detect the air flow rate and sends it to the ECU as the intake air volume signal.

The ECU uses this intake air volume signal to decide the basic fuel injection duration.



Circuit Diagram



Troubleshooting Hints

1. If the engine stalls occasionally, crank the engine and shake the AFS harness. If the engine stalls, check for the poor contact of the AFS connector.
2. If the AFS output frequency is other than 0 when the ignition switch is turned on (do not start the engine), Check for the faulty AFS or ECU.
3. If the engine can be idle even if the AFS output frequency is out of specification, check for the following conditions:
 - 1) Disturbed air flow in the AFS.
Disconnected air duct, clogged air cleaner element.
 - 2) Poor combustion in the cylinder.
Faulty ignition plug, ignition coil, injector, incorrect compression.
 - 3) Air leaks in the intake manifold.
 - 4) Loose EGR valve seat.

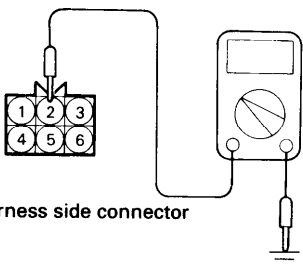
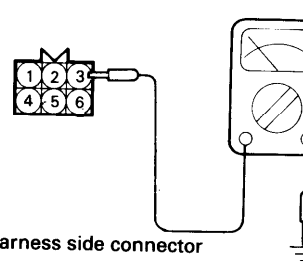
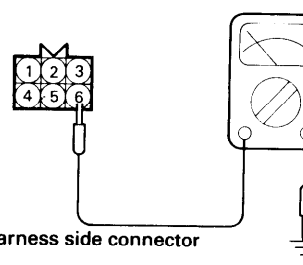
Using Multi-use Tester

Check Item	Data display	Check conditions	Engine state	Test specification
Air flow sensor o Service data o Item No. 12	Sensor air volume (frequency)	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral	750 rpm (Idle)	27-33 Hz
			2,000 rpm	60-80 Hz
			Racing	Frequency increases with racing

NOTE

When the vehicle is new [within initial operation of about 500 km (300 miles)], the air flow sensor output frequency may be about 10% higher.

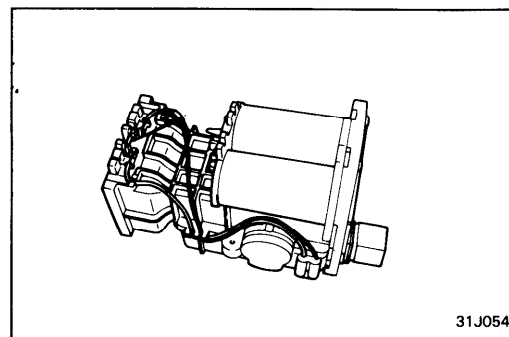
Harness Inspection Procedures

1  H Harness side connector	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage (V): SV	OK → 2 NG → Repair the harness (H2 - Control relay) or check the control relay.
2  H Harness side connector	Measure the terminal voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8-5.2V	OK → 3 NG → Repair the harness. (H 3 - C01-1 3)
3  H Harness side connector	Check for continuity of the ground circuit. o Connector: Disconnected	OK → END! NG → Repair the harness. (H 6 - C01-1 20, 13)

BAROMETRIC PRESSURE SENSOR

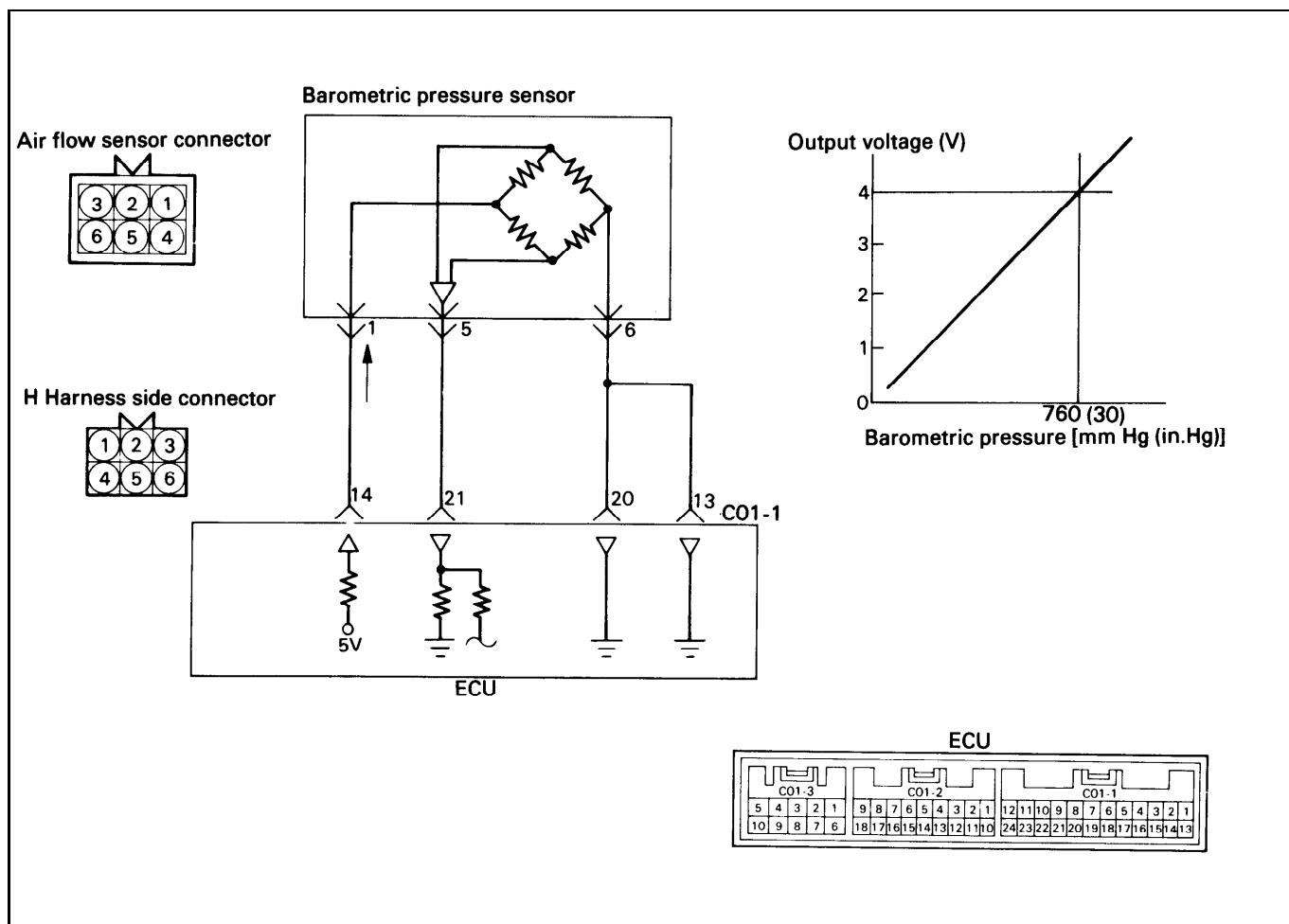
The barometric pressure sensor installed on the AFS senses the barometric pressure and converts it into a voltage which is sent to the ECU.

The ECU uses this signal to compute the altitude at which the vehicle is running and corrects the air-fuel ratio and the ignition timing, thus improving driveability at high altitude.



31J054

Circuit Diagram



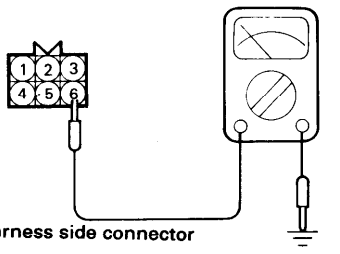
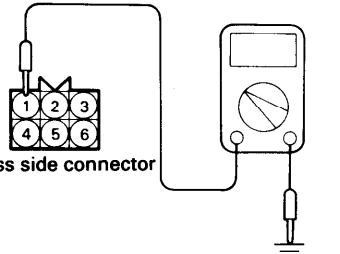
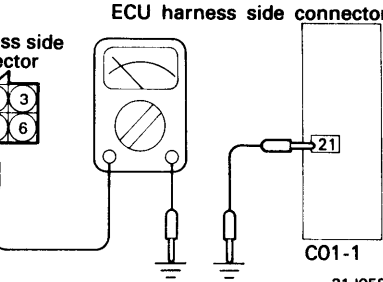
Troubleshooting Hints

1. If the barometric pressure sensor is faulty, the vehicle will experience poor driveability
2. If the pressure of the barometric pressure sensor drops greatly during high speed driving, check the air cleaner for clogging.

Using Multi-use Tester

Check Item	Data display	Check conditions	Altitude	Test specification
Barometric pressure sensor o Service data o Item No. 25	Sensor pressure	Ignition switch: ON	When 0 m (0 ft.)	760 mmHg
			When 600 m (1,969 ft.)	710 mmHg
			When 1,200 m (3,937 ft.)	660 mmHg
			When 1,800 m (5,906 ft.)	610 mmHg

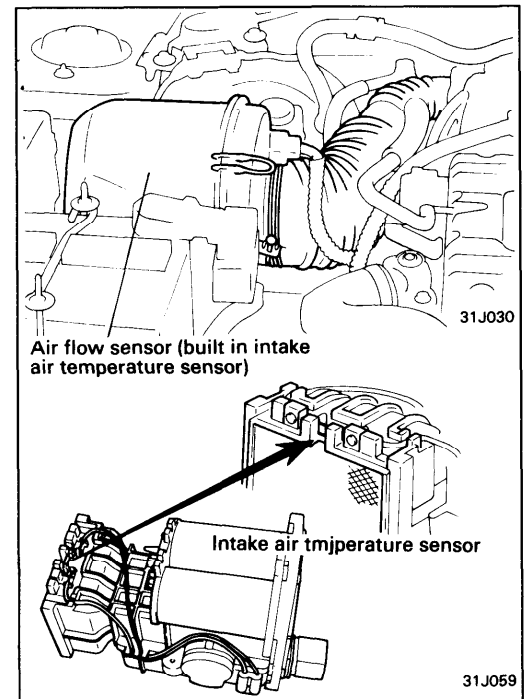
Harness Inspection Procedures

1  H Harness side connector	Check for continuity of the ground circuit. o Connector: Disconnected OK → NG →	2 Repair the harness (H 6 — C01-1 20 , 13)
2  H Harness side connector	Measure the power supply voltage of the barometric pressure sensor. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8-5.2V OK → NG →	3 Repair the harness. (H 1 — C01-1 14)
3  H Harness side connector ECU harness side connector C01-1 31J058	Check for an open-circuit, or a short-circuit to ground between the engine control unit and the barometric pressure sensor. o Air flow sensor connector: Disconnected o Engine control unit connector: Disconnected OK → NG →	END! Repair the harness. (H 5 — C01-1 21)

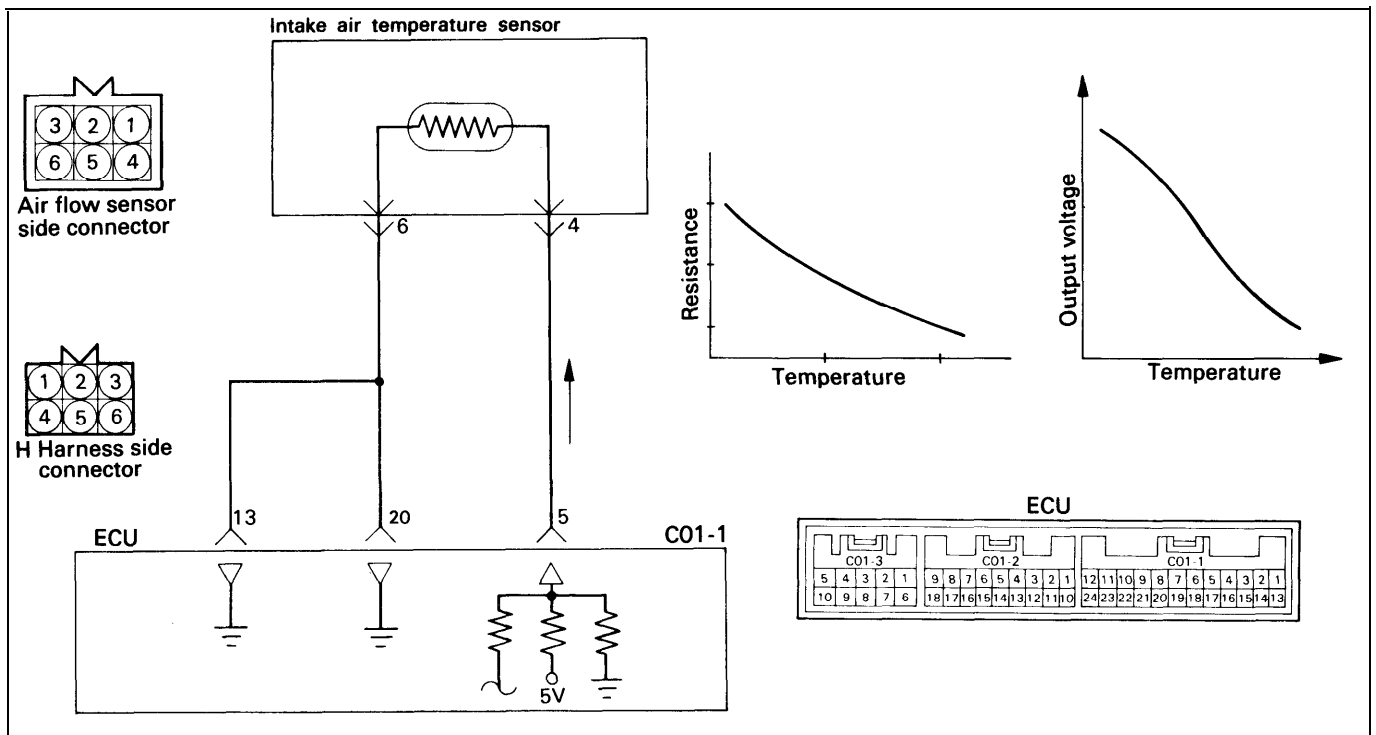
INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor, located at the illustrated position on AFS, is a resistor-based sensor for detecting the intake air temperature.

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



Circuit Diagram



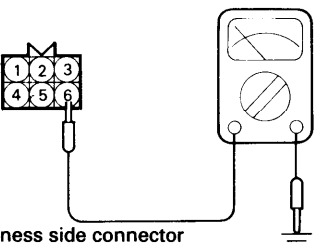
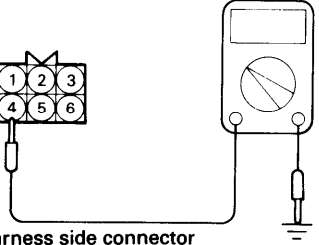
Troubleshooting Hints

The intake air temperature sensor senses the intake air temperature in the air cleaner to indicate a temperature different from outside temperature.

Using Multi-use Tester

Check Item	Data display	Check conditions	Intake air temperature	Test specification
Intake air temperature sensor o Service data o Item No. 13	Sensor temperature	Ignition switch: ON or engine running	When -20°C (-4°F)	-20°C
			When 0°C (32°F)	0°C
			When 20°C (68°F)	20°C
			When 40°C (104°F)	40°C
			When 80°C (176°F)	80°C

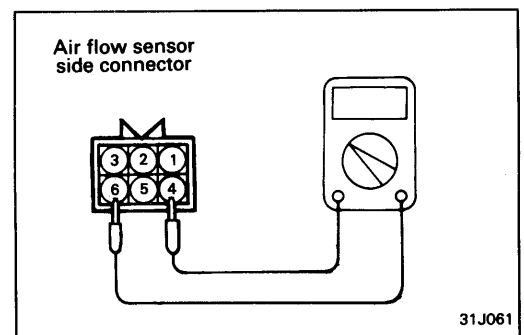
Harness Inspection Procedures

<div>1</div>  <p>H Harness side connector</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<div>2</div> <p>Repair the harness (H 6 - C01-1 20, 13)</p>
<div>2</div>  <p>H Harness side connector</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.5-4.9V <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 4 - C01-1 15)</p>

Sensor Inspection

1. Disconnect the air flow sensor connectors.
2. Measure resistance between terminals 4 and 6.

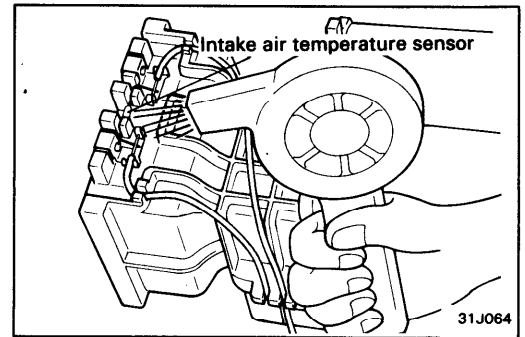
Temperature [°C (°F)]	Resistance (KΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4



3. Measure resistance while heating the sensor using a hair drier.

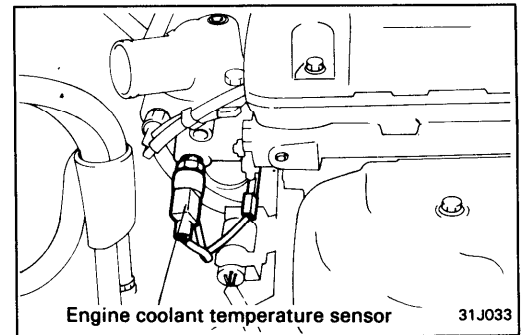
Temperature [°C (°F)]	Resistance (K Ω)
Higher	Smaller

4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

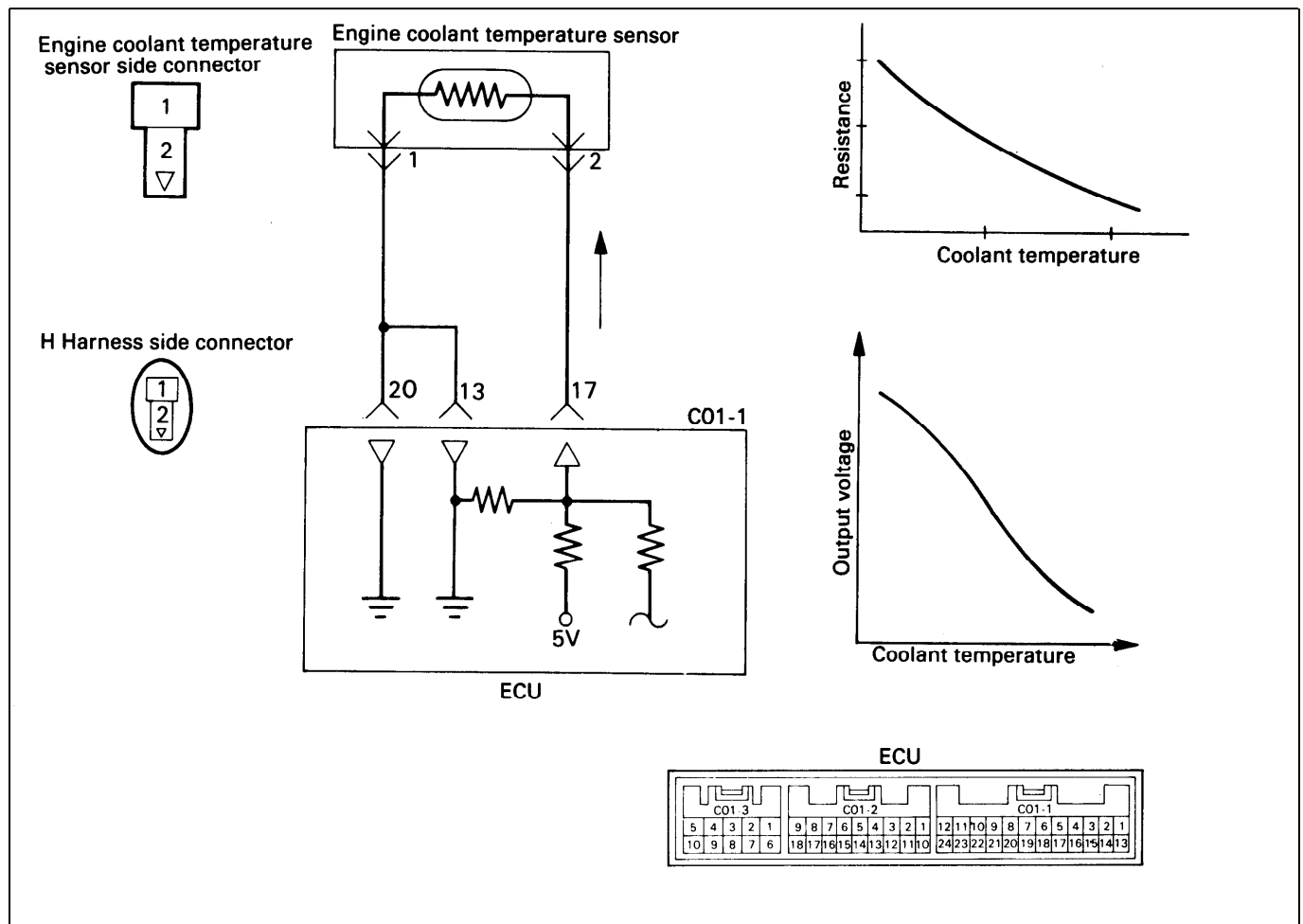


ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor is installed in the engine coolant passage of the cylinder head. The ECU judges engine temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



Circuit Diagram



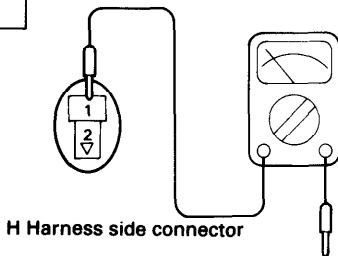
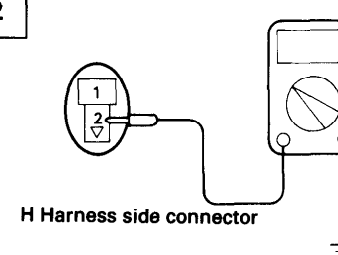
Troubleshooting Hints

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 causes.

Using Multi-use Tester

Check Item	Data display	Check conditions	Coolant temperature	Test specification
Engine coolant temperature sensor o Service data o Item No. 21	Sensor temperature	Ignition switch: ON or engine running	When -20°C (-4°F)	-20°C
			When 0°C (32°F)	0°C
			When 20°C (68°F)	20°C
			When 40°C (104°F)	40°C
			When 80°C (176°F)	80°C

Harness Inspection Procedures

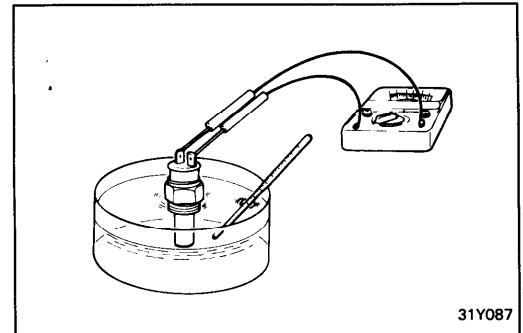
<div>1</div>  <p>H Harness side connector</p> <p>31J066</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<div>2</div> <p>Repair the harness (H 1 — C01-120 , 13)</p>
<div>2</div>  <p>H Harness side connector</p> <p>31J067</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.5—4.9V <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 2 — C01-117)</p>

Sensor Inspection

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

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

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



31Y087

Installation

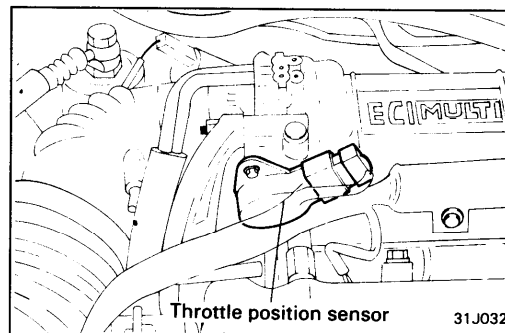
1. Apply sealant LOCTITE 962T or equivalent to threaded portion.
2. Install engine coolant temperature sensor and tighten it to specified torque.

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

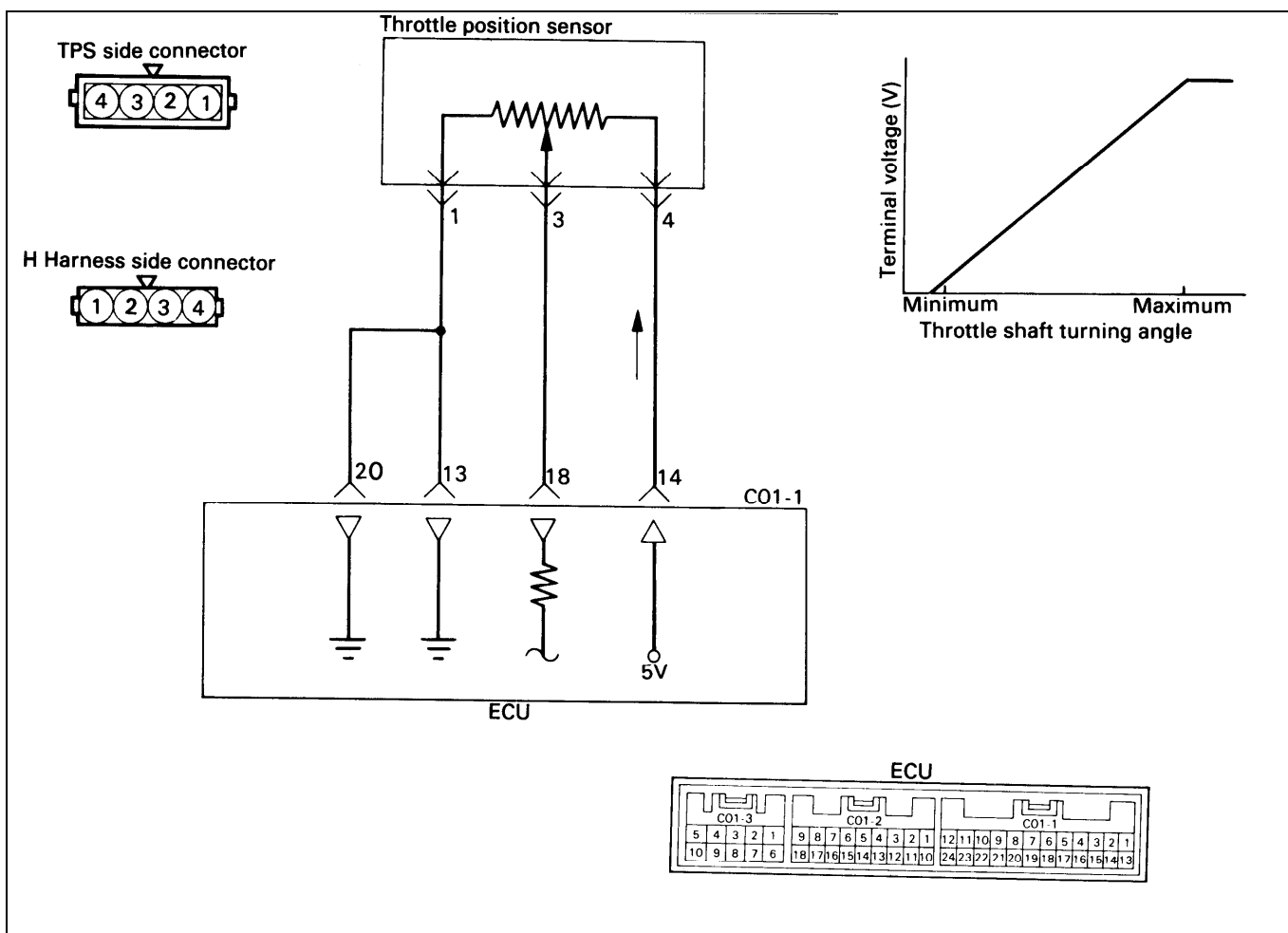
3. Connect the harness connector securely.

THROTTLE POSITION SENSOR (TPS)

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



Circuit Diagram



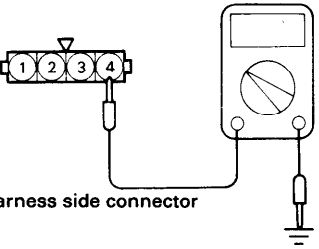
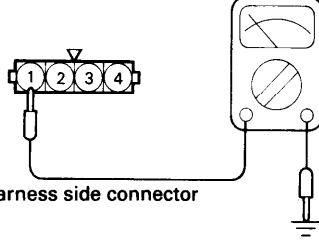
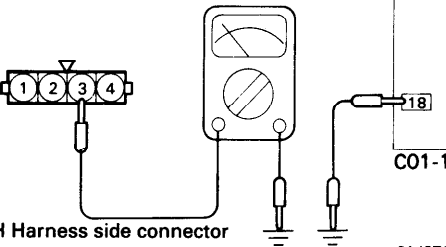
Troubleshooting Hints

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

Using Multi-use Tester

Check Item	Data display	Check conditions	Throttle valve	Test specification
Throttle position sensor o Service data o Item No. 14	Sensor voltage	Ignition switch: ON	At idle position	450-550 mV
			Open slowly	Increases with valve opening
			Open widely	4,500-5,500 mV

Harness Inspection Procedures

<p>1</p>  <p>H Harness side connector</p> <p>31J069</p>	<p>Measure the power supply voltage of the barometric pressure sensor.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8—5.2V <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness (H 4 — C01-14)</p>
<p>2</p>  <p>H Harness side connector</p> <p>31J070</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>3</p> <p>Repair the harness. (H 1 — C01-20 , 13)</p>
<p>3</p>  <p>ECU harness side connector</p> <p>H Harness side connector</p> <p>C01-1</p> <p>31J071</p>	<p>Check for an open-circuit, or a short-circuit to ground between the engine control unit and the barometric pressure sensor.</p> <ul style="list-style-type: none"> o Throttle position sensor connector: Disconnected o Engine control unit connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 3 — C01-18)</p>

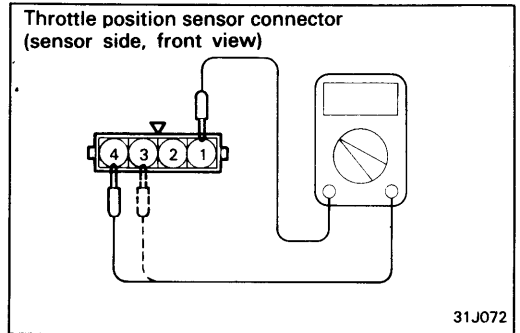
Sensor Inspection

1. Disconnect the throttle position sensor connector.
2. Measure resistance between terminal 1 (sensor ground) and terminal 4 (sensor power).

Standard value: 3.5-6.5 $k\Omega$

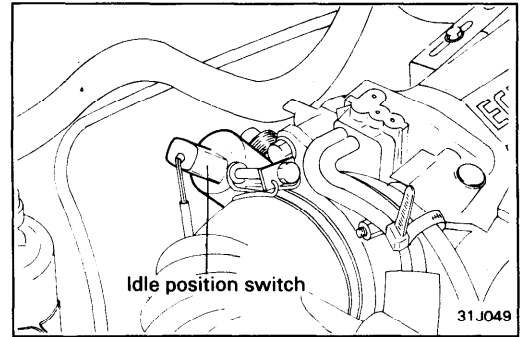
3. Connect a pointer type ohmmeter between terminal 1 (sensor ground) and terminal 3 (sensor output).
4. Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

TPS tightening torque
1.5-2.5 Nm (15-25 kg.cm, 1.1-1.8 lb.ft)

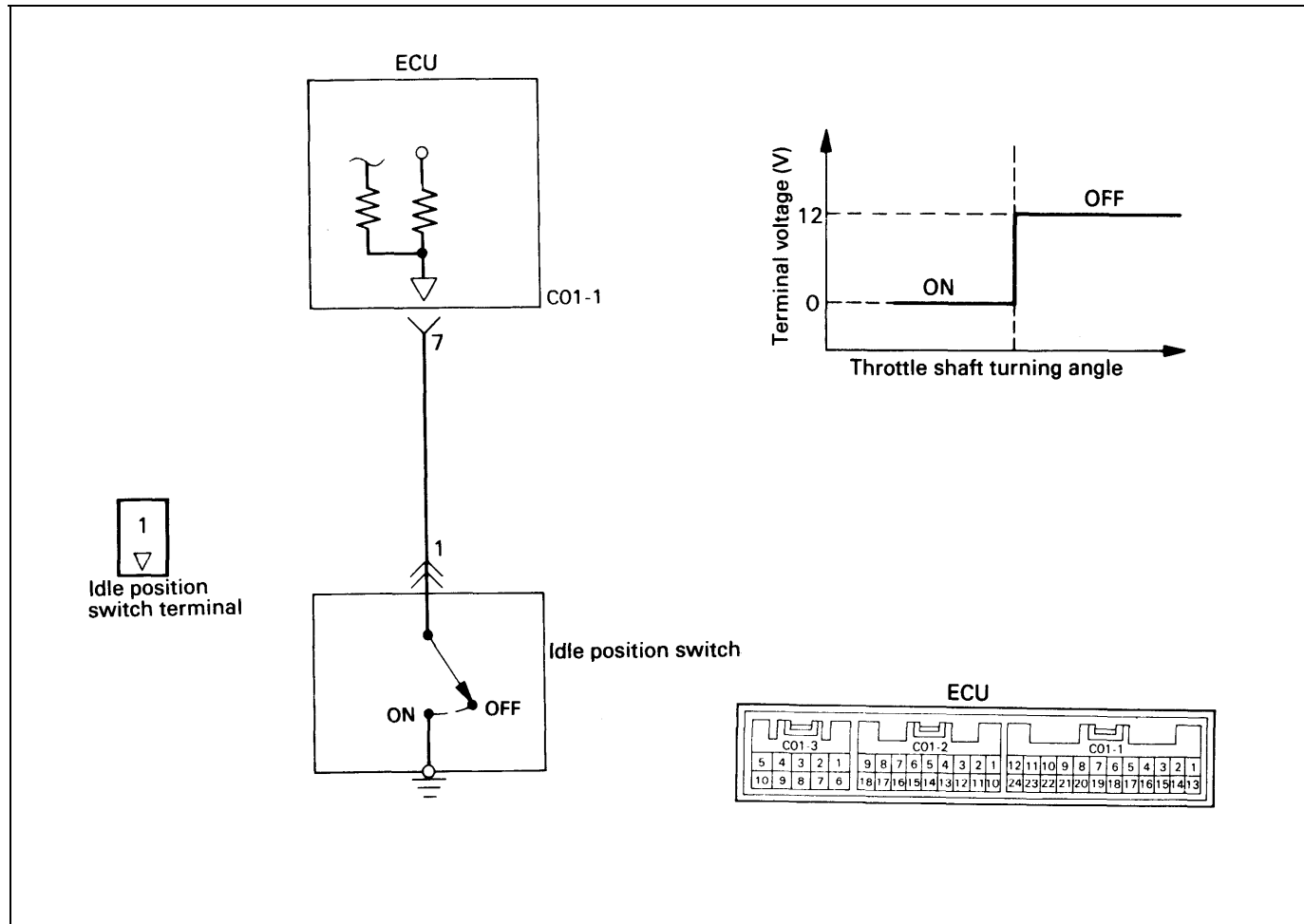


IDLE POSITION SWITCH

The idle switch, which is a contact type switch, senses accelerator operation.



Circuit Diagram



Troubleshooting Hints

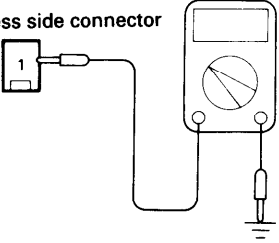
If the idle position switch harness is OK, but the idle position switch output is abnormal, check for the following items.

1. Poorly adjusted accelerator cable or auto-cruise control cable.
2. Poorly adjusted **idle position switch** (fixed SAS).

Using Multi-use Tester

Check Item	Data display	Check condition	Throttle valve	Normal indication
Idle position switch o Service data o Item No. 26	Switch state	Ignition switch: ON (check by operating accelerator pedal repeatedly)	At idle position	ON
			Open a little	OFF

Harness Inspection Procedure

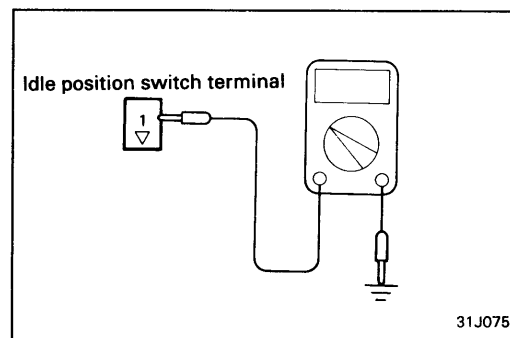
<div data-bbox="188 623 212 655" data-label="Text">1</div> <div data-bbox="188 676 427 697" data-label="Text">H Harness side connector</div>  <div data-bbox="587 921 643 942" data-label="Text">31J074</div>	<div data-bbox="675 623 1121 687" data-label="Text">Measure the power supply voltage of the idle position switch.</div> <div data-bbox="675 697 1002 793" data-label="List-Group"> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4V or more </div> <div data-bbox="1161 687 1313 729" data-label="Text">OK →</div> <div data-bbox="1161 836 1313 878" data-label="Text">NG →</div>	<div data-bbox="1337 687 1433 729" data-label="Text">END!</div> <div data-bbox="1337 783 1520 921" data-label="Text"> Repair the harness. (H 1 — C01-1 7) </div>
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Sensor Inspection

1. Disconnect the idle position switch connector.
2. Check the continuity between terminal 1 and sensor ground.

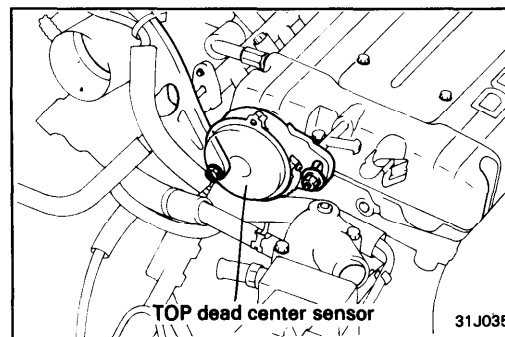
Accelerator pedal	Continuity
Depressed	Non-conductive ($\infty\Omega$)
Released	Conductive (0Ω)

3. If out of specification, replace the idle position switch.

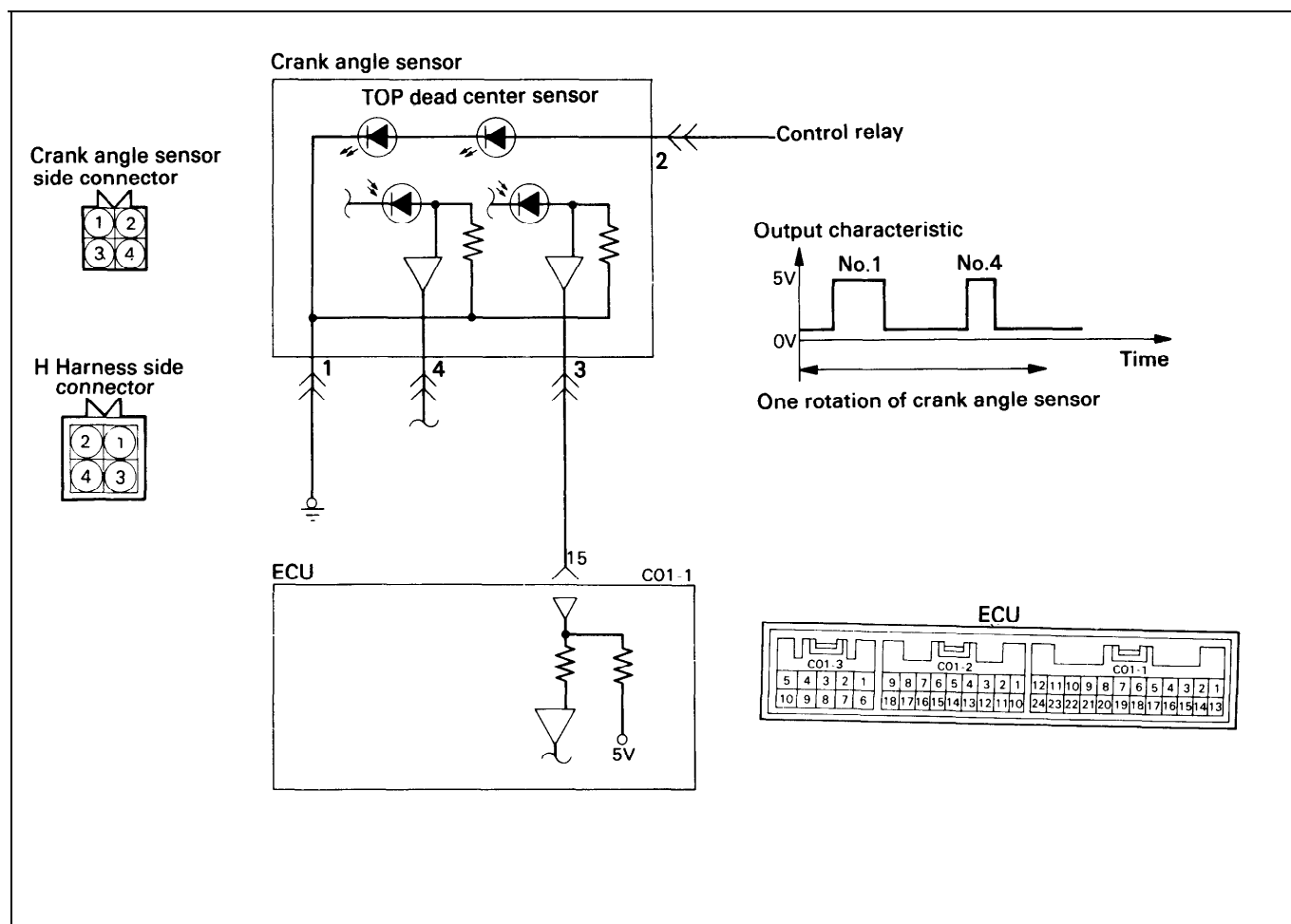


TOP DEAD CENTER (TDC) SENSOR

The TDC sensor senses the top dead center on compression stroke of the No. 1 and No. 4 cylinders, converts it into a pulse signal and inputs it to the ECU. The ECU then computes the fuel injection sequence, etc. based on the input signal.



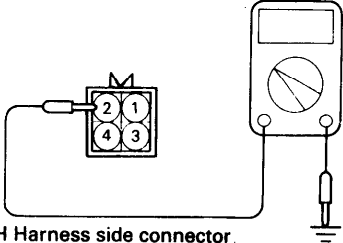
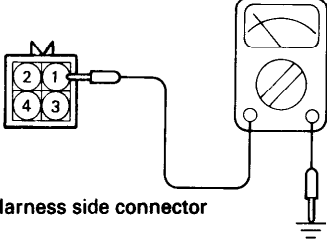
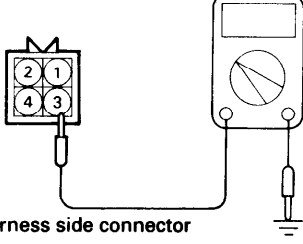
Circuit Diagram



Troubleshooting Hints

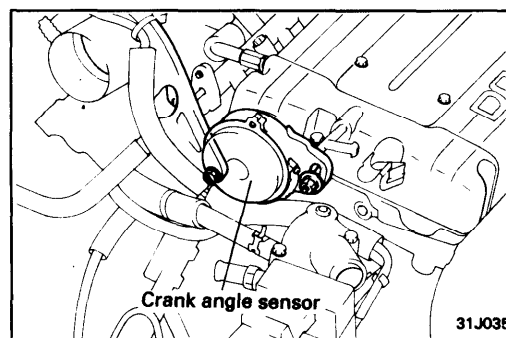
If the TDC sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

Harness Inspection Procedures

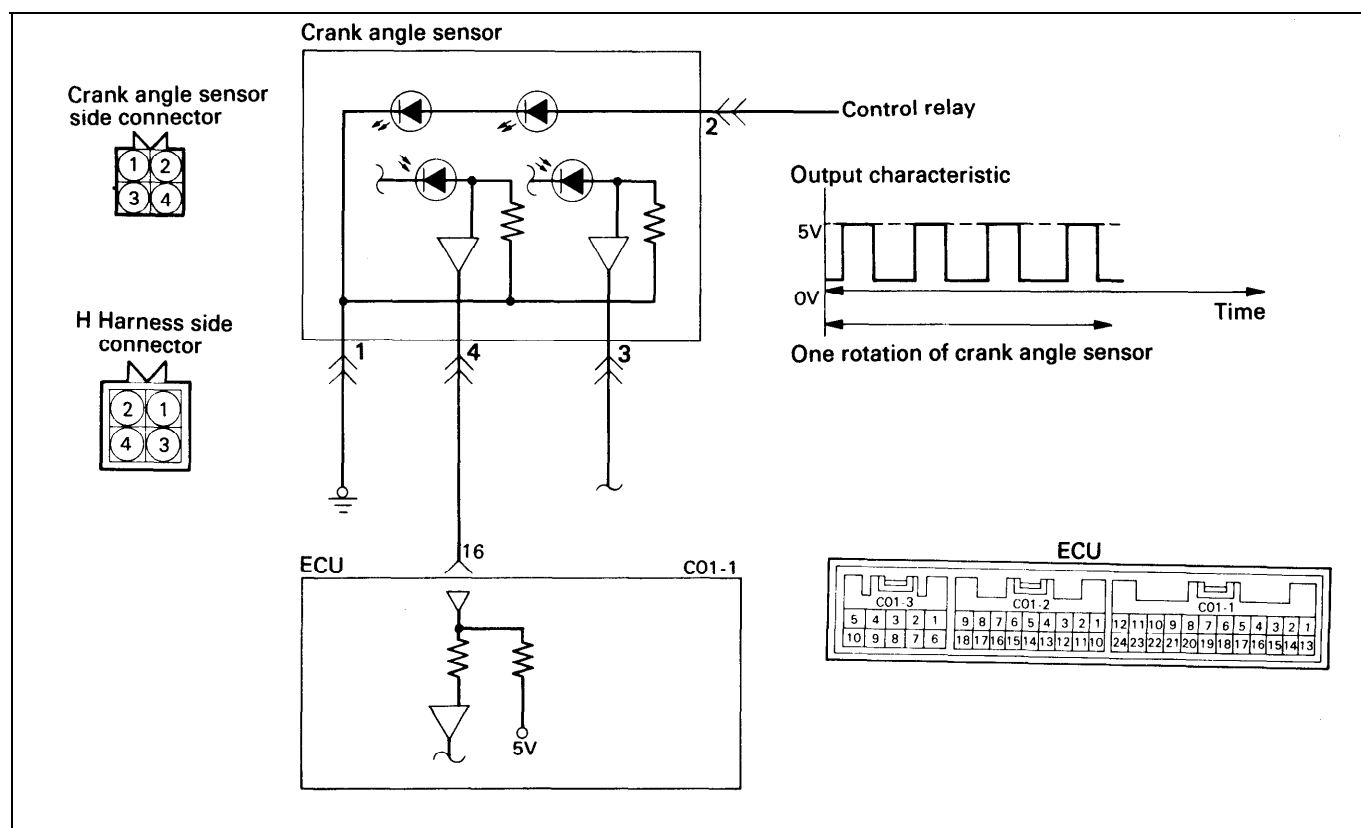
<div data-bbox="183 251 220 293">1</div>  <p>H Harness side connector.</p> <p>31J077</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): SV <p>OK →</p> <p>NG →</p>	<div data-bbox="1343 304 1407 368">2</div> <p>Repair the harness (H 2 — Control relay)</p>
<div data-bbox="183 623 220 666">2</div>  <p>H Harness side connector</p> <p>31J078</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<div data-bbox="1343 676 1407 740">3</div> <p>Repair the harness. (H 1 — Ground)</p>
<div data-bbox="183 995 220 1038">3</div>  <p>H Harness side connector</p> <p>31J079</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8—5.2V <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 3 — C01-15)</p>

CRANK ANGLE SENSOR

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



Circuit Diagram



Troubleshooting Hints

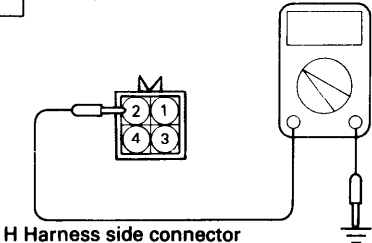
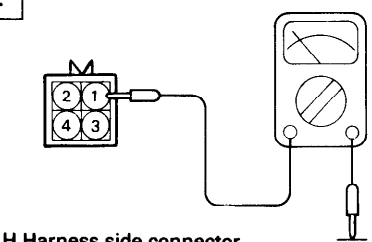
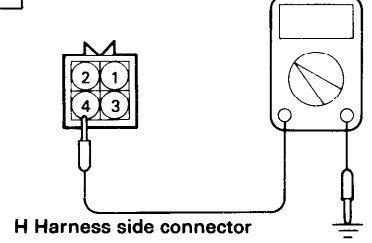
1. If unexpected shocks are felt during driving or the engine stalls suddenly, shake the crank angle sensor harness. If this causes the engine to stall, check for poor contact of the sensor connector.
2. If the tachometer reads 0 rpm when the engine is cranked, check for faulty crank angle sensor, broken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

Using Multi-use Tester

Check Item	Data display	Check condition	Check content	Normal state
Crank angle sensor o Service data o Item No. 22	Cranking speed	o Engine cranking o Tachometer connected (check on and off of primary current of ignition coil by tachometer)	Compare cranking speed and multi-use tester reading	Indicated speed agrees

Check Item	Data display	Check condition	Coolant temperature	Test specification
Crank angle sensor o Service data o Item No.22	Idle speed	o Engine: Running at idle o Idle position switch: ON	When -20°C (-4°F)	1,500—1,700 rpm
			When 0°C (32°F)	1,350—1,550 rpm
			When 20°C (68°F)	1,200—1,400 rpm
			When 40°C (104°F)	1,000—1,200 rpm
			When 80°C (176°F)	650—850 rpm

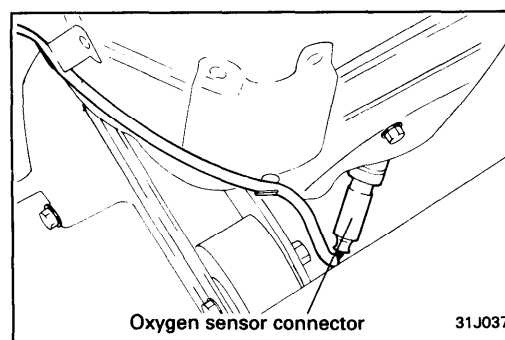
Harness Inspection Procedures

<p>1</p>  <p>H Harness side connector</p> <p>31J081</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): SV <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness (H 2 — Control relay)</p>
<p>2</p>  <p>H Harness side connector</p> <p>31J082</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>3</p> <p>Repair the harness. (H 1 — Ground)</p>
<p>3</p>  <p>H Harness side connector</p> <p>31J083</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8—5.2V <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 4 — C01-16)</p>

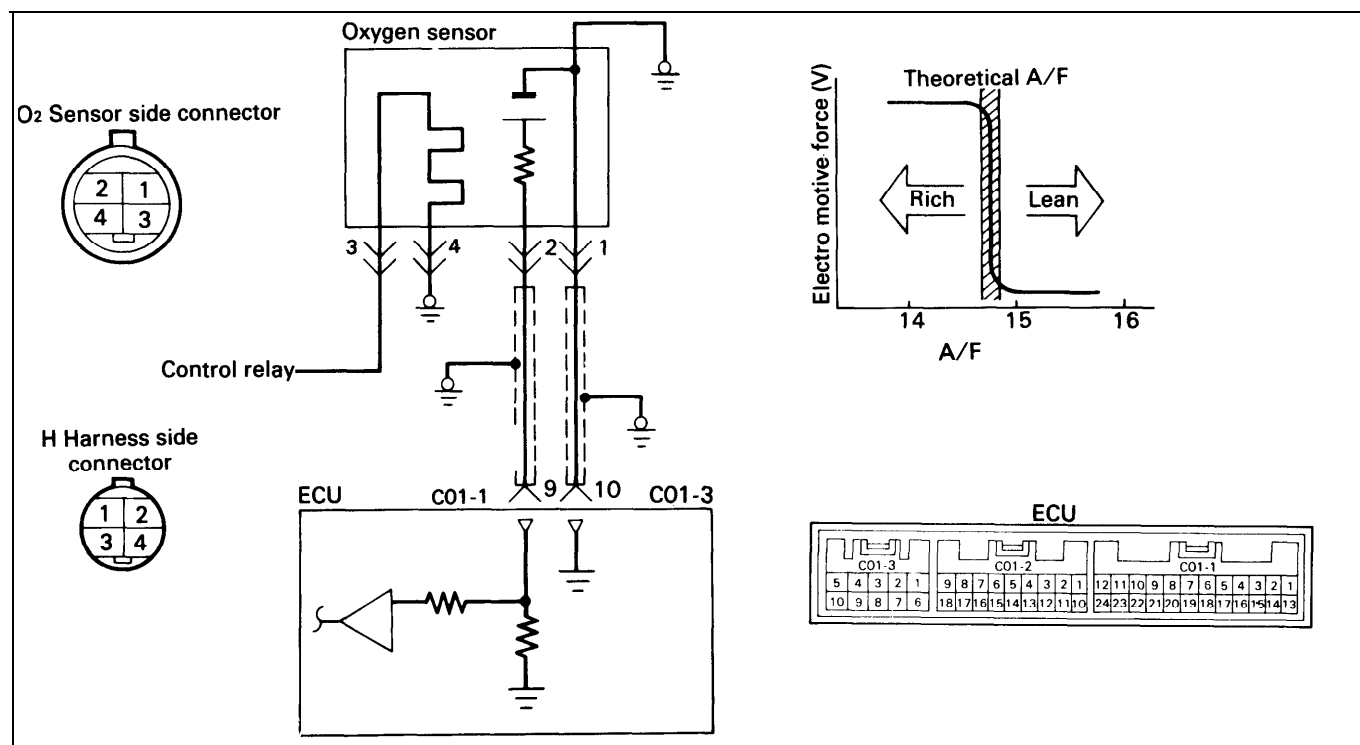
OXYGEN SENSOR

The oxygen sensor senses the oxygen concentration in exhaust gas, converts it into a voltage which is sent to the ECU. The oxygen sensor output about 1V when the air fuel ratio is richer than the theoretical ratio and output about 0V when the ratio is leaner (higher oxygen concentration in exhaust gas.).

The ECU 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 heater element which ensures the sensor performance during all driving conditions.



Circuit Diagram



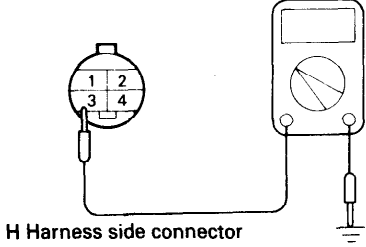
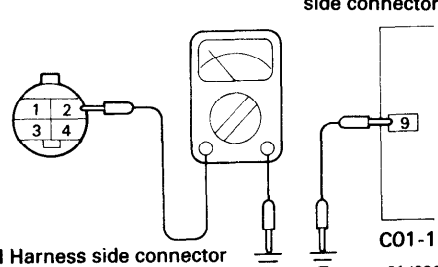
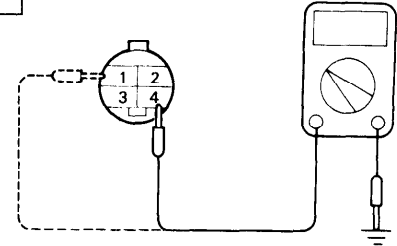
Troubleshooting Hints

1. If the oxygen sensor is defective abnormally high emissions may occur.
2. If the oxygen sensor check has resulted normal but the sensor output voltage is out of specification, check for the following items related to air fuel ratio control system.
 - 1) Faulty injector
 - 2) Air leaks in the intake manifold.
 - 3) Faulty air flow sensor, intake air temperature sensor, barometric pressure sensor, engine coolant temperature sensor.

Using Multi-use Tester

Check Item	Data display	Check condition	Engine state	Test specification
Oxygen sensor o Service data o Item No.11	Sensor voltage	Engine: Warm-up (make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	200 mV or lower
			When engine is suddenly raced	600-1,000 mV
		Engine: Warmed-up (using the oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control unit)	750 rpm (Idle)	400 mV or lower ↓ (changes)
			2,000 rpm	600-1,000 mV

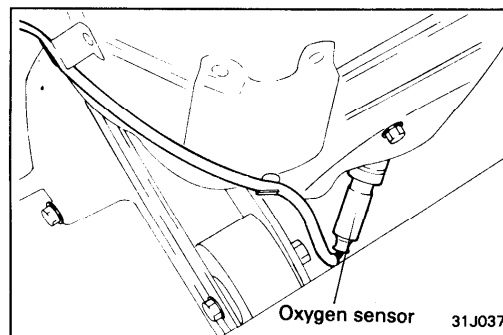
Harness Inspection Procedures

<p>1</p>  <p>H Harness side connector</p> <p>31J085</p>	<p>Measure the power supply voltage of the oxygen sensor.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness (H 3 — Control relay)</p>
<p>2</p>  <p>H Harness side connector</p> <p>ECU harness side connector</p> <p>C01-1</p> <p>31J086</p>	<p>Check for an open-circuit, or a short-circuit of ground between the engine control unit and the oxygen sensor.</p> <ul style="list-style-type: none"> o Oxygen sensor connector: Disconnected o ECU connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>3</p> <p>Repair the harness. (H 2 — C01-1 9)</p>
<p>3</p>  <p>H Harness side connector</p> <p>31J087</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 1 — C01-3 10) (H 4 — Ground)</p>

Sensor Inspection

NOTE

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



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

Standard value

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

2. Replace the oxygen sensor if there is a malfunction.
3. Using the special tool (09392-33000), apply battery voltage directly between terminal 3 and terminal 4.

NOTE

Take care when applying the voltage, because damage will result if the terminals are incorrect or are short-circuited.

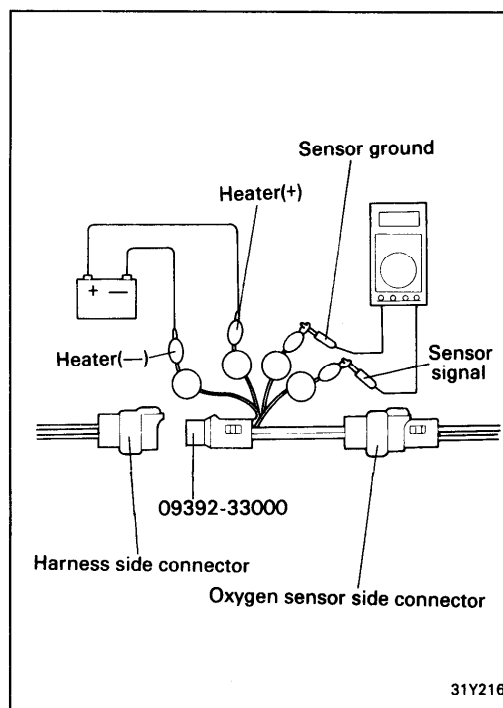
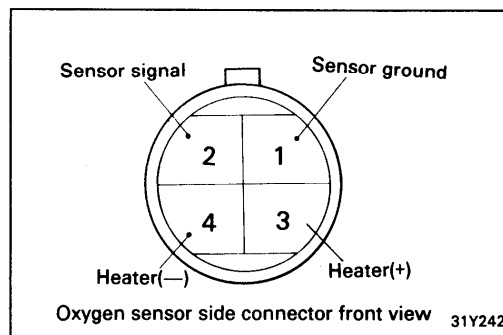
4. Connect a digital-type voltmeter between terminal 1 and terminal 2.
5. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Engine	Oxygen sensor output voltage	Remarks
Race	Min. 0.6V	Makes the air/fuel mixture rich by increased engine speed

6. If there is a problem, it is probable that there is a malfunction of the oxygen sensor.

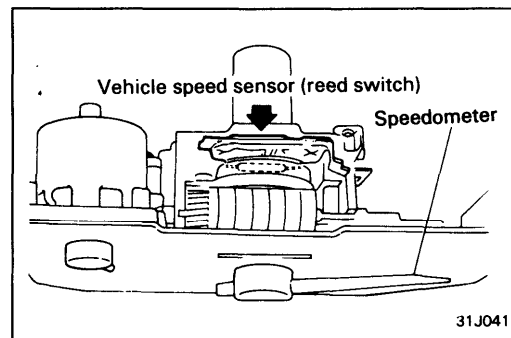
Tightening torque

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

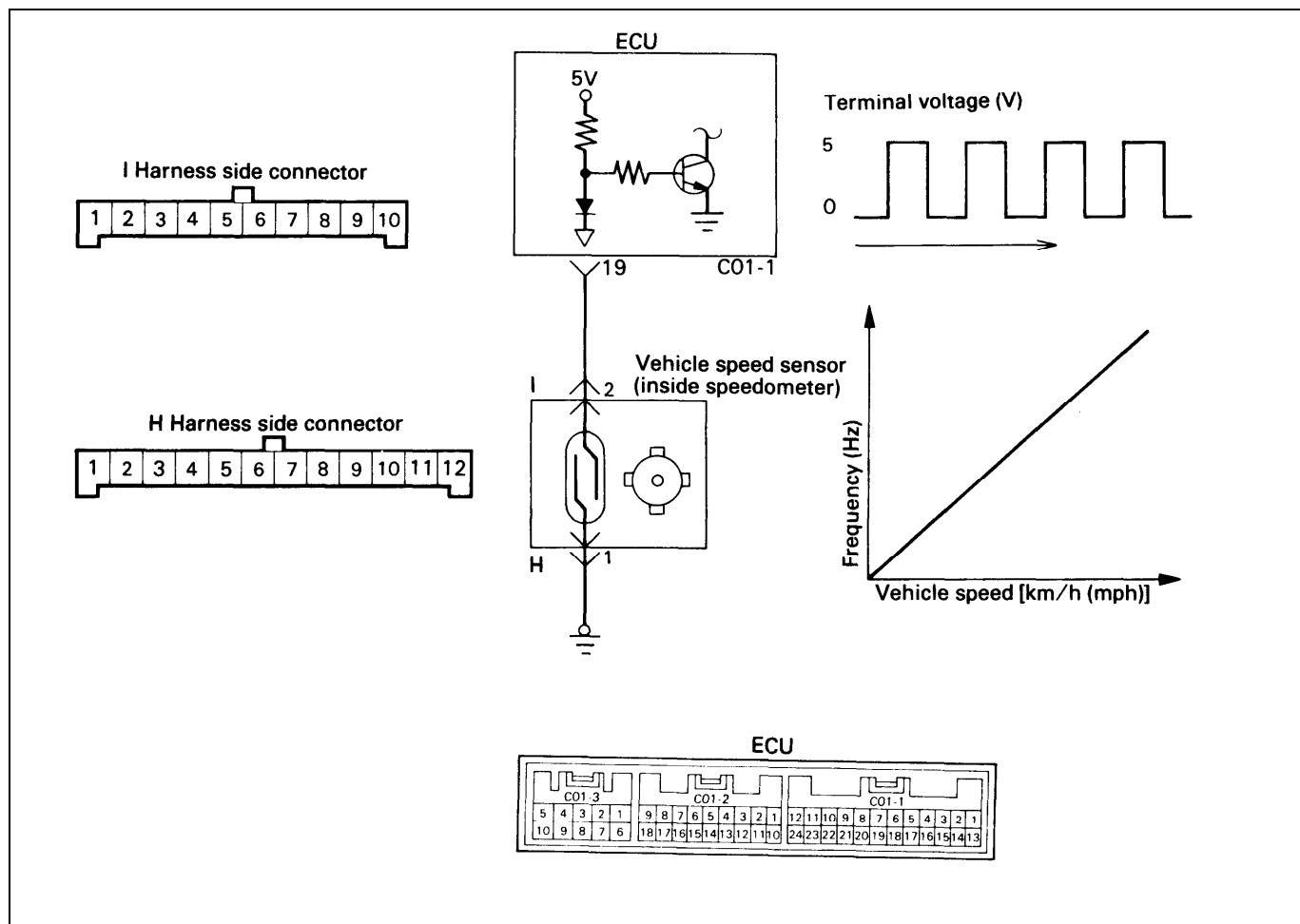


VEHICLE SPEED SENSOR

The vehicle speed sensor is a reed switch. The speed sensor is built into the speedometer and converts the transaxle gear revolutions into pulse signals, which are sent to the ECU.



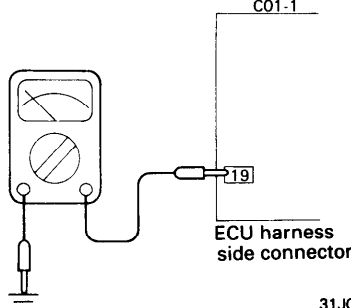
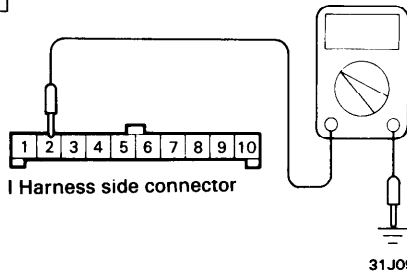
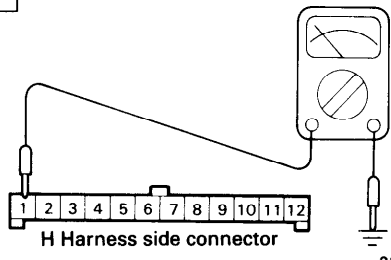
Circuit Diagram



Troubleshooting Hints

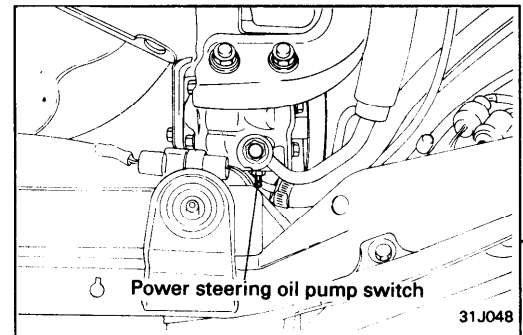
If there is an open or short circuit in the vehicle speed sensor signal circuit, the engine may stall when the vehicle is decelerated to stop.

HARNESS INSPECTION PROCEDURES

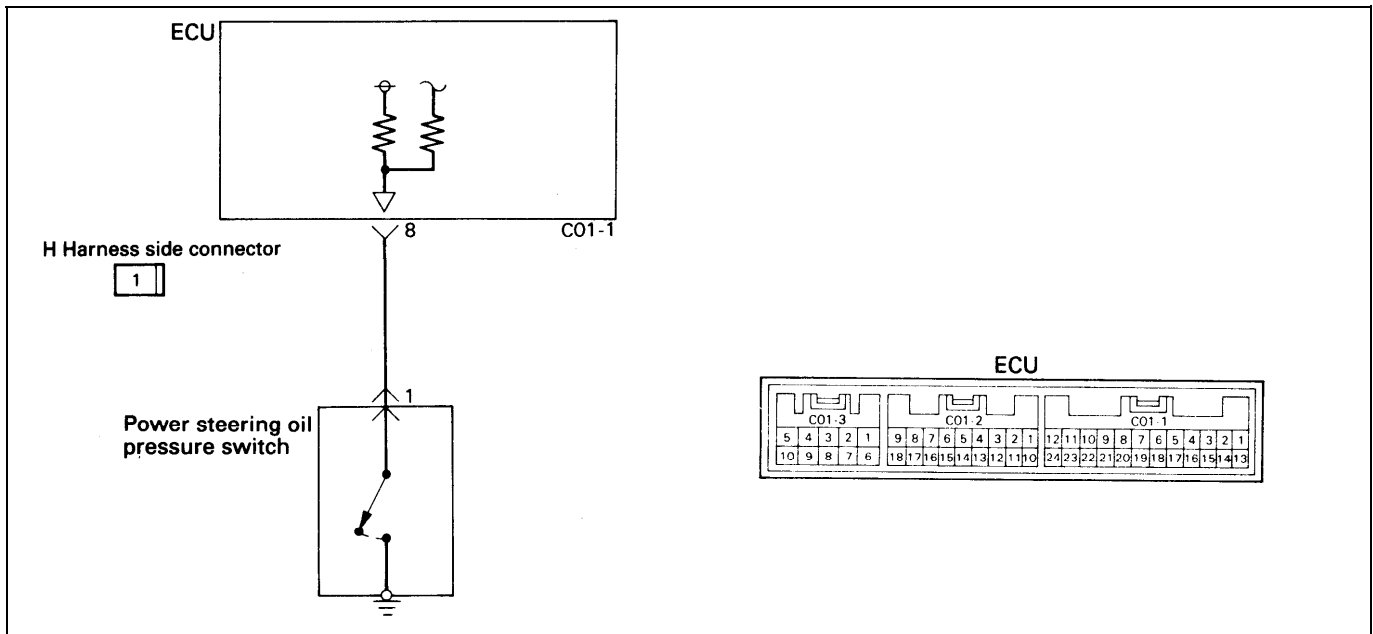
<div data-bbox="135 244 167 287">1</div>  <div data-bbox="534 542 598 563">31J089</div>	<p>Check the vehicle speed sensor, output circuit for continuity.</p> <ul style="list-style-type: none"> o Engine control unit connector: Disconnected o Move the vehicle. 	<p>OK → END!</p> <p>NG → <div data-bbox="1284 436 1348 500">2</div></p>
<div data-bbox="135 606 167 649">2</div>  <div data-bbox="534 904 598 925">31J090</div>	<p>Measure the power supply voltage of the vehicle speed sensor.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.5—4.9V 	<p>OK → <div data-bbox="1284 649 1348 712">3</div></p> <p>NG → Repair the harness. (H 2 — C01-1 19)</p>
<div data-bbox="135 972 167 1015">3</div>  <div data-bbox="534 1266 598 1287">31J091</div>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected 	<p>OK → END!</p> <p>NG → Repair the harness. (H 1 — Ground)</p>

POWER STEERING OIL PRESSURE SWITCH

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



Circuit Diagram



Using Multi-use Tester

Check Item	Data display	Check condition	Steering wheel	Normal indication
Power steering oil pressure switch o Service data o Item No. 27	Switch state	Engine: Idling	Steering wheel neutral position (wheels straight-ahead direction)	OFF
			Steering wheel half turn	ON

Harness Inspection Procedure

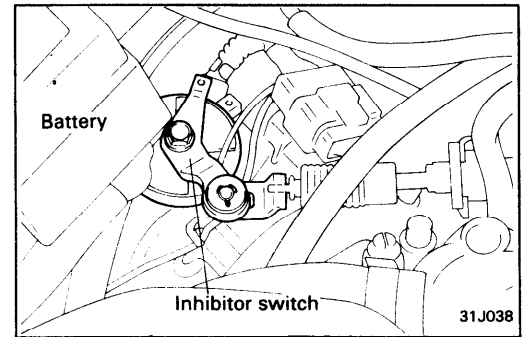
<div data-bbox="135 1621 183 1669">1</div> <div data-bbox="550 1915 614 1934">31J093</div>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): System Voltage <div data-bbox="1125 1669 1284 1732">OK →</div> <div data-bbox="1125 1837 1284 1900">NG →</div>	<div data-bbox="1300 1669 1412 1732">END!</div> <div data-bbox="1300 1774 1503 1921"> Repair the harness. (H 1 — C01-1 8) </div>
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IGNITION SWITCH-ST AND INHIBITOR SWITCH [A/T]

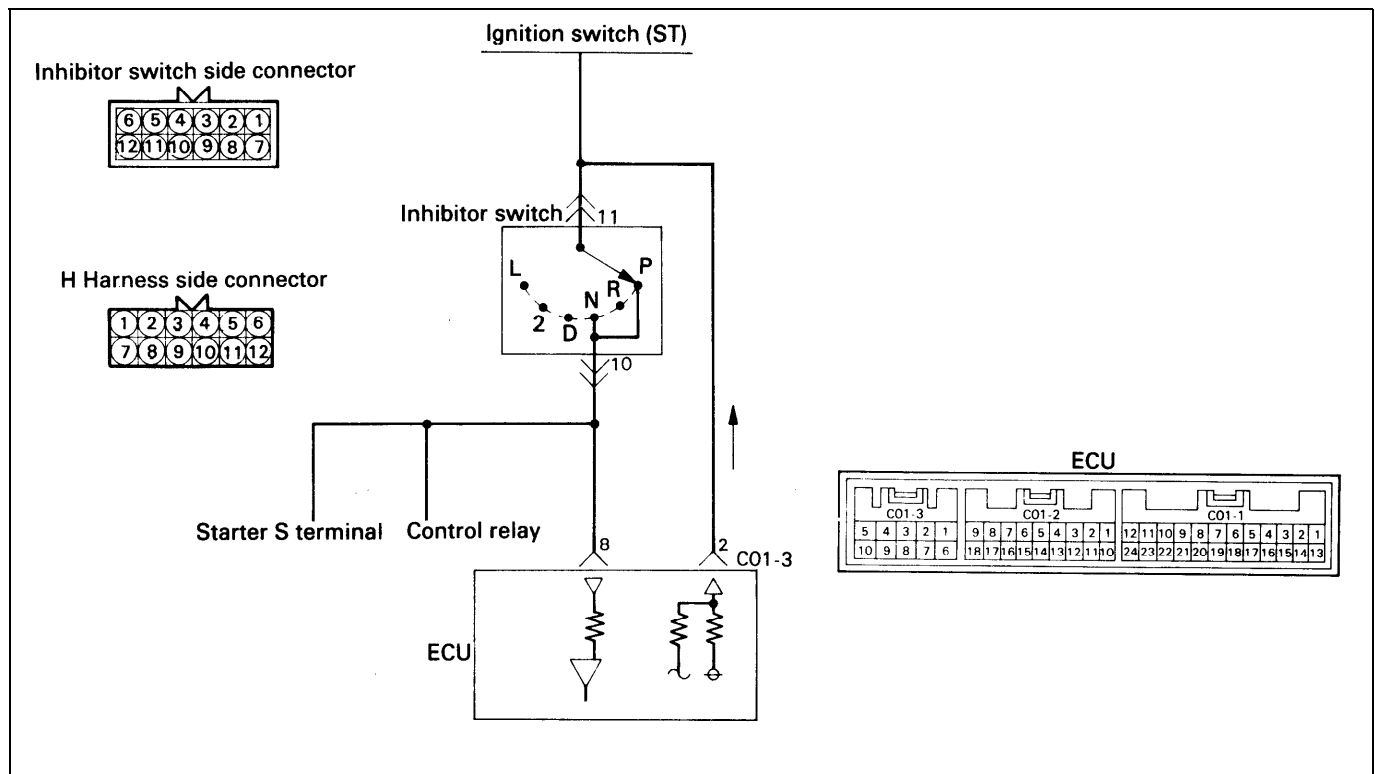
When the ignition switch is set to ST position, the battery voltage is applied through the ignition switch and inhibitor switch to the ECU.

If the selector lever is not P or N position, the battery voltage will not reach to the ECU.

Based on this signal, the ECU determines the automatic transaxle load and drives the ISC servo to maintain optimum idle speed.



Circuit Diagram



Troubleshooting Hints

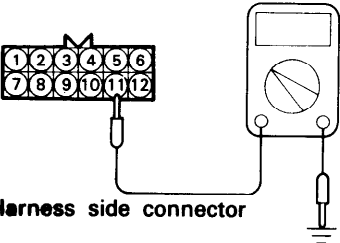
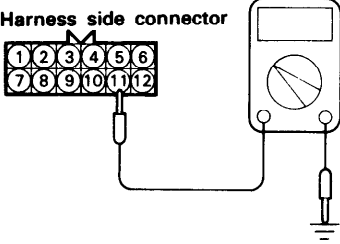
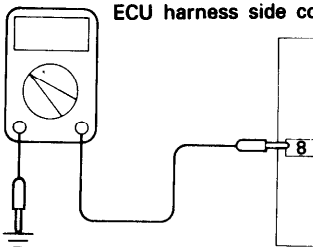
If the inhibitor switch harness check is normal but the inhibitor switch output is abnormal, check for the control cable adjustment.

Using Multi-use Tester

Check Item	Data display	Check condition	Engine	Normal indication
Crank signal o Service data o Item No. 18	Switch state	Ignition switch: ON	Stop	OFF
			Cranking	ON

Check Item	Data display	Check condition	Select lever position	Normal indication
Inhibitor switch o Service data o Item No. 29	Shift position	Ignition switch: ON	P or N	P or N
			D,2,L or R	D,2,L or R

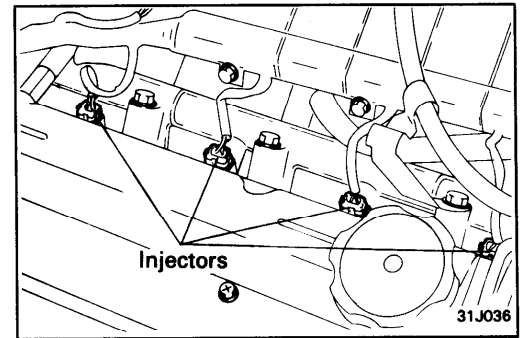
Harness Inspection Procedures

<p>1</p>  <p>H Harness side connector</p> <p>31J095</p>	<p>Measure the power supply voltage of the inhibitor switch.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected o Inhibitor switch connector: Disconnected o Ignition switch: START o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Check the power supply circuit.</p>
<p>2</p>  <p>H Harness side connector</p> <p>31J096</p>	<p>Measure the inhibitor switch terminal input voltage.</p> <ul style="list-style-type: none"> o ECU connector: Connected o Inhibitor switch connector: Disconnected o Ignition switch: ON o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>3</p> <p>Repair the harness. (H 11 — C01-3 2)</p>
<p>3</p>  <p>ECU harness side connector C01-3</p> <p>31J097</p>	<p>Measure the input voltage of engine control unit.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected o Inhibitor switch connector: Connected o Select lever: P range o Ignition switch: START o Voltage: 8V or more <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 10 — C01-3 8)</p>

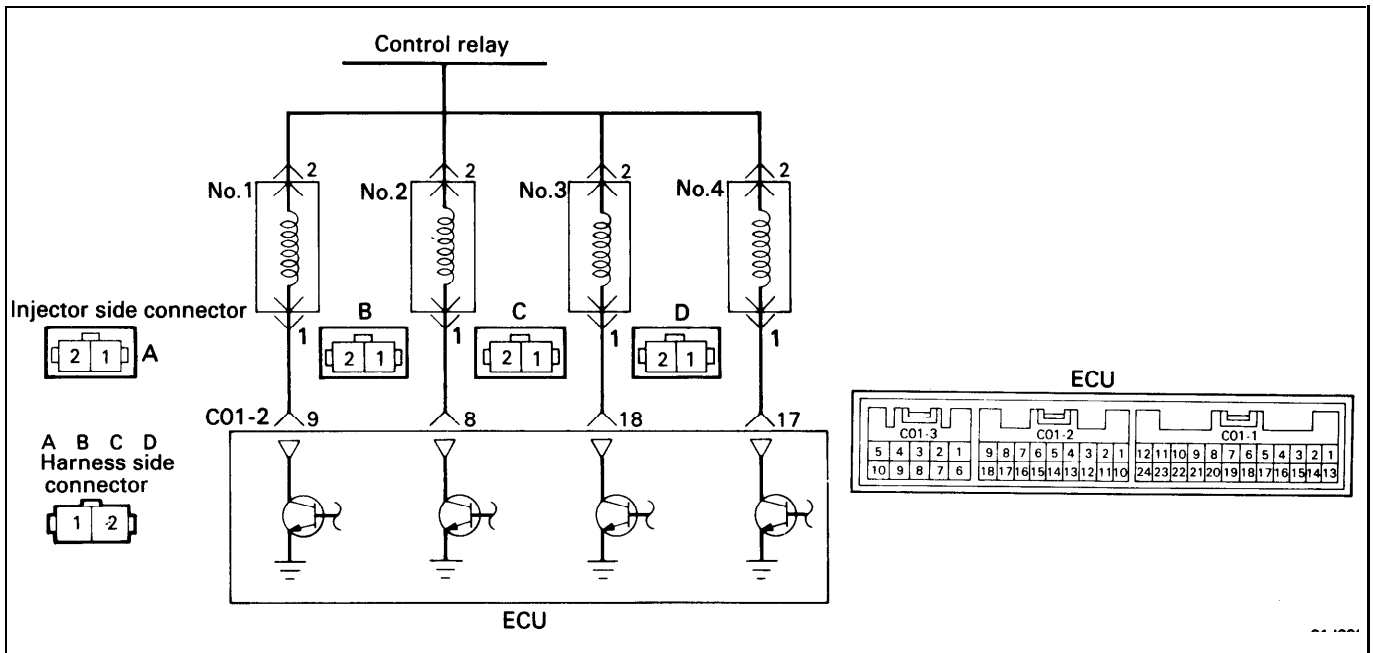
INJECTORS

The injectors inject fuel according to a signal coming from the ECU.

The volume of fuel injected by the injector is determined by the time during which the solenoid valve is energized.



Circuit Diagram



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;
 - 1) Faulty power supply circuit to the ECU, faulty ground circuit
 - 2) Faulty control relay
 - 3) Faulty crank angle sensor, top dead center sensor
3. If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, check for the following items about such cylinder.
 - 1) Injector and harness
 - 2) Ignition plug and high tension cable
 - 3) Compression pressure

If the injection system is ok but the injector drive time is out of specification, check for the following items.

 - 1) Poor combustion in the cylinder (faulty ignition plug, ignition coil, compression pressure, etc.)
 - 2) Loose EGR valve seating

Using Multi-use Tester

Check Item	Data display	Check condition	Coolant temperature	Test specification
Injector o Service data o Item No. 41	Drive time* ¹	Engine: Cranking	0°C (32°F)* ²	Approx. 18 ms
			20°C (68°F)	Approx. 34 ms
			80°C (176°F)	Approx. 6.1 ms

Check Item	Data display	Check condition	Engine state	Test specification
Injector o Service data o Item No. 41	Drive time* ³	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral	750 rpm (Idle)	2.5—3.1 ms
			2,000 rpm	2.2—2.8 ms
			Rapid racing	To increase

NOTE

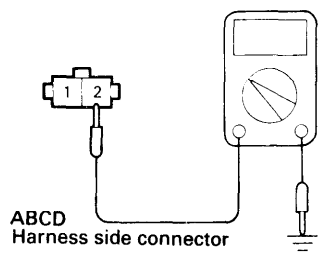
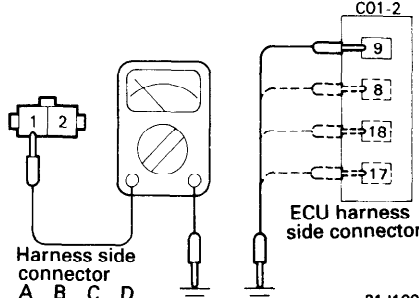
*1: The injector drive time refers to when the supply voltage is 11 V and the cranking speed is less than 250 rpm.

*2: When coolant temperature is lower than 0°C (32°F), the ECU fires all four cylinders simultaneously.

*3: When the vehicle is new [within initial operation of about 500 km (300 miles)], the injector drive time may be about 10% longer.

Check Item	Item No.	Drive content	Check condition	Normal state
Injector o Actuator test	01	No. 1 injector shut off	Engine: Idling after warm-up (Shut off the injectors in sequence during after engine warm-up, check the idling condition)	Idle should become unstable as injector shut off.
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		

Harness Inspection Procedures

<p>1</p>  <p>ABCD Harness side connector</p> <p>31J099</p>	<p>Measure the power supply voltage of the injector.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness. (A B C D 2 — Control relay) Check the power supply.</p>
<p>2</p>  <p>Harness side connector A B C D</p> <p>ECU harness side connector C01-2</p> <p>31J100</p>	<p>Check for an open-circuit, or a short-circuit to ground between the engine control unit and the injector.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected o Injector connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (A B C D 1 — C01-2 9 , 8 , 18 , 17)</p>

Actuator Inspection

Operation Check

Using a multi-use tester, check as described below.

- o Cut off the fuel injectors in sequence.
- o Check the operation time of the injectors.

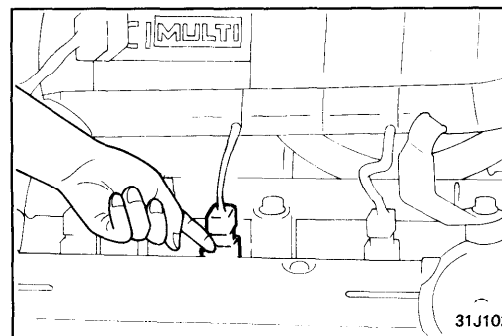
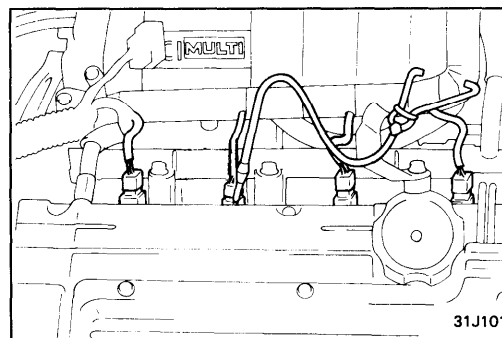
Operation Sound Check

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

NOTE

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

- If a stethoscope is not available, check the injector operation with your finger.
If no vibrations are felt, check the wiring connector, injector, or injection signal from ECU.

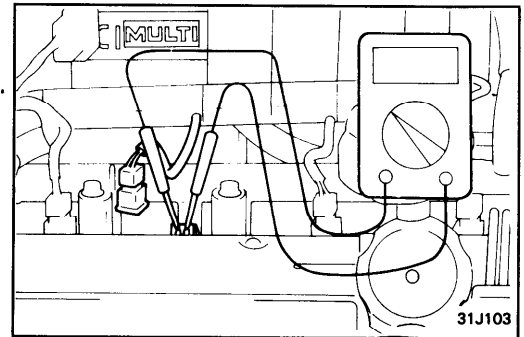


Resistance Measurement Between Terminals

1. Disconnect the connector at the injector.
2. Measure the resistance between terminals.

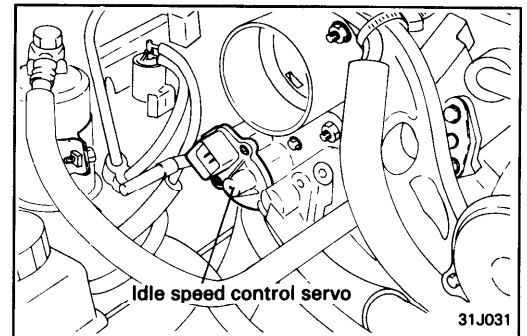
Standard value 13-16 Ω
[at 20°C (68°)]

3. Connect the connector to the injector.

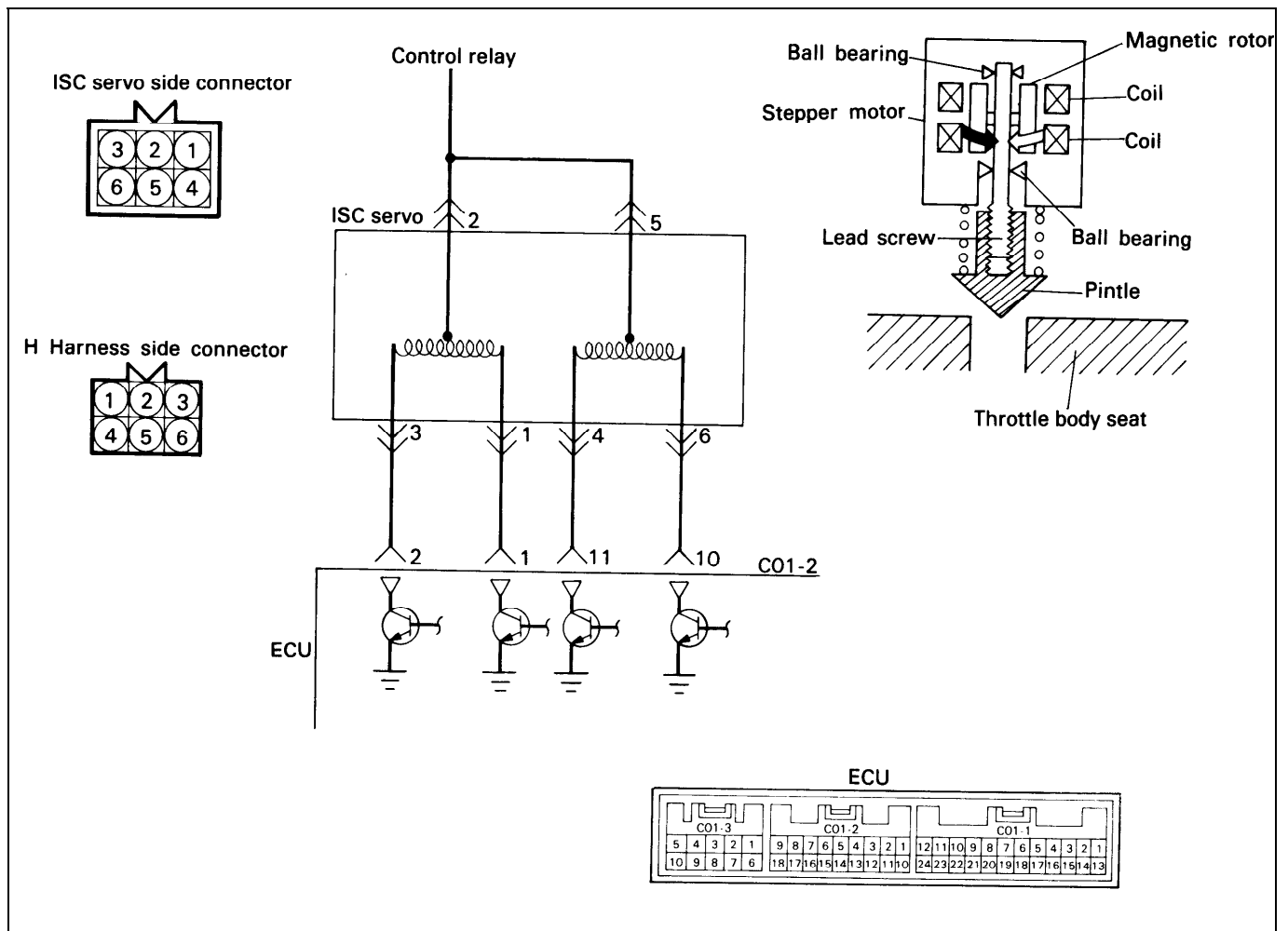


IDLE SPEED CONTROL SERVO (STEPPER MOTOR TYPE)

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



Circuit Diagram



Troubleshooting Hints

1. If the stepper motor step increases to 100 to 120 steps or decreases to 0 step, check for faulty stepper motor or open circuit in the harness.
2. If the idle speed control servo is normal but the stepper motor steps are out of specification, check the following items;
 - 1) Poorly adjusted reference idle speed
 - 2) Deposit on the throttle valve
 - 3) Air leaking into the intake manifold through gasket gap
 - 4) Loose EGR valve seat
 - 5) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, low compression pressure, etc.)

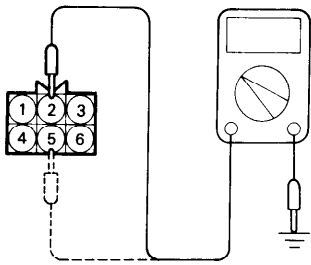
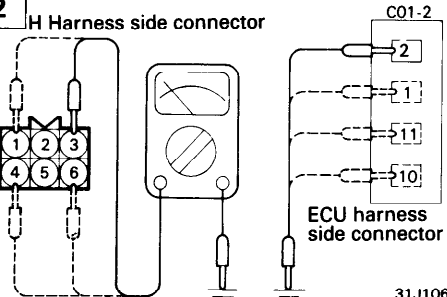
Using Multi-use Tester

Check Item	Data display	Check Conditions		Test specifications
Stepper motor o Service data o Item No. 45	Stepper motor steps	o Engine coolant temperature: 80 to 95°C (176 to 205°F)	Air conditioner switch: OFF	4-14 step
		o Lamps, electric cooling fan, accessory units: All OFF	Air conditioner switch: ON	40-60 step
		o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral o Idle position switch: ON (compressor clutch to be ON if air conditioner switch is ON) o Engine: Idling	o Air conditioner switch: ON o Selector lever: Shift to D range	48-68 step

NOTE

When the vehicle is new [within initial operation of about 500 km (300 miles)], the stepper motor steps may be about 30 steps more than standard.

Harness Inspection Procedures

<p>1</p>  <p>H Harness side connector 31J105</p>	<p>Measure the power supply voltage of idle speed control servo.</p> <ul style="list-style-type: none"> Idle speed control servo connector: Disconnected Ignition switch: ON Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness. (Control relay — H 2) (Control relay — H 5)</p>
<p>2</p>  <p>H Harness side connector 31J106</p>	<p>Check for an open-circuit, or a short-circuit to ground between the engine control unit and the idle speed control servo.</p> <ul style="list-style-type: none"> Engine control unit connector: Disconnected Idle speed control servo connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 3—C01-2 2) (H 1—C01-2 1) (H 4—C01-2 11) (H 6—C01-2 10)</p>

Actuator Inspection

Operation Sound Check

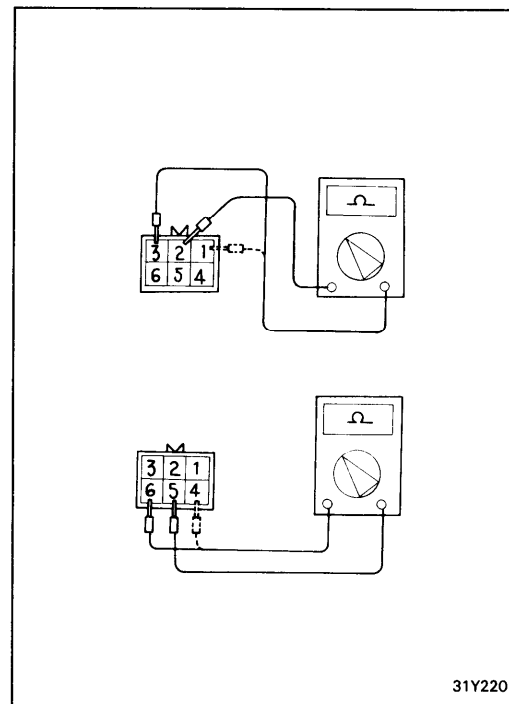
1. Check for the sound of the stepper motor after the ignition is switched ON (but without starting the motor).
2. If the operation sound cannot be heard, check the stepper motor's circuit.
3. If the circuit is normal, then the problem may be the stepper motor or the ECU.

Resistance Measurement between terminals

Measure the resistance between the respective terminals.

Standard value:

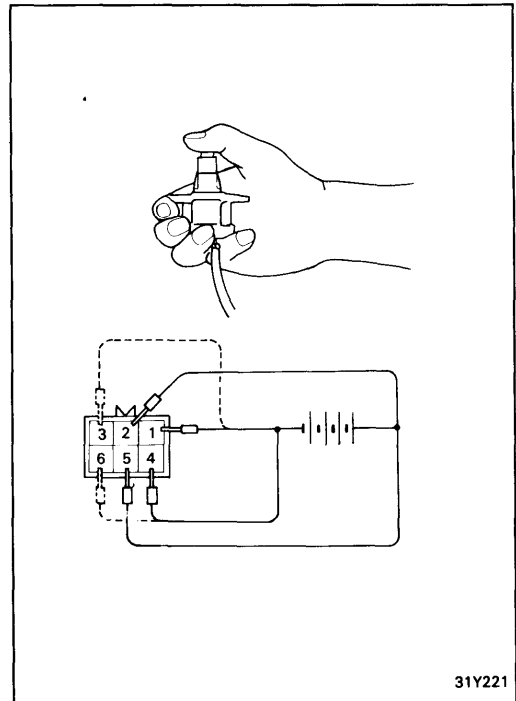
Terminals 2 - 3 and 1	28-33 Ω [at 20°C (68°F)]
Terminals 5 - 4 and 6	28-33 Ω [at 20°C (68°F)]



Operation check

Apply voltage as follows and check whether or not stepper motor movement occurs.

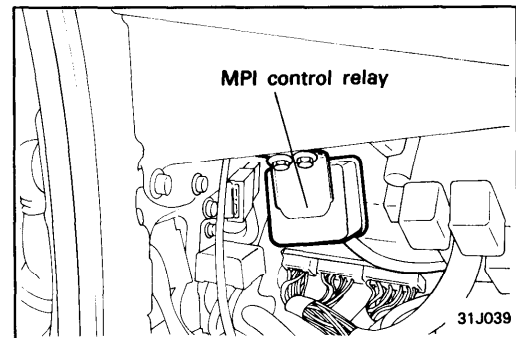
- o Connect the power supply (approx. 6V) terminal (+) to terminals 2 and 5 of the connector.
- o Connect the power supply (-) terminal to terminals 1 and 4.
- o Connect the power supply (-) terminal to terminals 3 and 4.
- o Connect the power supply (-) terminal to terminals 3 and 6.
- o Connect the power supply (-) terminal to terminals 1 and 6.
- o Connect the power supply (-) terminal to terminals 1 and 4.



31Y221

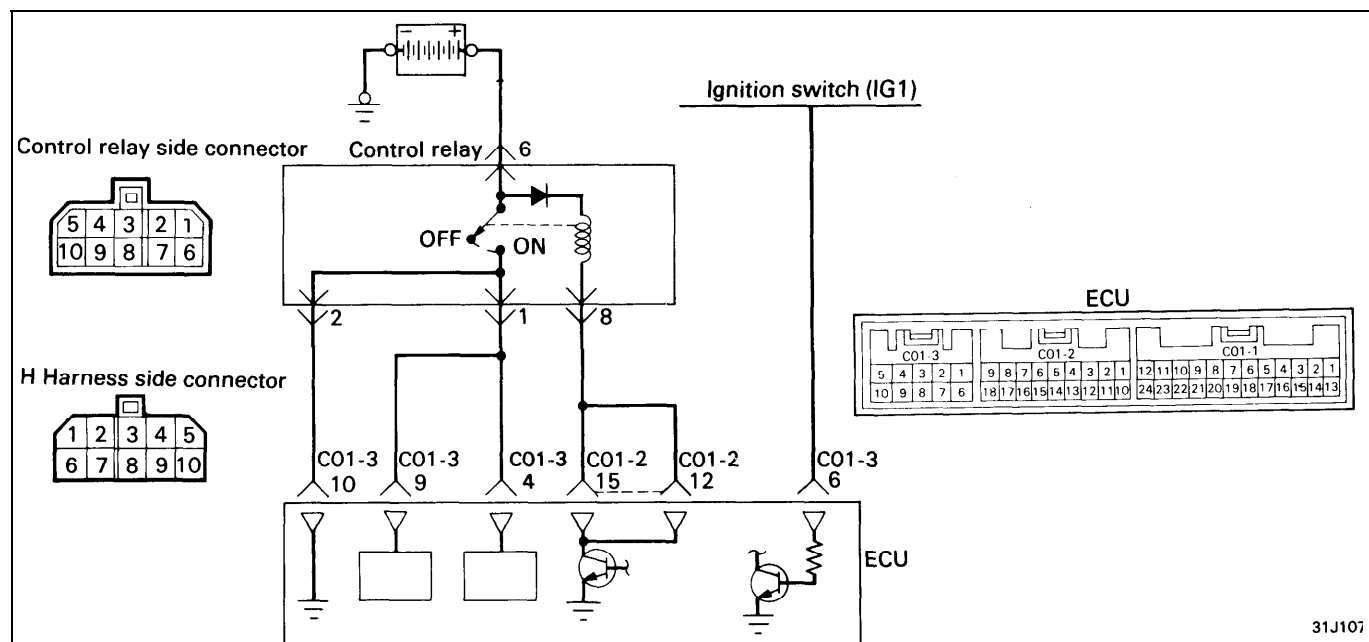
CONTROL RELAY AND IGNITION SWITCH-IG

When the ignition **switch** is turned on, battery voltage is applied from the ignition switch to the ECU. This turns ON the power transistor and energizes the control relay coil. This turns ON the control relay switch and power is supplied from the battery to the ECU through the control relay switch.



31J039

Circuit Diagram

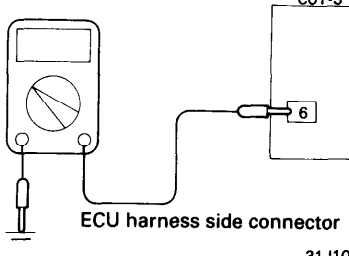
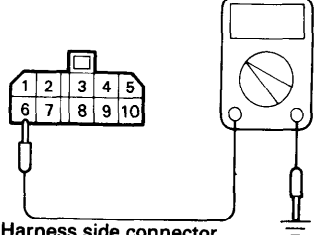
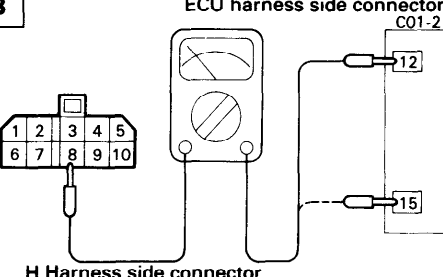
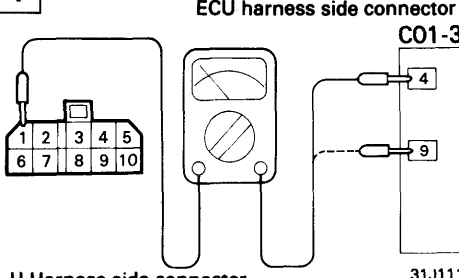


31J107

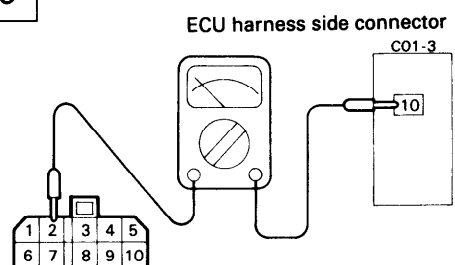
Using Multi-use Tester

Check Item	Data display	Check condition	Test specification
Battery voltage o Service data o Item No. 16	Engine control unit power voltage	Ignition switch: ON	11—13V

Harness Inspection Procedures

<p>1</p>  <p>ECU harness side connector</p> <p>31J108</p>	<p>Measure the inhibitor switch terminal input voltage.</p> <ul style="list-style-type: none"> o ECU connector: Connected o Ignition switch: ON o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness. (Ignition switch- C01-3 6)</p>
<p>2</p>  <p>H Harness side connector</p> <p>31J109</p>	<p>Measure the power supply voltage of the control relay.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<p>3</p> <p>Repair the harness. (Battery- H 6)</p>
<p>3</p>  <p>ECU harness side connector C01-2</p> <p>H Harness side connector</p> <p>31J110</p>	<p>Check for an open-circuit, or a short-circuit to ground, between the ECU and the control relay.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected o Control relay connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>4</p> <p>Repair the harness. (H 8 — C01-2 15) (H 8 — C01-2 12)</p>
<p>4</p>  <p>ECU harness side connector C01-3</p> <p>H Harness side connector</p> <p>31J111</p>	<p>Check for an open-circuit, or a short-circuit to ground between the engine control unit and the control relay.</p> <ul style="list-style-type: none"> o Control relay connector: Disconnected o ECU connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>5</p> <p>Repair the harness. (H 1 — C01-3 4 , 9)</p>

5



ECU harness side connector C01-3

31J112

Check for an open circuit, or a short-circuit to ground between the ECU and the control relay.

- o Control relay connector:
Disconnected
- o ECU Connector:
Disconnected

OK →

NG →

END!

Repair the harness.
(H 2 — C01-3 10)

Control Relay Inspection

NOTE

When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

1. Connect a 12V power supply (+) terminal to the terminal 6 of the control relay and measure the voltages at terminals 2 and 1 when the (-) terminal is connected to and disconnected from the terminal 8.

Terminal 8 and 12V power supply (-) terminal	Terminal 2	Terminal 1
Connected	12V	12V
Disconnected	0V	0V

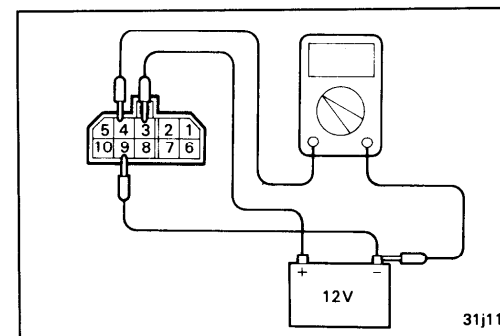
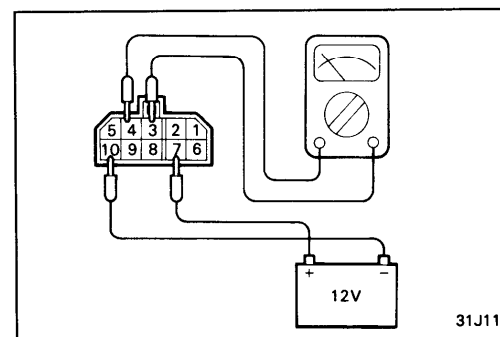
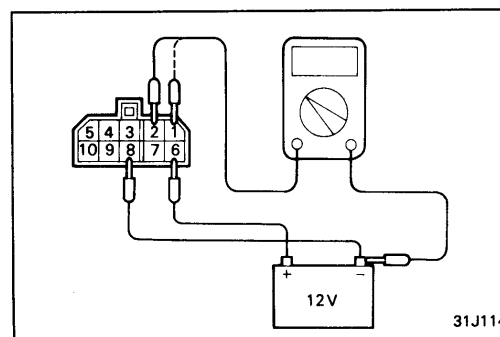
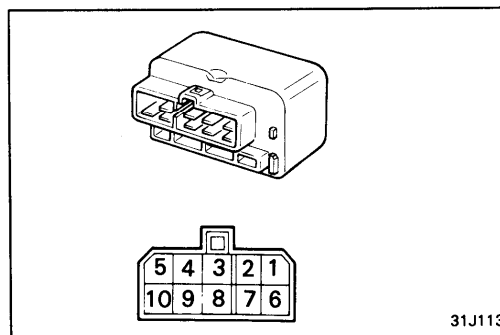
2. Connect a 12V power supply (-) terminal to the terminal 10 of the control relay and check the continuity between terminals 3 and 4 when the (+) terminal is connected to and disconnected from the terminal 7.

Terminal 7 and 12V power supply (+) terminal	Terminal 3 and terminal 4 .
Connected	Continuity
Disconnected	Discontinuity

3. Connect a 12V power supply (+) terminal to the terminal 3 of the control relay and measure the voltages at the terminal 4 when the (-) terminal is connected to and disconnected from the terminal 9.

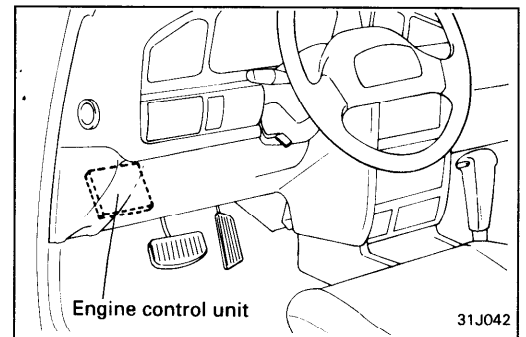
Terminal 9 and 12V power supply (—) terminal	Terminal 4 .
Connected	12V
Disconnected	0V

4. If one of the above is improper, replace the control relay.

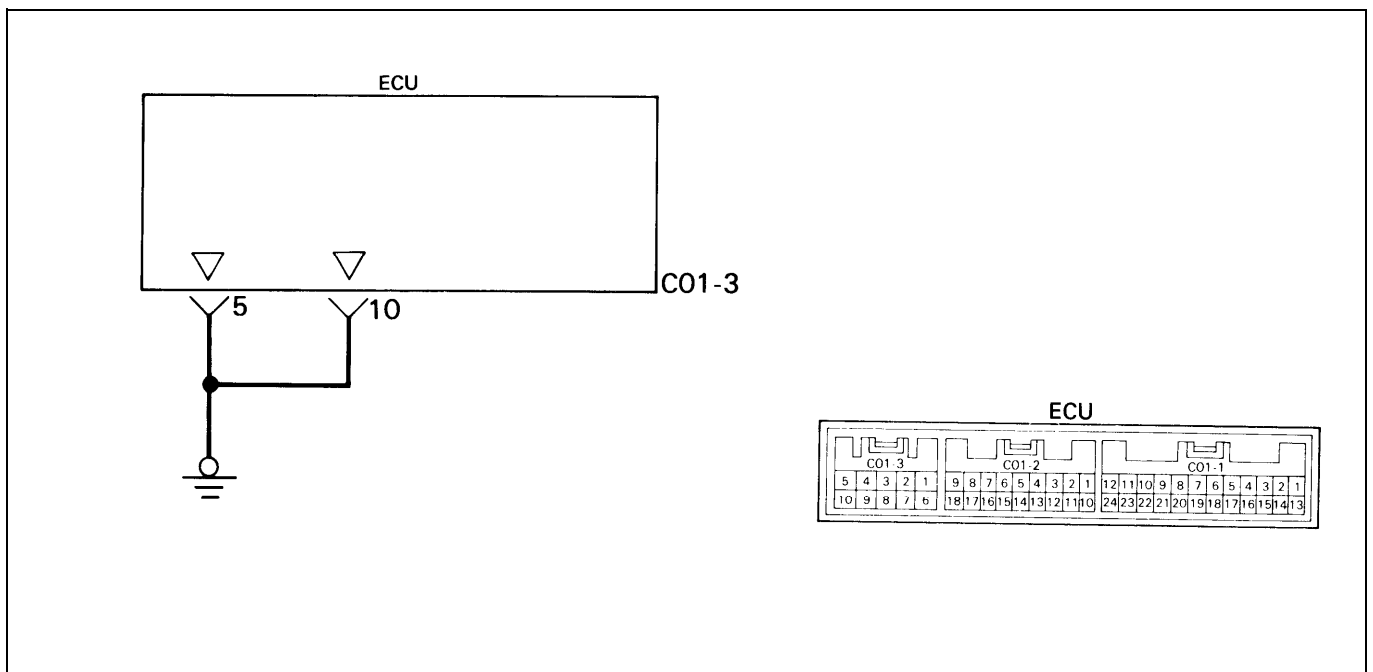


ELECTRONIC CONTROL UNIT (ECU)- POWER GROUND

Grounds the electronic control unit.



Circuit Diagram



Troubleshooting Hints

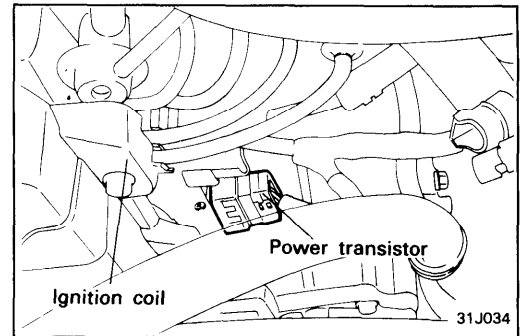
If the ground wire of the ECU is not connected securely to ground, the unit will not operate correctly.

Harness Inspection Procedure

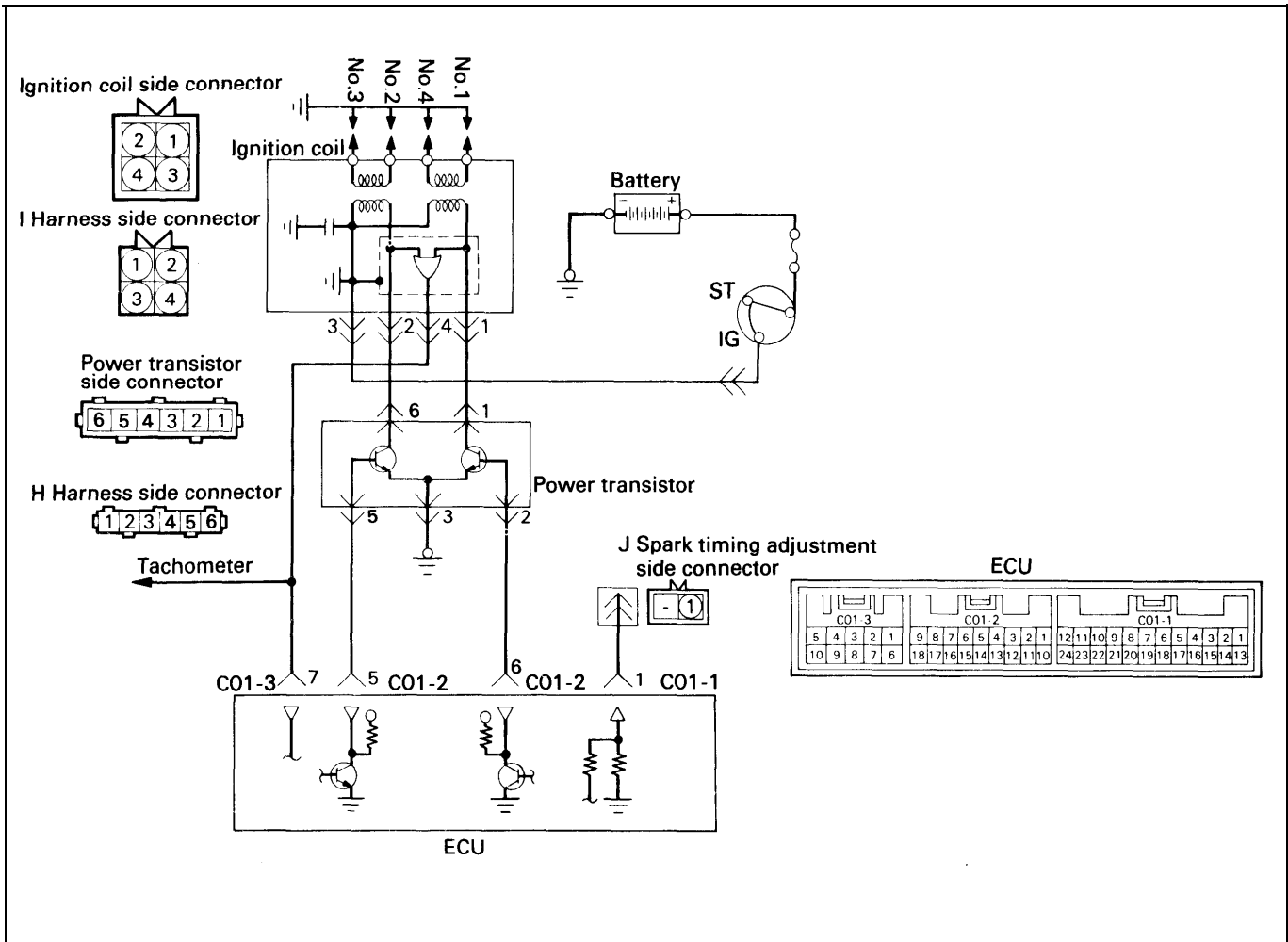
<p>1</p> <p>ECU harness side connector 31J118</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected 	<p>OK → END!</p> <p>NG →</p> <p>Repair the harness. (C01-3 5 — Ground) (C01-3 10 — Ground)</p>
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IGNITION COIL AND POWER TRANSISTOR

The power transistor functions to control the ignition timing by controlling the ignition coil primary current by signals from the ECU.



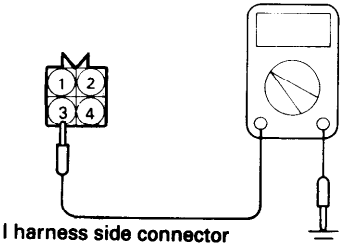
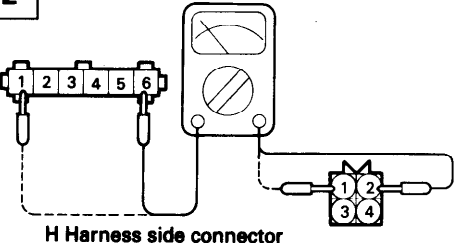
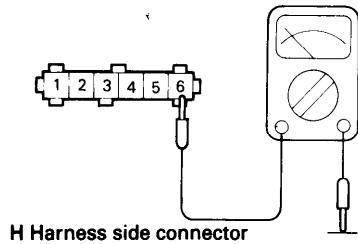
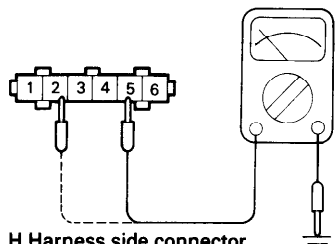
Circuit Diagram



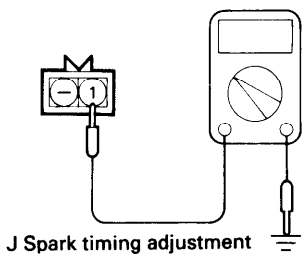
Using Multi-use Tester

Check Item	Check condition	Engine state	Test specification
Ignition advance o Service data o Item No. 44	o Engine: Warmed up o Timing light: Set (set timing light to check actual ignition timing)	750 rpm (Idle)	5—15°BTDC
		2,000 rpm	32—40°BTDC

Harness Inspection Procedures

<div data-bbox="156 247 196 289">1</div>  <p>I harness side connector</p> <p>31J120</p>	<p>Measure the power supply voltage of the ignition coil.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage (V): System Voltage <p>OK →</p> <p>NG →</p>	<div data-bbox="1313 300 1377 363">2</div> <p>Repair the harness. (I 3—Ignition switch)</p>
<div data-bbox="156 611 196 653">2</div>  <p>H Harness side connector</p> <p>31J121</p>	<p>Check for an open-circuit, or a short-circuit to ground between the power transistor and the ignition coil.</p> <ul style="list-style-type: none"> o Ignition coil connector: Disconnected o Power transistor connector: Disconnected <p>OK →</p> <p>NG →</p>	<div data-bbox="1313 657 1377 720">3</div> <p>Repair the harness. (I 1— H 1) (I 2— H 6)</p>
<div data-bbox="156 974 196 1016">3</div>  <p>H Harness side connector</p> <p>31J122</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<div data-bbox="1313 1035 1377 1098">4</div> <p>Repair the harness. (H 6—Ground)</p>
<div data-bbox="156 1337 196 1379">4</div>  <p>H Harness side connector</p> <p>31K123</p>	<p>Measure the voltage of the control signal circuit of the power transistor.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: START o Voltage: 0.5—4.0V <p>OK →</p> <p>NG →</p>	<div data-bbox="1313 1390 1377 1453">5</div> <p>Repair the harness. (H 5—C01-2 5) (H 2—C01-2 6)</p>

5



J Spark timing adjustment side connector

31J124

Measure the voltage of the ignition timing adjustment terminal.

- o Ignition switch: ON
- o Voltage: 4.0—5.2V

OK →

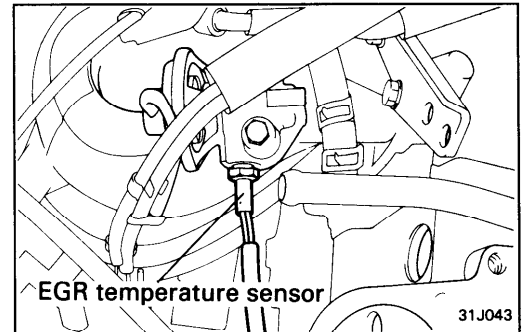
NG →

END!

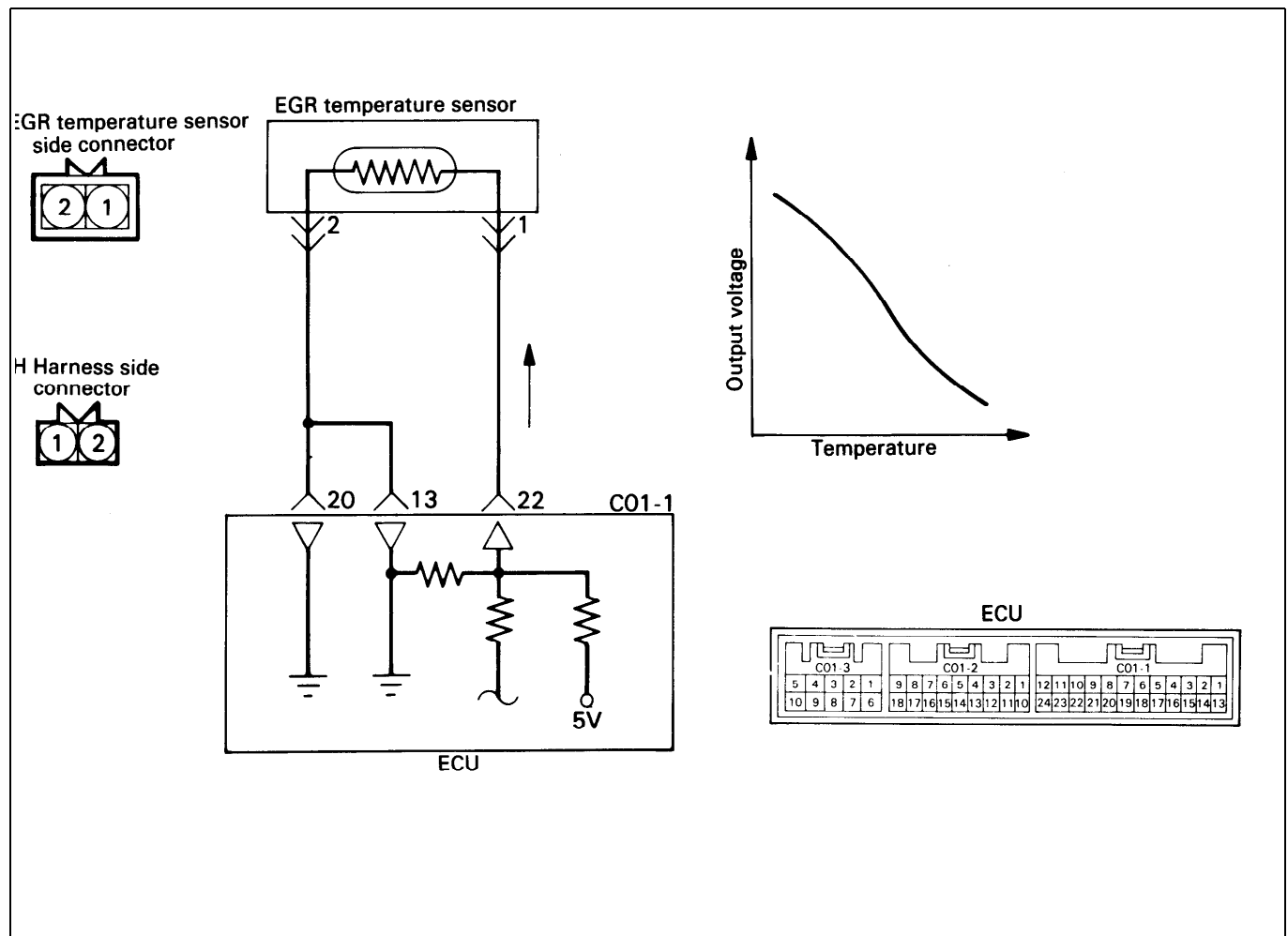
Repair the harness.
(J 1—C01-1 1)

EGR TEMPERATURE SENSOR [California]

The EGR temperature sensor converts the temperature of EGR gas downstream from the EGR valve to voltage and inputs it to the ECU. The ECU judges the condition of the EGR by this signal. If there is abnormal condition, the engine warning light is turned on to notify the driver.



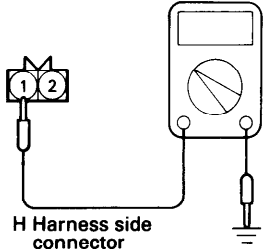
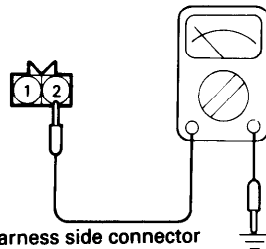
Circuit Diagram



Using Multi-Use Tester

Check Item	Data display	Check condition	Engine state	Test specification
EGR temperature sensor o Service data o Item No. 43	Sensor temperature	Engine: Warmd up Engine is maintained in a constant state for 2 minutes or more	750 rpm (Idle)	70°C (158°F) or less
			3,500 rpm	70°C (158°F) or more

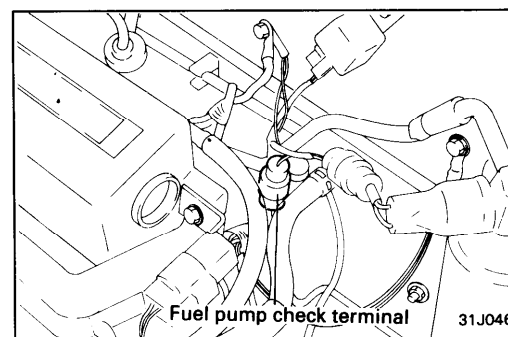
Harness Inspection Procedures

<div style="border: 1px solid black; padding: 2px; width: 20px; float: left; margin-right: 10px;">1</div>  <p>H Harness side connector</p> <p style="text-align: right;">31J126</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage: 4.3—4.7V <p style="text-align: right;">OK →</p> <p style="text-align: right;">NG →</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; float: left; margin-right: 10px;">2</div> <p>Repair the harness. (H 1—C01-1 22)</p>
<div style="border: 1px solid black; padding: 2px; width: 20px; float: left; margin-right: 10px;">2</div>  <p>H Harness side connector</p> <p style="text-align: right;">31J127</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p style="text-align: right;">OK →</p> <p style="text-align: right;">NG →</p>	<p>END!</p> <p>Repair the harness. (H 2—C01-1 13 , 20)</p>

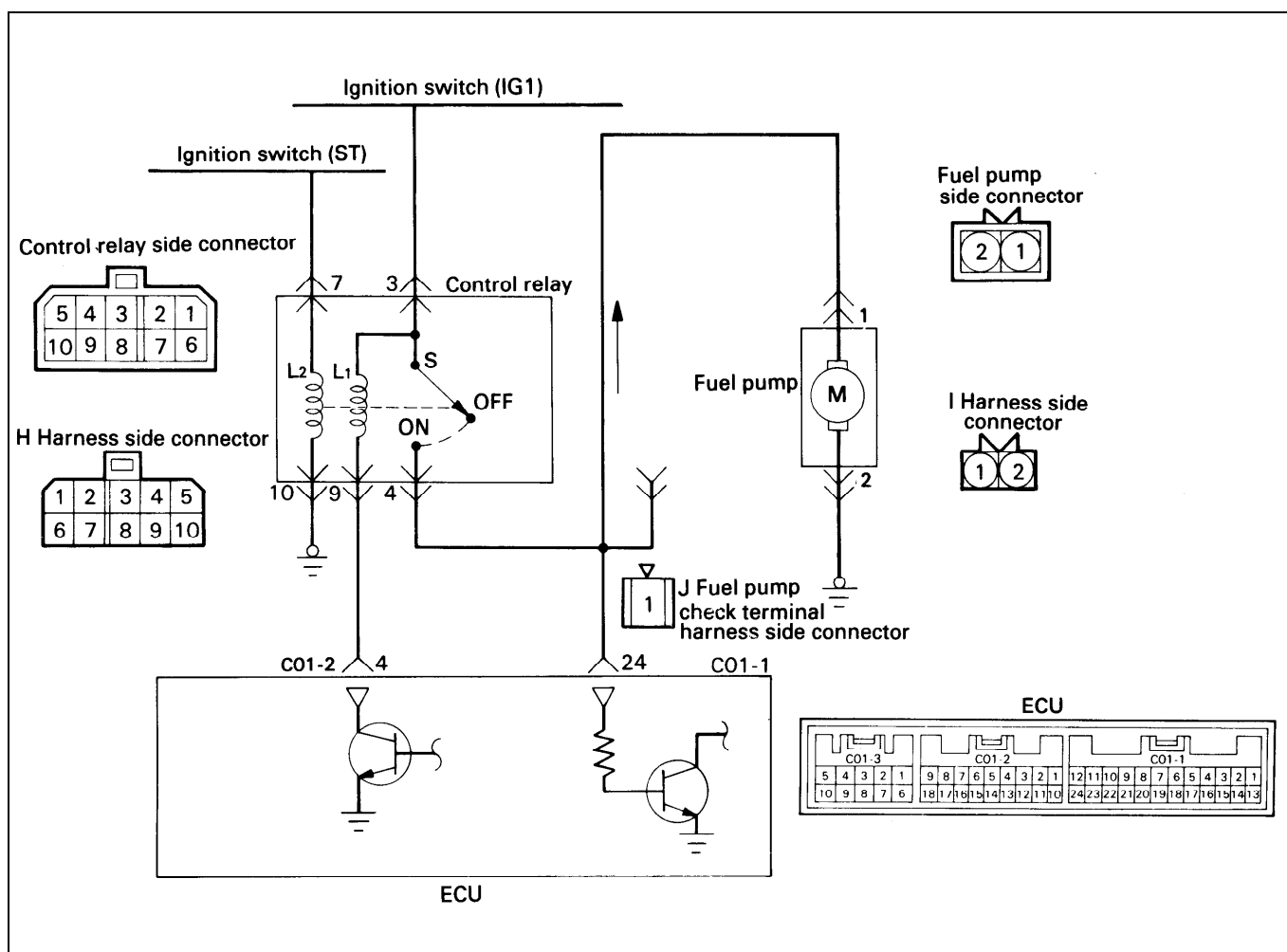
SENSOR INSPECTION

Refer to GROUP 29-Exhaust Gas Recirculation (EGR) System.

FUEL PUMP



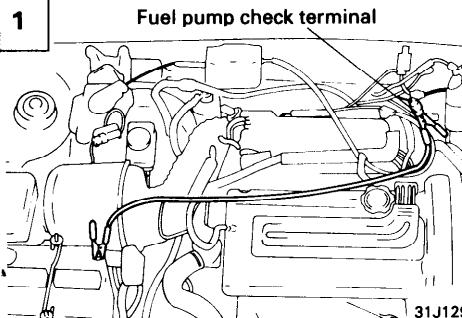
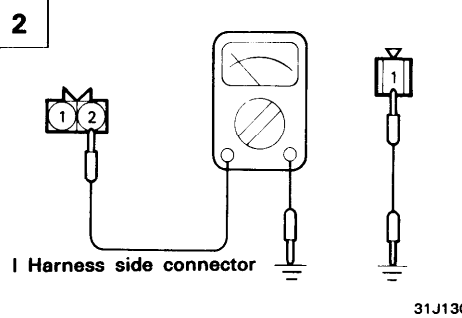
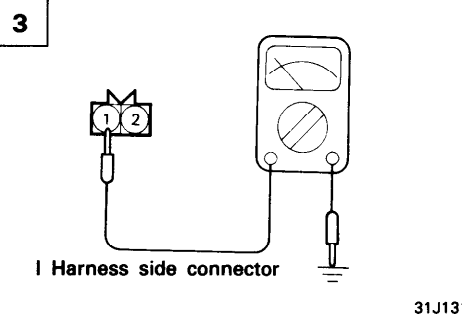
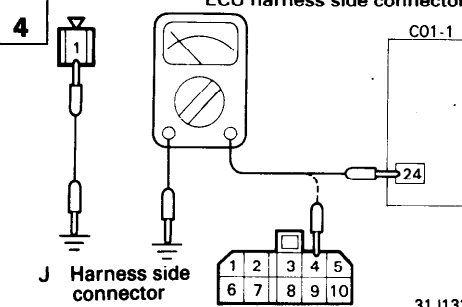
Circuit Diagram

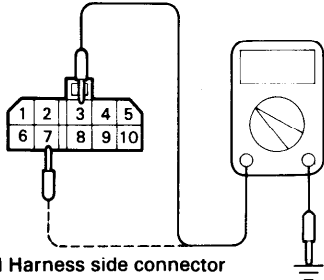
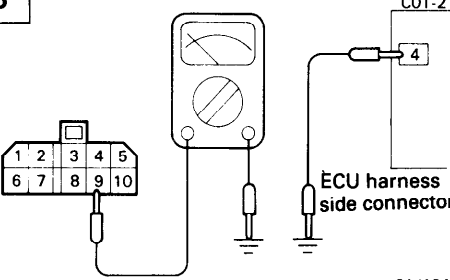
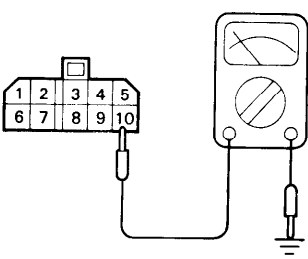
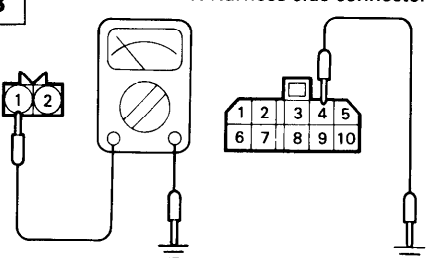


Using Multi-use Tester

Function	Item No.	Drive	Check condition	Check content	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	<ul style="list-style-type: none"> Engine cranking Forced drive of fuel pump Check is made for above two conditions	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is heard

Harness Inspection Procedures

<p>1</p>  <p>Fuel pump check terminal</p> <p>31J129</p>	<p>Check the fuel pump.</p> <ul style="list-style-type: none"> o Apply battery voltage to the checking terminal and operate the pump 	<p>OK → 4</p> <p>NG → 2</p>
<p>2</p>  <p>I Harness side connector</p> <p>31J130</p>	<p>Check the ground circuit of the fuel pump.</p> <ul style="list-style-type: none"> o Connector: Disconnected 	<p>OK → 3</p> <p>NG → Repair the harness. (I 2—Ground)</p>
<p>3</p>  <p>I Harness side connector</p> <p>31J131</p>	<p>Check for continuity between the fuel pump and the checking terminal.</p> <ul style="list-style-type: none"> o Connector: Disconnected 	<p>OK → 4</p> <p>NG → Repair the harness. (I 1 — J 1)</p>
<p>4</p>  <p>J Harness side connector</p> <p>ECU harness side connector</p> <p>C01-1</p> <p>24</p> <p>31J132</p>	<p>Check for continuity between the checking terminal and the engine control unit, and between the control relay terminals.</p> <ul style="list-style-type: none"> o Control relay connector: Disconnected o Engine control unit connector: Disconnected o Fuel pump connector: Disconnected 	<p>OK → 5</p> <p>NG → Repair the harness. (J 1—C01-1 24)</p>

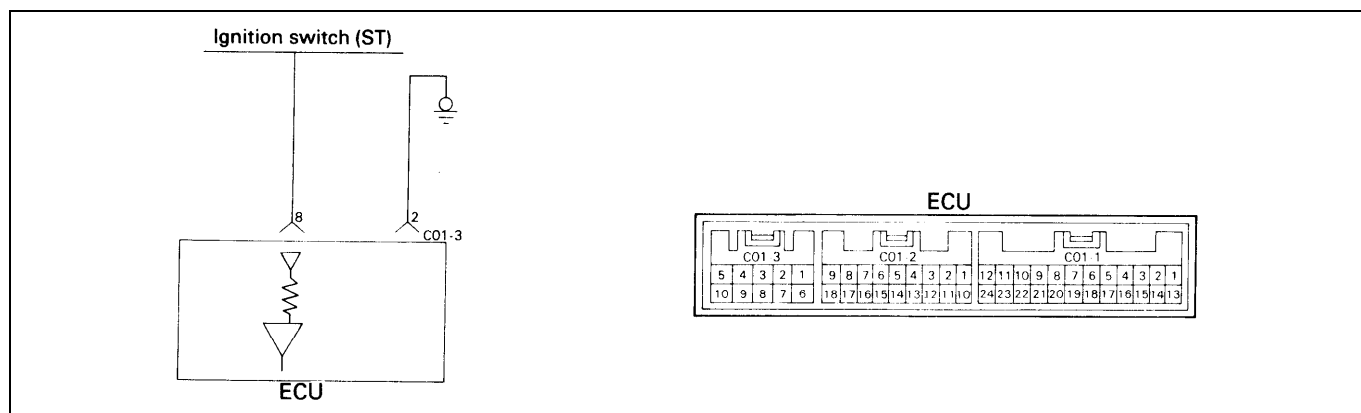
<div>5</div>  <p>H Harness side connector</p> <p>31J133</p>	<p>Measure the power supply voltage of the control relay.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: START (when H 2 checked) o Ignition switch: ON (when H 3 checked) o Voltage: 8V or more <p>OK →</p> <p>NG →</p>	<div>6</div> <p>Repair the harness. (Ignition switch-ON—H 3) (Ignition switch-ST—H 7)</p>
<div>6</div>  <p>H Harness side connector</p> <p>31J134</p>	<p>Check for an open-circuit, or a short-circuit to ground between the control relay and the engine control unit.</p> <ul style="list-style-type: none"> o Control relay connector: Disconnected o Engine control unit connector: Disconnected <p>OK →</p> <p>NG →</p>	<div>7</div> <p>Repair the harness. (H 9—C01-2 4)</p>
<div>7</div>  <p>H Harness side connector</p> <p>31J135</p>	<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o Connector: Disconnected <p>OK →</p> <p>NG →</p>	<div>8</div> <p>Repair the harness. (H 10—Ground)</p>
<div>8</div>  <p>H Harness side connector</p> <p>I Harness side connector</p> <p>31J136</p>	<p>Check for an open-circuit, or a short-circuit to ground between the control relay and the fuel pump.</p> <ul style="list-style-type: none"> o Control relay connector: Disconnected o Fuel pump connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 4 — I 1)</p>

IGNITION SWITCH-ST [M/T]

The ignition switch-ST inputs a high signal to the ECU while the engine is cranking.

The ECU provides fuel injection control, etc. at engine start-up based on this signal.

Circuit Diagram



Using Multi-uses Tester

Function	Item No.	Data display	Check condition	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	stop	OFF
				Cranking	ON

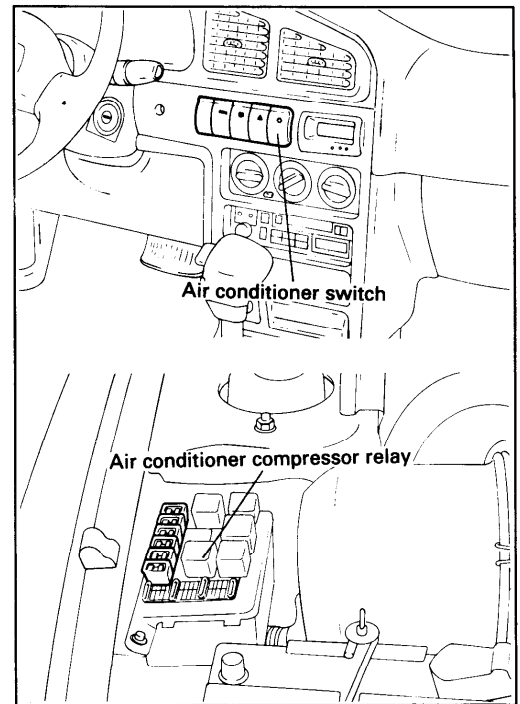
Harness Inspection Procedures

1		<p>Measure the input voltage to the ECU.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected o Ignition switch: START o Voltage : 8V or more <p>OK →</p> <p>NG →</p>	<p>2</p> <p>Repair the harness. (C01-3 8 -Ignition switch)</p>
2		<p>Check for continuity of the ground circuit.</p> <ul style="list-style-type: none"> o ECU connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (C01-3 2-Ground)</p>

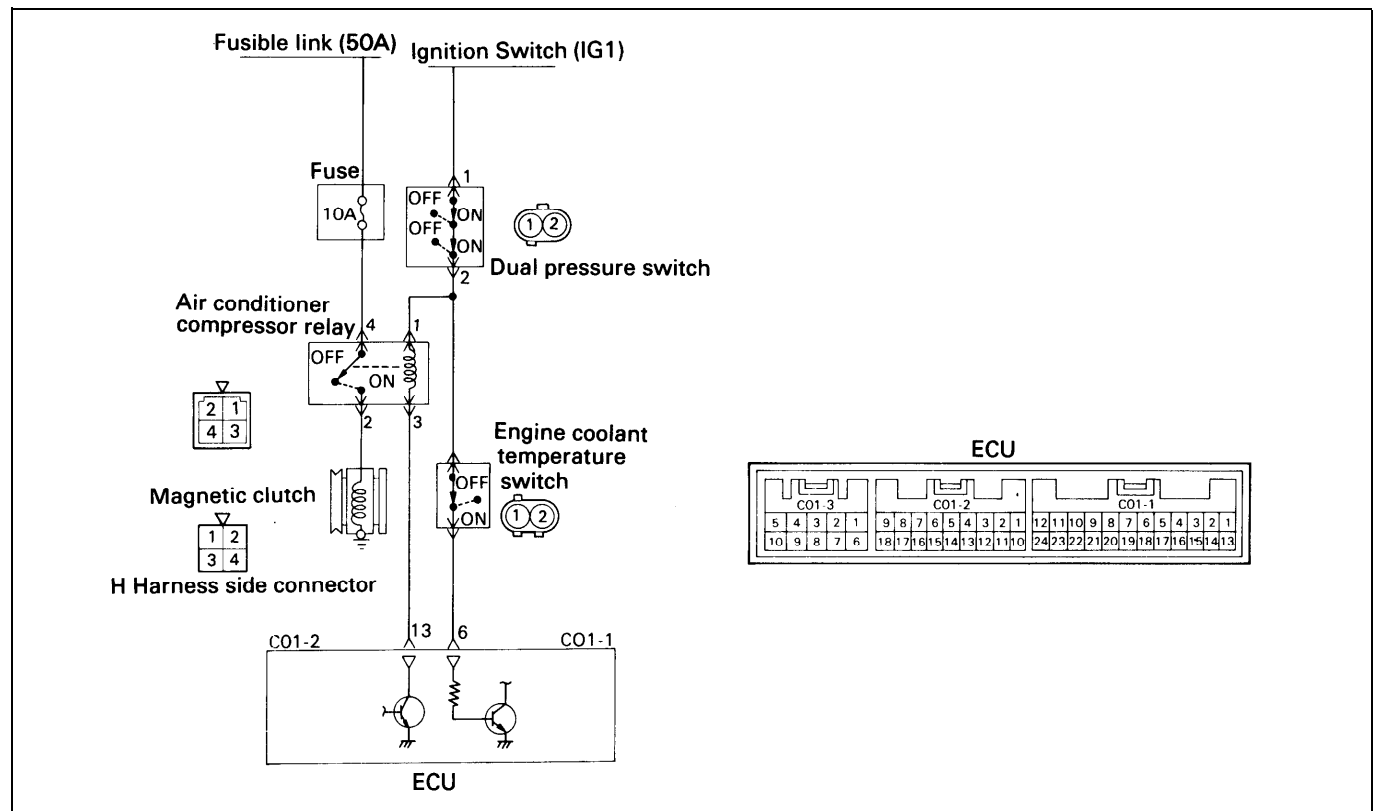
AIR CONDITIONER SWITCH AND AIR CONDITIONER RELAY

The air conditioner switch applies the battery voltage to the ECU when the air conditioner is turned on.

When the air conditioner ON signal is input, the ECU drives the ISC servo and turns ON the power transistor. And then the air conditioner power relay coil is energized to turn on the relay switch, which activates the air compressor magnetic clutch.



Circuit Diagram



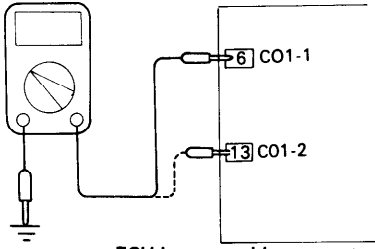
Troubleshooting Hints

If the **air compressor magnet clutch** is not activated when the air conditioner switch is turned on during idling, faulty air conditioner control system is suspected.

Using Multi-use Tester

Check Item	Data display	Check condition	Air conditioner switch	Normal indication
Air conditioner switch o Service data o Item No.28	Switch state	Engine: Idling (air compressor to be running when air conditioner switch is ON)	OFF	OFF
			ON	ON
Air conditioner relay o Service data o Item No.49	Air conditioner relay state	Engine: Idling after warm-up	OFF	OFF (compressor clutch non-activation)
			ON	ON (compressor clutch activation)

Harness Inspection Procedure

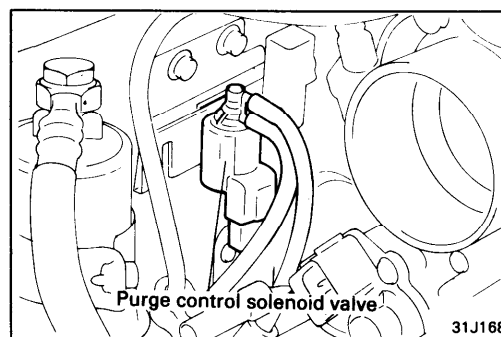
<div style="border: 1px solid black; padding: 5px; width: 40px; float: left; text-align: center; margin-bottom: 10px;">1</div>  <p style="text-align: center;">ECU harness side connector</p>	<p>Measure the power supply voltage of the air conditioner circuit.</p> <ul style="list-style-type: none"> o Air conditioner switch: ON o Engine control unit connector: Disconnected o Ignition switch: ON o Voltage : System Voltage 	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: right; padding-right: 10px;"> OK → NG → </div> <div style="width: 80%;"> <p>END!</p> <p>Check the air conditioner circuit.</p> </div> </div>
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Air Conditioner Inspection

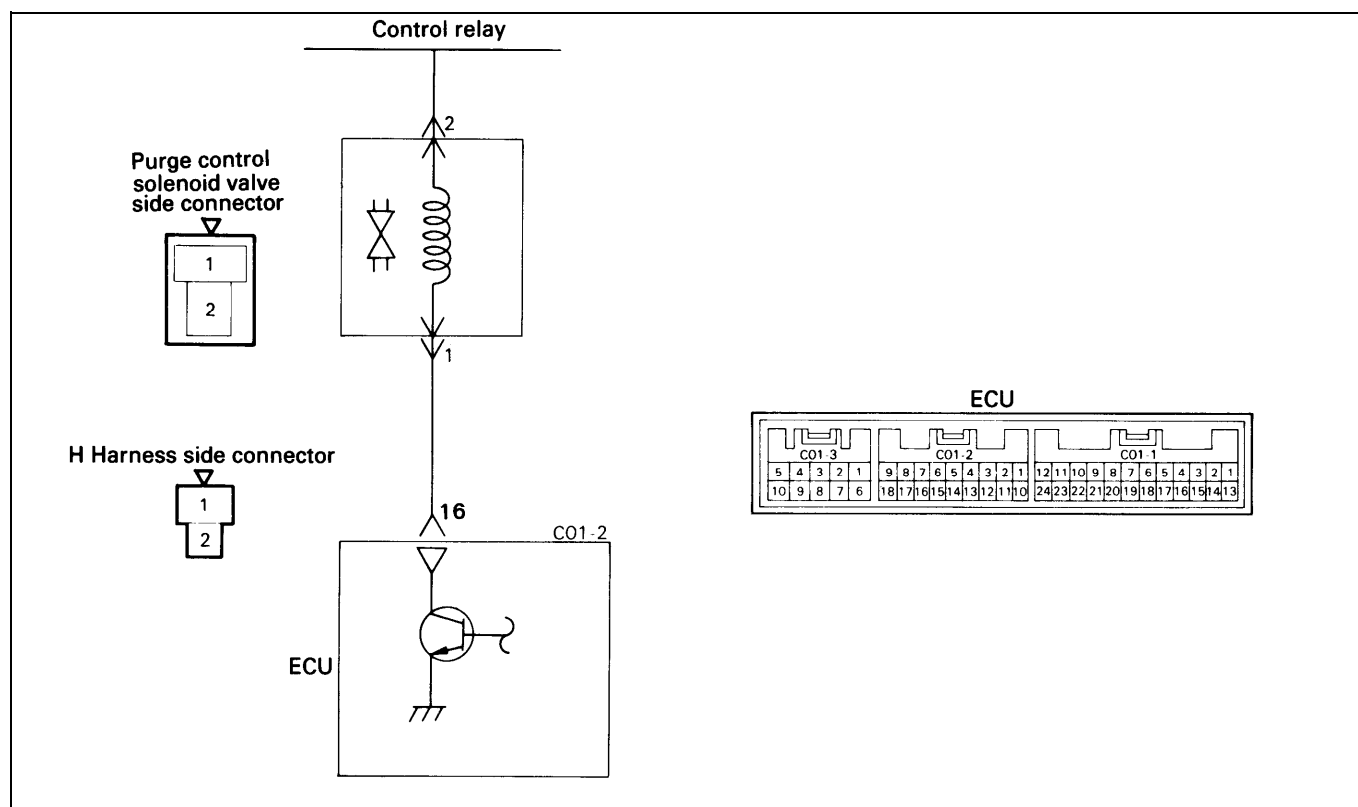
Refer to GROUP 97-Service Adjustment Procedures.

PURGE CONTROL SOLENOID VALVE

The purge control solenoid valve is an ON-OFF type, which controls introduction of purge air from the canister.



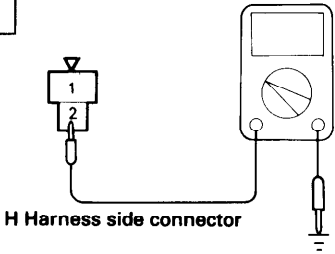
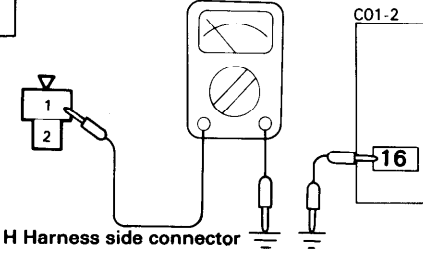
Circuit Diagram



Using Multi-use Tester

Check Item	Drive content	Check condition	Normal state
Purg control solenoid valve o Service data o Item No.8	Solenoid valve from OFF to ON	Ignition switch: ON	Operating sound is heard when driven

Harness Inspection Procedures

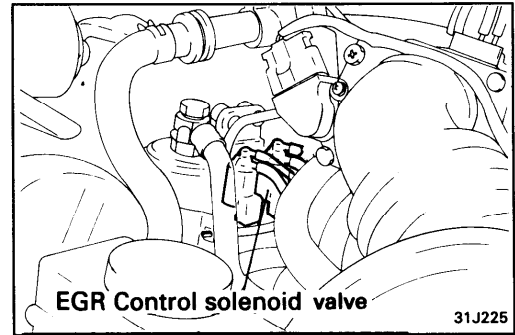
<div data-bbox="188 233 236 285" data-label="Text">1</div>  <div data-bbox="587 527 651 548" data-label="Text">31J223</div>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage : System Voltage <div data-bbox="1161 285 1321 338" data-label="Text">OK →</div> <div data-bbox="1161 453 1321 506" data-label="Text">NG →</div>	<div data-bbox="1343 285 1401 338" data-label="Text">2</div> <p>Repair the harness. (Control relay — H 2)</p>
<div data-bbox="188 594 236 646" data-label="Text">2</div>  <div data-bbox="587 888 651 909" data-label="Text">31J224</div>	<p>Check for an open-circuit, or a short-circuit to ground between the purge control solenoid valve and the engine control unit.</p> <ul style="list-style-type: none"> o Engine control unit connector: Disconnected o Purge control solenoid valve connector: Disconnected <div data-bbox="1161 646 1321 699" data-label="Text">OK →</div> <div data-bbox="1161 814 1321 867" data-label="Text">NG →</div>	<p>END!</p> <p>Repair the harness. (H 1 — C01-2 16)</p>

Actuator Inspection

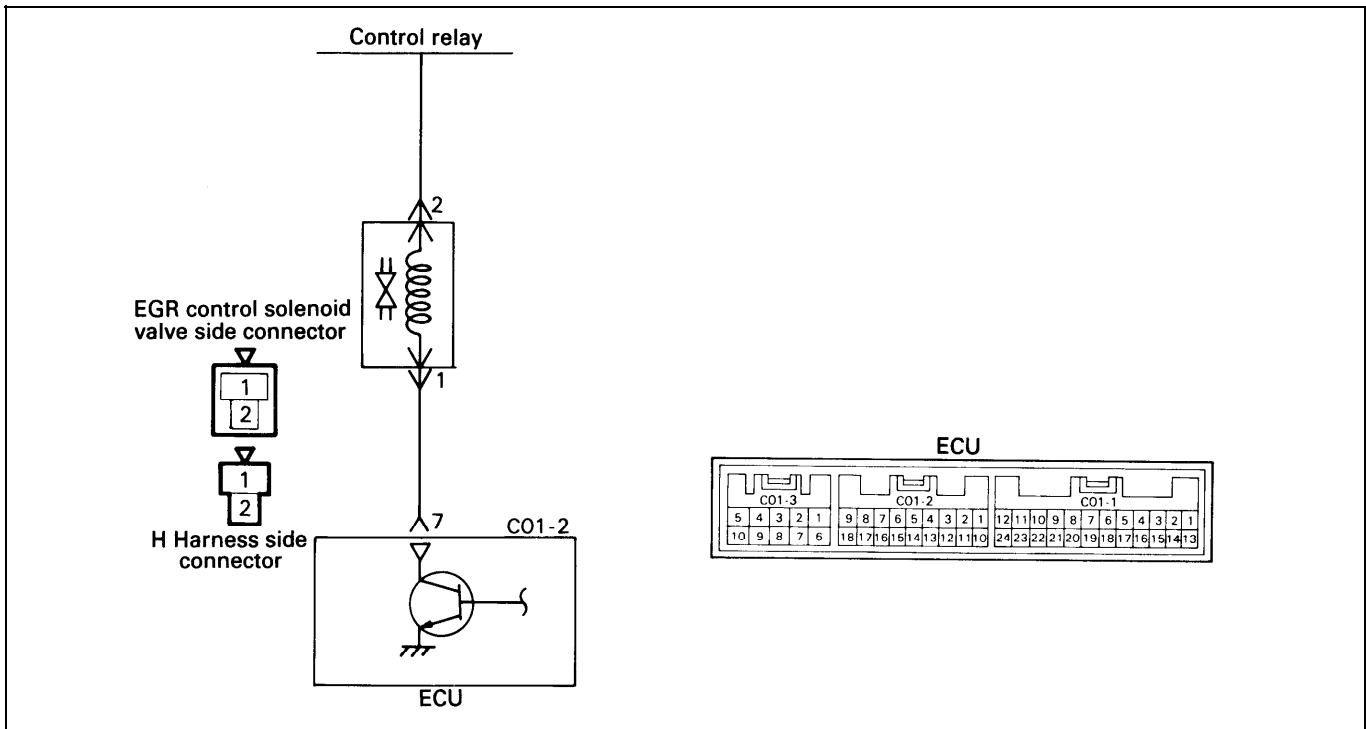
Refer to GROUP 29- Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE (California)

The EGR control solenoid valve is a duty control type solenoid valve, which makes control by leaking EGR valve operating negative pressure to the throttle body a port.



Circuit Diagram



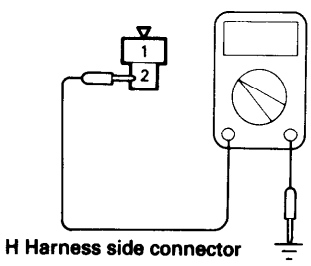
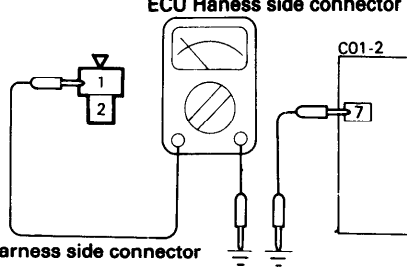
Troubleshooting Hint

If the results of EGR control solenoid valve on-vehicle and off-vehicle inspections are normal but the self-diagnosis code for EGR system failure is displayed, check the EGR valve, vacuum hose and EGR passage for blocking.

Using Multi-use Tester

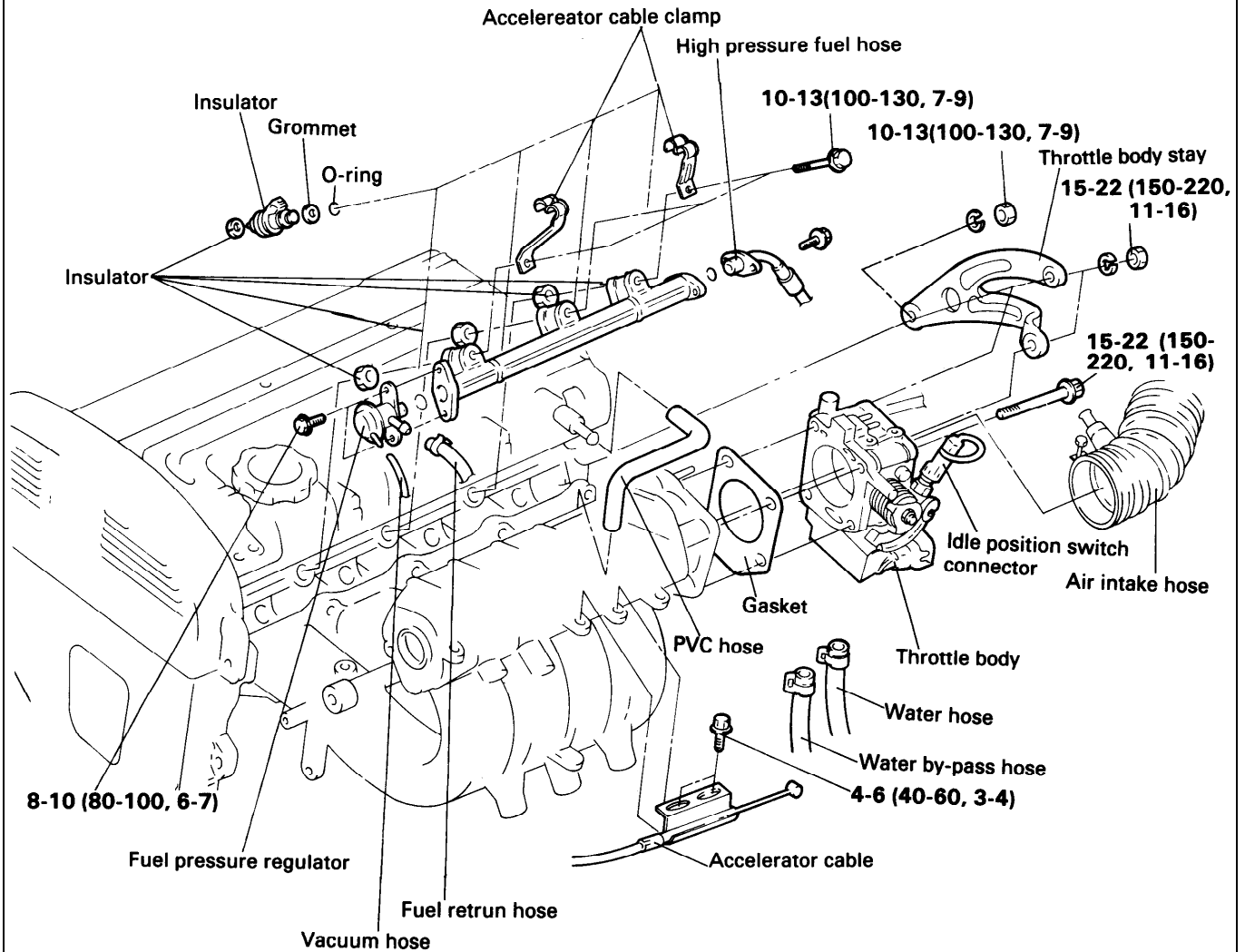
Check Item	Drive content	Check condition	Normal state
EGR control solenoid valve o Service data o Item No.10	Change solenoid valve from OFF to ON state	Ignition switch: ON	Operating sound is heard when driven

Harness Inspection Procedures

<div data-bbox="199 563 247 612">1</div>  <p>H Harness side connector</p> <p>31J227</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> o Connector: Disconnected o Ignition switch: ON o Voltage : System Voltage <p>OK →</p> <p>NG →</p>	<div data-bbox="1348 627 1412 691">2</div> <p>Repair the harness. (H 2 — Control relay)</p>
<div data-bbox="199 932 247 983">2</div>  <p>H Harness side connector</p> <p>ECU Harness side connector</p> <p>C01-2</p> <p>31J228</p>	<p>Check for an open-circuit, or a short-circuit to ground between the EGR control solenoid valve and the engine control unit.</p> <ul style="list-style-type: none"> o EGR control solenoid valve connector: Disconnected o ECU connector: Disconnected <p>OK →</p> <p>NG →</p>	<p>END!</p> <p>Repair the harness. (H 1 — C01-2 7)</p>

INJECTOR AND THROTTLE BODY

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

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

CAUTION

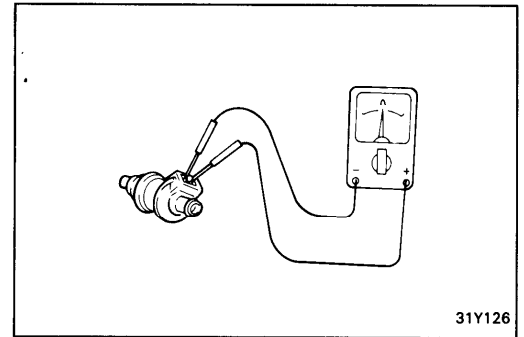
Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

INSPECTION

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

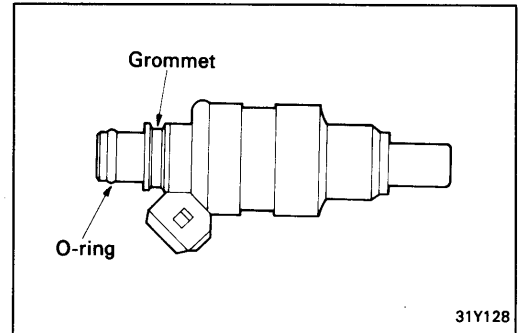
Resistance **13—1** [at 20°C (68°F)]

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



INSTALLATION

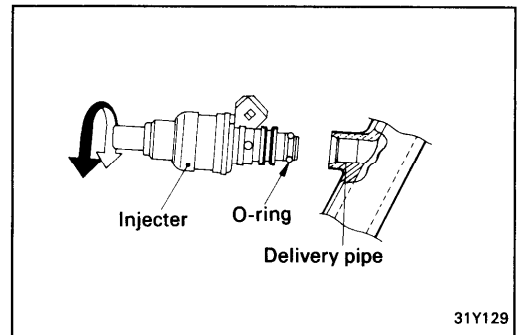
1. install a new grommet and O-ring to the injector.
2. Apply a coating of solvent, spindle oil or gasoline to the O-ring of the injector.



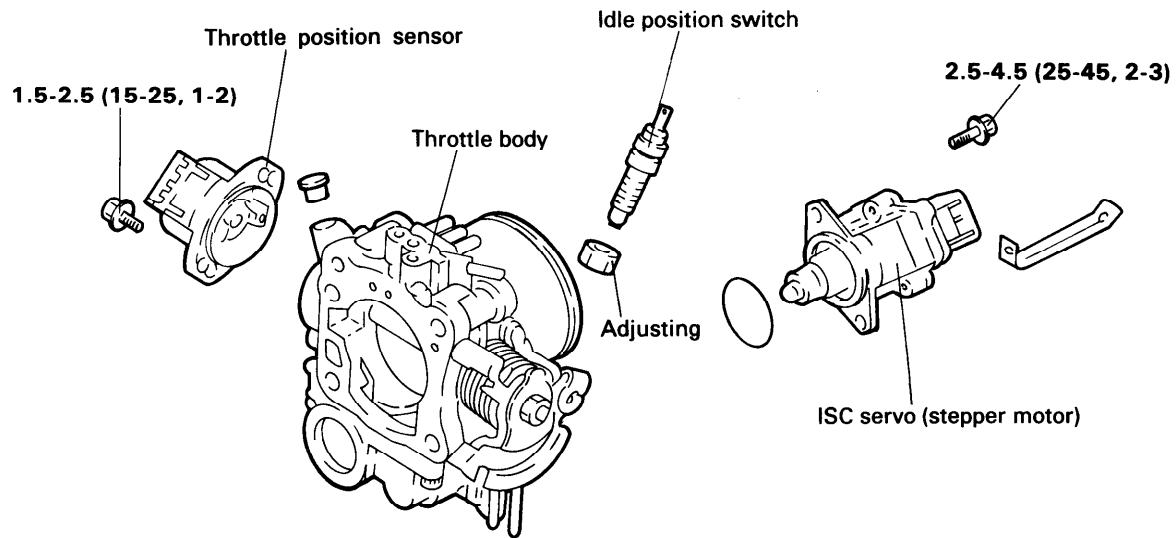
3. While turning the injector to the left and right, install it on to the delivery pipe.
4. Be sure the injector turns smoothly.

NOTE

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



THROTTLE BODY

COMPONENTS

TORQUE : Nm (kg.cm, lb.ft)

REMOVAL**CAUTION**

1. The throttle valve must not be removed.
2. When loosening a phillips screw firmly tightened, use an exact phillips screwdriver for the screw.

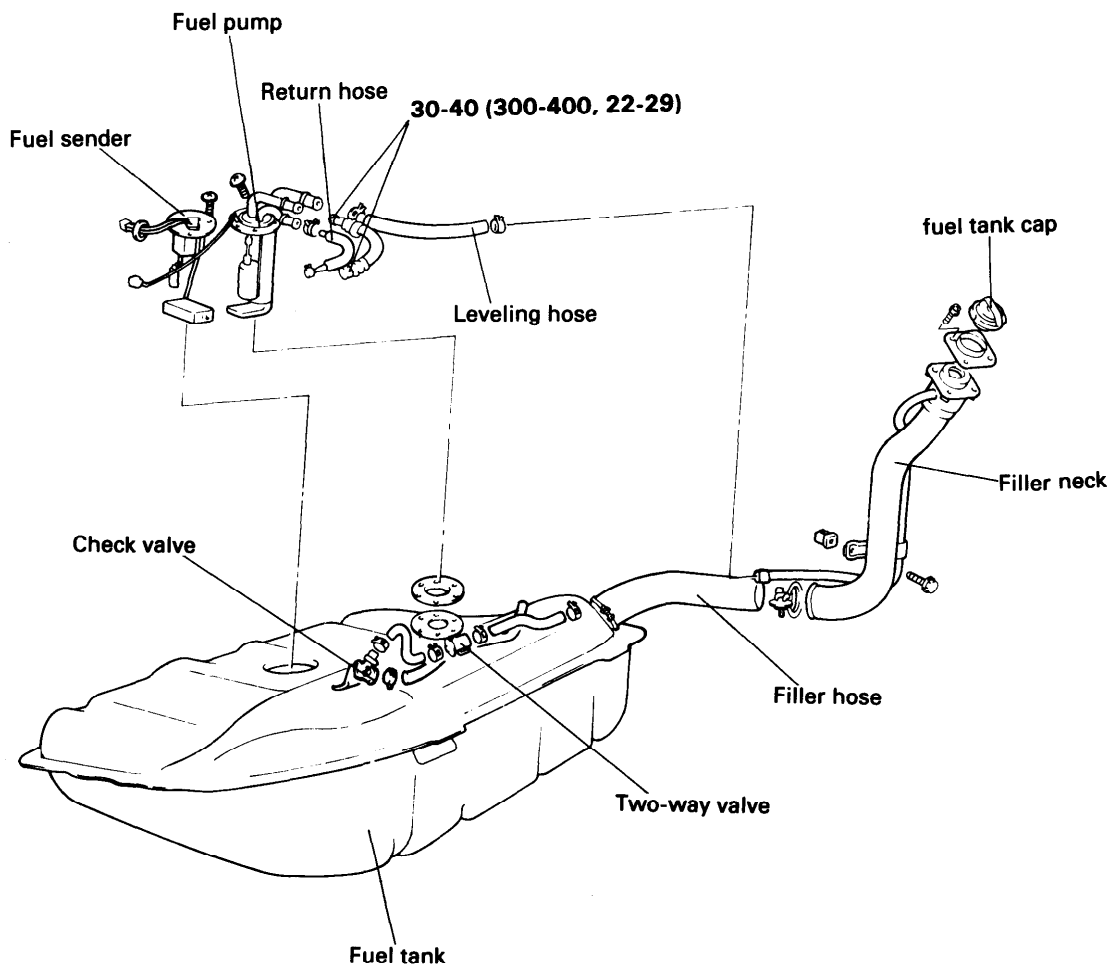
INSPECTION**Cleaning Throttle Body Components**

1. Clean all components. The following components must not be cleaned by immersion in cleaning solvents.
 - o Throttle position sensor
 - o ISC servo assembly
 - o Idle position switch

The insulation of these components will be damaged if they are immersed in cleaning solvent. They should be cleaned by using a piece of cloth.
2. Check for restriction of the vacuum port or passage. Clean the vacuum passage by using compressed air.

FUEL TANK

COMPONENTS



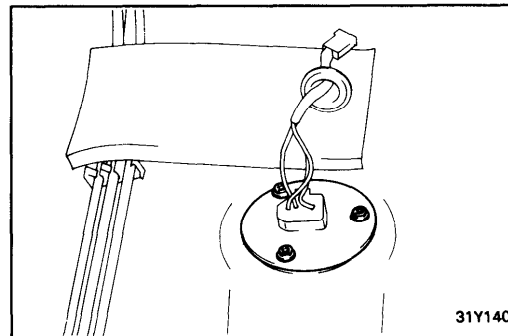
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

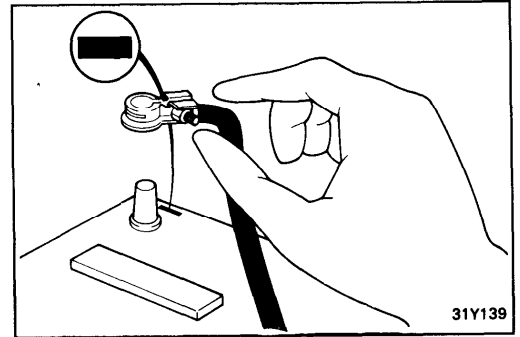
1. To reduce the internal pressure of the fuel main pipes and hose, first start the engine and then disconnect the electrical fuel pump connector in the rear seat side. Disconnect the fuel sender connector.

CAUTION

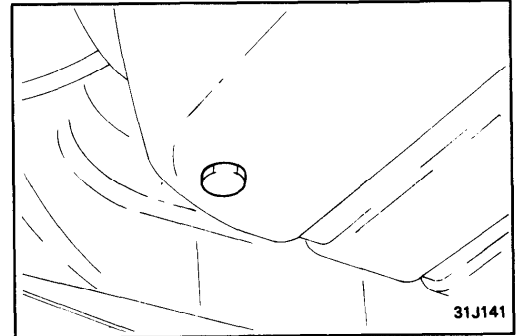
Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose otherwise fuel will spill out.



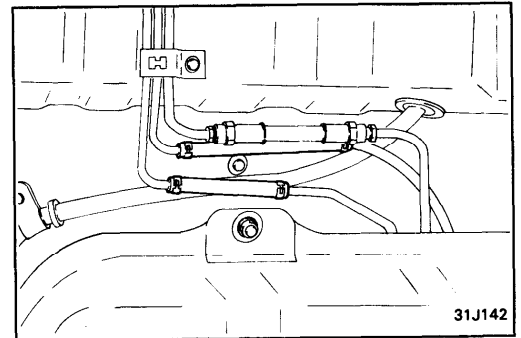
2. Disconnect the battery cable from the negative terminal of the battery.



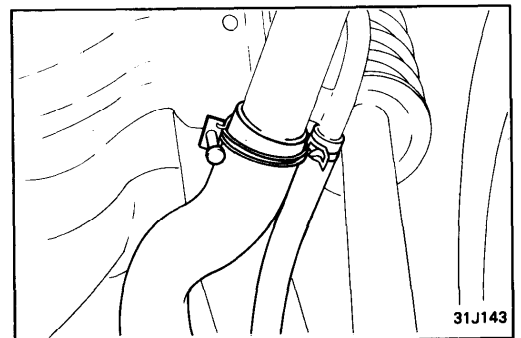
3. Remove the fuel tank cap.
4. Remove the drain plug and drain the fuel.



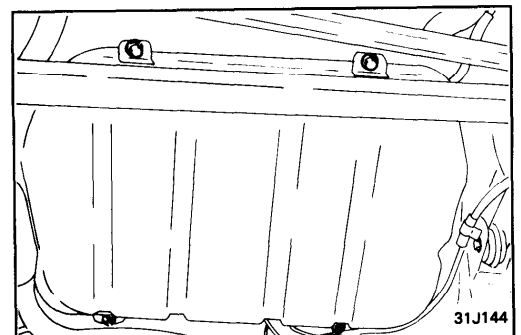
5. Disconnect the return hose and vapor hose.



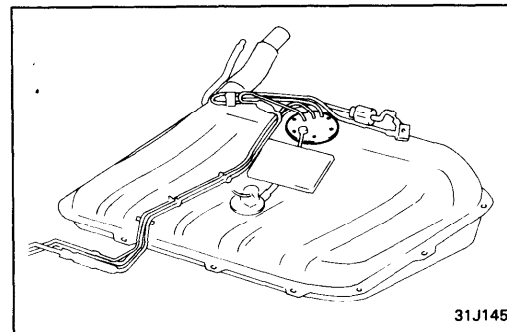
6. Detach the fuel filler hose and leveling hose.



7. Loosen the self locking nuts.



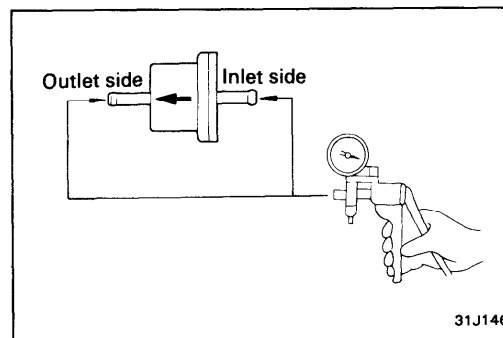
8. Disconnect the high pressure hose from the fuel tank.
9. Remove the fuel vapor hose and the fuel tank.



INSPECTION

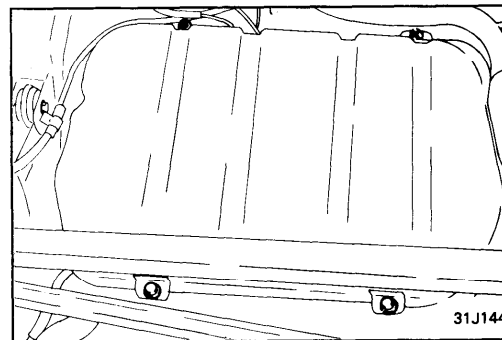
1. Check the hoses and the pipes for cracks or damage.
 2. Check the fuel tank cap for proper operation.
 3. Check the fuel tank for deformation, corrosion or cracking.
 4. Check the inside fuel tank for dirt or foreign material.
 5. Check the in-tank fuel filter for damage or restriction.
6. Test the two-way valve for proper operation.
 7. Using a vacuum hand pump, check the operation of the two-way valve.

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

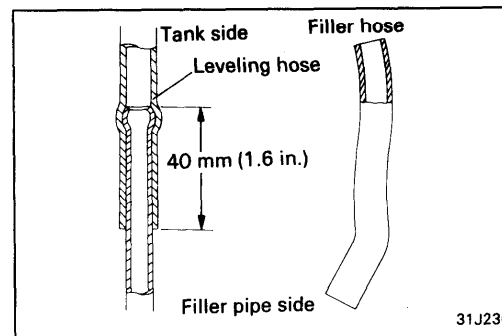


INSTALLATION

1. Install the fuel tank by tightening the self locking nuts.

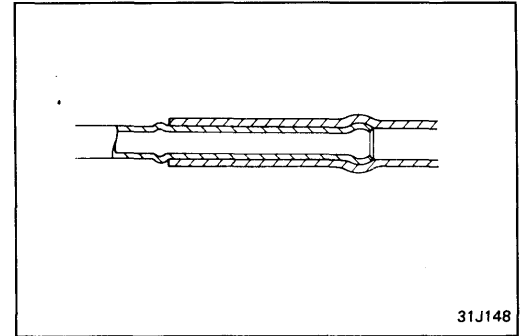


2. Connect the leveling hose to the tank and approximately 40 mm (1.6 in.) at the filler neck.
3. When connecting the filler hose, the end with the shorter straight pipe should be connected to the tank side.



4. Connect the vapor hose and return hose.

When attaching the fuel hose to the line, be sure that the hose is attached as shown in the illustration.



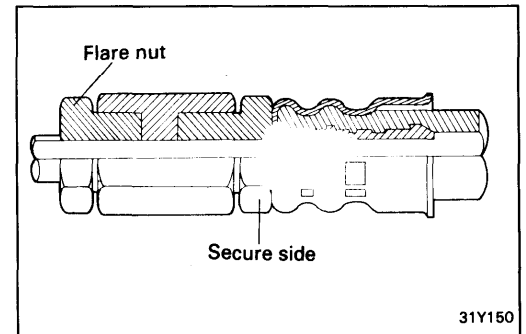
5. To connect the high pressure hose to the fuel pump, temporarily the flare nut by hand, and then tighten it to the specified torque. Be careful that the fuel hose does not twist.

Tightening torque

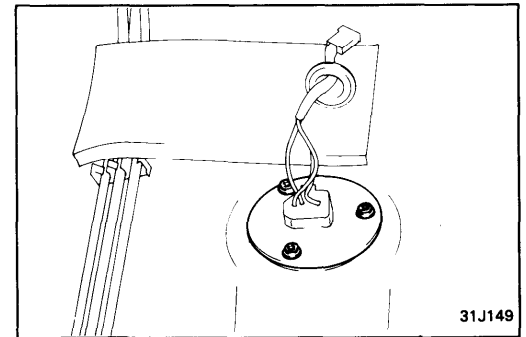
High pressure hose flare nut
30-40 Nm (300-400 kg.cm, 22-29 lb.ft)

NOTE

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



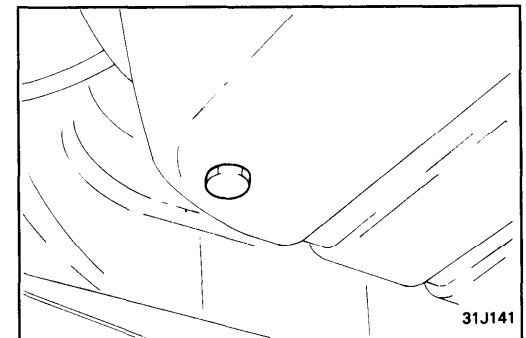
6. Connect the electrical fuel pump and fuel gauge unit connector.



7. Tighten the drain plug to the specified torque.

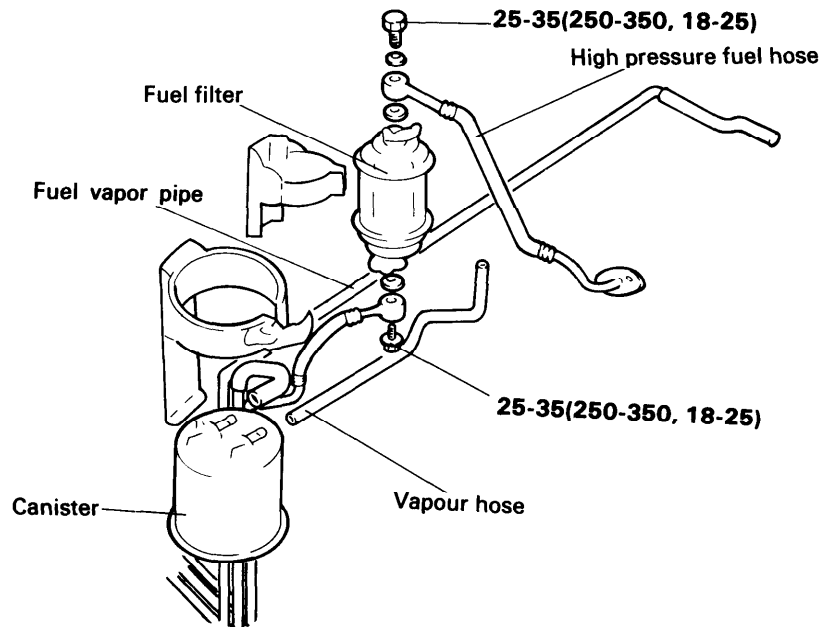
Tightening torque

Drain plug
15-25 Nm (150-250 kg.cm, 11-18 lb.ft)



FUEL LINE AND VAPOR LINE

COMPONENTS



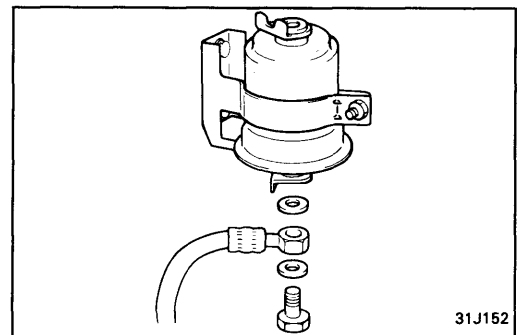
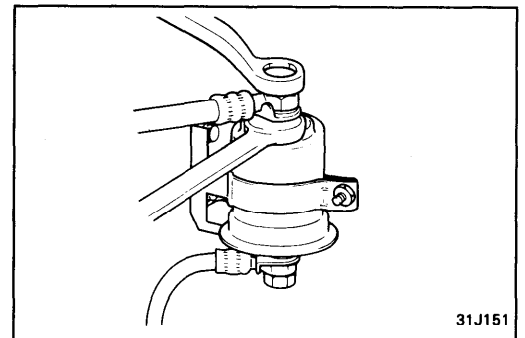
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the upper eye bolt while holding the fuel filter nut securely and remove the high pressure fuel hose.

CAUTION

- 1) Be sure to reduce the fuel pressure before disconnecting the fuel line and hose, otherwise fuel will spill out.
 - 2) Cover the hose connection with a shop towel to prevent splashing of fuel that could be caused by residual pressure in the fuel line.
2. Remove the lower eye bolt while holding the fuel filter nut assembly.
 3. Remove the fuel filter mounting bolts, then remove the fuel filter from the bracket.
 4. Remove the fuel return hose and line.
 5. Remove the fuel vapor hose and line.

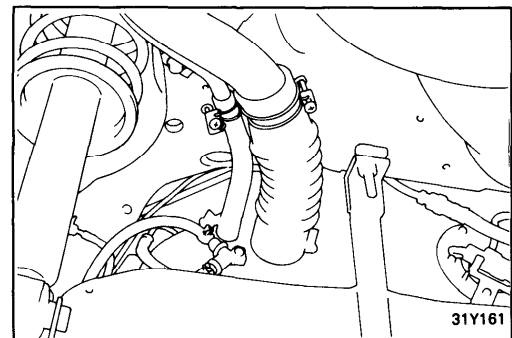
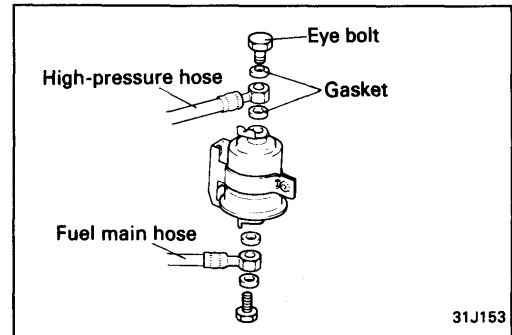
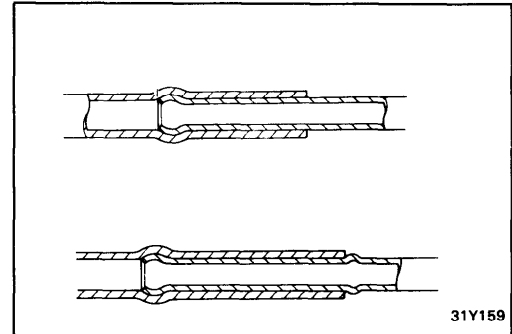


INSPECTION

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

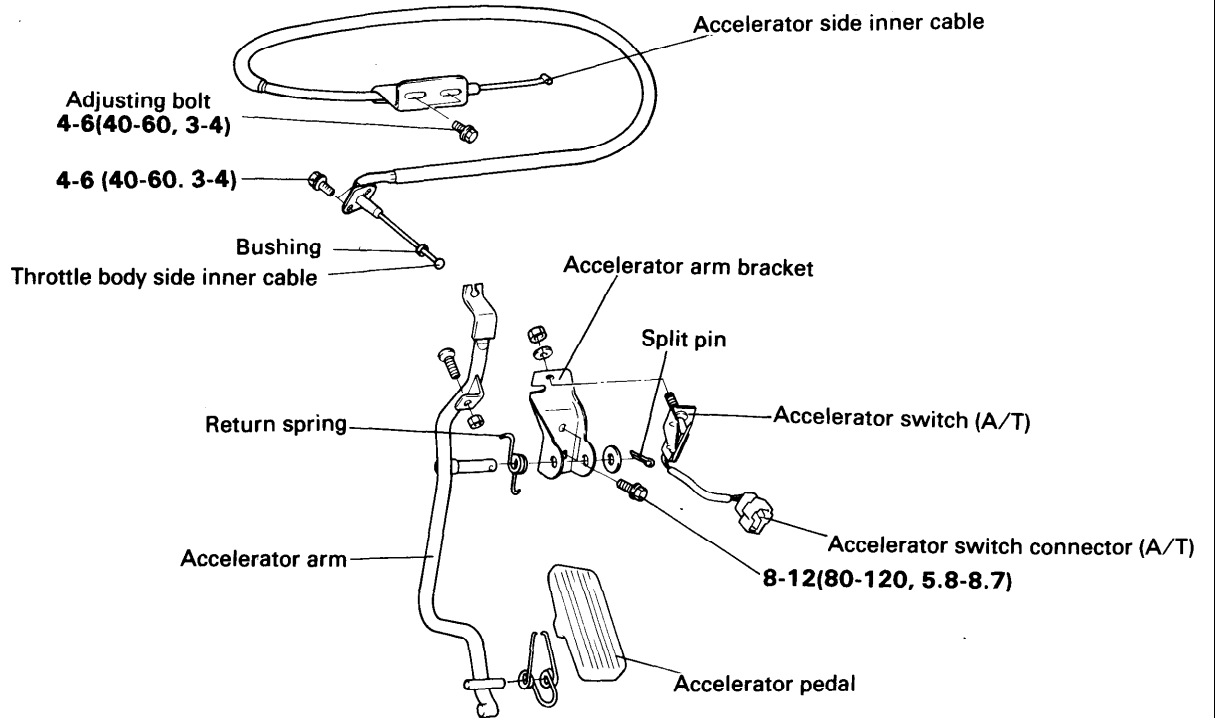
INSTALLATION

1. Install the fuel vapor hose and return hoses.
 - o If the fuel line has a stepped section, connect the fuel hose to the line securely, as shown in the illustration.
 - o If the fuel line does not have a stepped section, connect the fuel hose to the line securely.
2. Install the fuel filter, and tighten the fuel filter bracket.
3. Insert the main line on the filter and tighten the eye bolts while holding the fuel filter nuts.
4. Install the clips and make sure that they do not interfere with other components.



ENGINE CONTROL

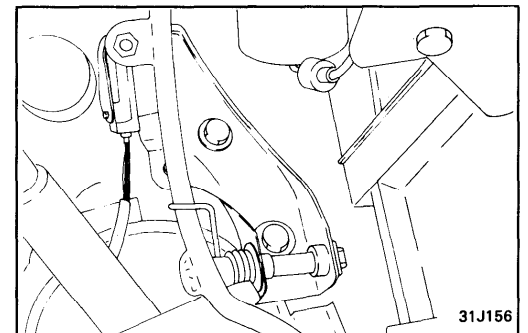
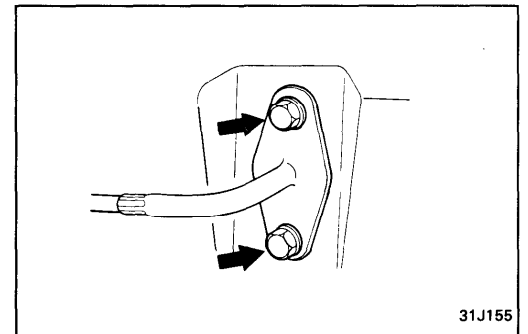
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the bushing and inner cable of the accelerator arm side,
2. After disconnecting the accelerator switch connector, loosen the bolts of the accelerator arm bracket and remove.



INSPECTION

1. Check the inner and outer cable for damage.
2. Check the cable for smooth movement.
3. Check the accelerator arm for deformation.
4. Check the return spring for deterioration.
5. Check the connection of the bushing to end metal fitting.
6. Check the accelerator switch proper operation.

INSTALLATION

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

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

Tightening torque

Accelerator arm bracket bolts
8-12 Nm (80-120 kg.cm, 6-7 lb.ft)

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

