FUEL SYSTEM

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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 (TP Sensor)	
Type	Variable resistor type
Resistance	3.5-6.5 kΩ
Output voltage at curb idle	0.48-0.52 V
Idle speed control (ISC) motor	
Type	Stepper motor
Resistance	28-33 Ω at 20°C (68°F)
Idle position switch	
Type	Contact type within ISC motor
Input sensor	
Volume air flow sensor (VAF Sensor)	
Type	Karman vortex type
Intake air temperature (IAT) sensor	
Type	Thermistor type
Resistance	2.33-2.97 kΩ at 20°C (68°F)
Engine coolant temperature (ECT) sensor	
Type	Thermistor type
Resistance	2.5 kΩ at 20°C (68°F) 0.3 kΩ at 80°C (176°F)
Heated oxygen sensor (HO2S)	
Type	Zirconia sensor
Vehicle speed sensor	
Type	Reed switch type
Camshaft position (CMP) sensor	
Type	Photo diode sensor
Crankshaft position (CKP) 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

Engine coolant temperature sensor assy	LOCTITE 962T or equivalent
Engine coolant temperature sender	Three bond No.231 or equivalent

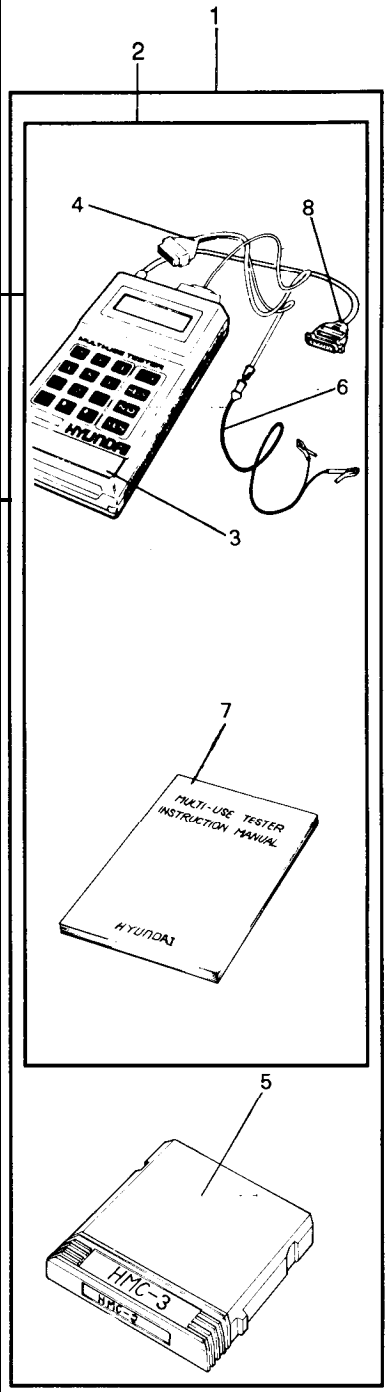
SERVICE STANDARD

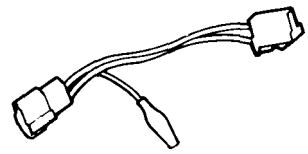
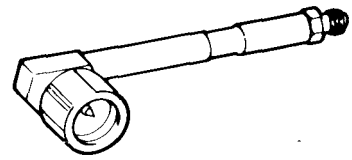
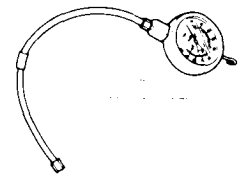
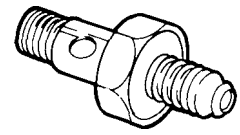
Basic ignition timing	BTDC $5^{o} \pm 2^{o}$ at curb idle
Curb idle speed	750 ± 100 rpm [For 1.6L Engine] 700 ± 100 rpm [For 1.8L Engine]
Throttle position sensor (TP Sensor) adjustment voltage	0.48-0.52 V at curb idle

TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Delivery pipe installation bolts	10-13	100-130	7-9
Engine coolant temperature sensor	20-40	200-400	14-29
Heated oxygen sensor (HO2S)	40-50	400-500	29-36
Throttle position sensor (TP Sensor) 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 surge tank 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. Scan Tool (ST) ass'y (Without Adapter Ass'y)		
09391-33100 2. Scan Tool sub ass'y		
09391-33200 3. Scan Tool main body		Diagnostic tester for MFI, automatic transaxle and cruise control systems
09391-33300 4. Wiring harness		
09391-33402 5. Rom-pack (HRP-B)		
09391-33500 6. Battery harness		
09391-33600 7. Instruction manual		
09391-33700 8. P/C connector (RS-232C)		For connection to the external communication device such as personal computer etc. in using Scan Tool.

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		
29353-24200 Fuel pressure gauge adapter		
J-38228 Fuel pressure gauge kit Includes-l 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.

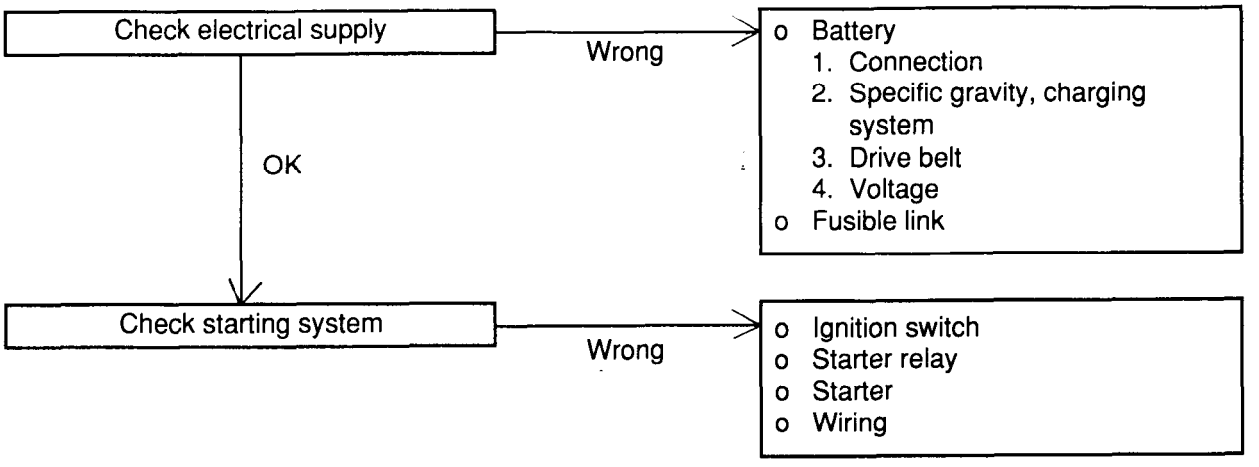
1. Power supply
    1) Battery
    2) Fusible link
    3) Fuse
2. Body ground
3. Fuel supply
    1) Fuel line
    2) Fuel filter
    3) Fuel pump
4. Ignition system
    1) Spark plug
    2) High-tension cable
    3) Ignition coil
5. Emission control system
    1) PCV system
    2) EGR system
    3) Vacuum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

Troubles with the MFI 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.

MFI TROUBLESHOOTING PROCEDURES

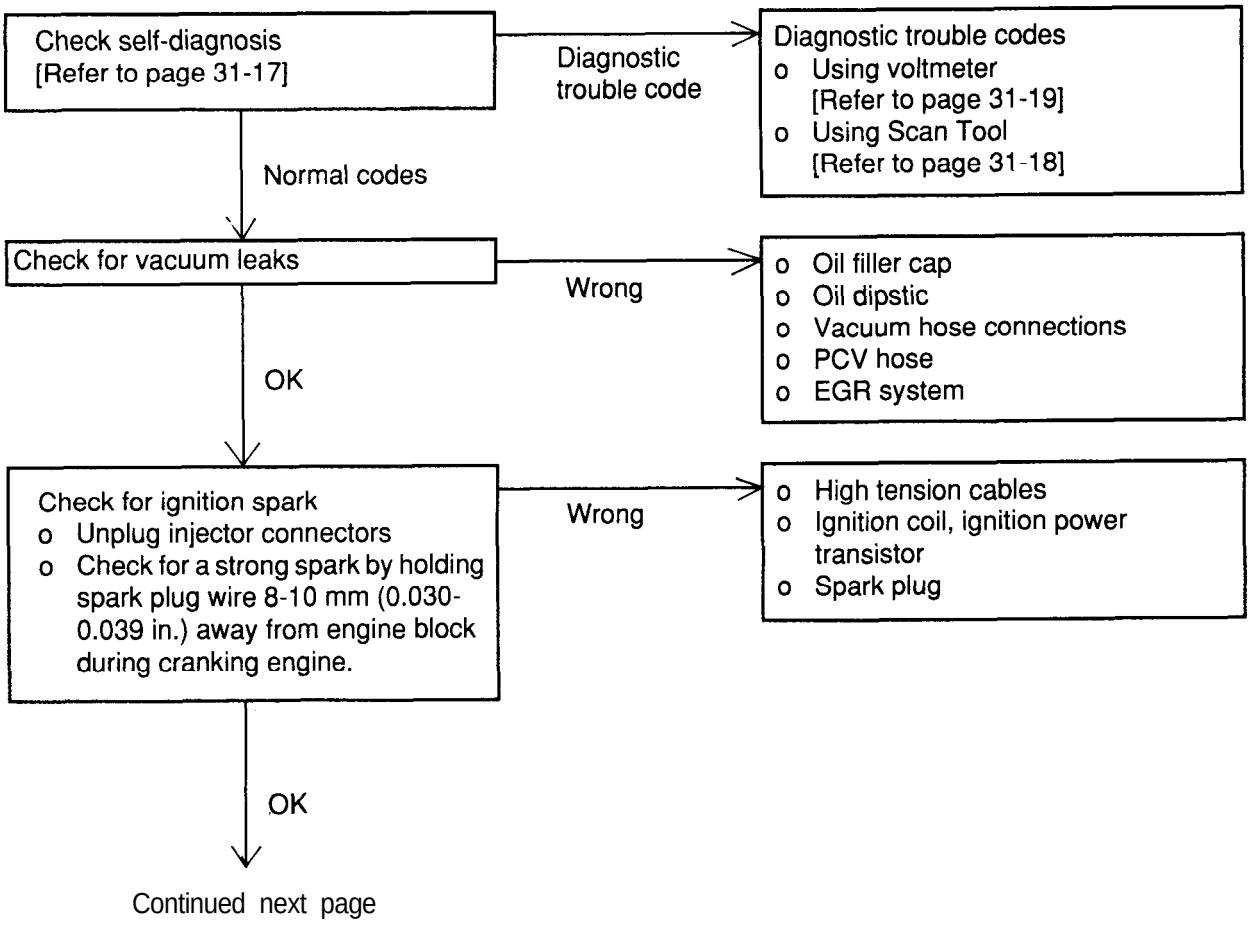
PROBLEM

Engine will not start



PROBLEM

Hard to start (Cranks OK)



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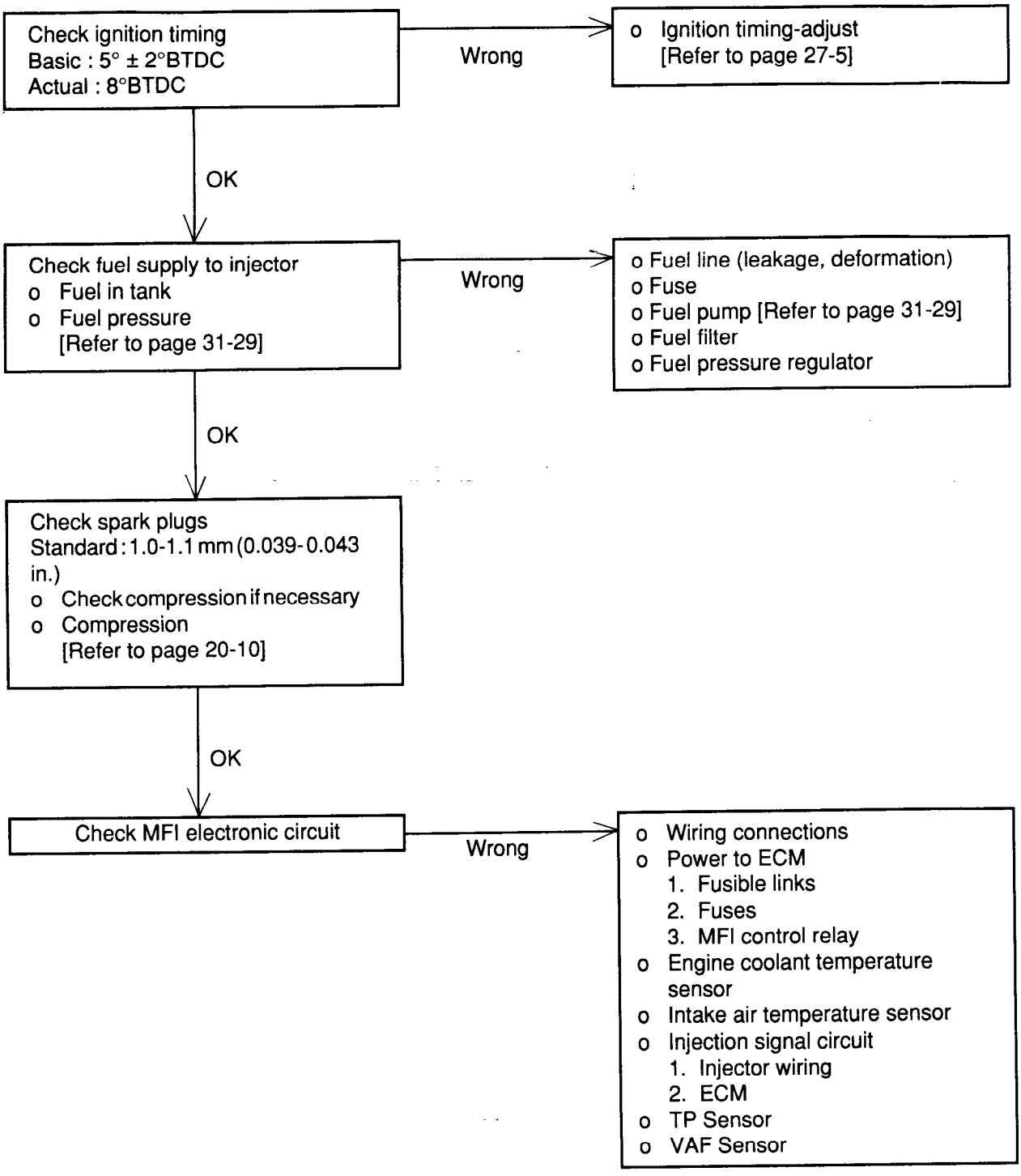
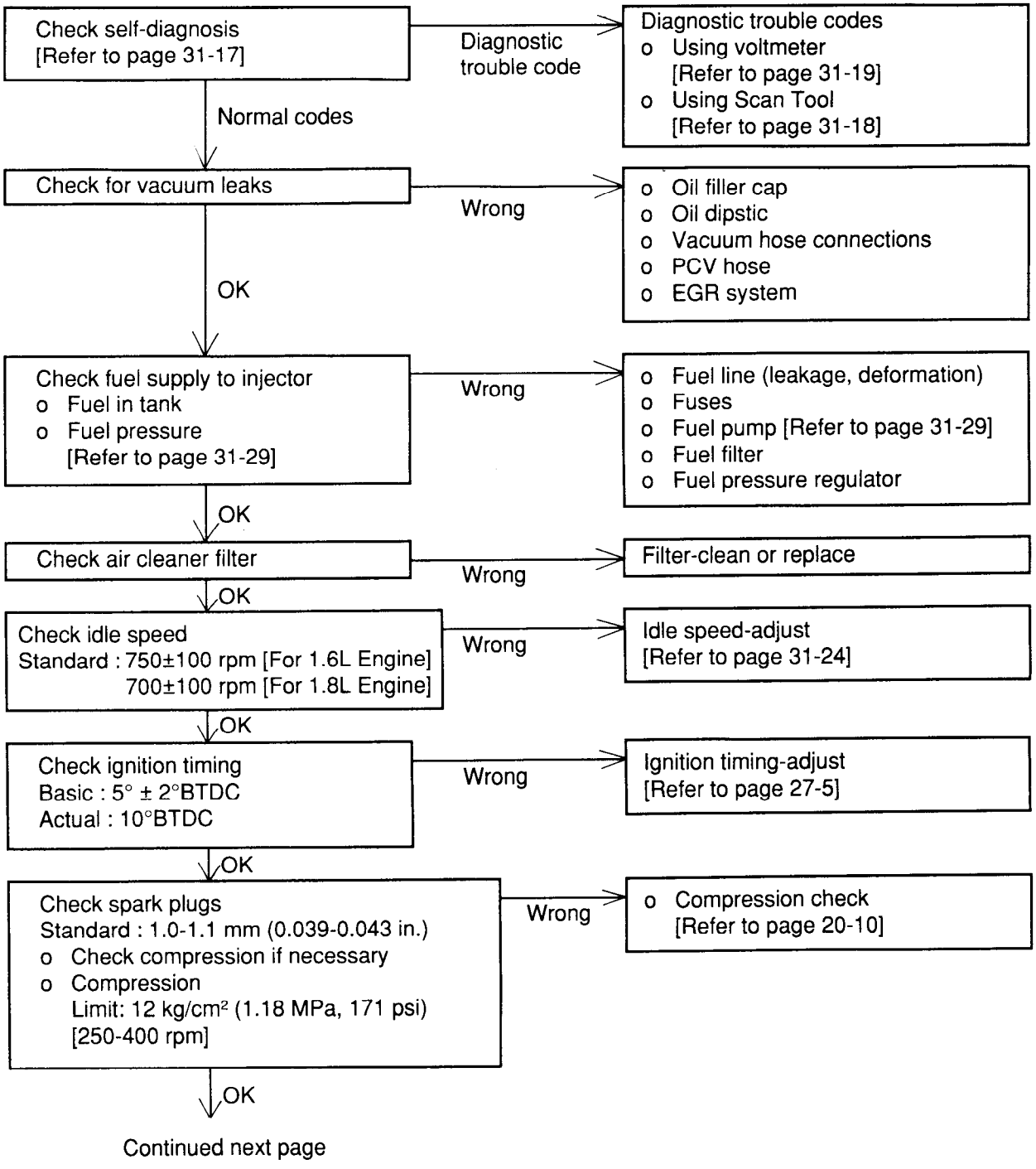
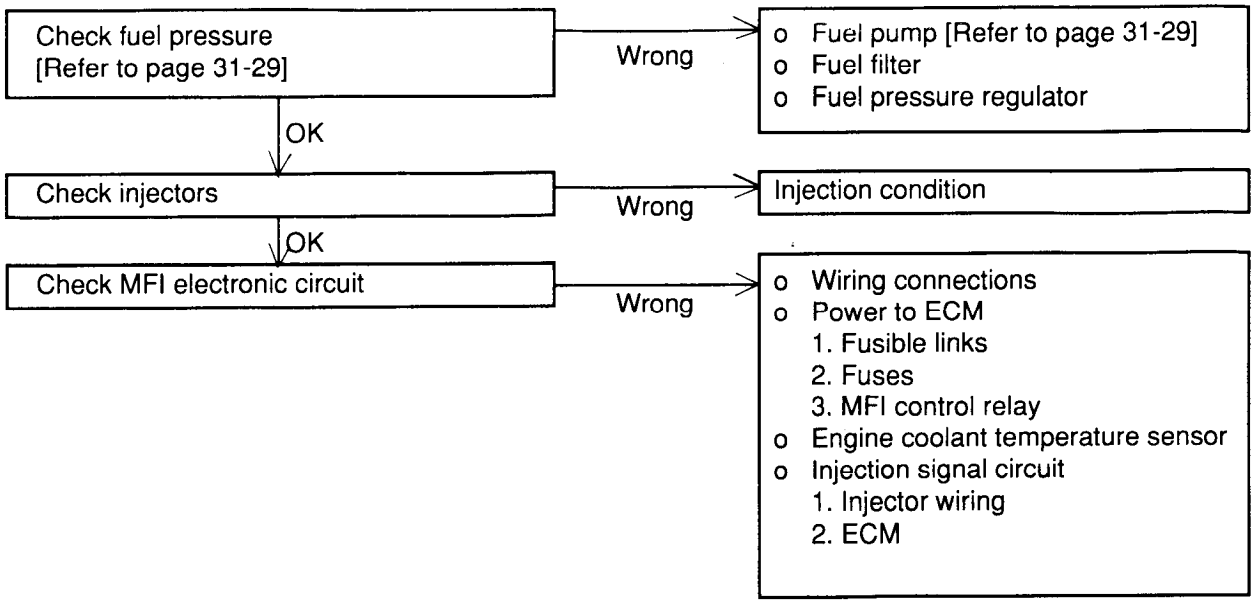

Check ignition timing
Basic : 5° ± 2°BTDC
Actual : 8°BTDC
Wrong
o Ignition timing-adjust
[Refer to page 27-5]
OK
Check fuel supply to injector
o Fuel in tank
o Fuel pressure
[Refer to page 31-29]
Wrong
o Fuel line (leakage, deformation)
o Fuse
o Fuel pump [Refer to page 31-29]
o Fuel filter
o Fuel pressure regulator
OK
Check spark plugs
Standard : 1.0-1.1 mm (0.039-0.043 in.)
o Check compression if necessary
o Compression
[Refer to page 20-10]
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Intake air temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM
o TP Sensor
o VAF Sensor

PROBLEM

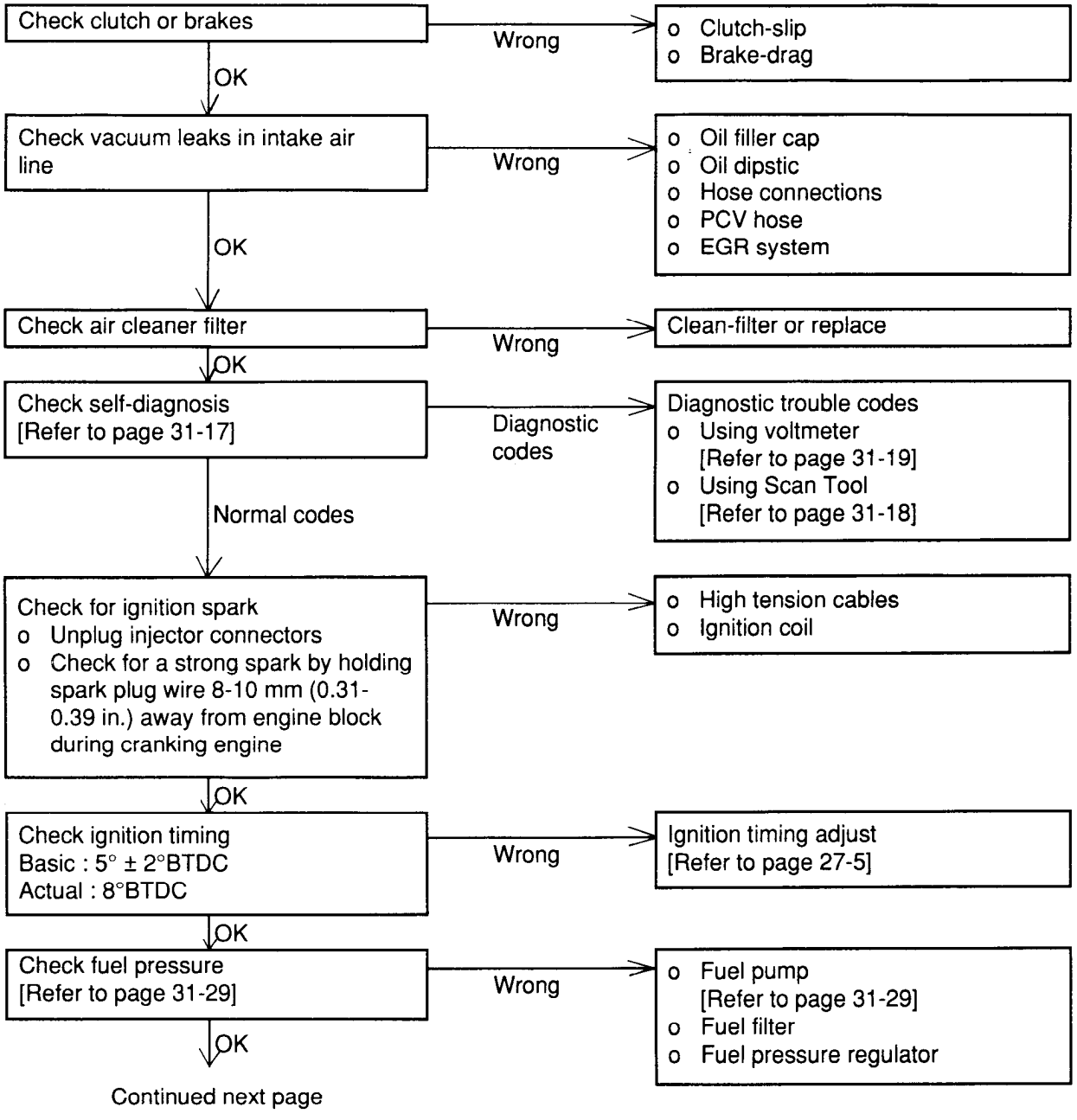
Rough idle or engine stalls




Check fuel pressure
[Refer to page 31-29]
Wrong
o Fuel pump [Refer to page 31-29]
o Fuel filter
o Fuel pressure regulator
OK
Check injectors
Wrong
Injection condition
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM

PROBLEM

Engine hesitates or accelerates poorly



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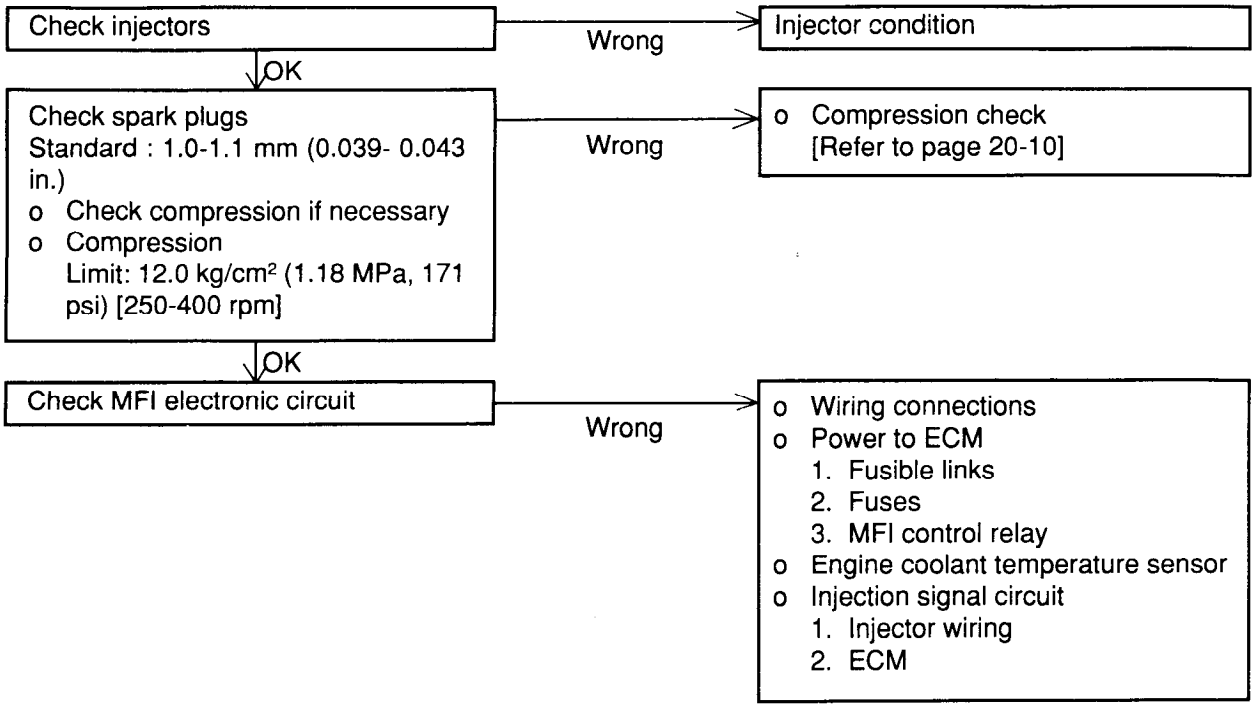

Check injectors
Wrong
Injector condition
OK
Check spark plugs
Standard : 1.0-1.1 mm (0.039- 0.043 in.)
o Check compression if necessary
o Compression
Limit: 12.0 kg/cm2 (1.18 MPa, 171 psi) [250-400 rpm]
Wrong
o Compression check
[Refer to page 20-10]
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM

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 of 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 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

TROUBLESHOOTING GUIDE CHART

Main Symptoms / Sub-Symptoms / Check points	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 fast idle	High idle speed	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1													
Starter	2	1		1										
TR SW [A/T] or Clutch start SW [M/T]	3													
Flywheel [M/T] or Drive plate [A/T]		2												
Volume air flow sensor circuit			1							4	11	8		
Idle speed control motor			2		3	3	3	3	3	2	8			2
Fuel pressure regulator			3		6	5	5				5	12	1	
ECT 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	
ECM			10		15	9	9	4	8	6	16	17	5	
A/C 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					
TP Sensor circuit									5			7		
Cylinder head											17			
Cluch [M/T]												1		
Brakes drag when released												2		
Oxygen 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/C 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 motor	6		1	2			
VAF sensor circuit	7	1	3		14		
ECT sensor circuit	8				12		
Injectors	9	7			11		
ECM	10	8	4	3	18		
TP Sensor circuit		3			13		
Spark plug		4			7	8	
A/C 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		
Oxygen 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	
Engine coolant pump						7	
Oil pump						9	
Cylinder head						10	
Cylinder block						11	
ECT sender						12	3

The number herein means the check order.

MFI SYSTEM INSPECTION

If the MFI system components (sensors, ECM, 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 MFI system components with the Scan Tool (ST).

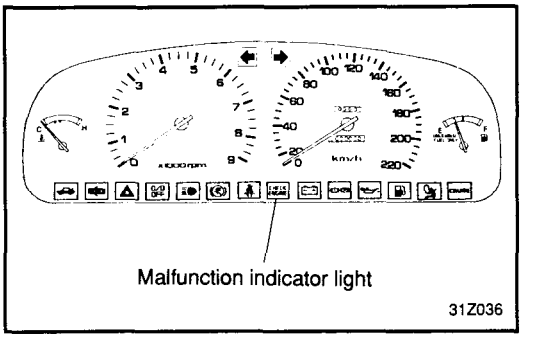
NOTES

1) Before removing or installing any part, read the diagnostic trouble 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 ECM.
3) The control harnesses between the ECM and heated 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 (MIL)

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

- Engine Control Module (ECM)
- Heated oxygen sensor (HO2S)
- Volume air flow sensor (VAF Sensor)
- Intake air temperature sensor (IAT Sensor)
- Throttle position sensor (TP Sensor)
- Engine coolant temperature sensor (ECT Sensor)



- Crankshaft position sensor (CKP Sensor)
- Camshaft position sensor (CMP Sensor)
- Injector
- Fuel pump
- EGR temperature sensor (Only California)
- Vehicle speed sensor
- Barometric pressure sensor
- Ignition coil

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 ECM monitors the input/output signals (some signals at all times and the others under specified conditions).
When the ECM detects that an irregularity memorize the diagnostic 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 Scan Tool.
Diagnostic trouble codes will remain in the ECM as long as battery power is maintained. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected.

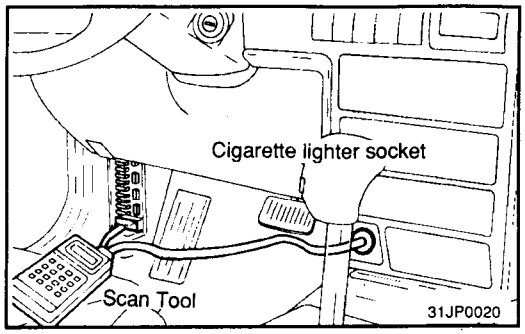
NOTE

If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble 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, diagnostic 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 ECM connector is disconnected. Do not disconnect the battery before the diagnostic trouble codes are completely read.

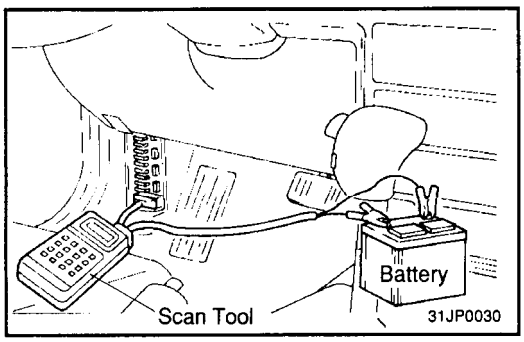
Inspection Procedure (Using Scan Tool)



1. Turn OFF the ignition switch.
2. Connect the Scan Tool to the diagnosis connector in the fuse box.
3. Connect the power-source terminal of the Scan Tool to the cigarette lighter socket.
4. Turn ON the ignition switch.
5. Use the scan tool to check the diagnostic trouble codes.
6. Repair the faulty part from the diagnosis chart.
7. Erase the diagnostic trouble code.

NOTE
1) Select 4. "SPECIAL TEST" from the function selection menu of the Scan Tool.
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.

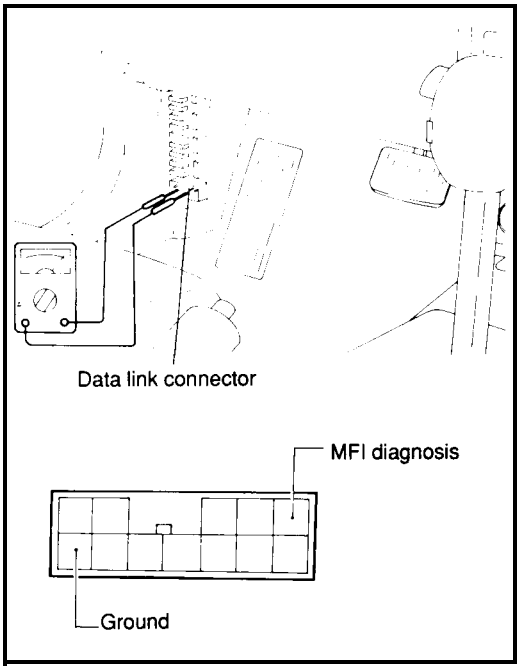
8. Disconnect the scan tool.



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.

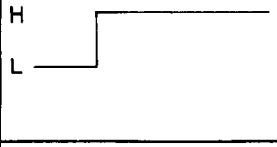
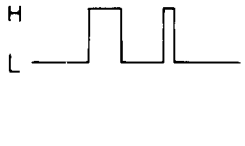
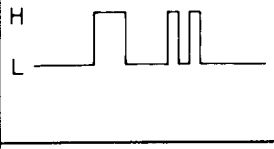
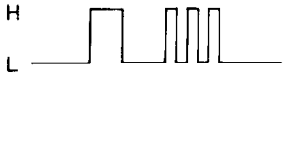
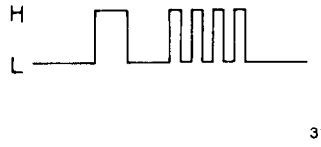
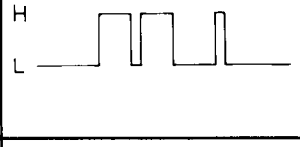
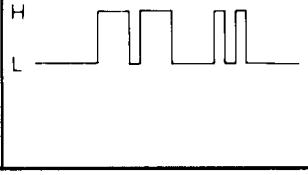
Inspection Procedure (Using Voltmeter)

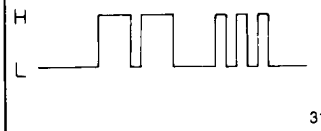
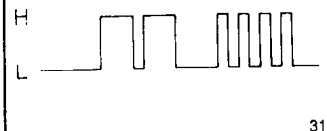
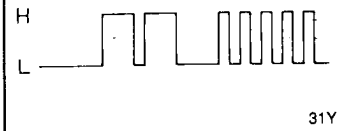
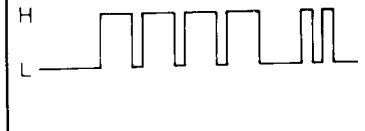
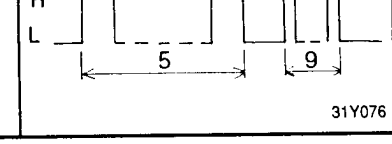
1. Connect the voltmeter to the data link connector.
2. Turn the ignition switch, and the engine control module (ECM) memory contents will immediately start.
   After recording the abnormal item, check and repair each part according to the check items in "Diagnosis Chart".
3. When the defective parts 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 diagnostic trouble code has been erased.



Diagnosis Chart

The 16 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	Diagnostic trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control module	 31J062	-	-	(Replace engine control module)
2	Heated oxygen sensor (Front)	 31J063	11	Retained	o Harness and connector o Fuel pressure o Injectors (Replace if defective.) o Intake air leaks o Oxygen sensor (Front)
3	Volume air flow sensor	 31Y064	12	Retained	o Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)
4	Intake air temperature sensor	 31Y065	13	Retained	o Harness and connector o Intake air temperature sensor
5	Throttle position sensor	 31Y066	14	Retained	o Harness and connector o Throttle position sensor o Idle position switch
6	Engine coolant temperature sensor	 31Y067	21	Retained	o Harness and connector o Engine coolant temperature sensor
7	Crankshaft position sensor	 31Y068	22	Retained	o Harness and connector If harness and connector are normal, replace crankshaft position sensor assembly.)

Output preference order	Diagnosis item	Diagnostic trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
8	Camshaft position sensor	 31Y070	23	Retained	o Harness and connector If harness and connector are normal, replace crankshaft position sensor.)
9	Vehiclespeed sensor (reed switch)	 31Y071	24	Retained	o Harness and connector o Vehicle-speed sensor (reed switch)
10	Barometric pressure sensor	 31Y072	25	Retained	o Harness and connector If harness and connector are normal, replace barometric pressure sensor assembly.)
11	Injector	 31Y073	41	Retained	o Harness and connector o Injector coil resistance
12	Fuel pump	 31Y074	42	Retained	o Harness and connector o Control relay
13	EGR*	 31Y075	43	Retained	o Harness and connector o EGR temperature sensor o EGR valve o EGR solenoid valve o EGR valve control vacuum
14	Ignition coil	 31J161	44	Retained	o Harness and connector o Ignition coil o Ignition power transistor
15	Heated * oxygen sensor (Rear)	 31Y076	59	Retained	o Harness and connector o Fuel pressure o Injectors o Intake air leaks o Heated oxygen sensor (Rear)

Output preference order	Diagnosis item	Trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
16	Normal state		-	-	-

NOTE

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

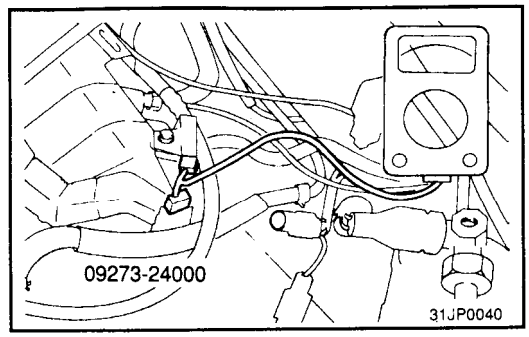
SERVICE ADJUSTMENT PROCEDURES

Idle Speed Check Procedures

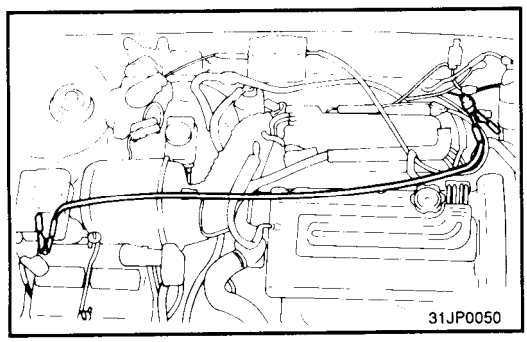
Checking conditions;

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

1. Install a tachometer and a timing light.



2. Ground the ignition timing adjustment terminal.



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

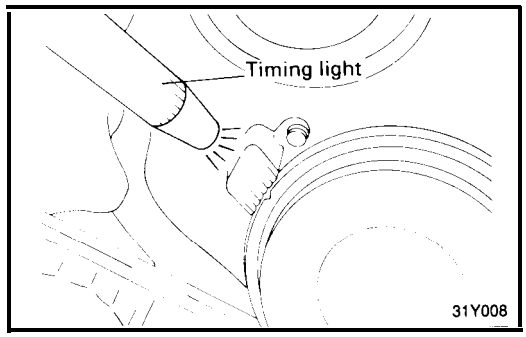
Basic ignition timing	$5^{o} \pm 2^{o}$BTDC (At idle)

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

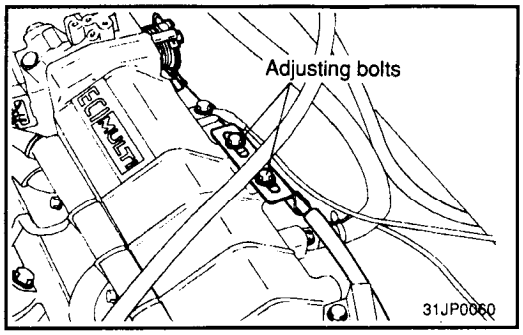
NOTE

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

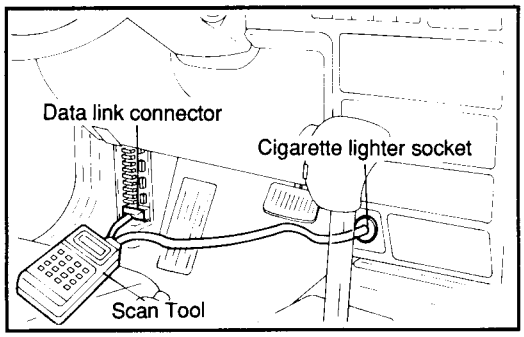
Adjustment conditions:

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

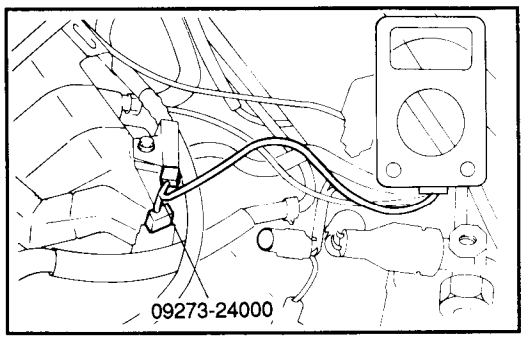
1. Loosen the accelerator cable.



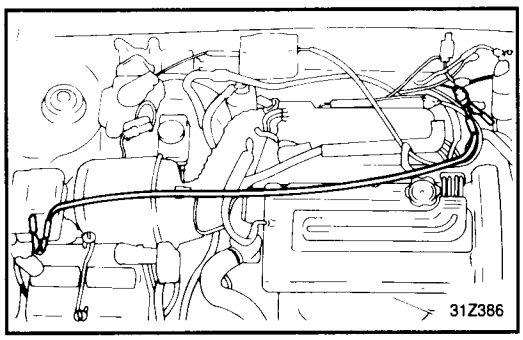
2. Connect the scan tool to the data link connector in the fuse box.



3. If the scan tool is not used, connect a tachometer. And ground the data link connector.



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 scan tool is used, press code No. 22 and read the engine rpm.

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

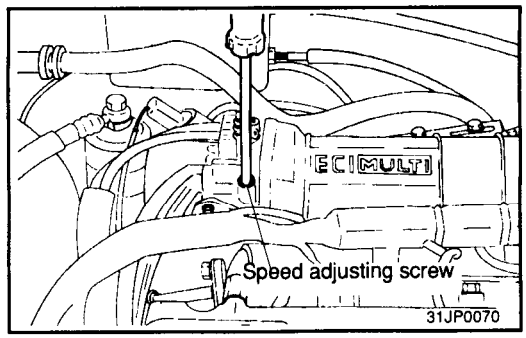
NOTE

1. The engine speed on a new vehicle driven less than 500 Km (300 miles) may be 20 to 100 prkm 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

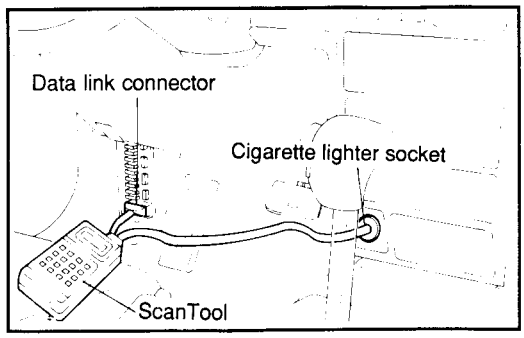
If the idle speed is higher than specified, even with the speed adjusting screw (SAS) fully closed, check whether the idle switch (fixed SAS) moving mark exists or not. If it is found that the switch has moved, adjust the idle switch (fixed SAS) has been mis-adjusted.



9. Turn the ignition switch to the OFF position.
10. If the scan tool was not used, disconnect the data link connector
11. Disconnect the lead wire from the ignition timing adjusting terminals.
12. Run the engine again and let it idle for about 10 minutes. Check that the engine is in normal idling condition.

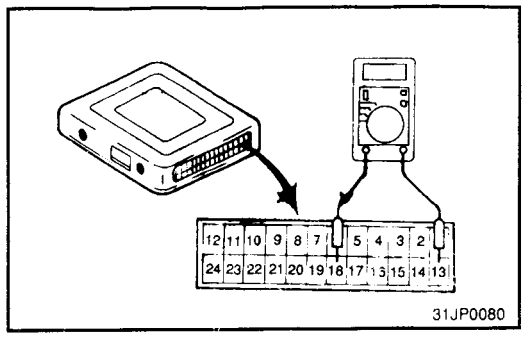
Throttle Position Sensor Adjustment

1. Connect a scan tool to the data link connector.



2. If a scan tool (ST) is not used, connect a digital-type voltmeter between terminal 13 and terminal 18 of the ECM.

   NOTE
   1. Do not disconnect the ECM connector from the ECM.
   2. Use a digital voltmeter.

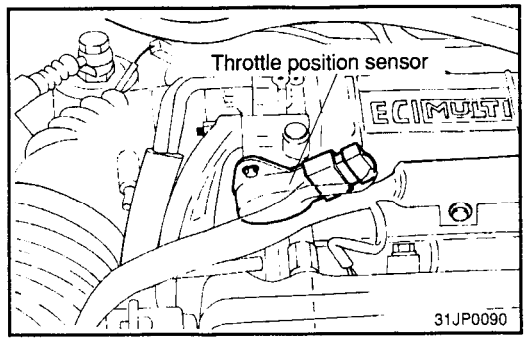


3. Turn the ignition switch to the ON position (do not start engine) and check that the TP Sensor output voltage is as specified. If a scan tool is used, press code No. 14 and read the voltage.

Standard value	**480-520** mV

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

   NOTE
   1. Turning the TP Sensor clockwise increases the output voltage.
   2. Tighten the screws securely after adjustment.



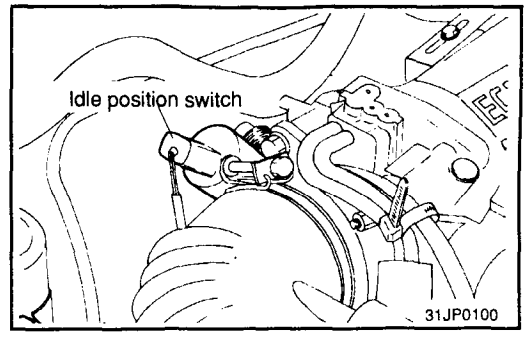
5. Turn the ignition switch to the OFF position.

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 swtich 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.

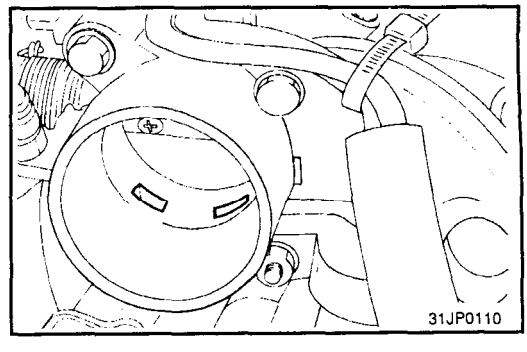
NOTE
Keep the idle switch (fixed SAS) from moving when tightening the lock nut.



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

Throttle Body (Throttle Valve Area) Cleaning

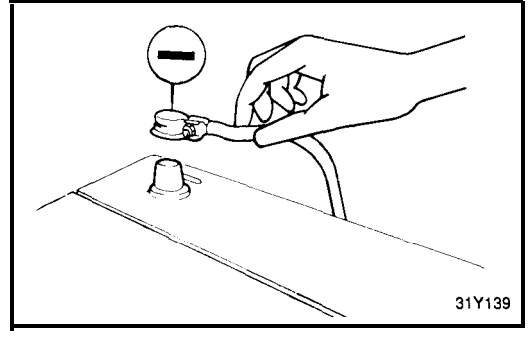
NOTE
Disconnect the intake air hose from the throttle body, and check the throttle valve surface for carbon deposits. Spray cleaning solvent on the valve to remove carbon deposits.



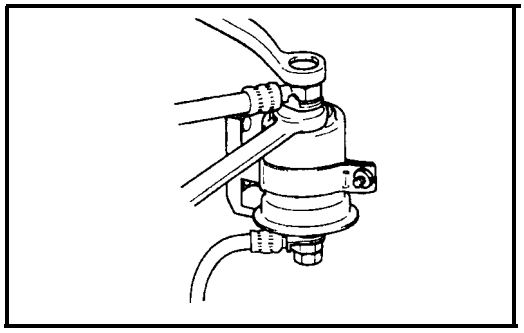
1. Warm up the engine, then stop it.
2. Remove the intake air hose from the throttle body.
3. Plug the bypass passage inlet of the throttle body.

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

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 intake air hose.
9. Disconnect the battery ground cable for more than 10 seconds.
10. Adjust the basic idle speed (Speed adjusting screw).

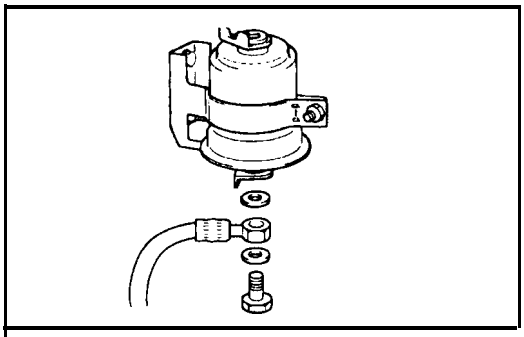


Fuel Filter Replacement



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

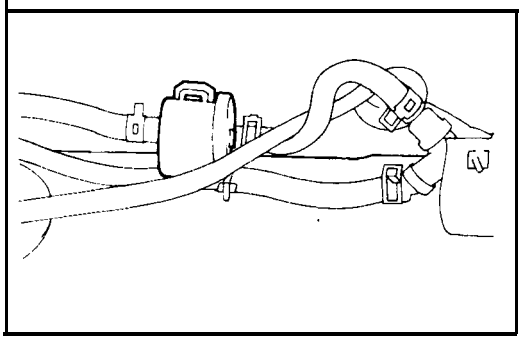
CAUTION
1) Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.
2) Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.



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.

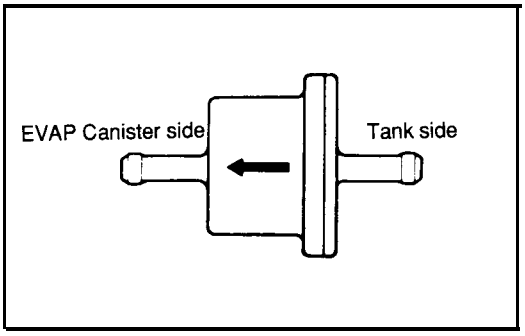
Tightening torque ..... 25-35 Nm (250-350 kg.cm, 18-25 lb.ft)

Overfill Limiter (Two-way Valve) Replacement



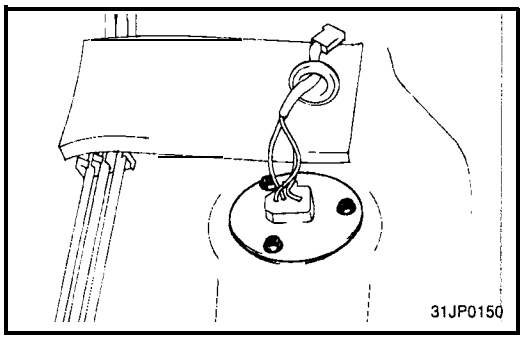
1. Disconnect the vapor hoses, and then remove the overfill limiter.

2. Connect the overfill limiter in the correct direction.

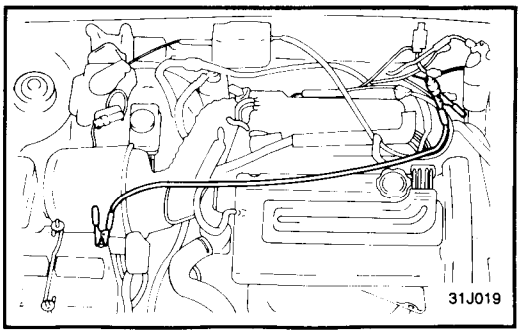


Fuel Sender Replacement

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



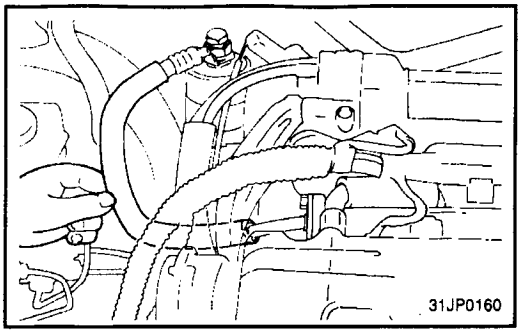
Fuel Pump Operation Check



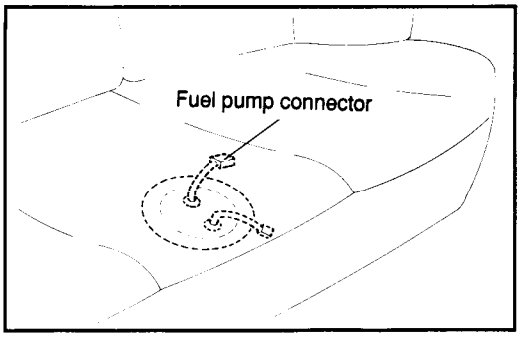
1. Turn the ignition switch to the OFF position.
2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.

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.



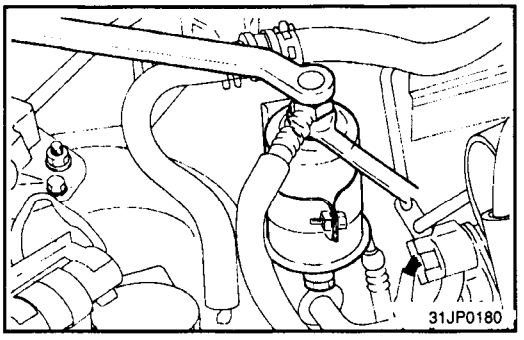
Fuel Pressure Test



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.

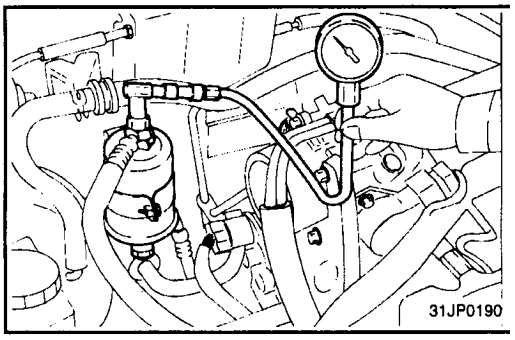
2. Remove the upper eye bolt while holding the fuel filter nut securely.

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



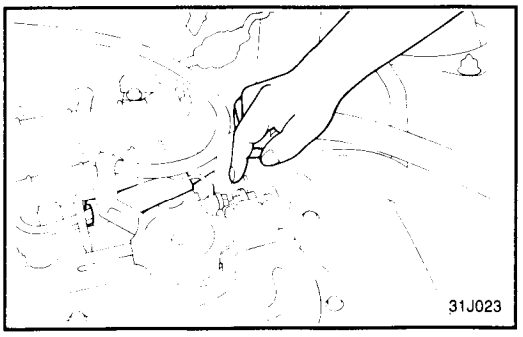
3. Using the fuel pressure gauge adapter (09353-24000,09353-24100, 09353-24200), install the fuel-pressure gauge to the fuel filter. Tighten the bolt to the specified torque.

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



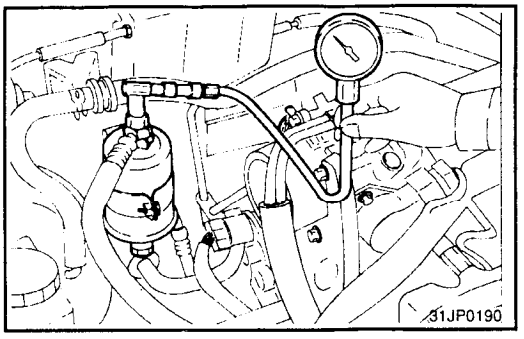
4. Connect the battery's negative (-) terminal.
5. Apply battery voltage to the terminal for the pump drive and activate the fuel pump; then, with fuel pressure applied, check that there is no fuel leakage from the pressure gauge or connection part.

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/cm^2, 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/cm^2, 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.
Ther is no difference in fue pressure when the vacuum hose is connected and when it is not.	a Clogging, or damaged vacuum hose of 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.

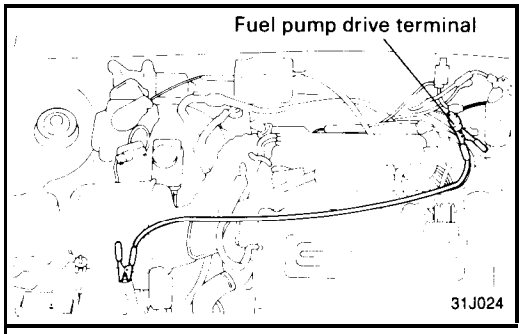
9. Stop the engine and check for a change in the fuel pressure gauge reading, which should hold for approximately 5 minutes. If the gauge indication drops, observe the rate of drop. Determine and remove the causes according to the following table.

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 delivery pipe.

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

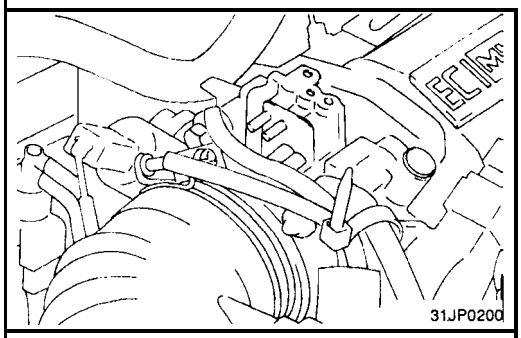
12. Install a new O-ring in the groove at the end of the high-pressure hose.
13. Connect the high pressure fuel hose to the fuel filter, and tighten the screws to the specified torque..
14. Check for fuel leaks.
    - o Apply battery voltage to the fuel pump drive terminal to operate the fuel pump.
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



EGR Valve Control Vacuum Check

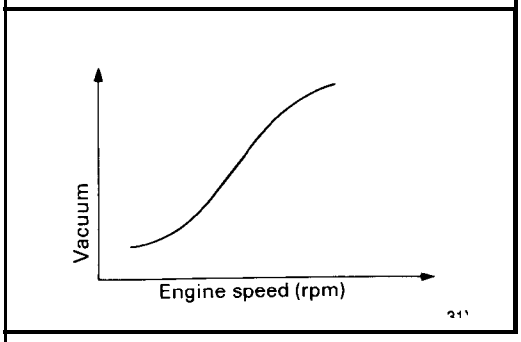
Checking Condition
Engine coolant temperature: 80-95°C (176-205°F)

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.

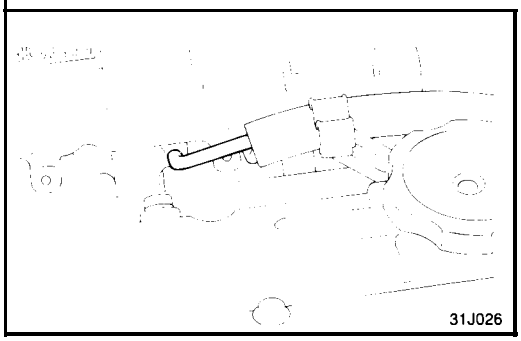
NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body port may be restricted and require cleaning.



Purge Port Vacuum Check

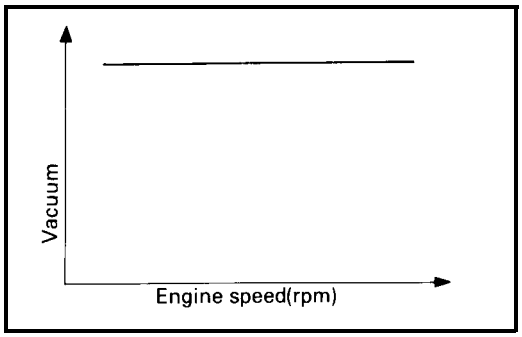
Checking Condition
Engine coolant temperature: 80-95°C (176-205°F)

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

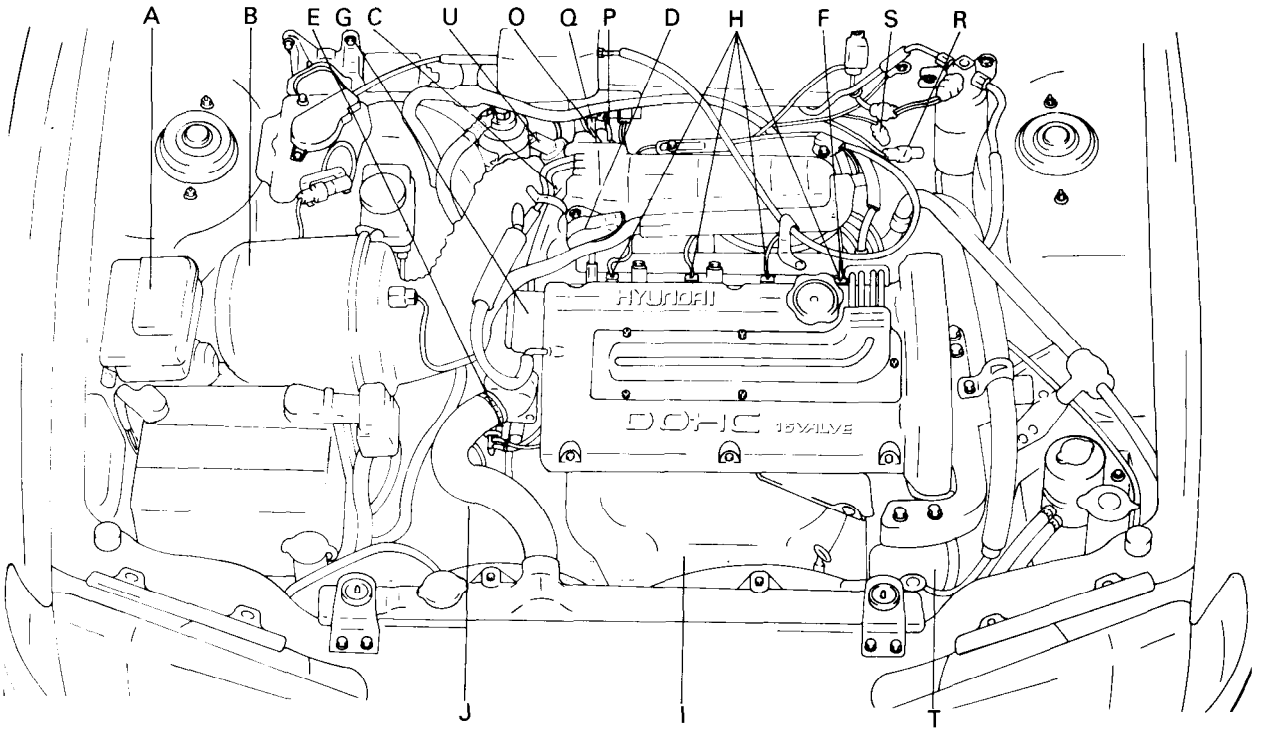


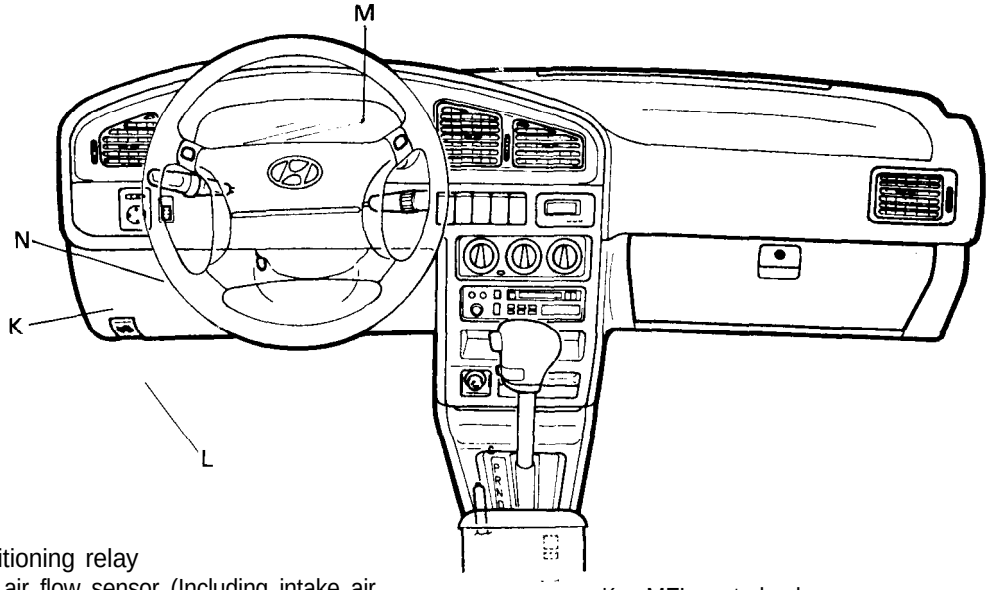
2. Start the engine and check to see that, after increasing the engine speed, vacuum remains fairly constant.

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



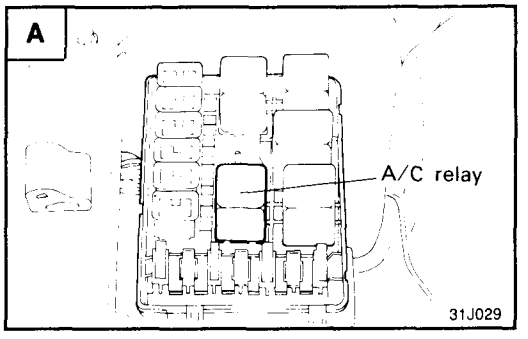
LOCATION OF MFI COMPONENTS



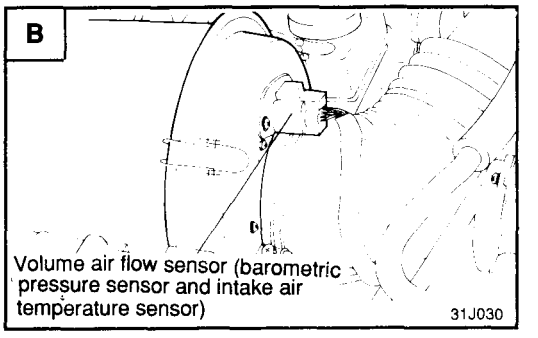


A. Air conditioning relay
B. Volume air flow sensor (Including intake air temp sensor and barometric pressure sensor)
C. ISC motor (Stepper motor)
D. Throttle position sensor (TP Sensor)
E. Engine coolant temperature sensor
F. Ignition Power transistor
G. Crankshaft position (CKP) sensor and camshaft position (CMP) sensor
H. Injectors
I. Heated oxygen sensor(HO2S)
J. Transaxle range (TR) switch
K. MFI control relay
L. Data link connector
M. Vehicle speed sensor
N. Engine control module (ECM)
O. EGR temperature sensor (For California only)
P. EGR solenoid valve (For California only)
Q. EVAP Canister Purge Solenoid Valve
R. Fuel pump check terminal
S. Ignition timing adjustment terminal
T. Power steering oil pressure switch
U. Idle position switch

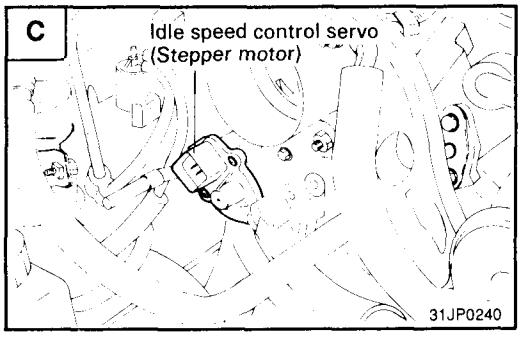
A


A/C relay
31J029

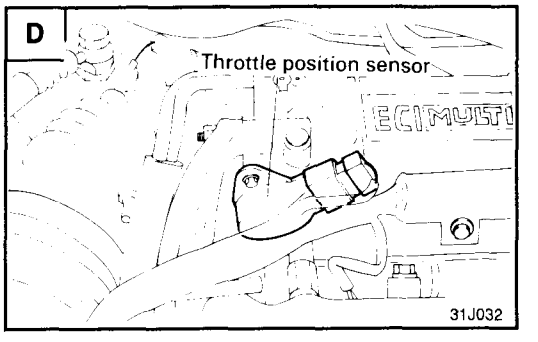
B


Volume air flow sensor (barometric pressure sensor and intake air temperature sensor)
31J030

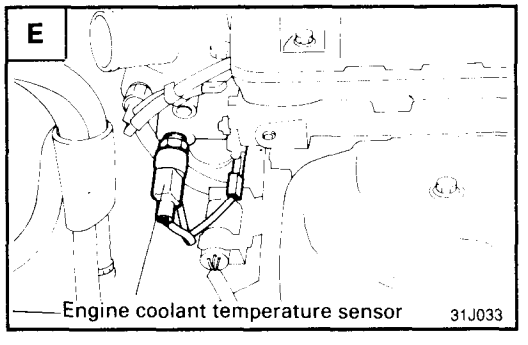
C


Idle speed control servo (Stepper motor)
31JP0240

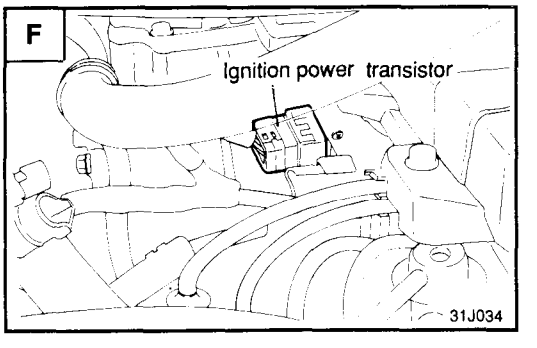
D


Throttle position sensor
31J032

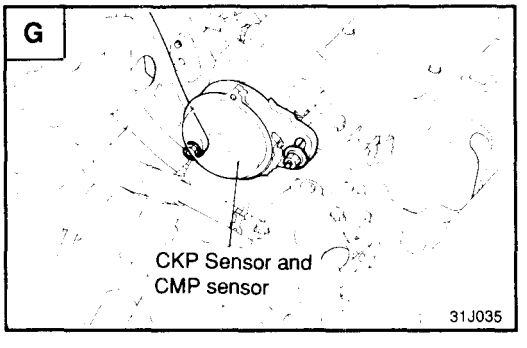
E


Engine coolant temperature sensor
31J033

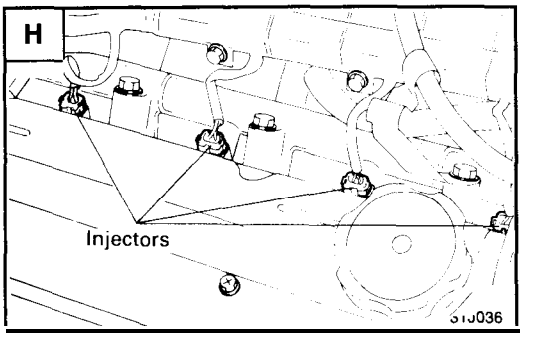
F


Ignition power transistor
31J034

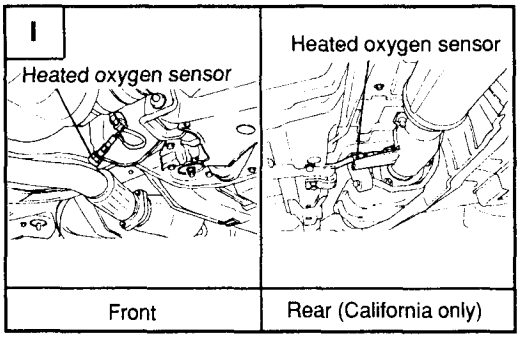
G


CKP Sensor and CMP sensor
31J035

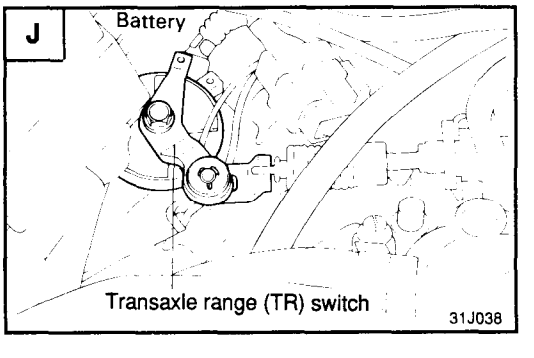
H


Injectors
31J036

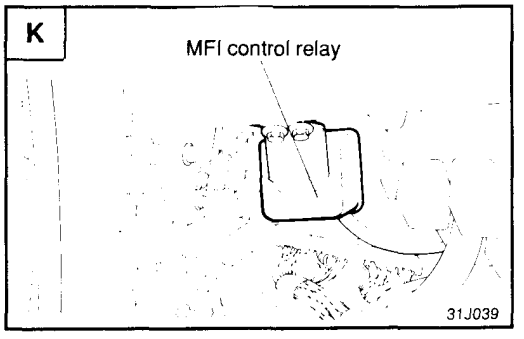
I


Heated oxygen sensor
Heated oxygen sensor
Front
Rear (California only)

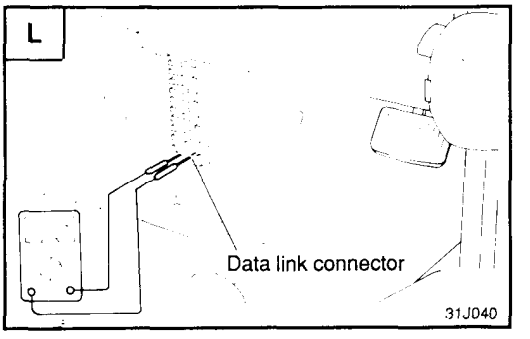
J


Battery
Transaxle range (TR) switch
31J038

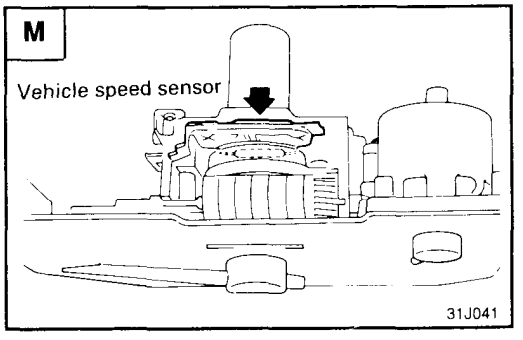
K


MFI control relay
31J039

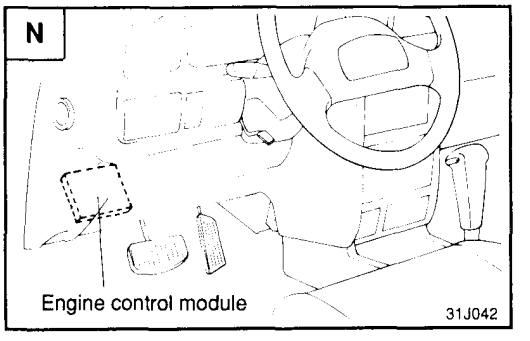
L


Data link connector
31J040

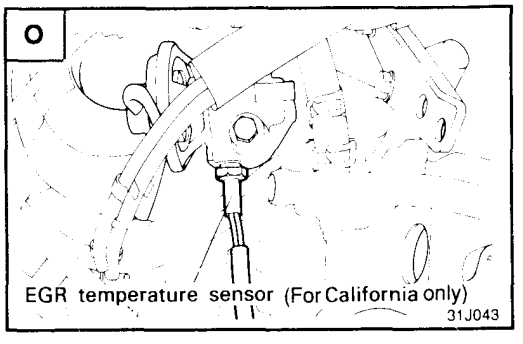
M


Vehicle speed sensor
31J041

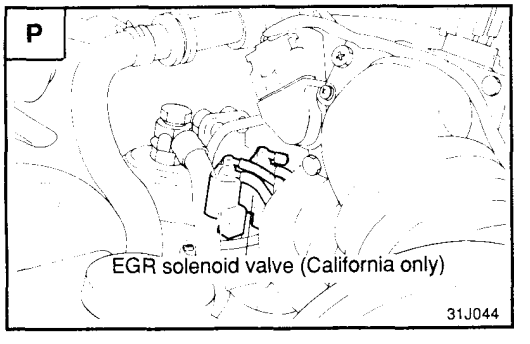
N


Engine control module
31J042

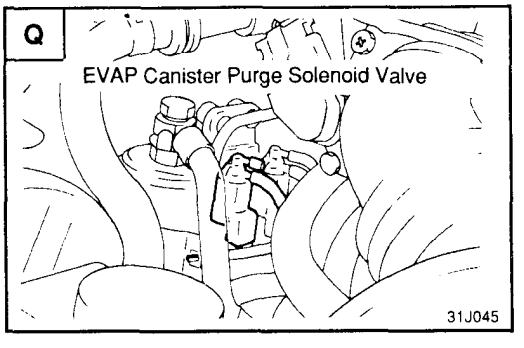
O


EGR temperature sensor (For California only)
31J043

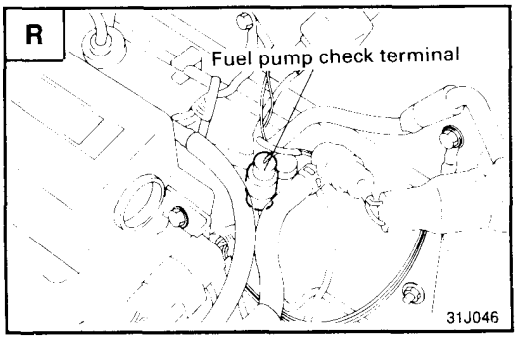
P


EGR solenoid valve (California only)
31J044

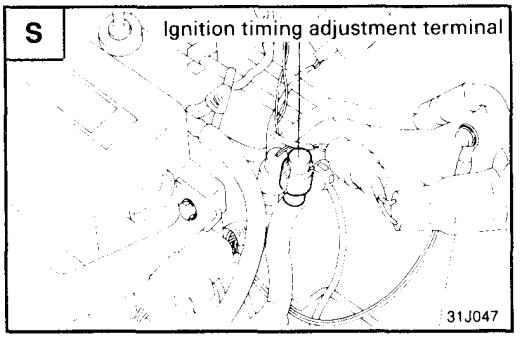
Q


EVAP Canister Purge Solenoid Valve
31J045

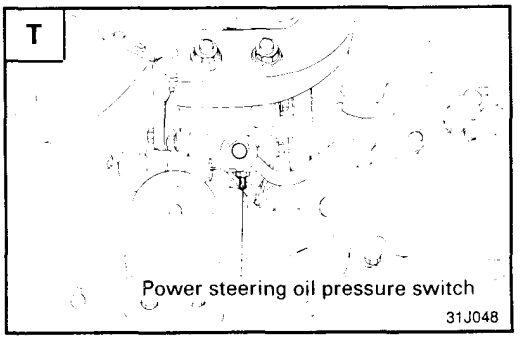
R

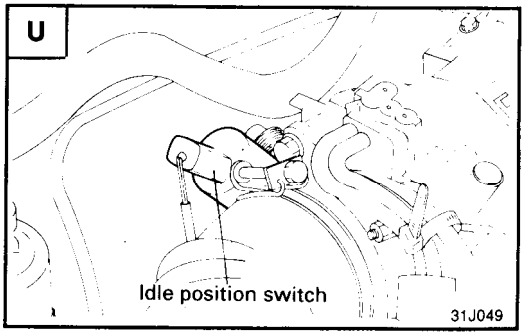

Fuel pump check terminal
31J046

S


Ignition timing adjustment terminal
31J047

T

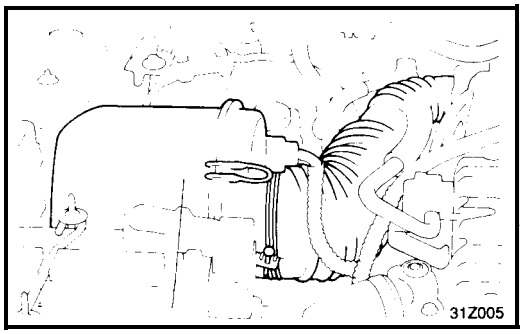

Power steering oil pressure switch
31J048


U
Idle position switch
31J049

MFI COMPONENTS INSPECTION

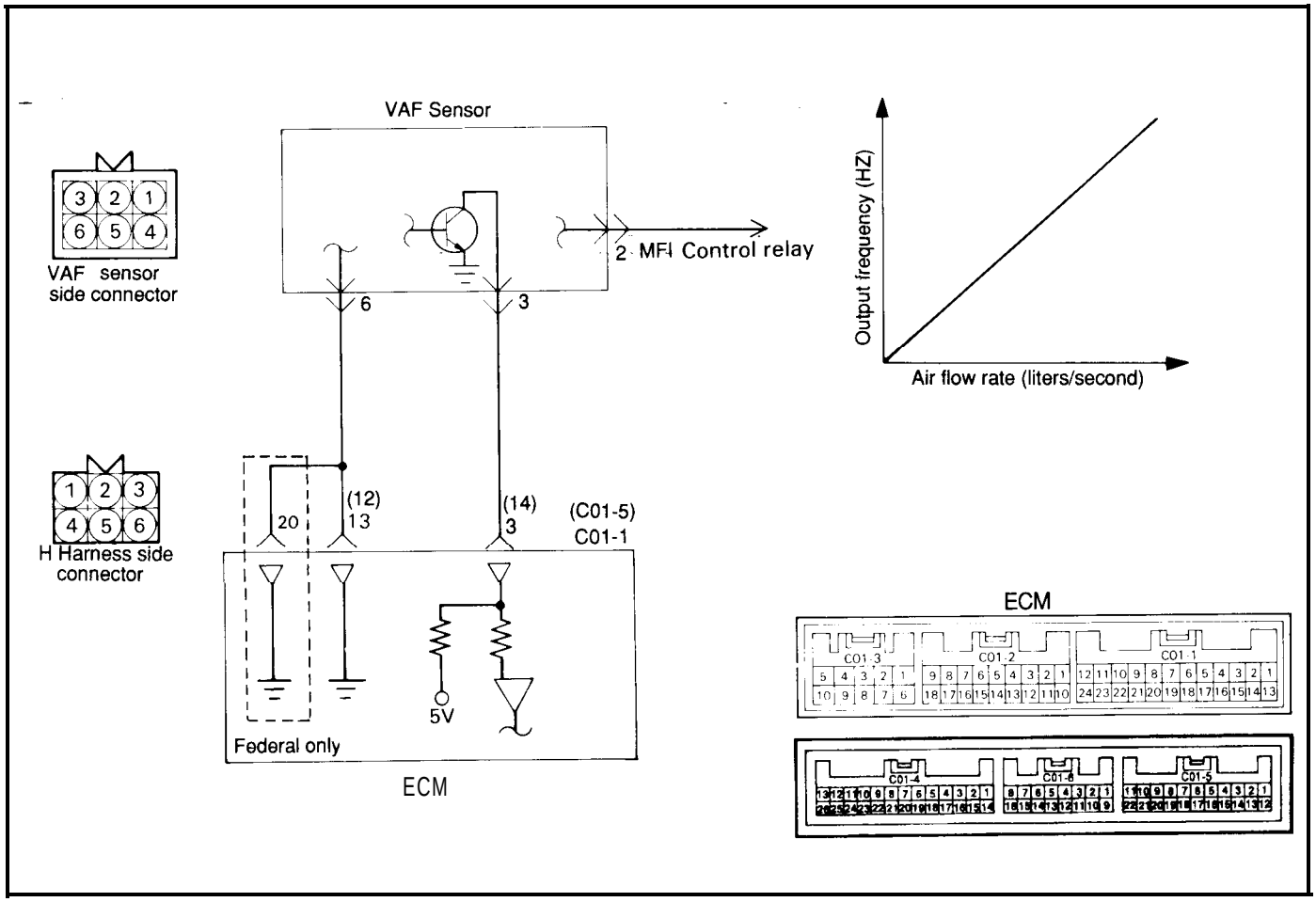
VOLUME AIR FLOW SENSOR (VAF Sensor)

The VAF Sensor measures the intake air volume. It makes use of a Karman vortex to detect the air flow rate and sends it to the ECM as the intake air volume signal.
The ECM uses this intake air volume signal to decide the basic fuel injection duration.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If the engine stalls occasionally, crank the engine and shake the VAF Sensor harness. If the engine stalls, check for the poor contact of the VAF Sensor connector.
2. If the VAF Sensor output frequency is other than 0 when the ignition switch is turned on (do not start the engine), Check for the faulty VAF Sensor or ECM.
3. If the engine can be idle even if the VAF Sensor output frequency is out of specification, check for the following conditions:
   1) Disturbed air flow in the VAF Sensor.
      Disconnected air duct, clogged air cleaner filter.
   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 Scan Tool

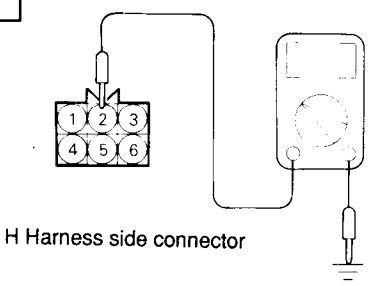
Check Item	Data display	Check conditions	Engine state	Test specification
Volume air flow sensor o Service data Item No. 12	Sensor air volume (frequency)	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle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

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

Harness Inspection Procedures

* : California only

1

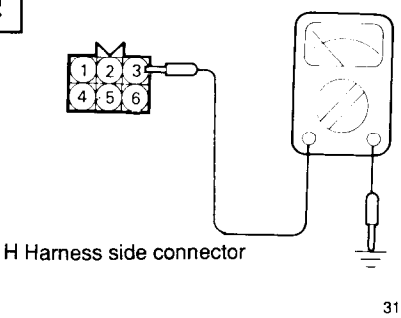


Measure the power supply voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): System voltage

OK → **2**

NG → Repair the harness (H 2 - MFI control relay) or check the MFI control relay.

2

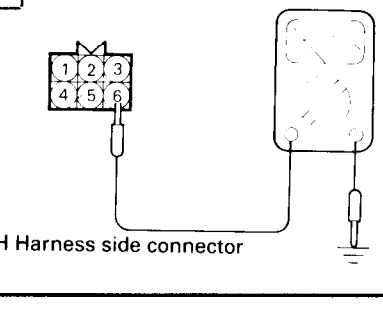


Measure the terminal voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → **3**

NG → Repair the harness. (H 3 - C01-1 3) * (H 3 - C01-5 14)

3



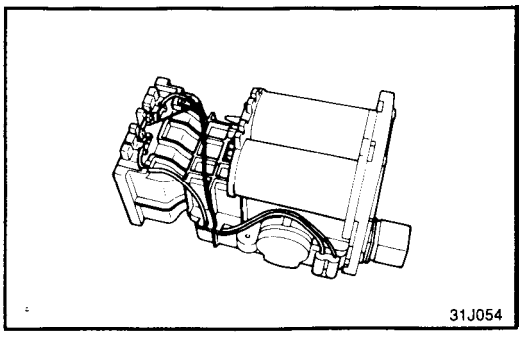
Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → **END !**

NG → Repair the harness. (H 6 - C01-1 20, 13) * (H 6 -C01-5 12)

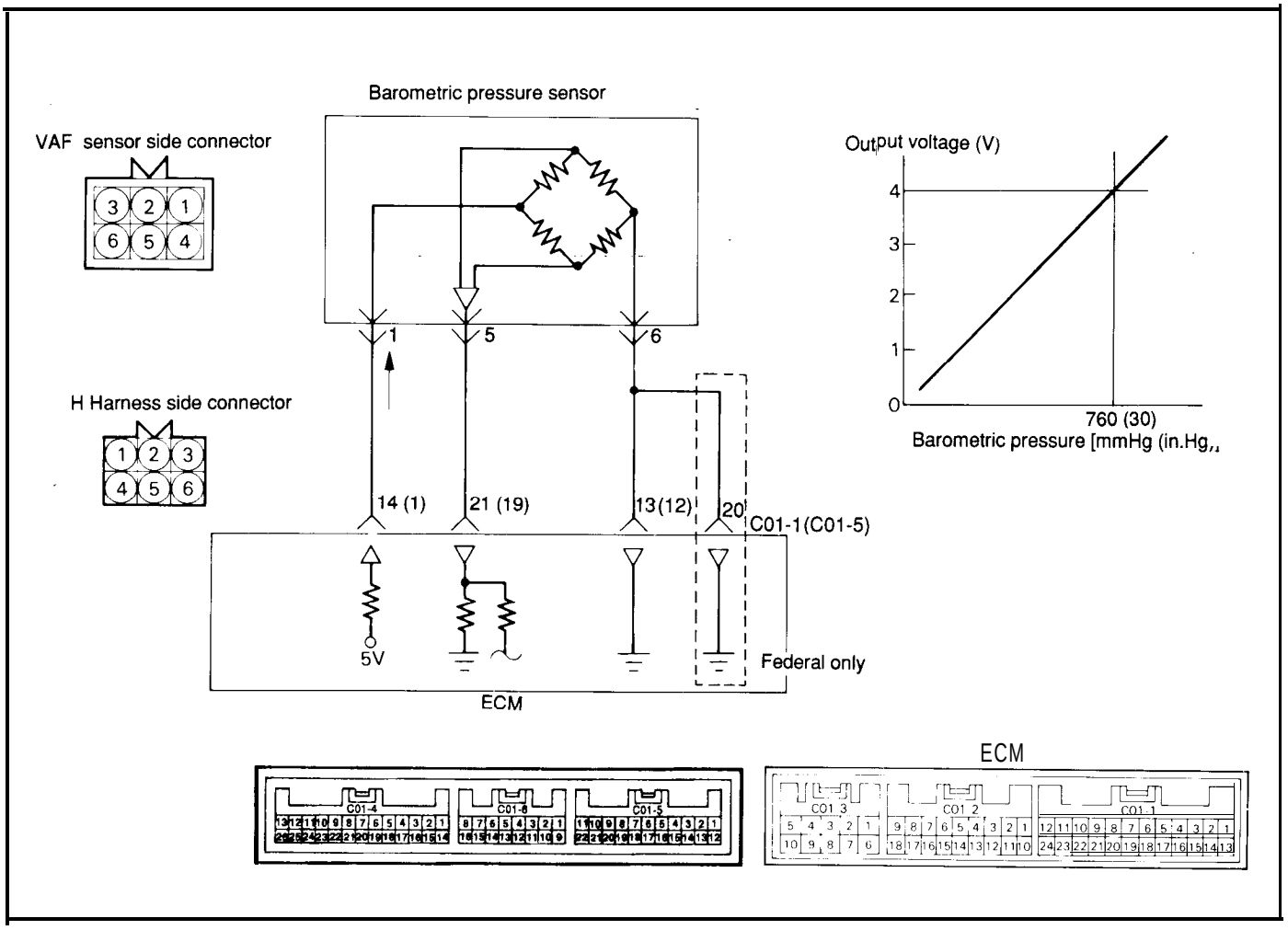
BAROMETRIC PRESSURE (BARO) SENSOR

The barometric pressure sensor installed on the VAF Sensor senses the barometric pressure and converts it into a voltage which is sent to the ECM.
The ECM 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.



Circuit Diagram

( ) : California only



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.

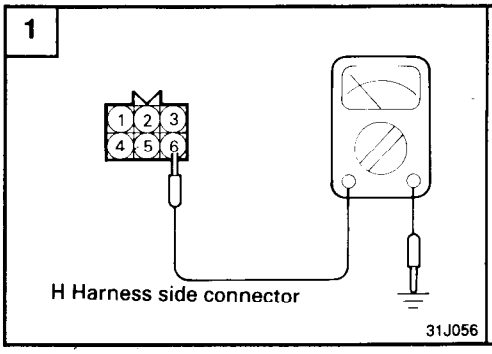
Using Scan Tool

Check Item	Data display	Check conditions	Altitude	Test specification
Barometric pressure sensor o Service data 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

* : California only

1

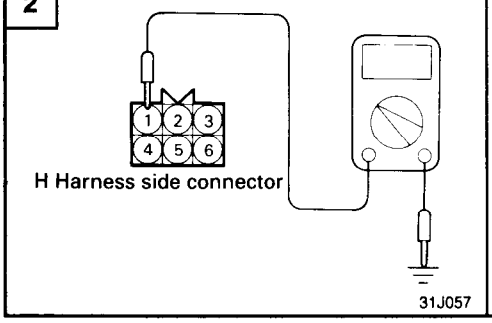


Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → **2**

NG → Repair the harness (H 6 - C01-1 20 , 13) * (H 6 - C01-5 12)

2

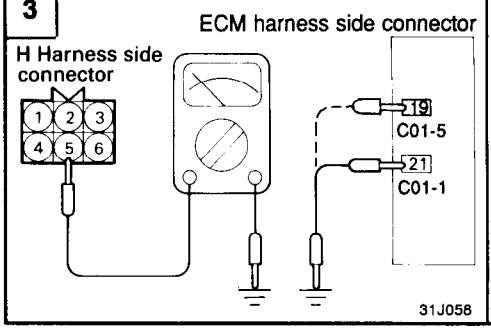


Measure the power supply voltage of the barometric pressure sensor.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → **3**

NG → Repair the harness. (H 1 - C01-1 14) * (H 1 - C01-5 1)

3



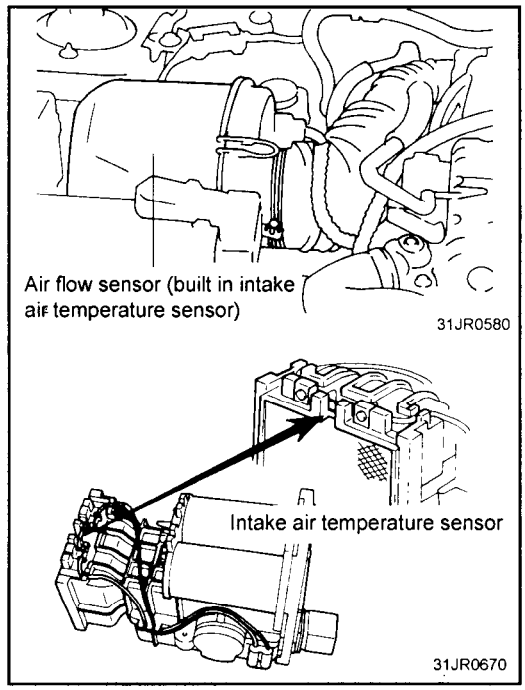
Check for an open-circuit, or a short-circuit to ground between the engine control module and the barometric pressure sensor.
- o VAF air flow sensor connector: Disconnected
- o Engine control module connector: Disconnected

OK → **END !**

NG → Repair the harness. (H 5 - C01-1 21) * (H 5 - C01-5 19)

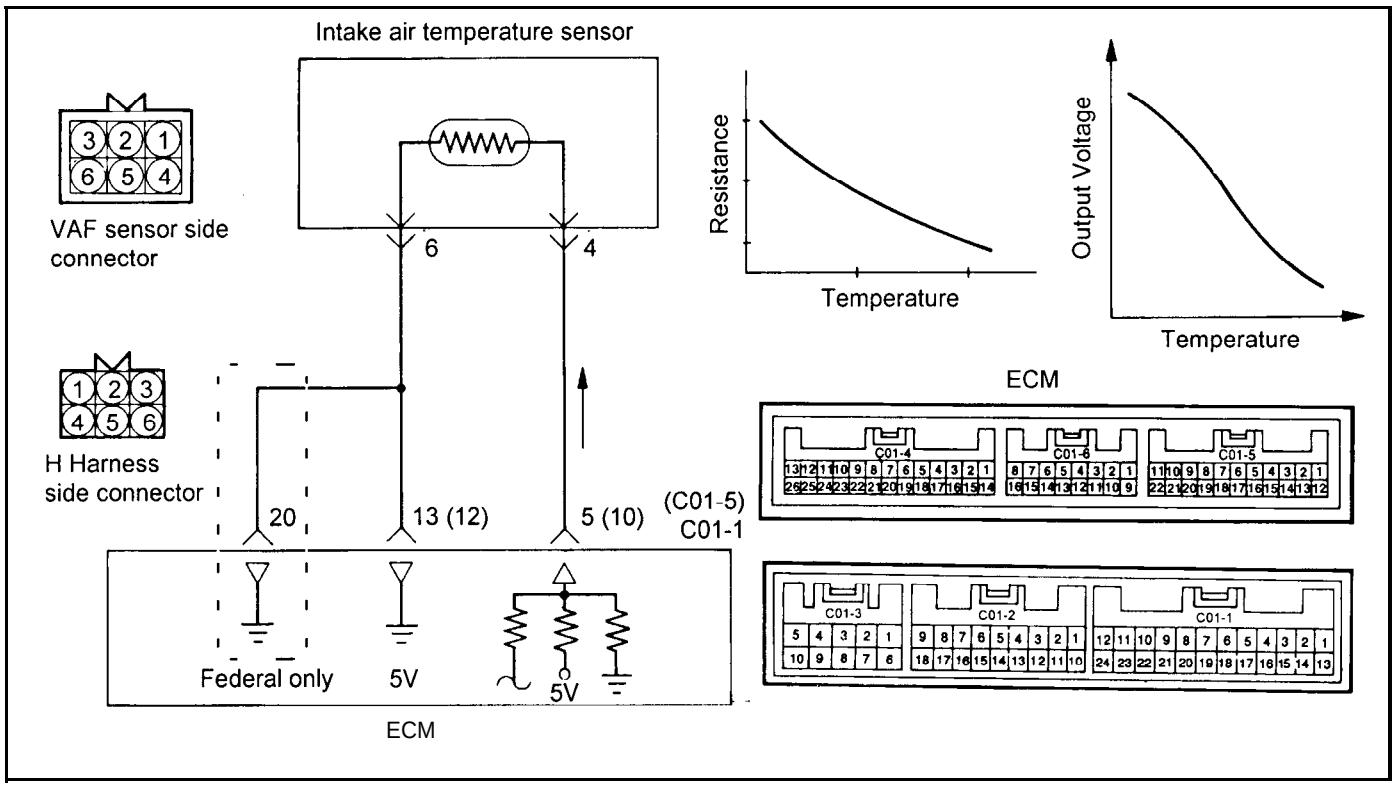
INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor, located at the illustrated position on VAF Sensor, is a resistor-based sensor for detecting the intake air temperature.
According to the intake air temperature information from the sensor, the ECM provides necessary fuel injection amount control.



Circuit Diagram

( ) : California only



Troubleshooting Hints

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

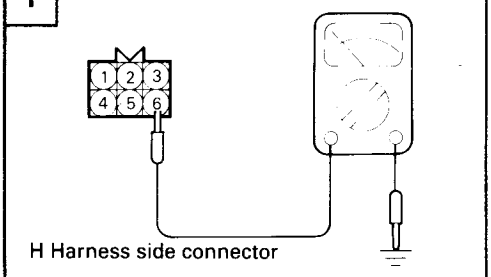
Using Scan Tool

Check Item	Data display	Check conditions	Intake air temperature	Test specification
Intake air temperature sensor o Service data 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

* : California only

1

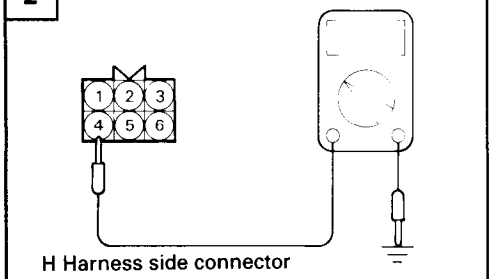


Check for continuity of the ground circuit.
- Connector: Disconnected

OK → **2**

NG → Repair the harness (H 6 - C01-1 20 , 13) * (H 6 - C01-5 12)

2



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

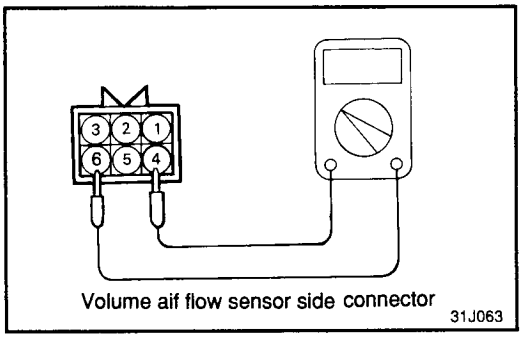
OK → **END !**

NG → Repair the harness. (H 4 - C01-1 15) * (H 4 -C01-5 10)

Sensor Inspection

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

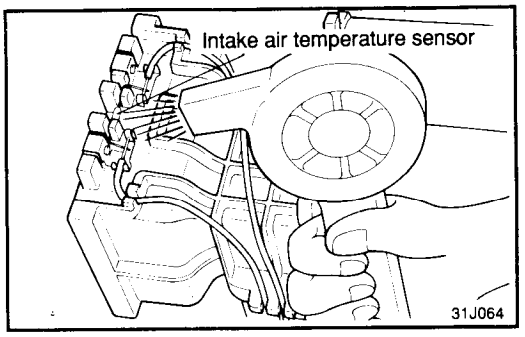
Temperature [°C (°F)]	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4



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

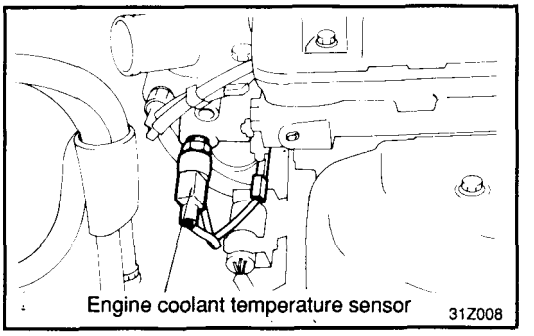
Temperature [°C(°F)]	Resistance (kΩ)
Higher	Smaller

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



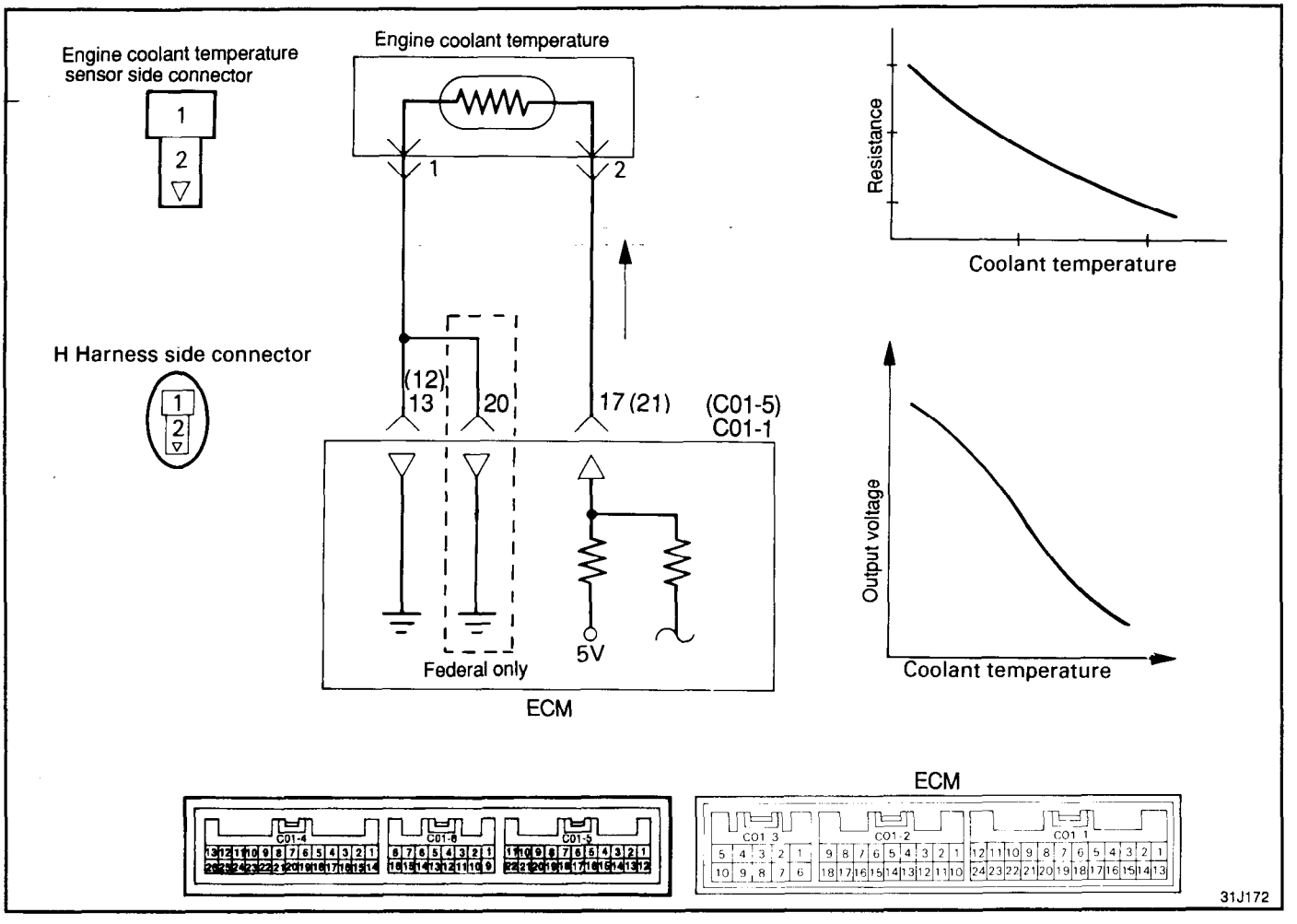
ENGINE COOLANT TEMPERATURE SENSOR

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



Circuit Diagram

( ) : California only



Troubleshooting Hints

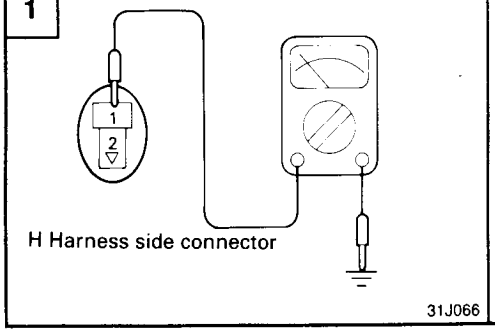
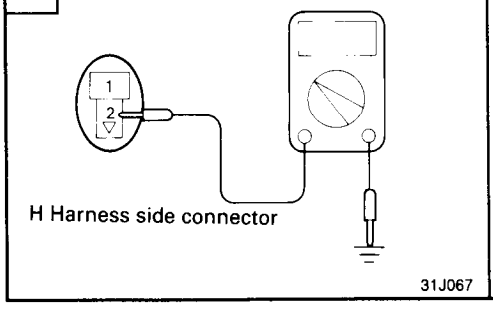
If the fast idle speed is not enough or the engine gives off dark smoke during the engine warm-up operation, the engine coolant temperature sensor might be the causes.

Using Scan Tool

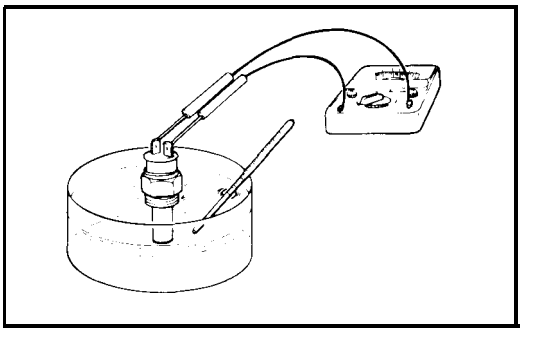
Check Item	Data display	Check conditions	Coolant temperature	Test specification
Engine coolant temperature sensor o Service data Item No. 21	Sensor temperature	Ignition switch: ON or engine running	When -20°C (-4°F)	-20°C
			When 0°C (32°F)	0°C
			When 20°C (68°F)	20°C
			When 40°C (104°F)	40°C
			When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

Harness Inspection Procedures

* : California only

1 	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	2
		NG →	Repair the harness (H 1 - C01-1 23 , 13) * (H 1 - C01-5 12)
2 	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.5-4.9V	OK →	END !
		NG →	Repair the harness. (H 2 - C01-1 17) * (H 2 - C01-5 21)

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.

Installation

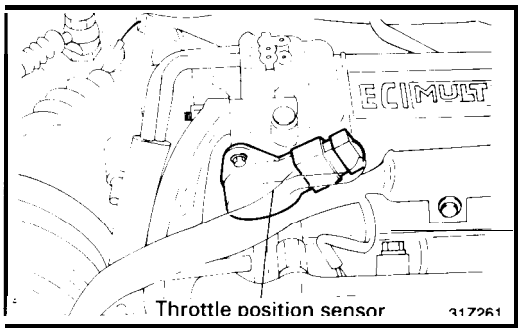
1. Apply sealant LOCTITE 962T or equivalent to threaded portion.
2. Install engine coolant temperature sensor and tighten it to specified torque.

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

3. Connect the harness connector securely.

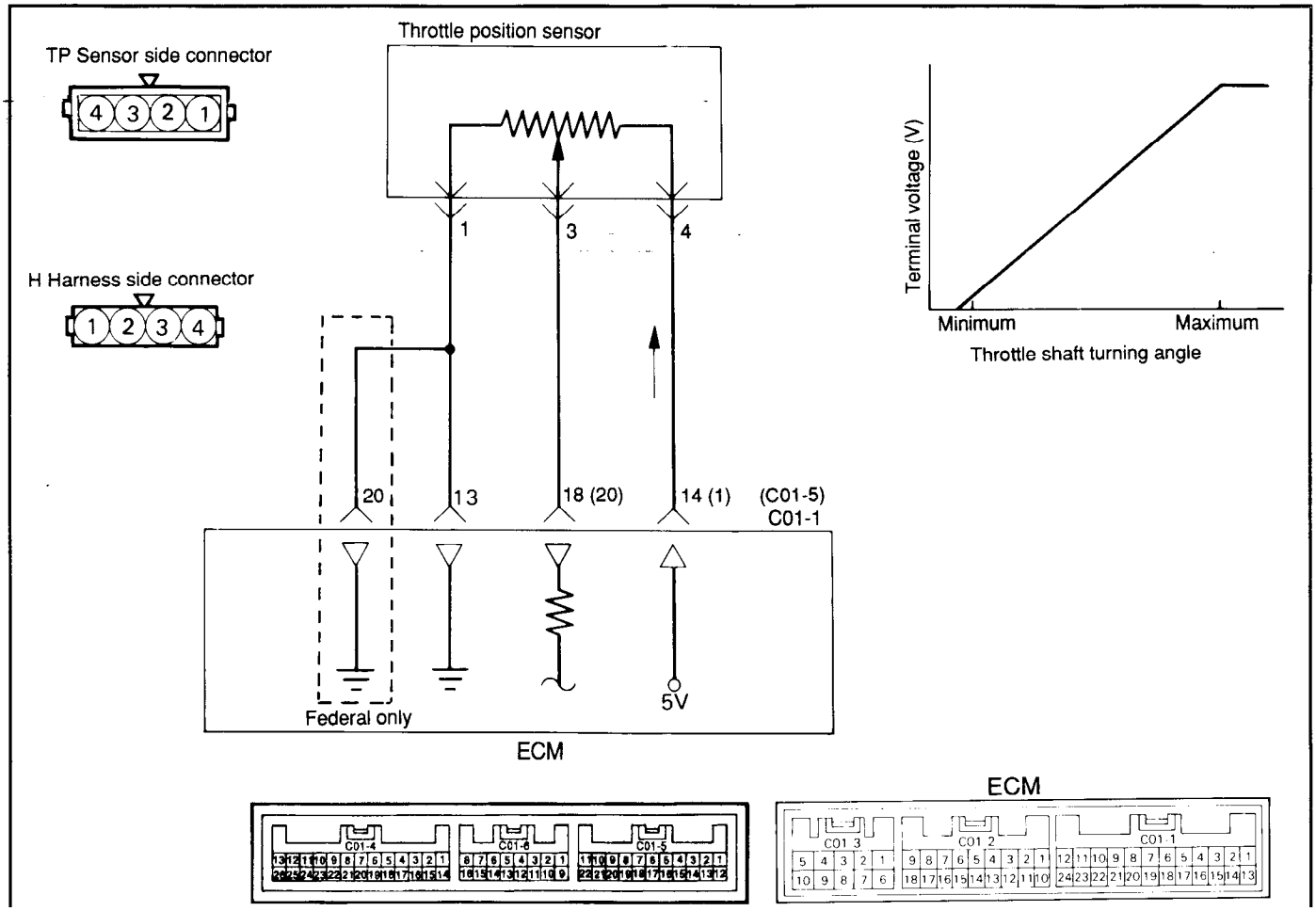
THROTTLE POSITION SENSOR (TP Sensor)

The TP Sensor 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 TP Sensor changes and the ECM detects the throttle valve opening based on the change of the voltage.



Circuit Diagram

( ) : California only



Troubleshooting Hints

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

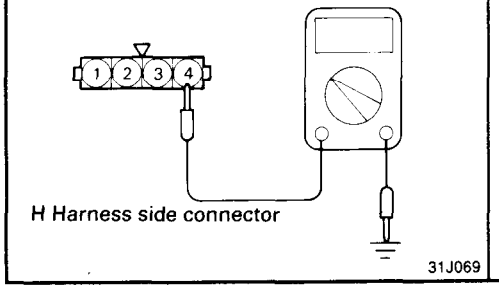
Using Scan Tool

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

Harness Inspection Procedures

* : California only

1

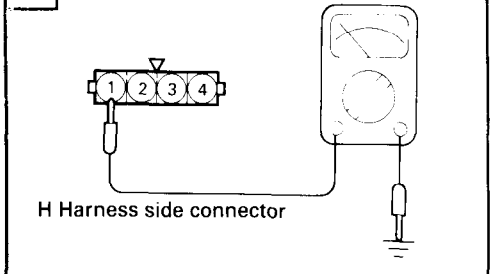


Measure the power supply voltage of the throttle position sensor.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → **2**

NG → Repair the harness (H 4 - C01-1 14) * (H 4 -C01-5 1)

2

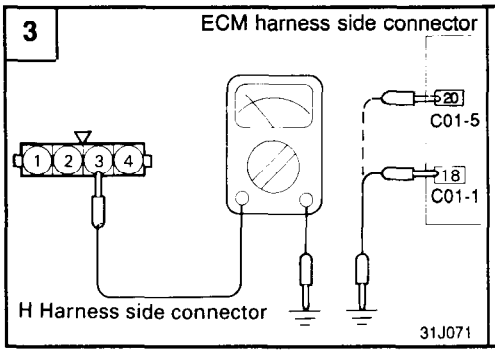


Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → **3**

NG → Repair the harness. (H 1 - C01-1 20 , 13) * (H 1 - C01-5 12)

3

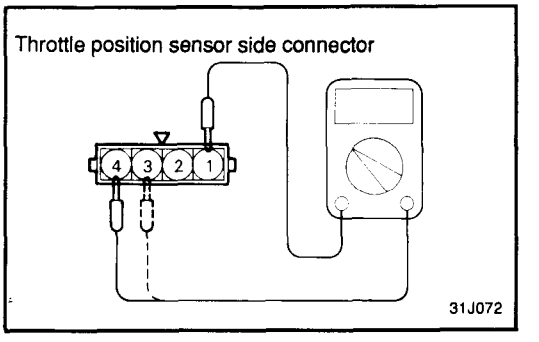


Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor.
- o Throttle position sensor connector: Disconnected
- o Engine control module connector: Disconnected

OK → **END !**

NG → Repair the harness. (H 3 - C01-1 18) * (H 3 - C01-5 20)

Sensor Inspection



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

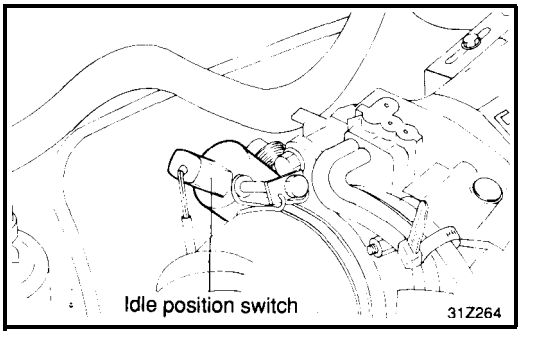
Standard value 3.5-6.5kΩ

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.

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

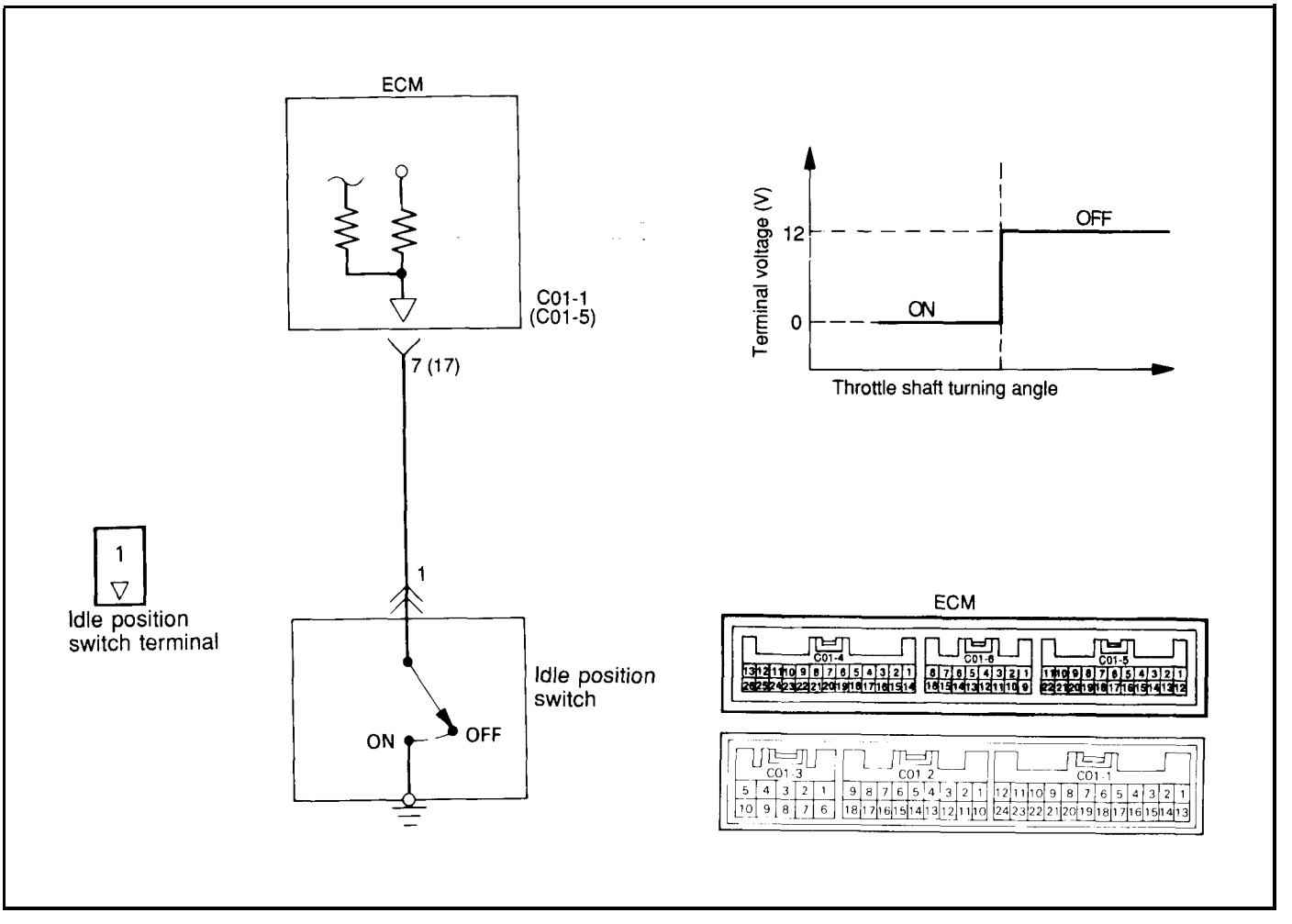
IDLE POSITION SWITCH

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



Circuit Diagram

( ) : California only



Troubleshooting Hints

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

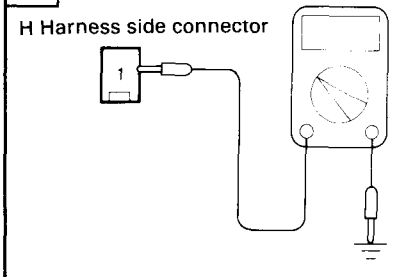
1. Poorly adjusted accelerator cable or auto-cruise control cable.
2. Poorly adjusted idle position switch (fixed SAS).

Using Scan Tool

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

Harness Inspection Procedures

* : California only

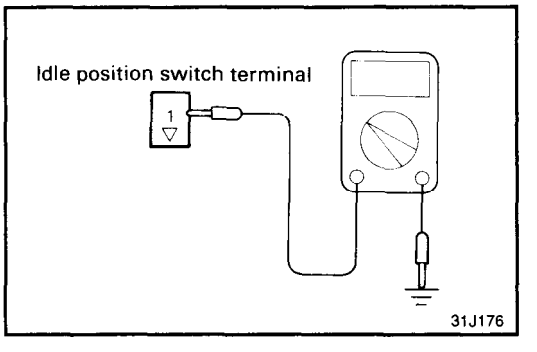
1 H Harness side connector  31J175	Measure the power supply voltage of the idle position switch. o Connector: Disconnected o Ignition switch: ON o Voltage: 4V or more	OK →	END !
		NG →	Repair the harness. (H 1 - C01-1 7) * (H 1 -C01-5 17)

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 (∞ Ω)
Released	Conductive (0 Ω)

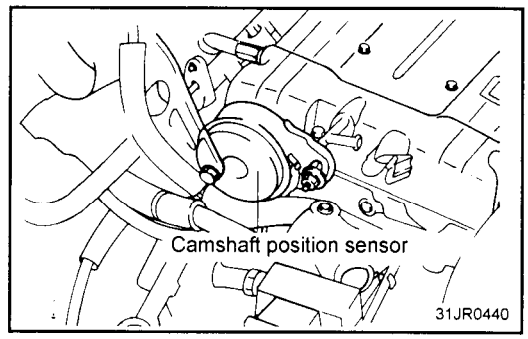
3. If out of specification, replace the idle position switch.



31J176

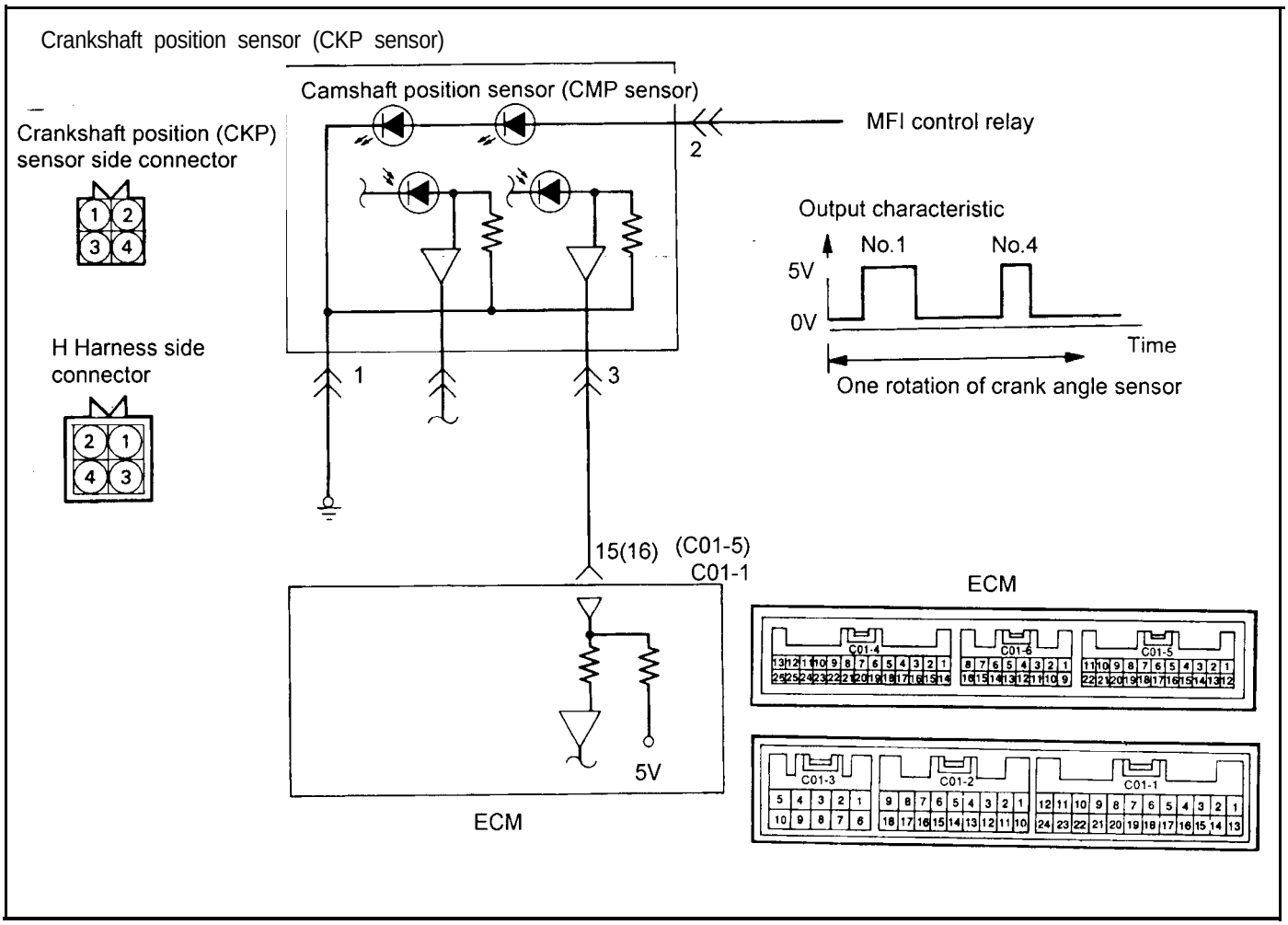
CAMSHAFT POSITION (CMP) SENSOR

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



Circuit Diagram

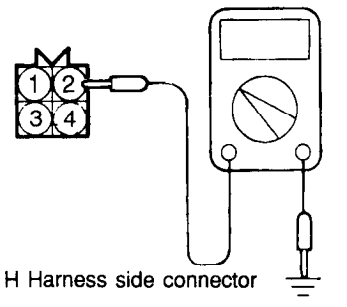
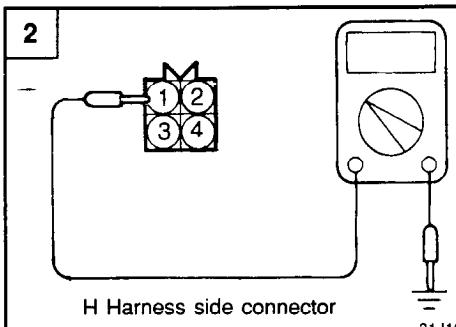
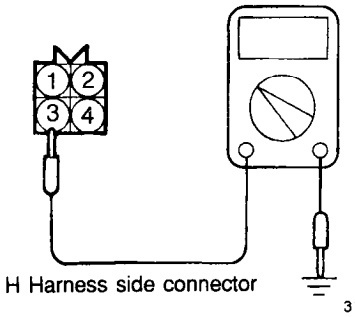
( ) : California only



Troubleshooting Hints

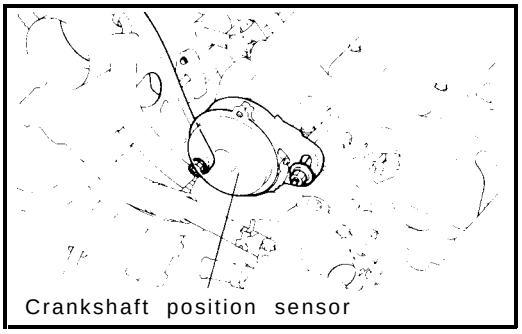
If the CMP Sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

Harness Inspection Procedures

1  H Harness side connector 31J185	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage (V): SV	OK →	2
		NG →	Repair the harness (H 2 - MFI control relay)
2  H Harness side connector 31J186	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	3
		NG →	Repair the harness. (H 1 - Ground)
3  H Harness side connector 31J187	Check for continuity of the ground circuit. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8-5.2V	OK →	**END !**
		NG →	Repair the harness. (H 3 - C01-1 15) * (H 3 - C01-5 16)

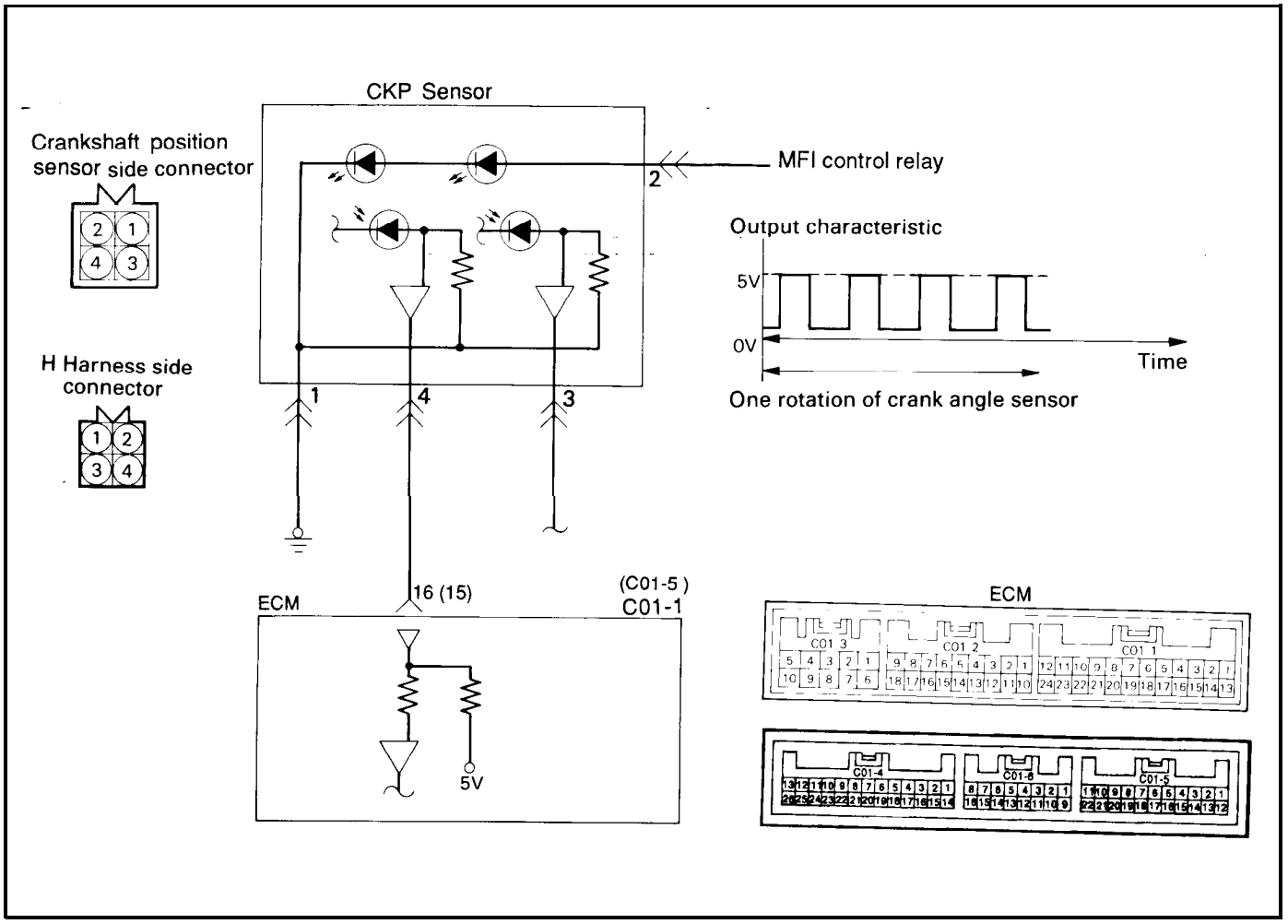
CRANKSHAFT POSITION (CKP) SENSOR

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


Crankshaft position sensor

Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If unexpected shocks are felt during driving or the engine stalls suddenly, shake the crankshaft position sensor harness. If this causes the engine to stall, check for poor 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 motor
   3) Poorly adjusted reference idle speed

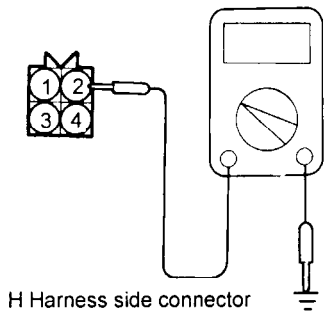
Using Scan Tool

Check Item	Data display	Check conditions	Check content	Normal state
Crankshaft position sensor o Service data 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-tester reading	Indicated speed agrees

Check Item	Data display	Check conditions	Coolant temperature	Test specification
Crankshaft position sensor o Service data 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

1



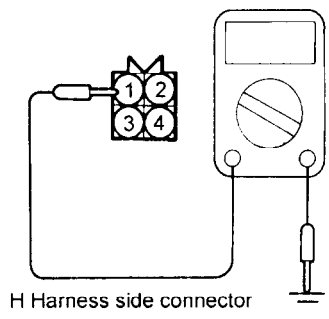
H Harness side connector 31JR0840

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

OK → 2

NG → Repair the harness (H 2 -MFI control relay)

2



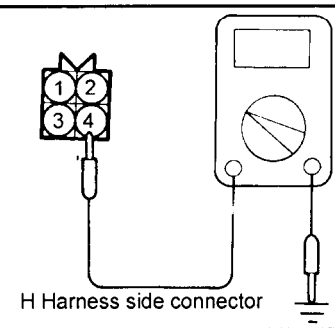
H Harness side connector 31JR0850

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

OK → 3

NG → Repair the harness. (H 1 - Ground)

3



H Harness side connector 31JR0880

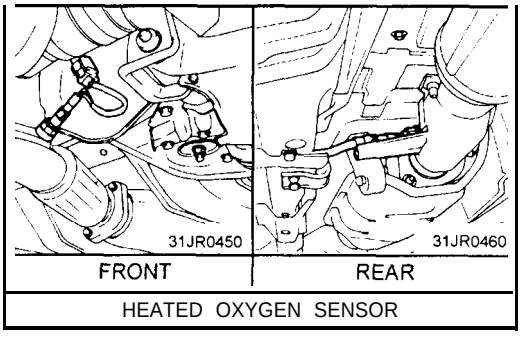
Check for continuity of the ground circuit.
- Connector: Disconnected
- Ignition switch: ON
- Voltage: 4.8-5.2V

OK → **END !**

NG → Repair the harness. (H 2 - C50-1 16)

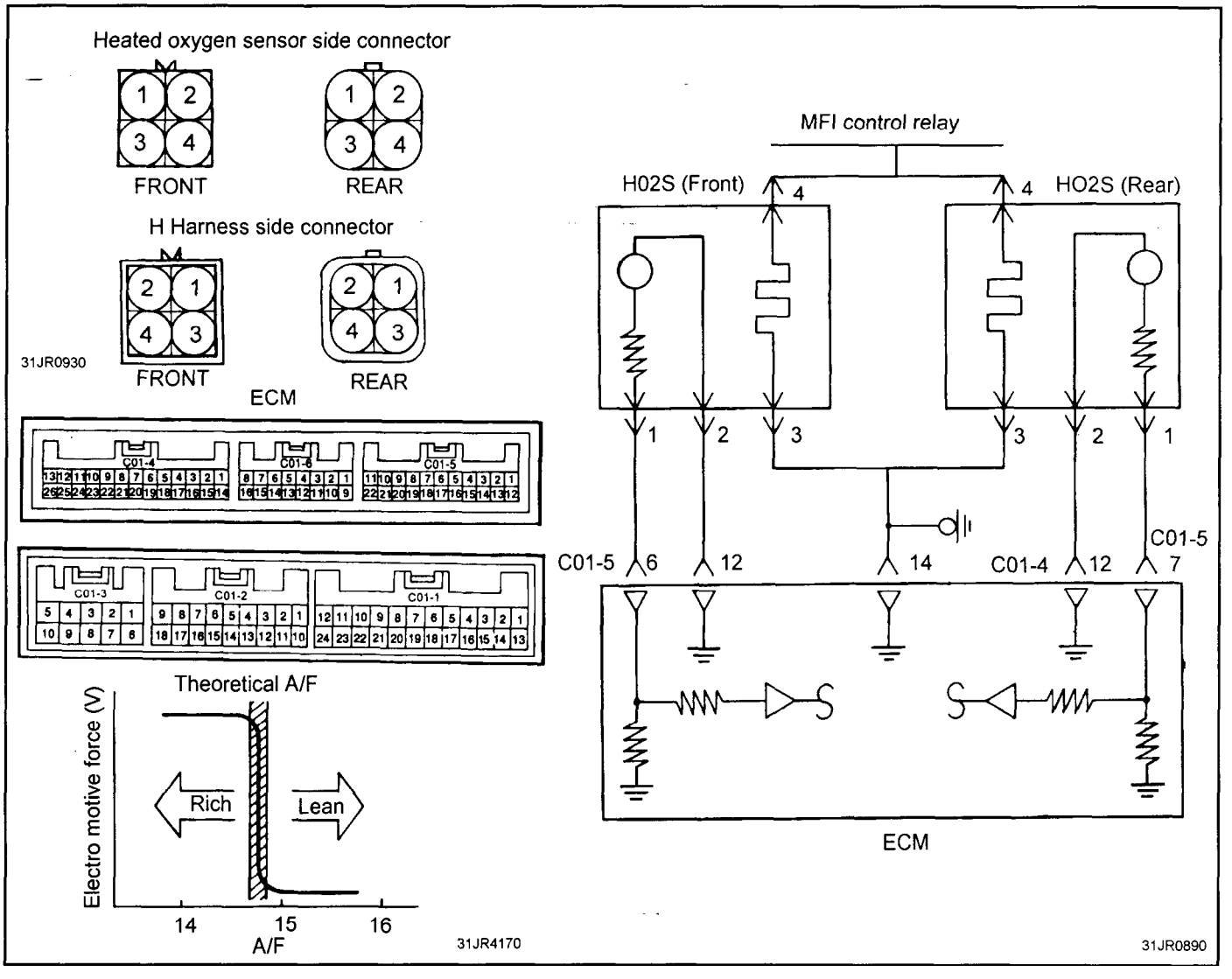
HEATED OXYGEN SENSOR (HO2S)

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



HEATED OXYGEN SENSOR

Circuit Diagram



Troubleshooting Hints

1. If the HO2S is defective abnormally high emissions may occur.
2. If the HO2S check has resulted normal but the sensor output voltage is out of specifications, check for the following items related to air fuel ratio control system.
   1) Faulty injector
   2) Faulty wiring connection.
   3) Air leaks in the intake manifold.
   4) Faulty volume air flow sensor, intake air temperature sensor, barometric pressure sensor, engine coolant temperature sensor.

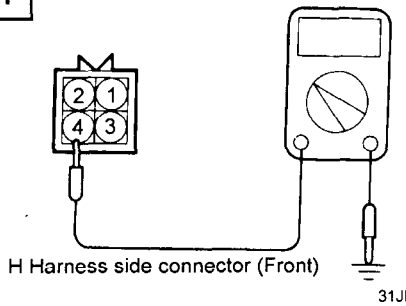
Using Scan Tool

Check item	Data display	Check condition	Engine condition	Test specification
Oxygen sensor o Service data Item No. 11, 59	Sensor voltage	Warm-up	When decelerating suddenly from 4,000 rpm	[A] 200 mV or lower
			When engine is suddenly raced	[B] 600-1,000 mV

NOTE
If you release the accelerator pedal suddenly during engine running with about 4000 rpm, fuel supply will be stopped for a while and the oxygen sensor service data in the scan tool will be displayed in the range [A].
And when you suddenly press down the acclerator pedal, the voltage will reaches [B] range.
And then, when you let the engine idle again, the voltage will fluctuate between [A] and [B] range.
In this case, the oxygen sensor can be determined as a good one.

Harness Inspection Procedures

1



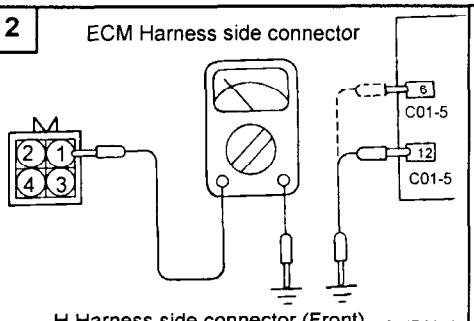
H Harness side connector (Front)
31JR0900

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

OK → **2**

NG → Repair the harness (H 4, - MFI control relay)

2



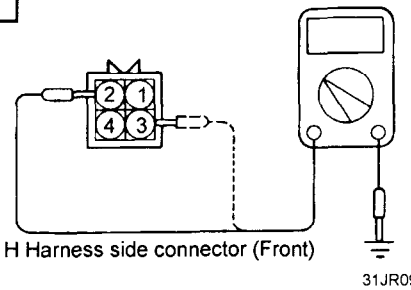
H Harness side connector (Front) 31JR0910

Check for an open-circuit, or a short-circuit of ground between the engine control module and the heated oxygen sensor.
- o Heated oxygen sensor connector: Disconnected
- o ECM connector: Disconnected

OK → **3**

NG → Repair the harness.
(H 1 - C01-5 6)
(H 1 - C01-5 7)

3



H Harness side connector (Front)
31JR0920

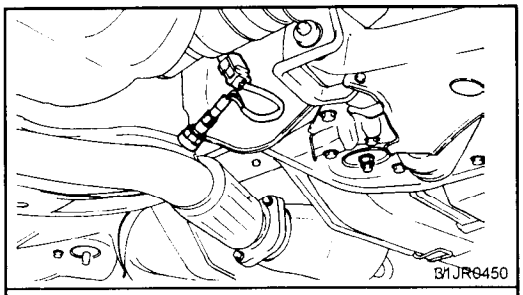
Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → **END !**

NG → Repair the harness.
(H 2 - C01-5 12)
(H 3 - C01-4 14)

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.

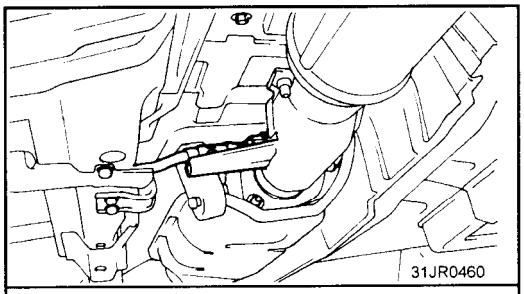


HO2S (Front)

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

   Standard value

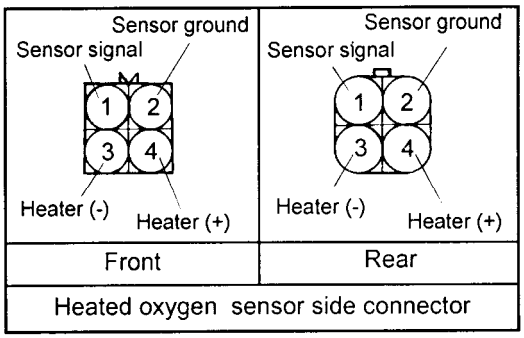
Temperature °C (°F)	Resistance (Ω)
400 (752)	30 or more



HO2S (Rear)

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

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



Front | Rear
Heated oxygen sensor side connector

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

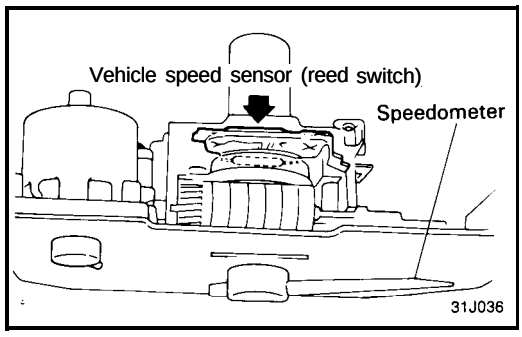
Engine	Oxygen sensor output voltage	Remarks
Race	Min. 0.6V	Makes the air/fuel mixture rich by increased engine speed

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)

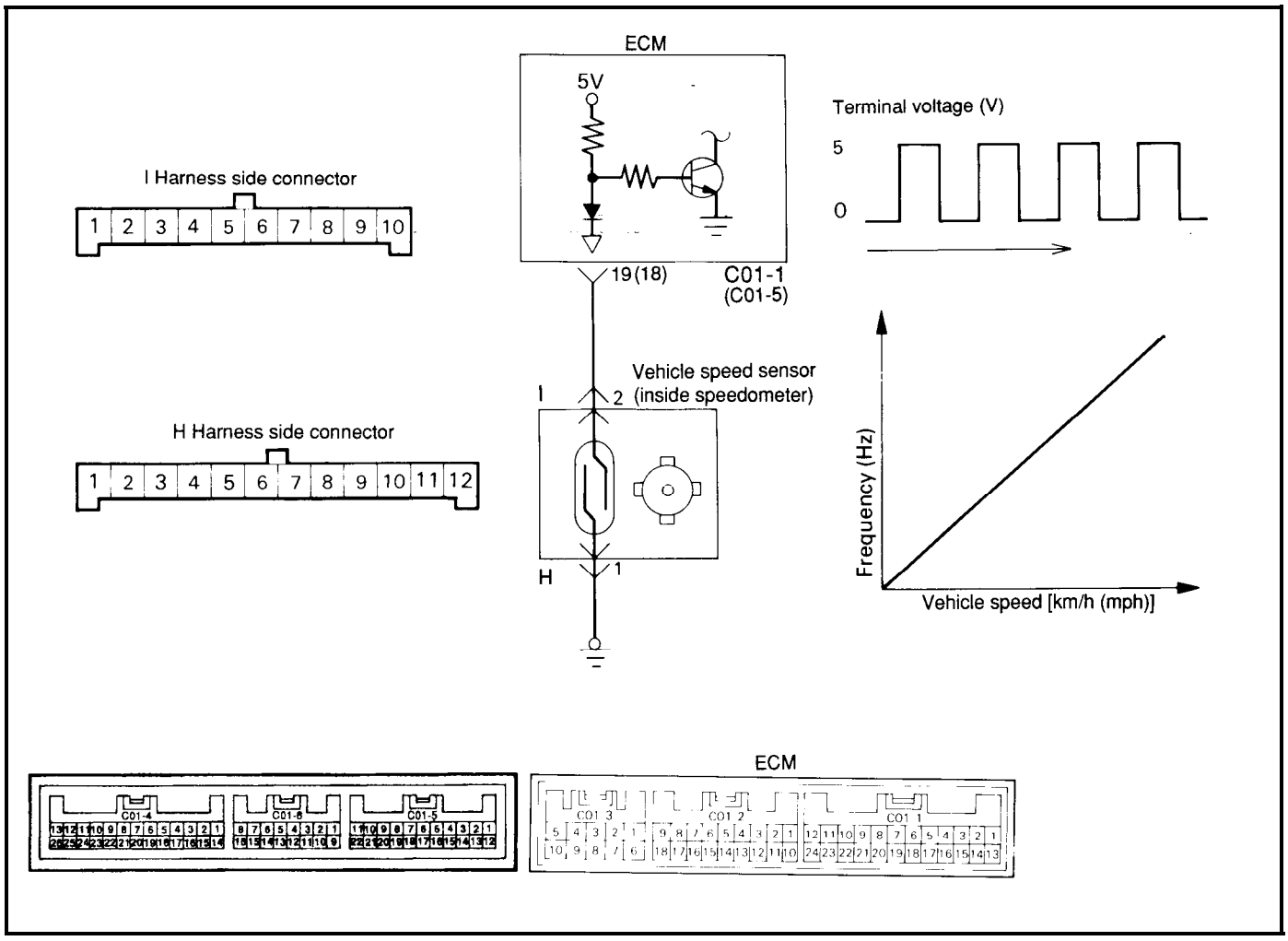
VEHICLE SPEED SENSOR

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 ECM.



Circuit Diagram

( ) : California only

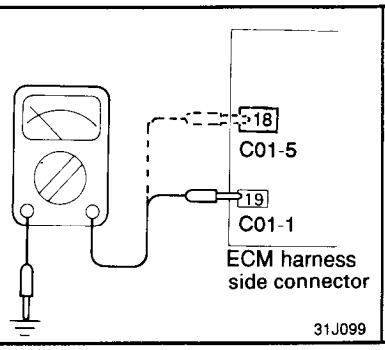
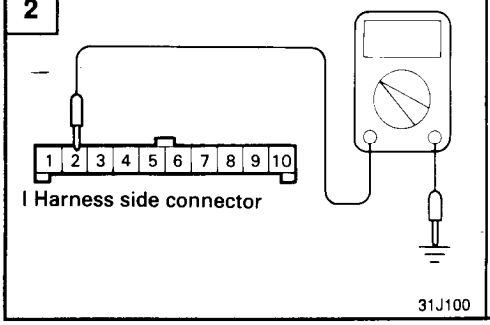
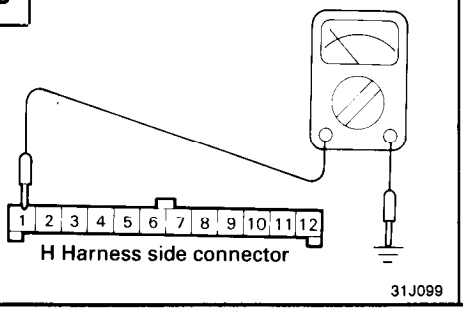


Troubleshooting Hints

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.

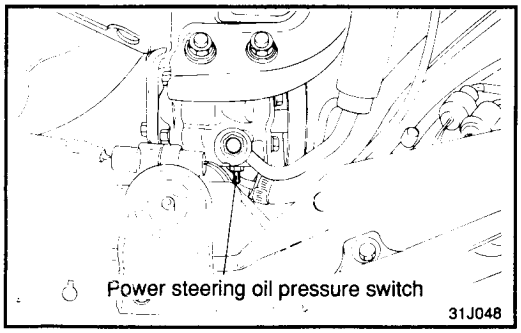
Harness Inspection Procedures

* : California only

1		Check the vehicle speed sensor output circuit for continuity. o Engine control module connector: Disconnected o Move the vehicle.	OK → END ! NG → 2
2		Measure the power supply voltage of the vehicle speed sensor. o Connector : Disconnected o Ignition switch : ON o Voltage : 4.5-4.9V	OK → 3 NG → Repair the harness. (H 2 - C01-1 19) * (H 2 - C01-5 18)
3		Check for continuity of the ground circuit. o Connector : Disconnected	OK → END ! NG → Repair the harness. (H 1- Ground)

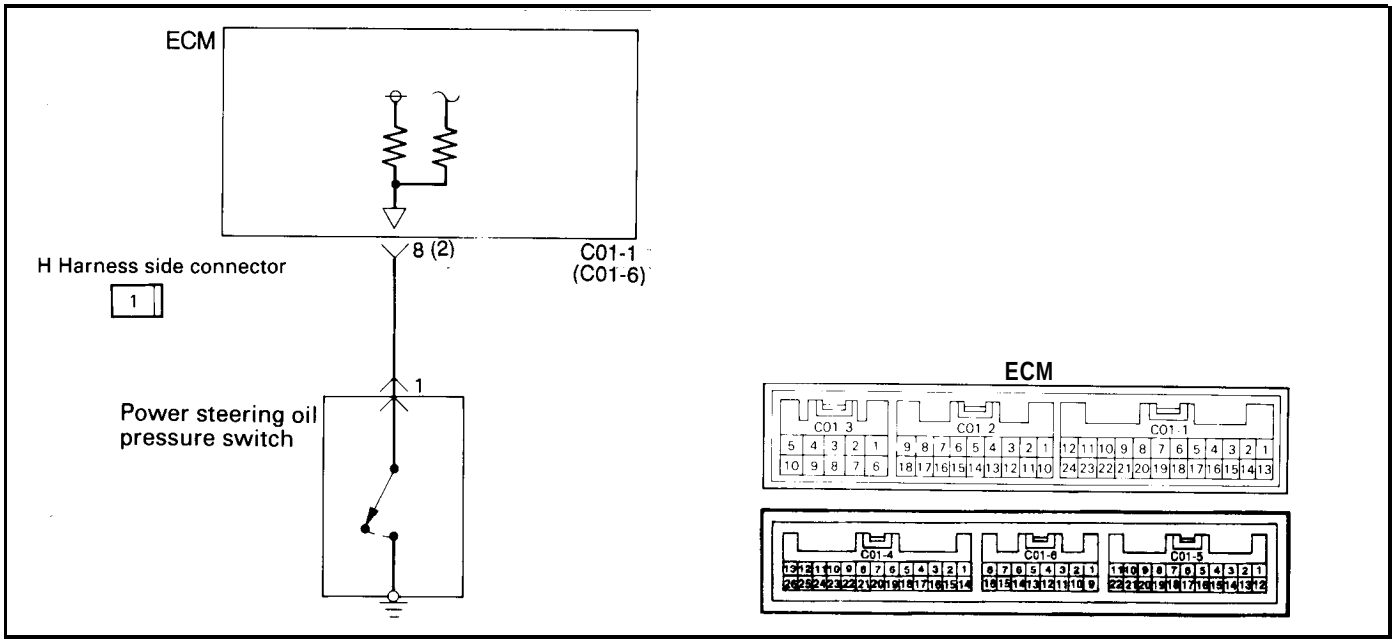
POWER STEERING OIL PRESSURE SWITCH

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



Circuit Diagram

( ) : California only

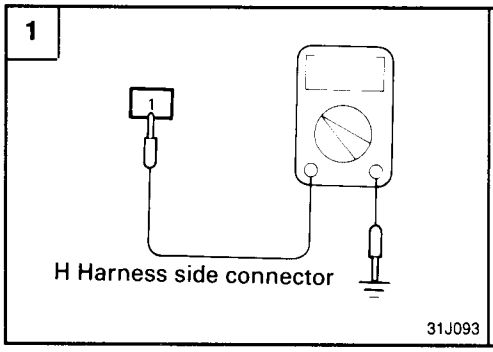


Using Scan Tool

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

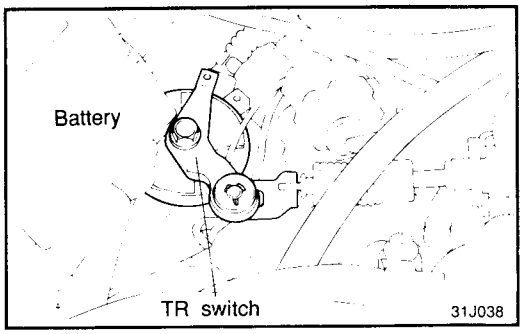
Harness Inspection Procedure

. : California only

1  	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK →	END !
		NG →	Repair the harness. (H 1- C01-1 8) * (H 1 - C01 - 6 2)

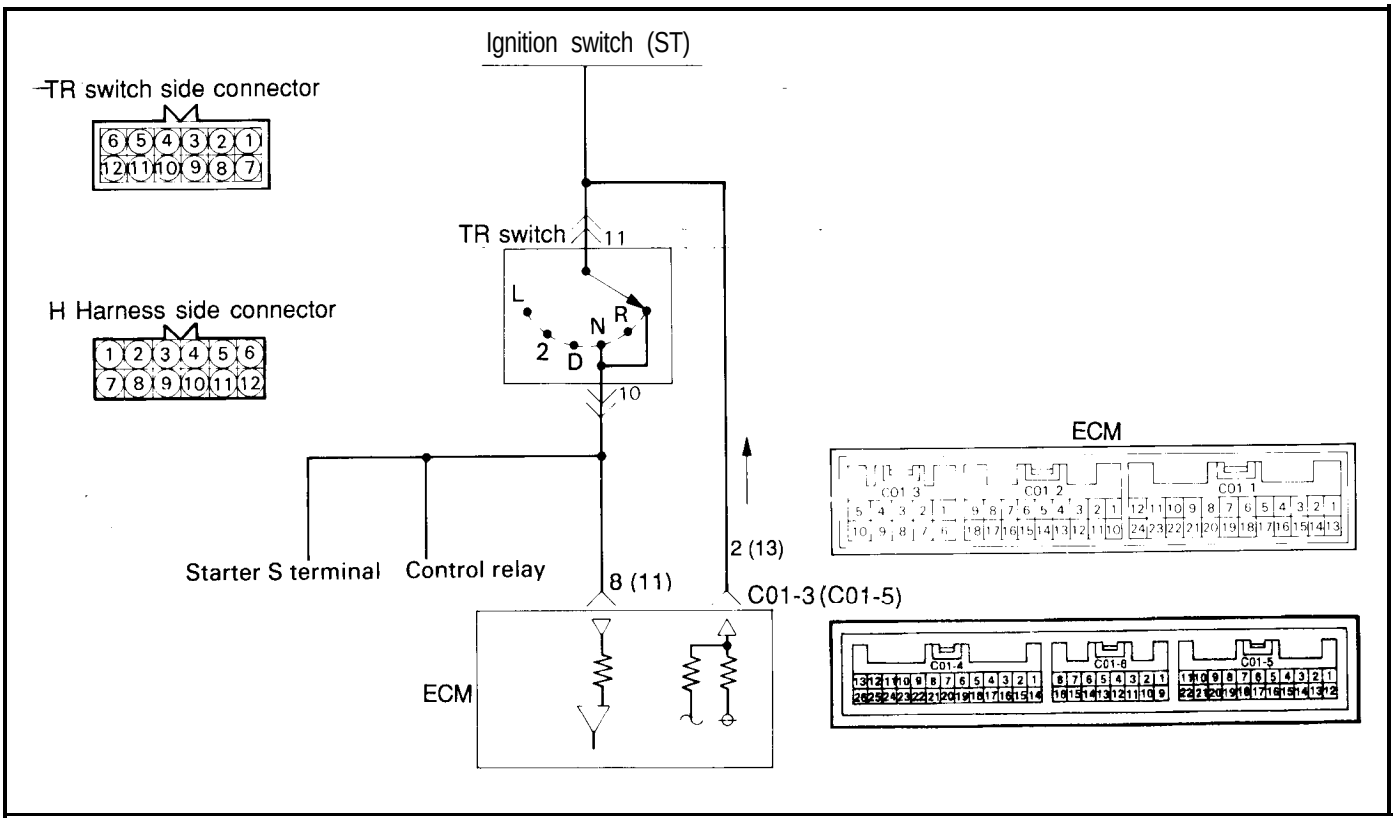
IGNITION SWITCH-ST AND TRANSAXLE RANGE (TR) SWITCH [A/T]

When the ignition switch is set ST position, the battery voltage is applied through the ignition switch and transaxle range switch to the ECM.
If the selector lever is not P or N position, the battery voltage will not reach to the ECM.
Based on this signal, the ECM determines the automatic transaxle load and drives the ISC motor to maintain optimum idle speed.



Circuit Diagram

( ) : California only



Troubleshooting Hints

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

Using Scan Tool

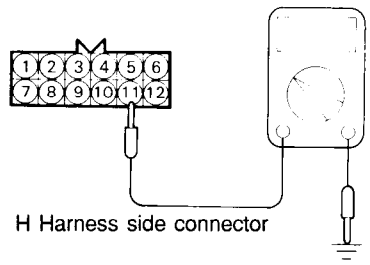
Check Item	Data display	Check conditions	Steering wheel	Normal indication
Crank signal o Service data Item No. 18	Switch state	Ignition switch: ON	Stop	OFF
			Cranking	ON

Check Item	Data display	Check conditions	Steering wheel	Normal indication
TR switch o Service data Item No. 29	Switch state	Ignition switch: ON	P or N	P or N
			D,2,L or R	D,2,L or R

Harness Inspection

• : California only

1



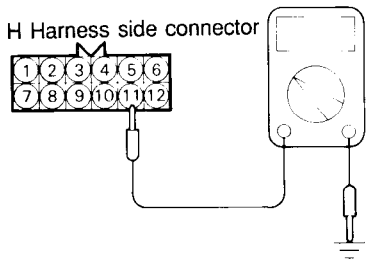
31J095

Measure the power supply voltage of the TR switch
- o ECM connector: Disconnected
- o TR switch connector: Disconnected
- o Ignition switch: START and ON
- o Voltage (V): System voltage

OK → 2

NG → Check the power supply circuit.

2



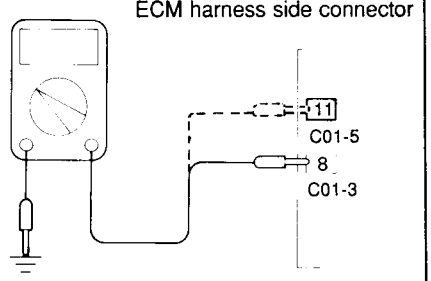
31J096

Measure the input voltage of engine control unit
- o ECM connector: Connected
- o TR switch connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): System voltage

OK → 3

NG → Repair the harness (H 11 - C01-3 2)
* (H 11 - C01-5 13)

3



31J097

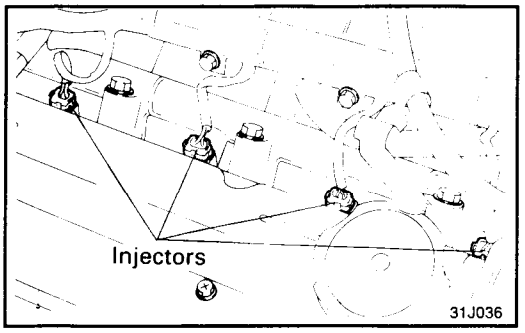
Measure the input voltage of engine control module
- o ECM connector: Disconnected
- o TR switch connector: Connected
- o Select lever: P range
- o Ignition switch: START
- o Voltage: 8V or more

OK → **END !**

NG → Repair the harness (H 10 - C01-3 8)
* (H 10 C01-5 11)

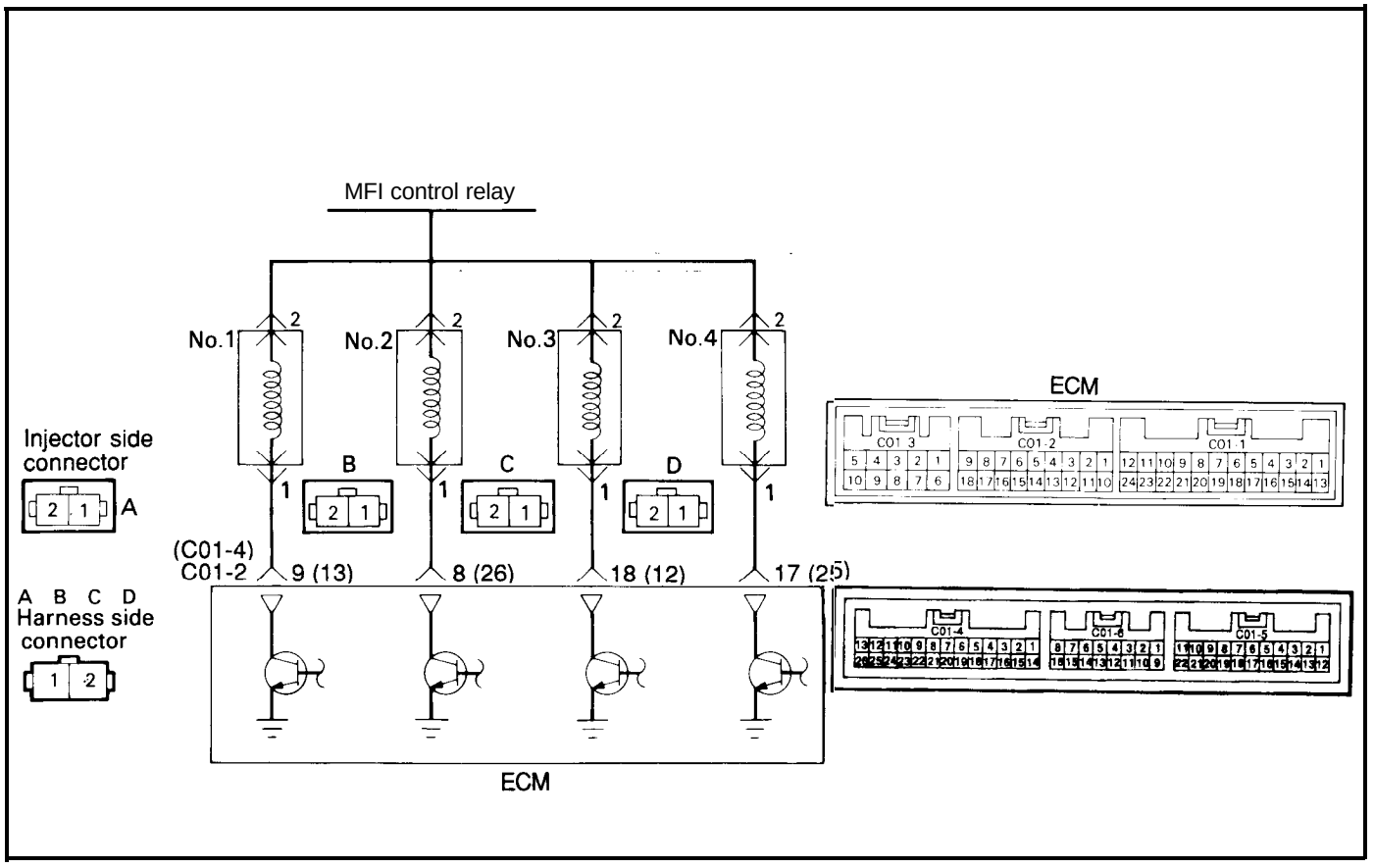
INJECTORS

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



Circuit Diagram

( ) : California only



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 ECM, faulty ground circuit
   2) Faulty control relay
   3) Faulty crankshaft position (CKP) sensor, camshaft position (CMP) sensor
3. If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, check for the following items about such 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 Scan Tool

Check Item	Data display	Check conditions	Check content	Test specification
Injector o Service data 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

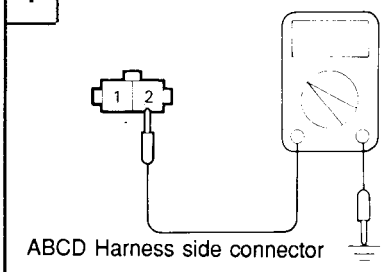
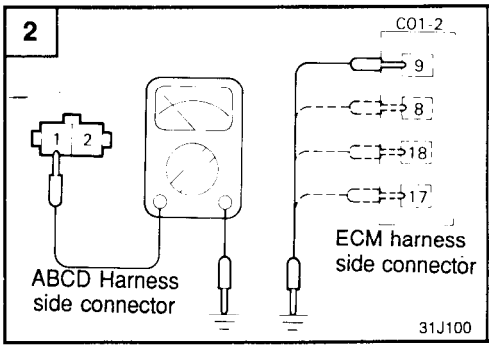
Check Item	Data display	Check conditions	Engine state	Test specification
Injector o Service data – Item No. 41	Drive time	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: 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 engine coolant temperature is lower than 0°C (32°F), the ECM fires all four cylinders simultaneously.**
***3: When the vehicle is new [within initial operation of about 500 km (300 miles)], the injector drive time may be about 10% longer.**

Check Item	Item No.	Drive content	Check condition	Normal state
Injector 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

. : California only

1  	Measure the power supply voltage of the injector. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK →	2 Repair the harness. (A B C D 2 - MFI control relay) Check the power supply.
		NG →	
2  	Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector. o ECM connector: Disconnected o Injector connector: Disconnected	OK →	END ! Repair the harness. (A B C D 1 - C01-2 9 , 8, 18 , 17) * (A B C D 1 - C01-4 12, 13, 25, 26)
		NG →	

Actuator Inspection

Operation Check

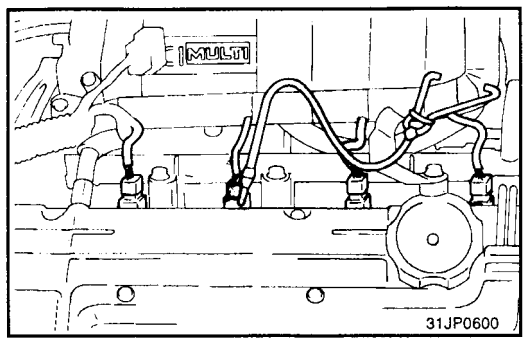
Using a scan tool, check as described below.

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

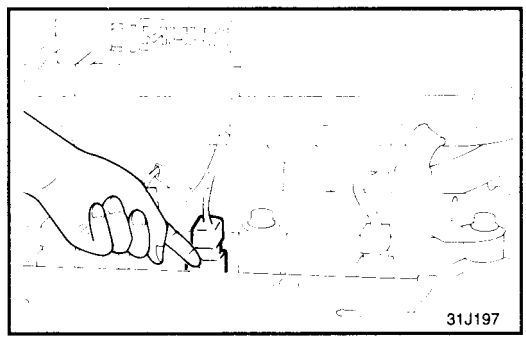
Operation Sound Check

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

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



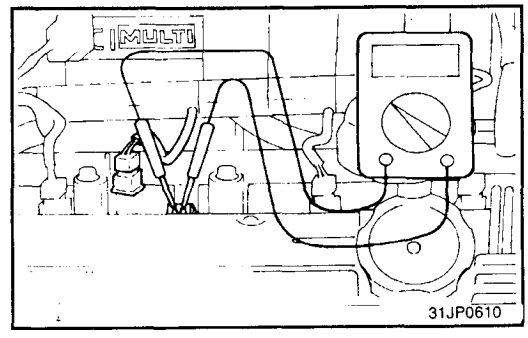
2. If a stethoscope is not available, check the injector operation with your finger.
   If no vibrations are felt, check the wiring connector, injector, or injection signal from ECM.



Resistance Measurement Between Terminals
1. Disconnect the connector at the injector.
2. Measure the resistance between terminals.

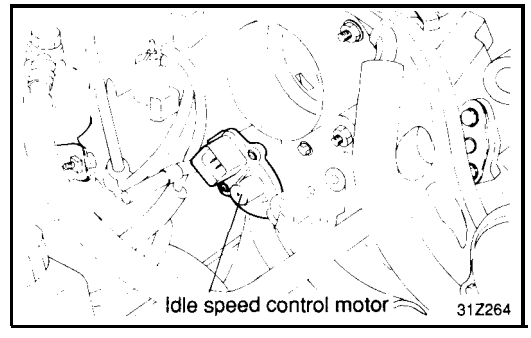
Standard value	13-16 Ω [at 20°C (68°F)]

3. Connect the connector to the injector.



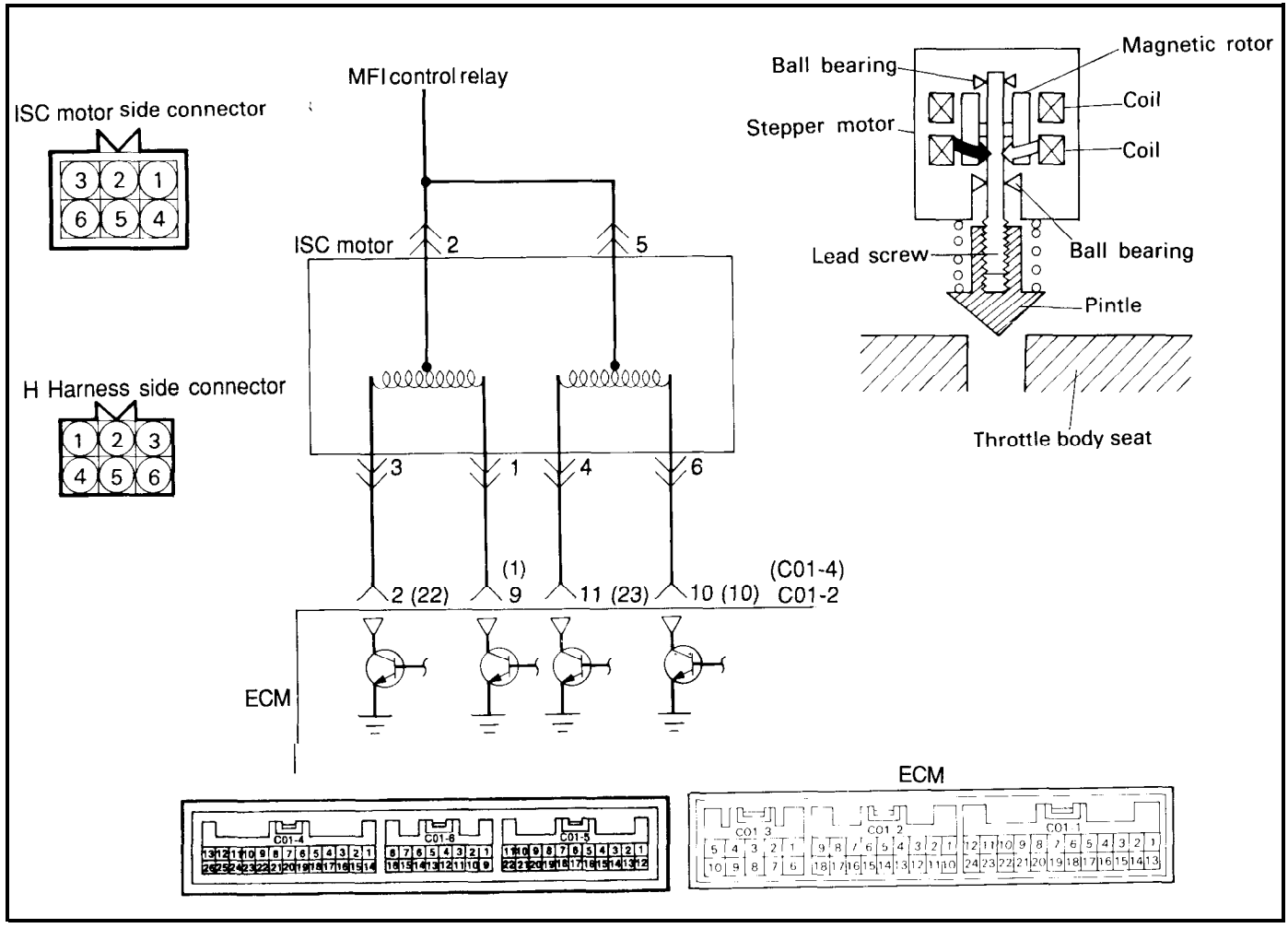
IDLE SPEED CONTROL MOTOR (STEPPER MOTOR TYPE)

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



Circuit Diagram

( ) : California only



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 motor 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.)

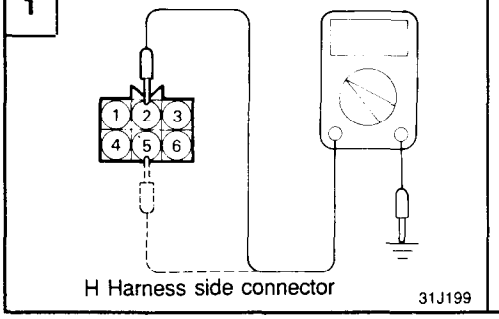
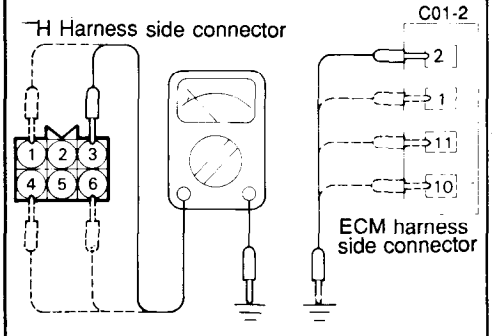
Using Scan Tool

Check item	Data display	Check conditions	Engine state	Test specifications
Stepper motor o Service data Item No. 45	Stepper motor steps	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 o Idle position switch : ON (compressor clutch to be ON if air conditioning switch is ON) o Engine : Idling	Air conditioning switch : OFF	4-14 step
			Air conditioning switch : ON	40-60 step
			o Air conditioning 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

* : California only

1  H Harness side connector 31J199	Measure the power supply voltage of idle speed control motor o Idle speed control motor connector: o Disconnected o Ignition switch : ON o Voltage (V) : System Voltage	OK →	2
		NG →	Repair the harness. (MFI control relay-H 2) (MFI control relay - H 5)
2  31J199	Check for an open-circuit, or a short-circuit to ground between the engine control module and the idle speed control motor o Engine control module connector: Disconnected o Idle speed control motor connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 3-C01-2 2) (H 1-C01-2 1) (H 4-C01-2 11) (H 6-C01-2 10) * (H 3-C01-4 22) * (H 1-C01-4 9) * (H 4-C01-4 23) * (H 6-C01-4 10)

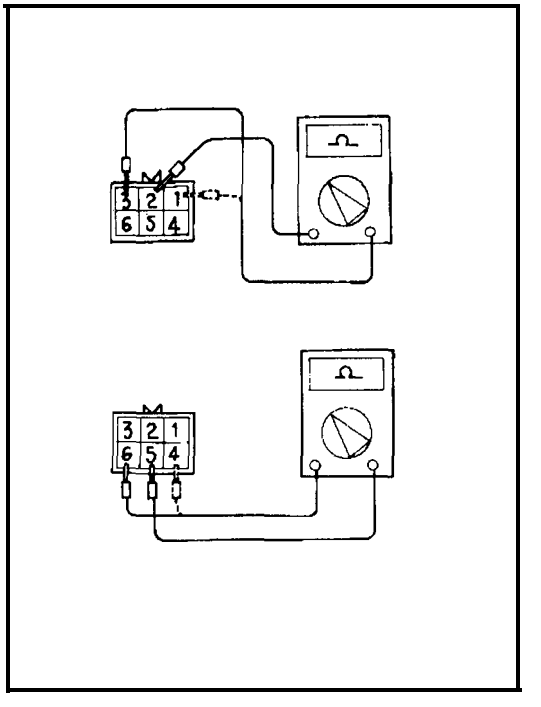
Actuator Inspection

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 ECM

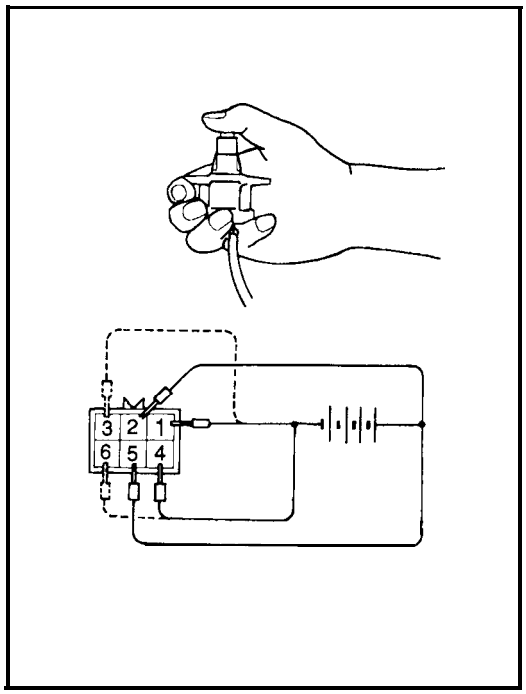
Resistance Measurement between terminals
Measure the resistance between the respective terminals.

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)]



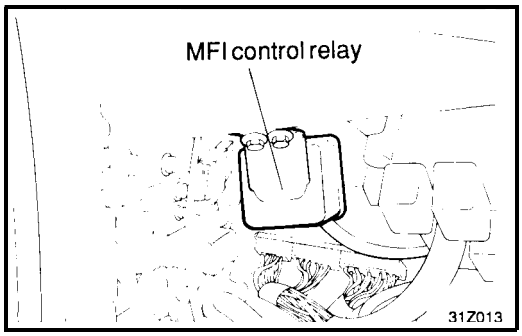
Operation check
Apply voltage as follows and check whether or not stepper motor movement occurs.

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



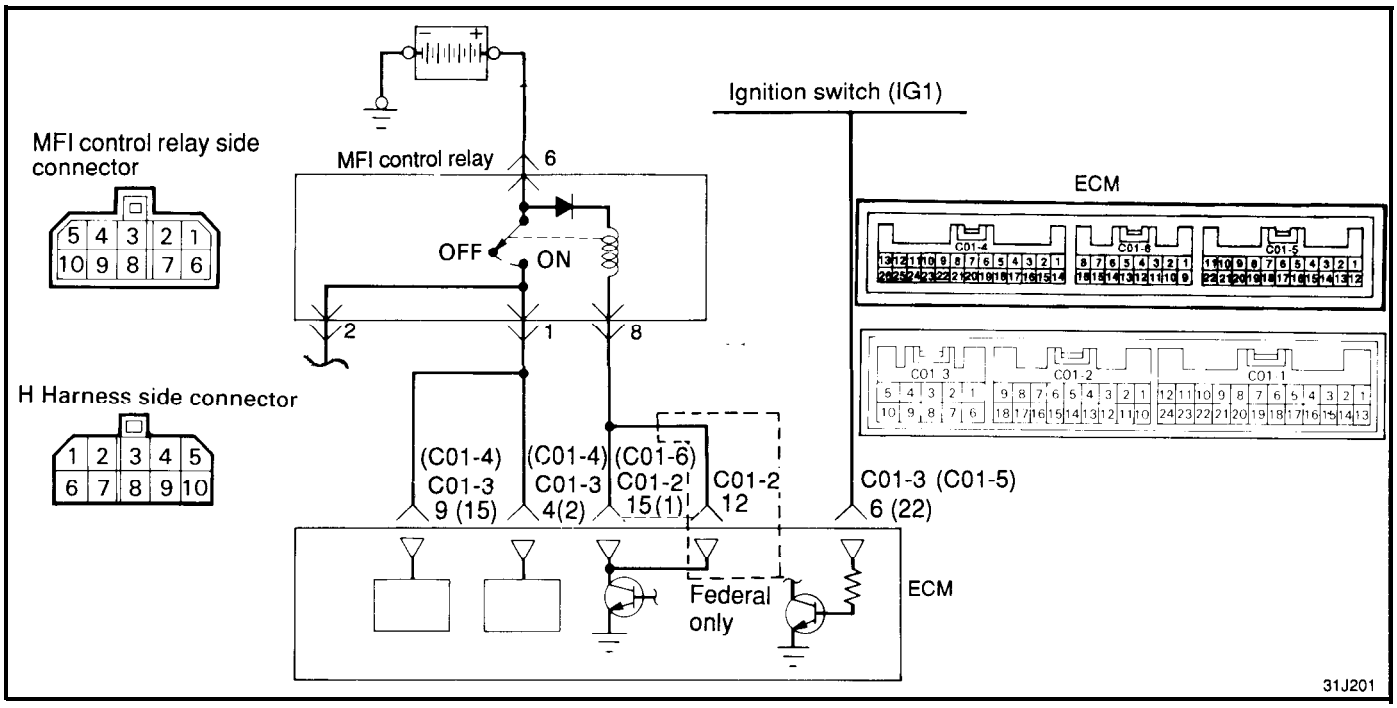
MFI CONTROL RELAY AND IGNITION SWITCH-IG

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



Circuit Diagram

( ) : California only



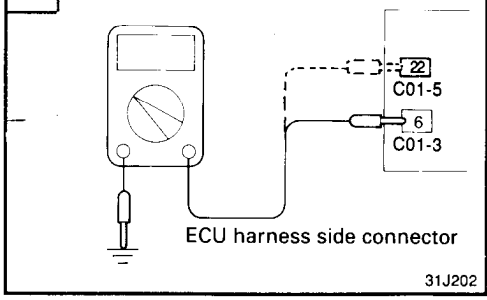
Using Scan Tool

Check Item	Data display	Check condition	Test specification
Battery voltage o Service data Item No. 16	Engine control module power voltage	Ignition switch: ON	**11-13v**

Harness Inspection

* : California only

1

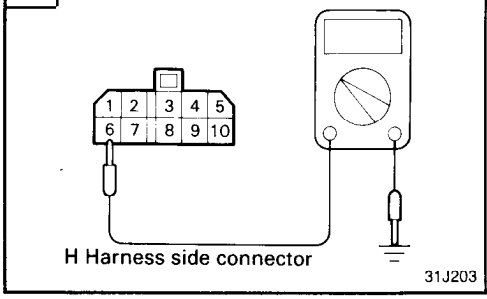


Measure the TR switch terminal input voltage.
- o ECM connector: Connected
- o Ignition switch : ON
- o Voltage (V) : System Voltage

OK → **2**

NG → Repair the harness. (Ignition-switch C01-3 6) * (Ignition switch -C01-5 22)

2

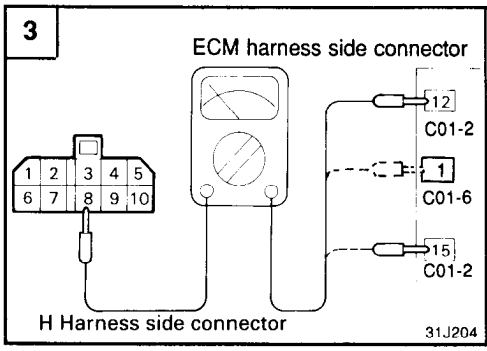


Measure the power supply votlage of the MFI control relay.
- o Connector : Disconnected
- o Voltage (V) : System Voltage

OK → **3**

NG → Repair the harness. (Battery-H 6)

3

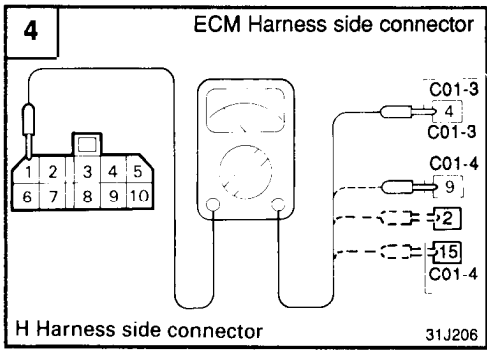


Check for an open-circuit, or a short-circuit to ground, between the ECM and the MFI control relay.
- o ECM connector: Disconnected
- o Control relay connnector: Disconnected

OK → **4**

NG → Repair the harness. (H 8-C01-2 15) (H 8-C01-2 12) * (H 8-C01-6 1)

4

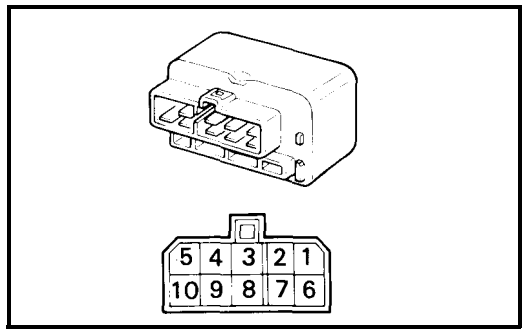


Check for open-circuit, or short-circuit to ground between the engine control module and the MFI control relay.
- o MFI control relay connector: Disconnected
- o ECM connector: Disconnected

OK → **END !**

NG → Repair the harness. (H 1-C01-3 4, 9) * (H 1-C01-4 2, 15)

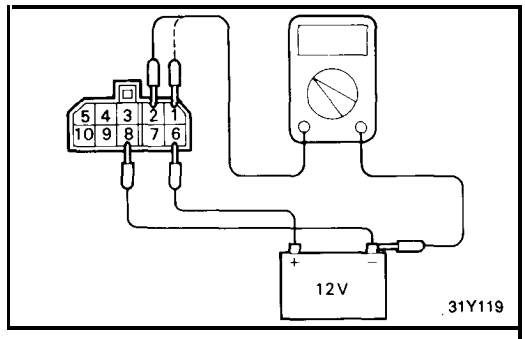
Control Relay Inspection



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

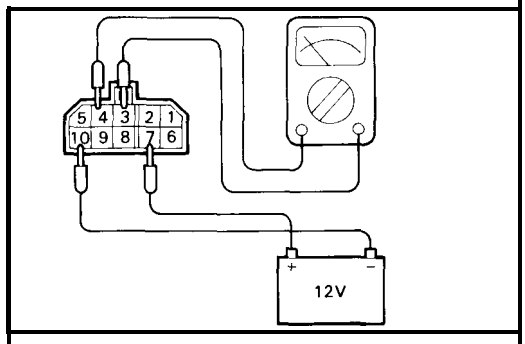
1. Connect a 12V power supply (+) terminal to the terminal 6 of the MFI control relay and measure the voltages at terminal 1 when the (-) terminal is connected to and disconnected from the terminal 8.

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



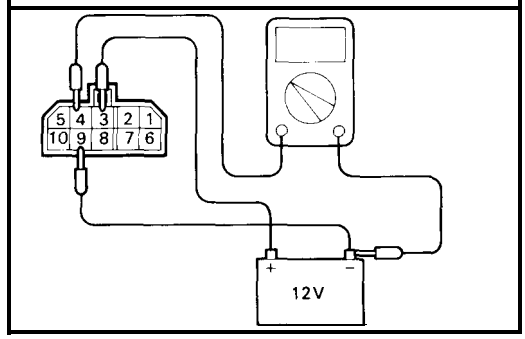
2. Connect a 12V power supply (-) terminal to the terminal 10 of the control relay and check the continuity between terminals 3 and 4 when the (+) terminal is connected to and disconnected from the terminal 7.

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 MFI control relay and measure the voltages at the terminal 4 when the (-) terminal is connected to and disconnected from the terminal 9.

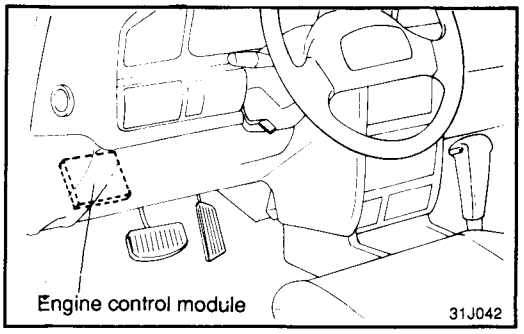
Terminal 9 and 12V power supply (-) terminal	Terminal 4
Connected	12v
Disconnected	ov



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

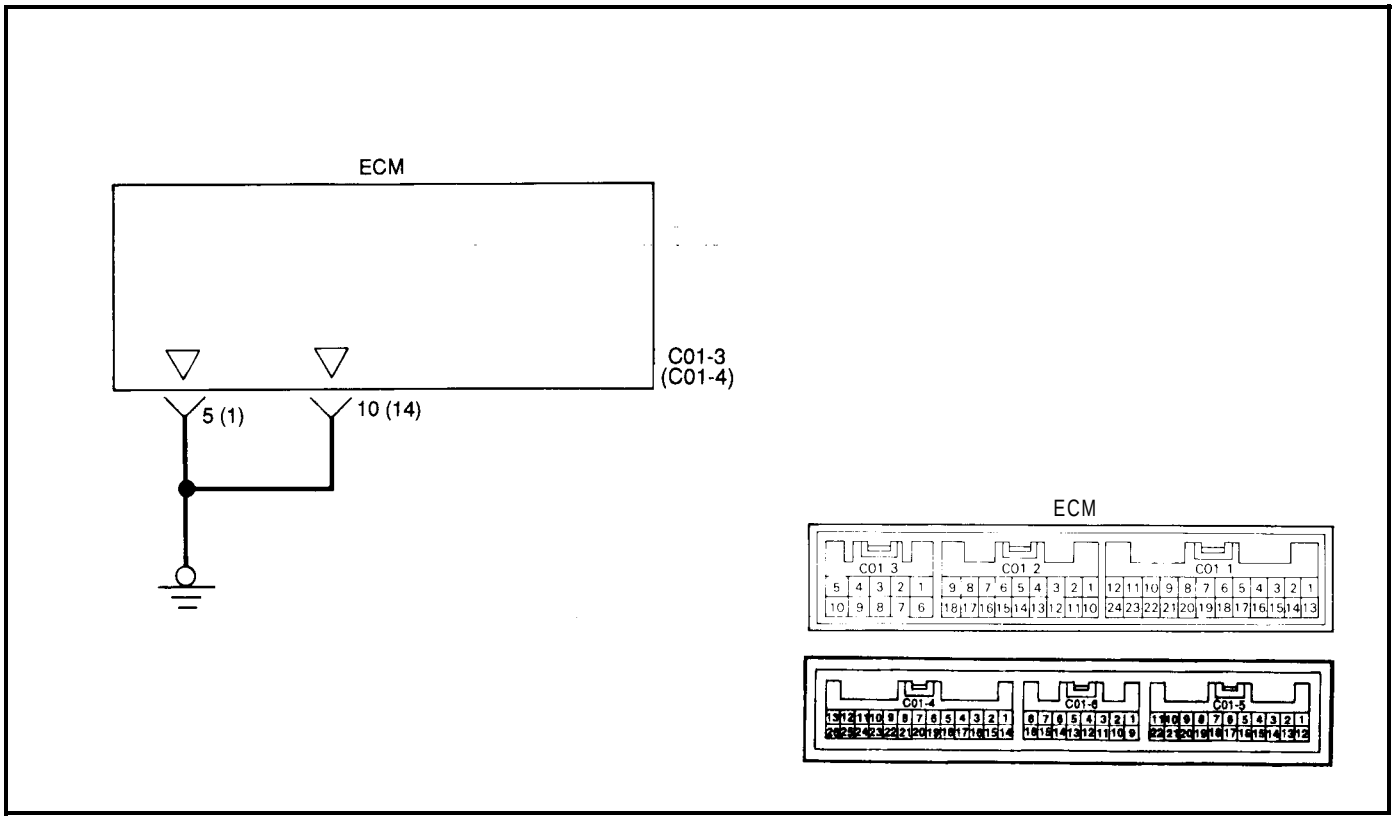
ENGINE CONTROL MODULE (ECM)- POWER GROUND

Grounds the engine control module (ECM).



Circuit Diagram

( ) : California only

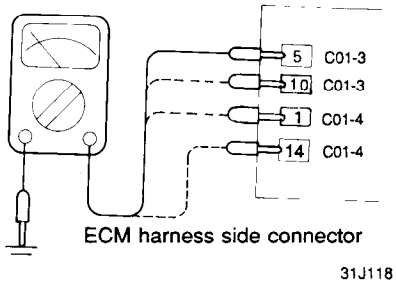


Troubleshooting Hints

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

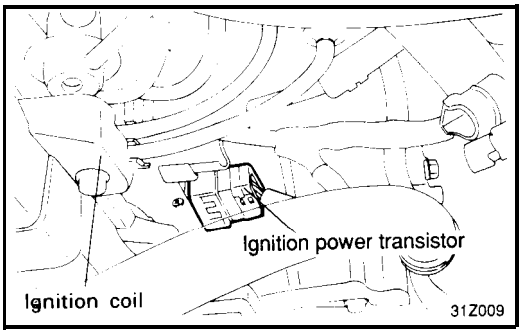
Harness Inspection

• : California only

1		Check for continuity of the ground circuit. o ECM connector: Disconnected	OK →	END !
			NG →	Repair the harness (C01-3 5, 10 - Ground) * (C01-4 1, 14 - Ground)

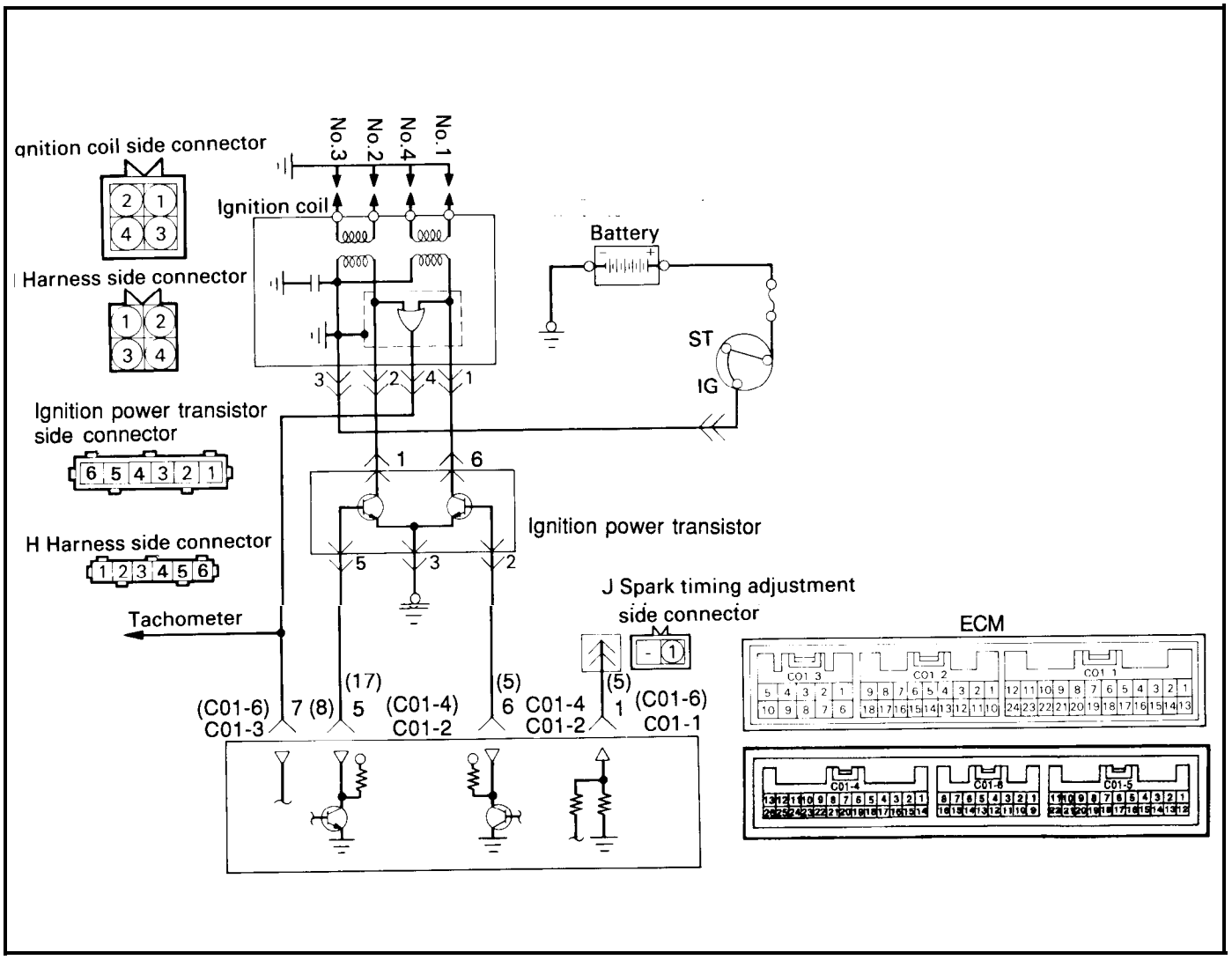
IGNITION COIL AND IGNITION POWER TRANSISTOR

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



Circuit Diagram

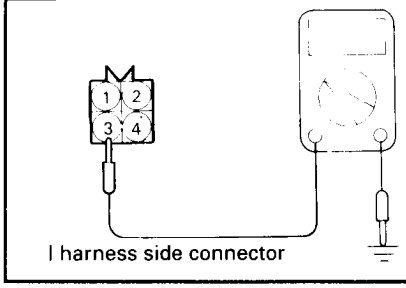
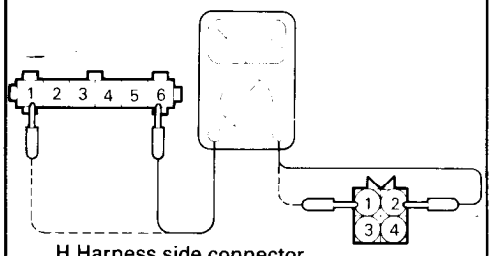
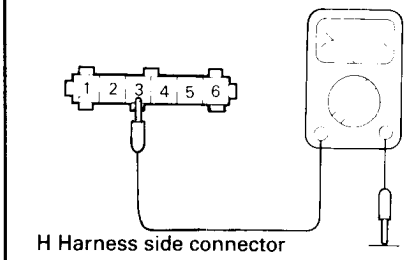
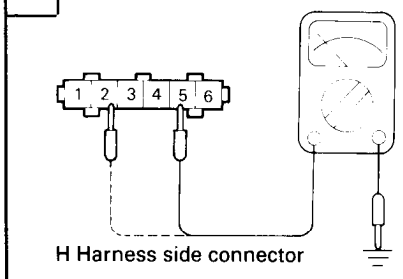
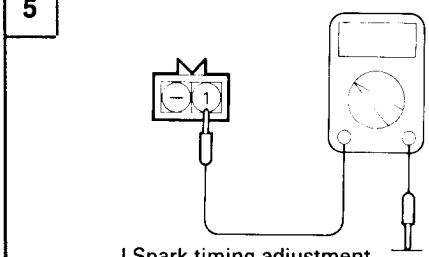
( ) : California only



Using Scan Tool

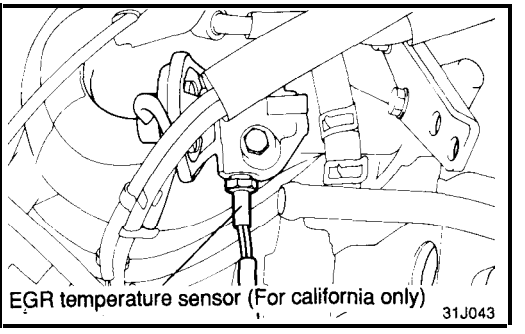
Check Item	Check condition	Engine state	Standard value
Ignition advance o Service data Item No. 44	o Engine: Warmed up o Timing light: Set (set timing light to check actual ignition timing)	750 rpm (Idle)	5-15°BTDC
		2,000 rpm	32-40°BTDC

Harness Inspection

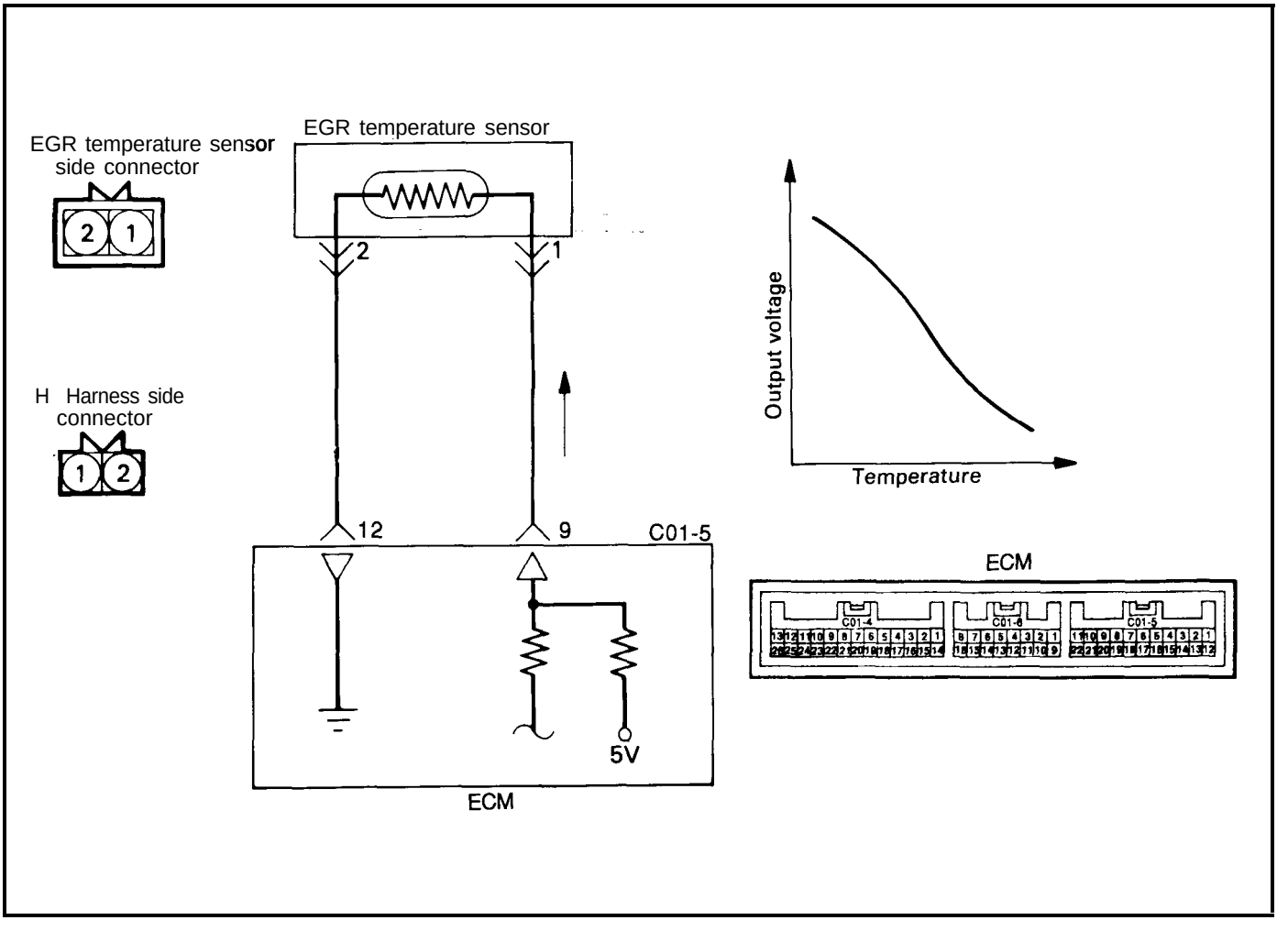
1	 I harness side connector 31J208	Measure the power supply voltage of the ignition coil. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK → 2 NG → Repair the harness. (I 3-Ignition switch)
2	 H Harness side connector 31J209	Check for an open-circuit, or a short-circuit to ground between the ignition power transistor and the ignition coil. o Ignition coil connector: Disconnected o Ignition power transistor connector: Disconnected	OK → 3 NG → Repair the harness. (I 1 - H 1) (I 2 - H 6)
3	 H Harness side connector 31J210	Check for continuity of the ground circuit. o Connector: Disconnected	OK → 4 NG → Repair the harness. (H 3-Ground)
4	 H Harness side connector 31J211	Measure the voltage of the control signal circuit of the ignition power transistor. o Connector: Disconnected o Ignition switch: START o Voltage: 0.5 - 4.0 V	OK → 5 NG → Repair the harness. (H 5-C01-2 5) (H 2-C01-2 6) *(H 3-C01-4 17) *(H2-C01-4 4)
5	 J Spark timing adjustment side connector 31J212	Measure the voltage of the ignition timing adjustment terminal. o Ignition switch: ON o Voltage: 4.0 - 5.2 V	OK → END ! NG → Repair the harness. (J 1 -C01-1 1) * (J 1 - C01-6 5)

EGR TEMPERATURE SENSOR [For California]

The EGR temperature sensor converts the temperature of EGR gas downstream from the EGR valve to voltage and inputs it to the ECM. The ECM 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.



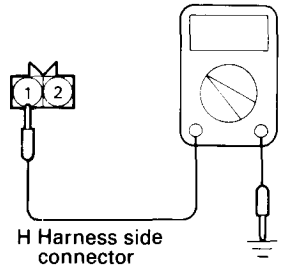
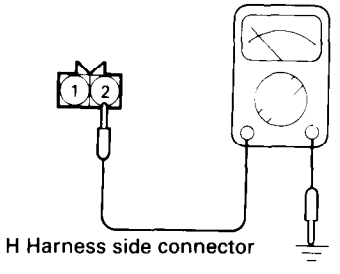
Circuit Diagram



Using Scan Tool

Check Item	Data display	Check condition	Engine state	Test specification
EGR temperature sensor o Service data Item No. 43	Sensor temperature	Engine: Warmed 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

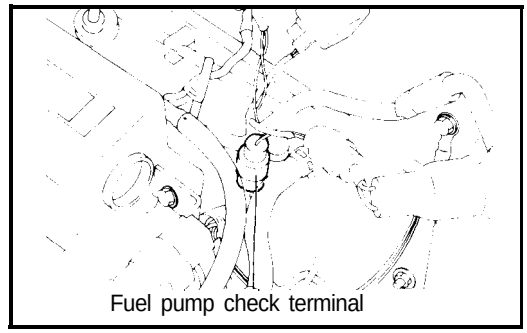
Harness Inspection

1  H Harness side connector 31J126	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.3-4.7V	OK →	2
		NG →	Repair the harness. (H 2 - C01-5 9)
2  H Harness side connector 31J127	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 1 - C01-5 12)

Sensor Inspection

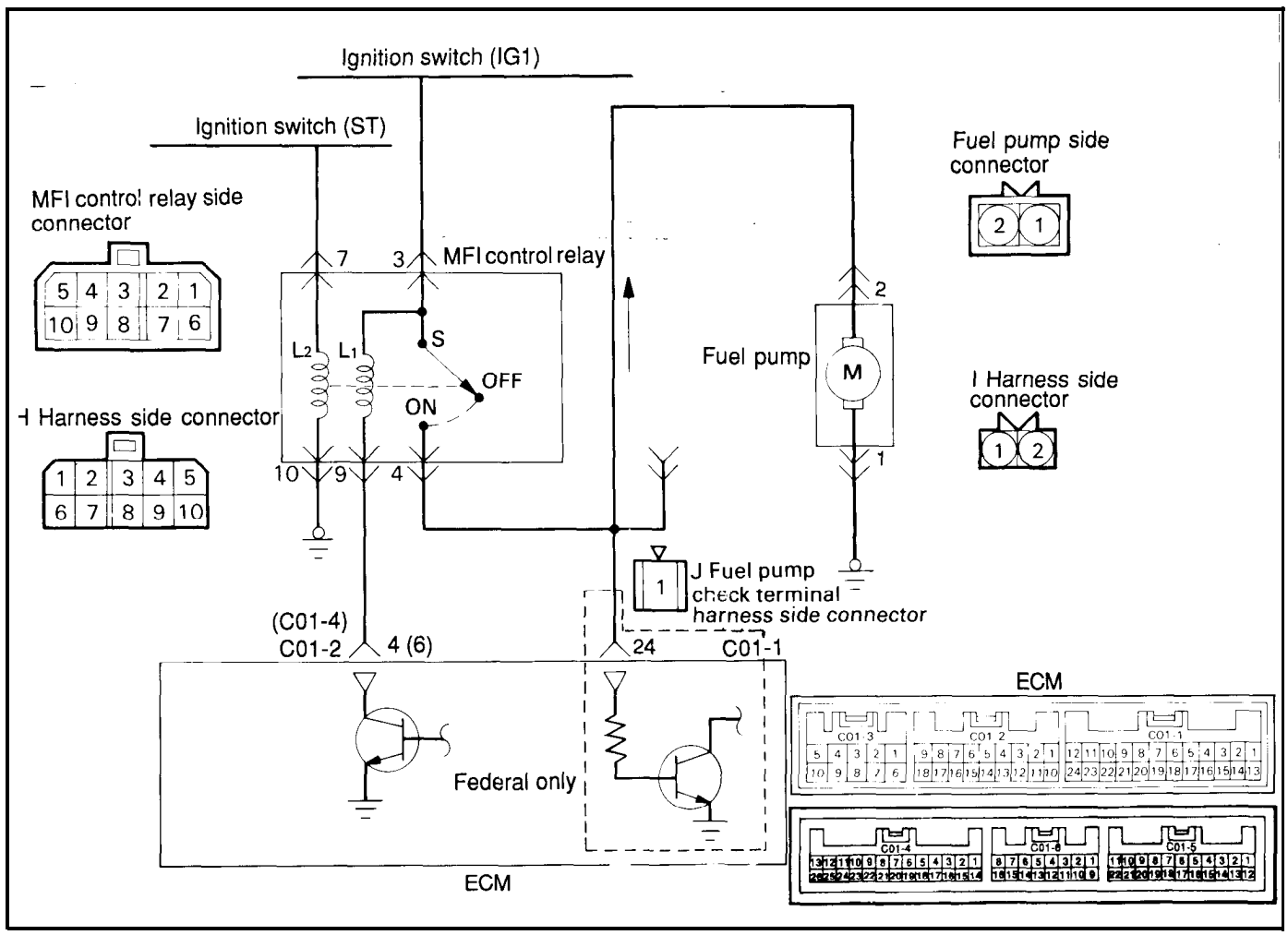
Refer to GROUP 29-Exhaust Gas Recirculation (EGR) System.

FUEL PUMP


Fuel pump check terminal

Circuit Diagram

( ) : California only

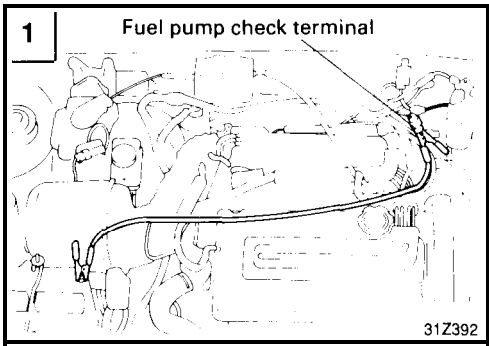
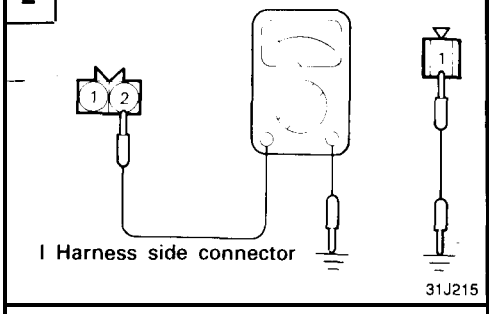
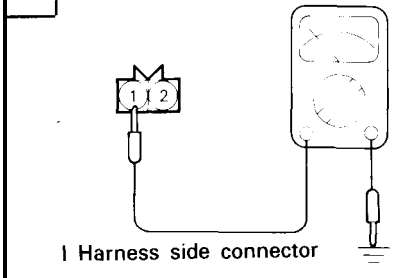


Using Scan Tool

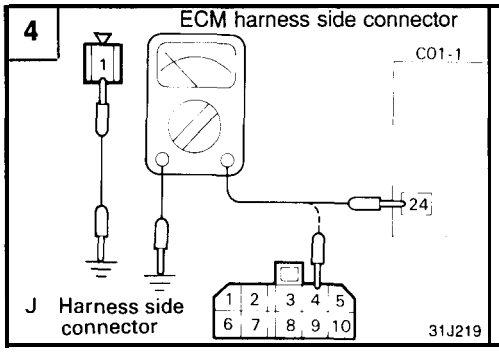
Check Item	Item No.	Drive	Check condition	Engine state	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	o Engine cranking o Forced drive of fuel pump Check is made for above two conditions	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is heard

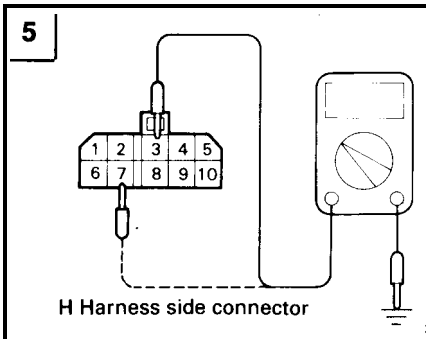
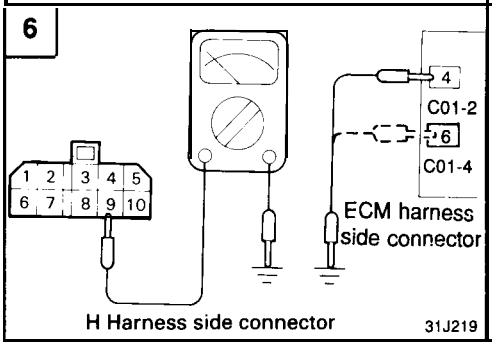
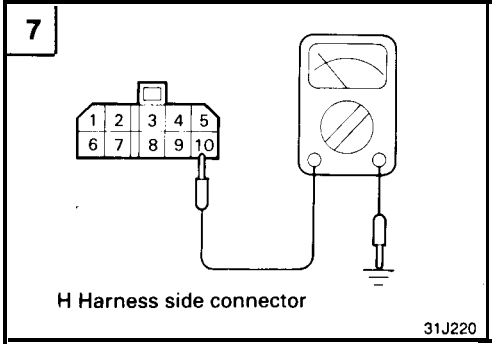
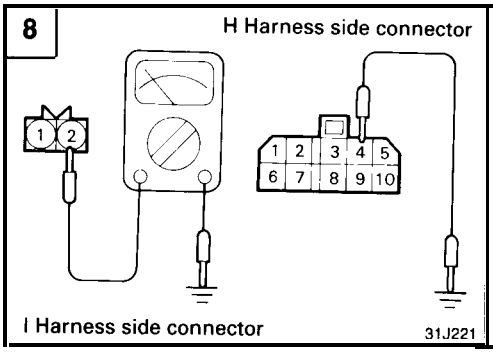
Harness Inspection

* : California only

1 	Check the fuel pump. o Apply battery voltage to the checking terminal and operate the pump	OK →	4
		NG →	2
2 	Check the ground circuit of the fuel pump. o Connector: Disconnected	OK →	3
		NG →	Repair the harness. (I 2-Ground)
3 	Check for continuity between the fuel pump and the checking terminal. o Connector: Disconnected	OK →	4
		NG →	Repair the harness. (I 1 - J I)

Federal only

4 	Check for continuity between the checking terminal and the engine control module, and between the MFI control relay terminals. o MFI control relay connector: Disconnected o Engine control module connector: Disconnected o Fuel pump connector: Disconnected	OK →	5
		NG →	Repair the harness (J 1 -CO1-1 24)

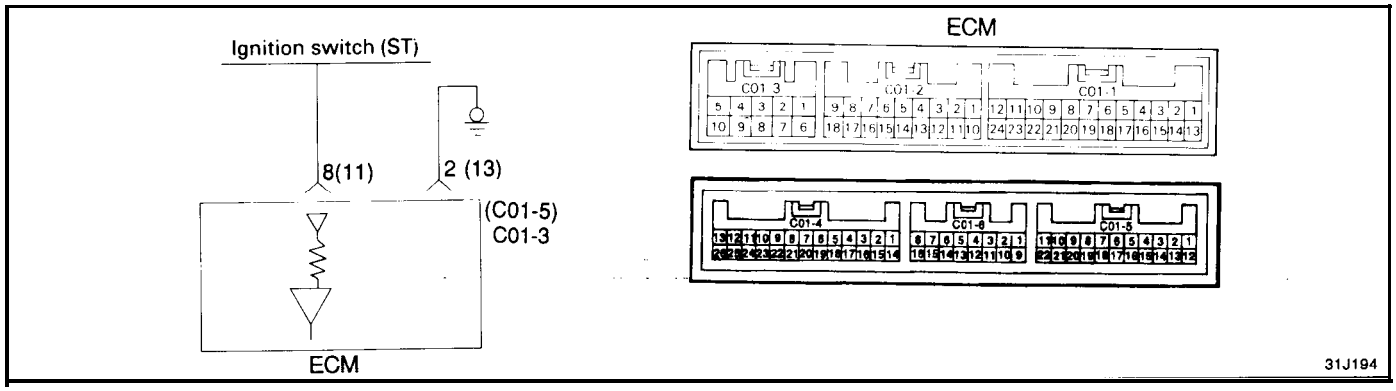
5  	Measure the power supply voltage of the MFI control relay. o Connector : Disconnected o Ignition switch: START (when H 2 checked) o Ignition switch : ON (when H 3 checked) o Voltage : 8V or more	OK → NG →	6 Repair the harness.(Ignitior switch-ON-H 3) (Ignition switch-ST-H 7)
6  	Check for an open-circuit, or a short-circuit to ground between the MFI control relay and the engine control moduel. o MFI Control relay connector: Disconnected o Engine control moduel connector: Disconnected	OK → NG →	7 Repair the harness. (H 9-C01 -2 4) * (H 9-C01 -4 6)
7  	Check for continuity of the ground circuit. o Control relay connector: Disconnected	OK → NG →	8 Repair the harness. (H 10 - Ground)
8  	Check for an open-circuit, or a short-circuit to ground between the MFI control relay and the fuel pump. o MFI control relay connector: Disconnected o Fuel pump connector: Disconnected	OK → NG →	END ! Repair the harness. (H 4 - I 1)

IGNITION SWITCH-ST [M/T]

The ignition switch-ST inputs a high signal to the ECU while the engine is cranking.
The ECM provides fuel injection control, etc. at engine start-up based on this signal.

Circuit Diagram

( ) : California only

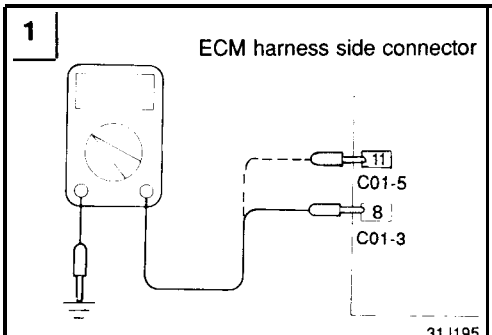
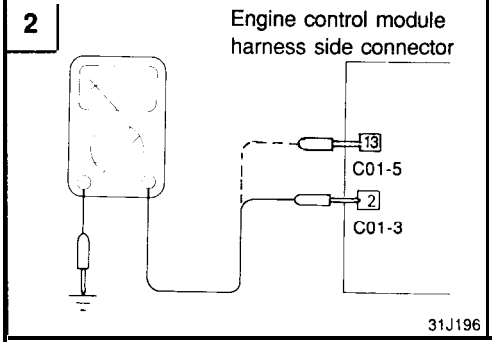


Using Scan Tool

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

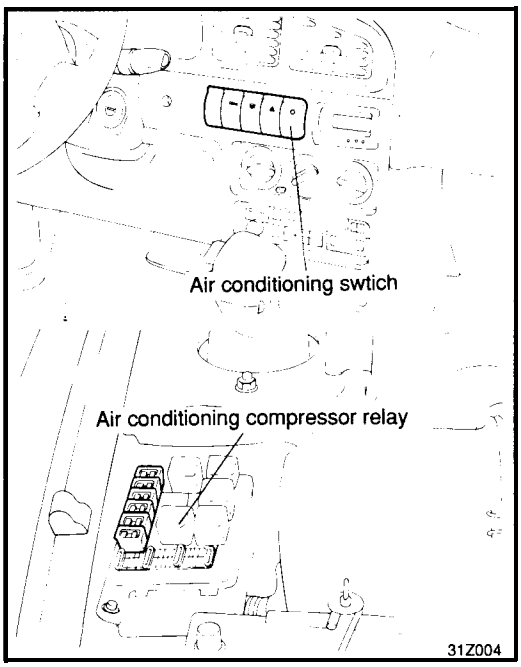
Harness Inspection

* : California only

1 	Measure the input voltage to the ECM o ECM connector: Disconnected o Ignition switch: START o Voltage: 8V or more	OK →	2
		NG →	Repair the harness (CO1 -3 8- Ignition switch) * (CO1 -5 11 - Ignition switch)
2 	Check for continuity of the ground circuit o ECM connector: Disconnected	OK →	END !
		NG →	Repair the harness (CO1 -3 2- Ground) * (C01-5 13 - Ground)

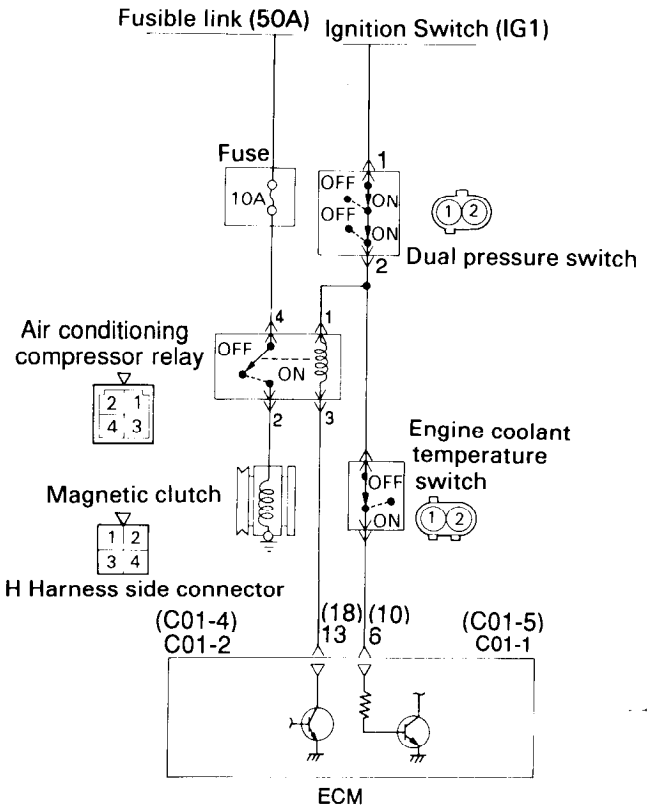
AIR CONDITIONING SWITCH AND AIR CONDITIONING RELAY

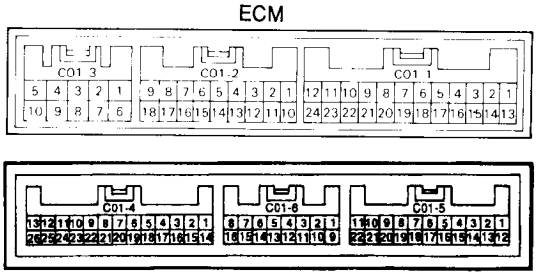
The air conditioning switch applies the battery voltage to the ECM when the air conditioner is turned on.
When the air conditioning ON signal is input, the ECM drives the ISC motor and turns ON the power transistor. And then the air conditioning power relay coil is energized to turn on the relay switch, which activates the air compressor magnetic clutch.



Circuit Diagram

( ) : California only





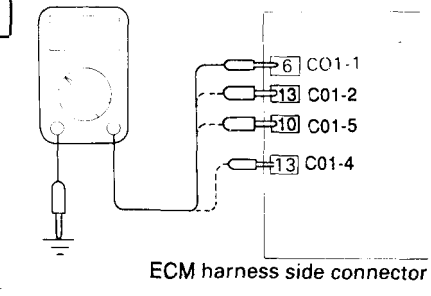
Troubleshooting Hints

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

Using Scan Tool

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

Harness Inspection

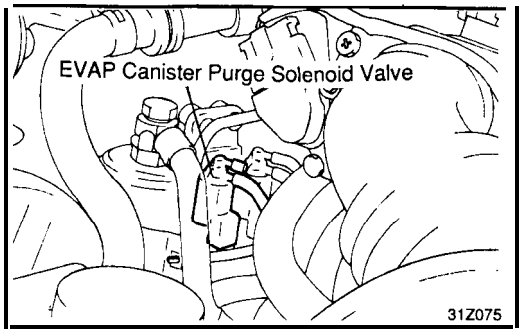
1  ECM harness side connector	Measure the power supply voltage of the air conditioning circuit. o Air conditioning switch: ON o Engine control module connector: Disconnected o Ignition switch: ON o Voltage: System voltage	OK →	END !
		NG →	Check the air conditioning circuit

Air Conditioning Inspection

Refer to GROUP 97-Service Adjustment Procedures.

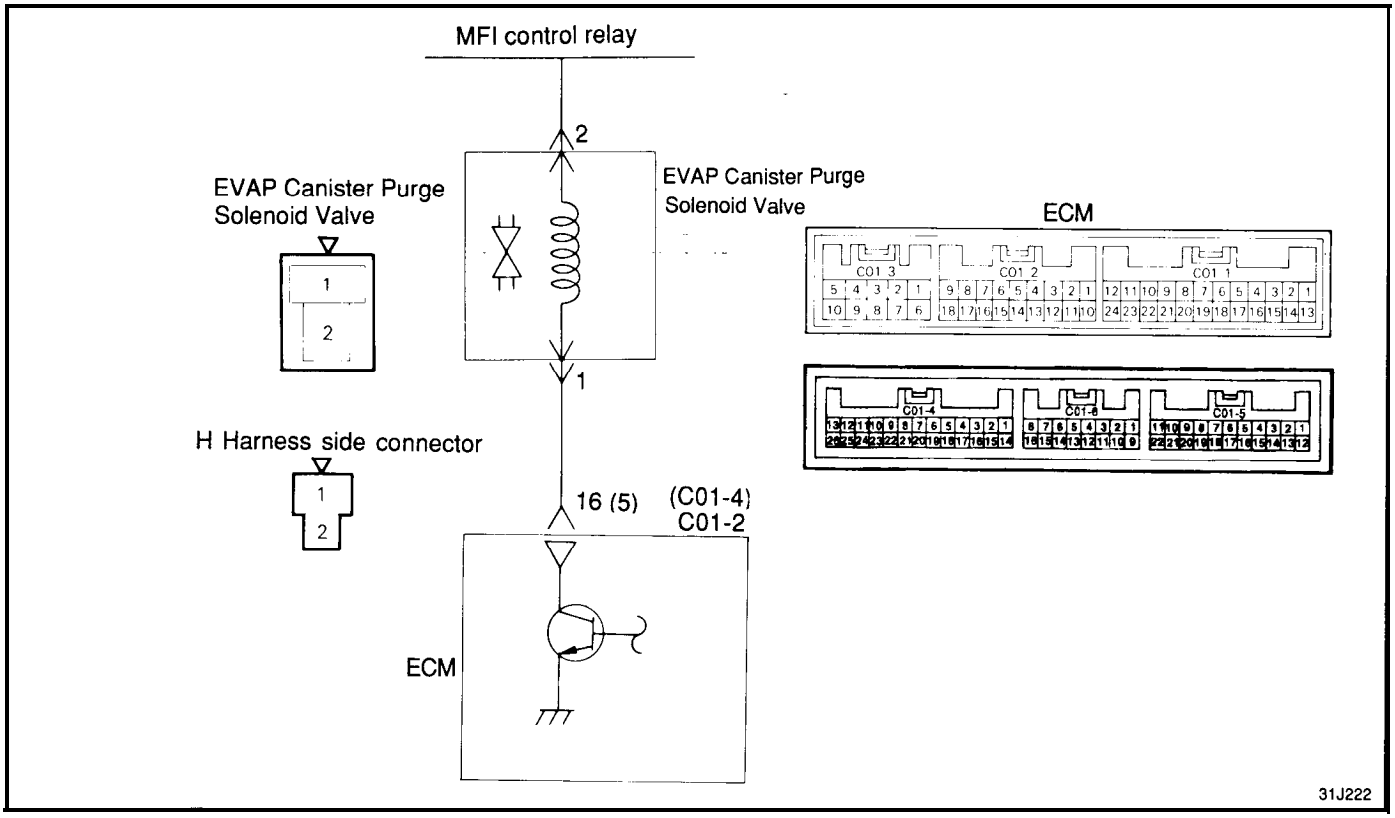
EVAP CANISTER PURGE SOLENOID VALVE

The EVAP Canister Purge Solenoid Valve solenoid valve is an ON-OFF type, which controls introduction of purge air from the EVAP canister.



Circuit Diagram

( ) : California only

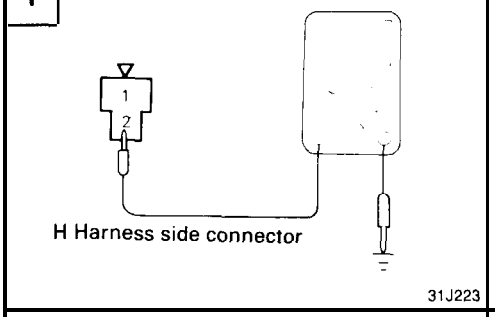
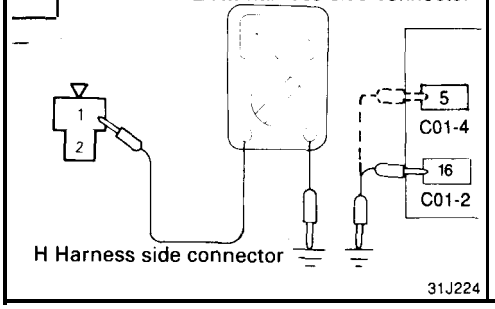


Using Scan Tool

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

Harness Inspection

* : California only

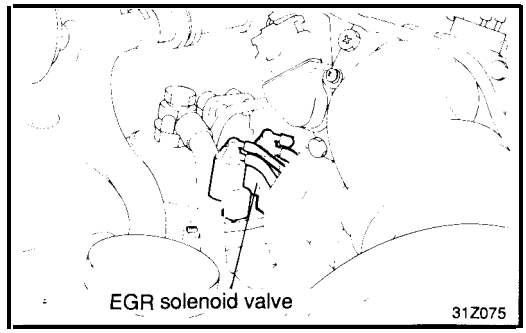
1  31J223	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: System voltage	OK →	2
		NG →	Repair the harness. (MFI control relay - H 2)
2  31J224	Check for an open-circuit, or a short-circuit to ground between the EVAP Canister Purge Solenoid Valve and the engine control module. o Engine control module connector: Disconnected o EVAP Canister Purge Solenoid Valve connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 1 - C01-2 16) * (H 1 - C01-4 5)

Actuator Inspection

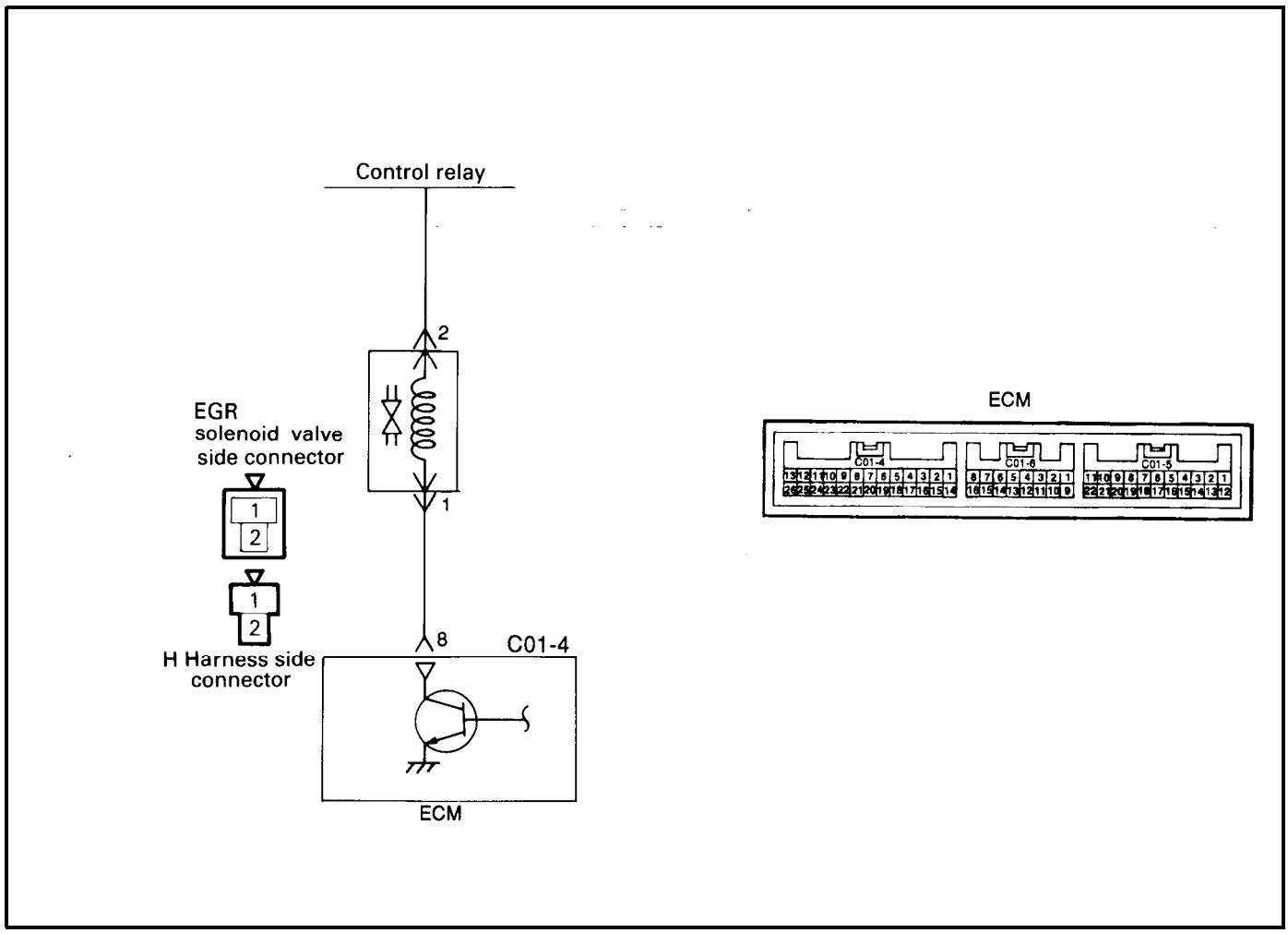
Refer to GROUP 29-Evaporative Emission System.

EGR SOLENOID VALVE (For California only)

The EGR 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



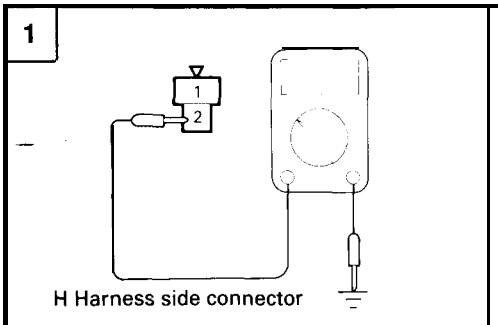
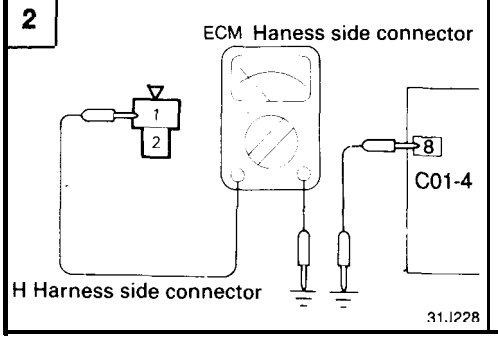
Troubleshooting Hint

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

Using Scan Tool

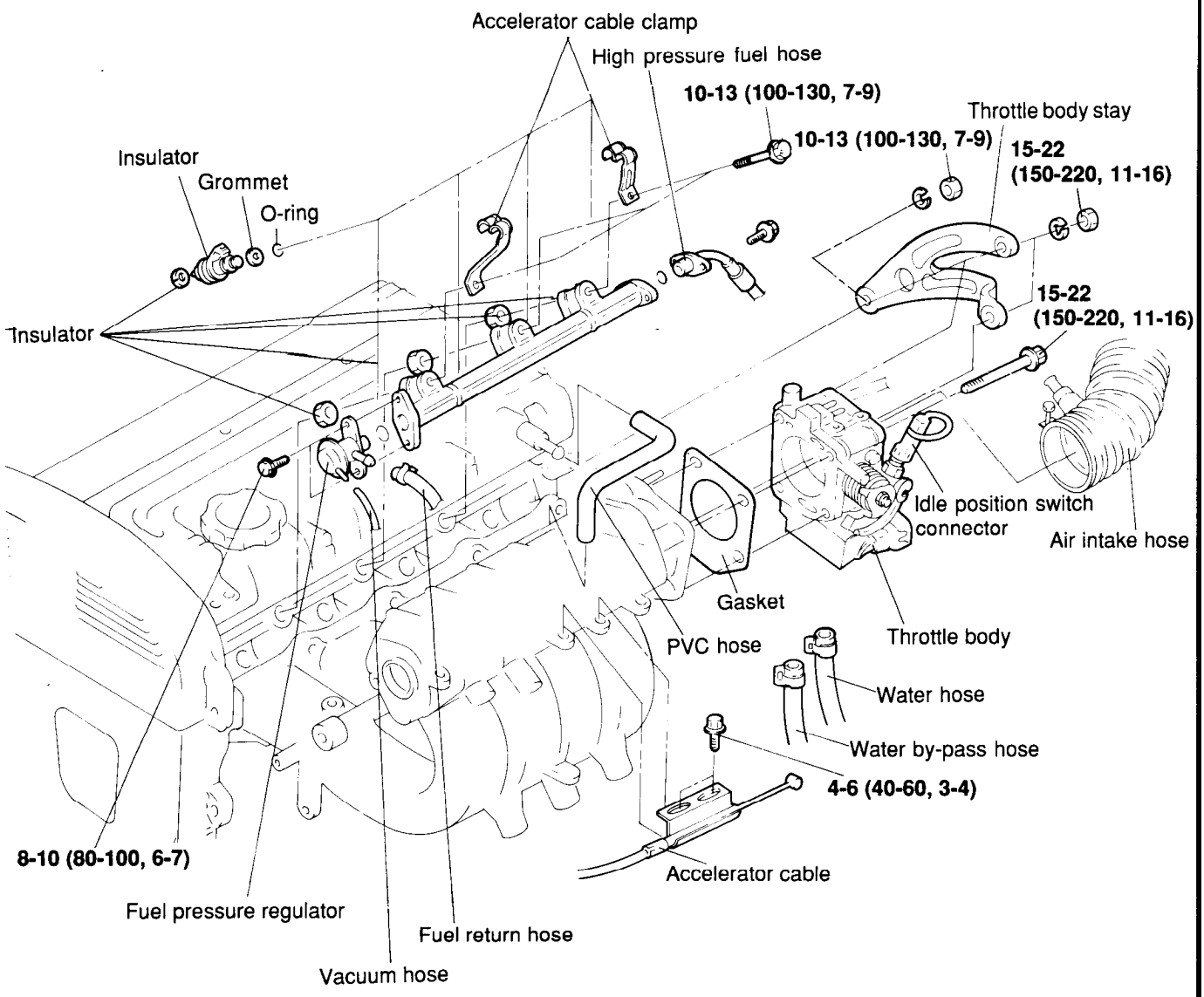
Check Item	Drive content	Check condition	Normal state
EGR solenoid valve o Service data Item No. 10	Change solenoid valve from OFF to ON state	Ignition switch: ON	Operating sound is heard when driven

Harness Inspection

1  	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON 0 Voltage: System Voltage	OK →	2
		NG →	Repair the harness. (H 2 - Control relay)
2  	Check for an open-circuit, or a short-circuit to ground between the EGR solenoid valve and engine control module. o EGR solenoid valve connector: Disconnected o ECM connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 1 - C01-4 8)

INJECTOR

COMPONENTS



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

REMOVAL

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

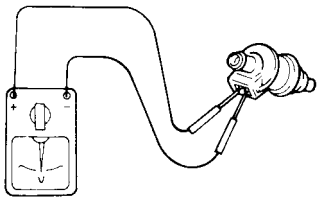
CAUTION
Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

INSPECTION

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

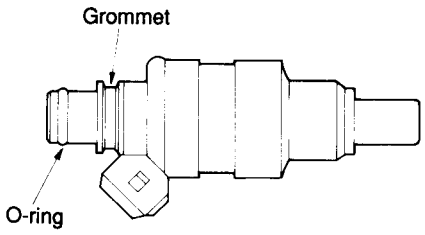
Resistance	13-1 Ω [at 20°C (68°F)]

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



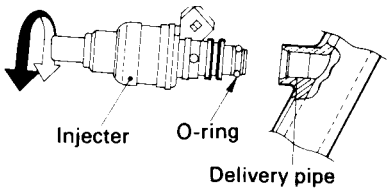
INSTALLATION

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.



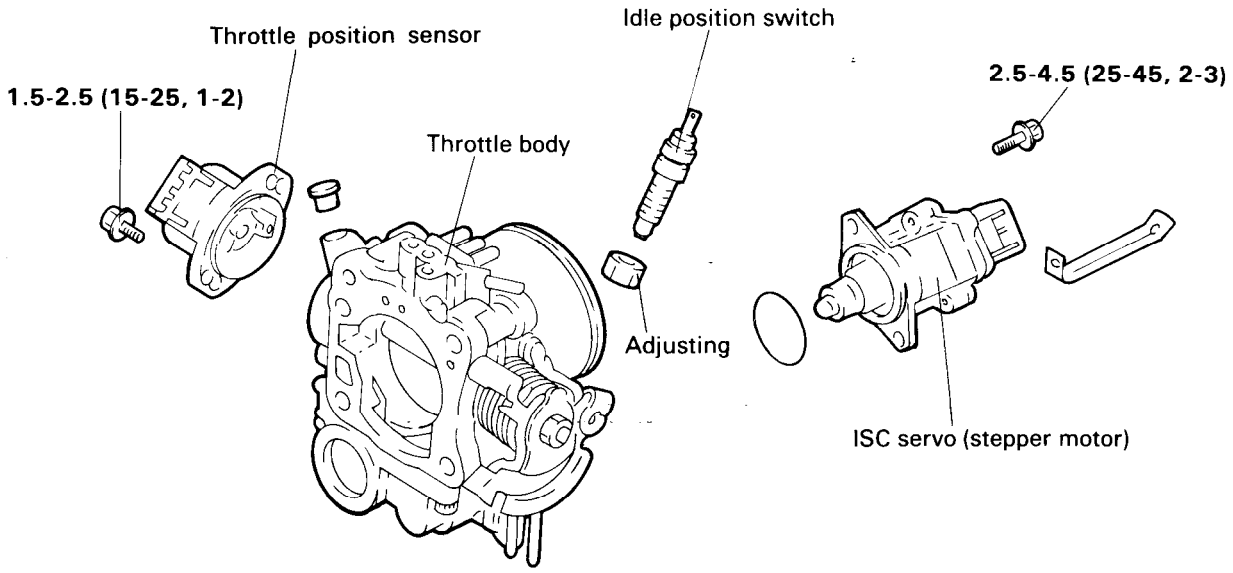
3. While turning the injector to the left and right, install it on to the delivery pipe.
4. Be sure the injector turns smoothly.

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

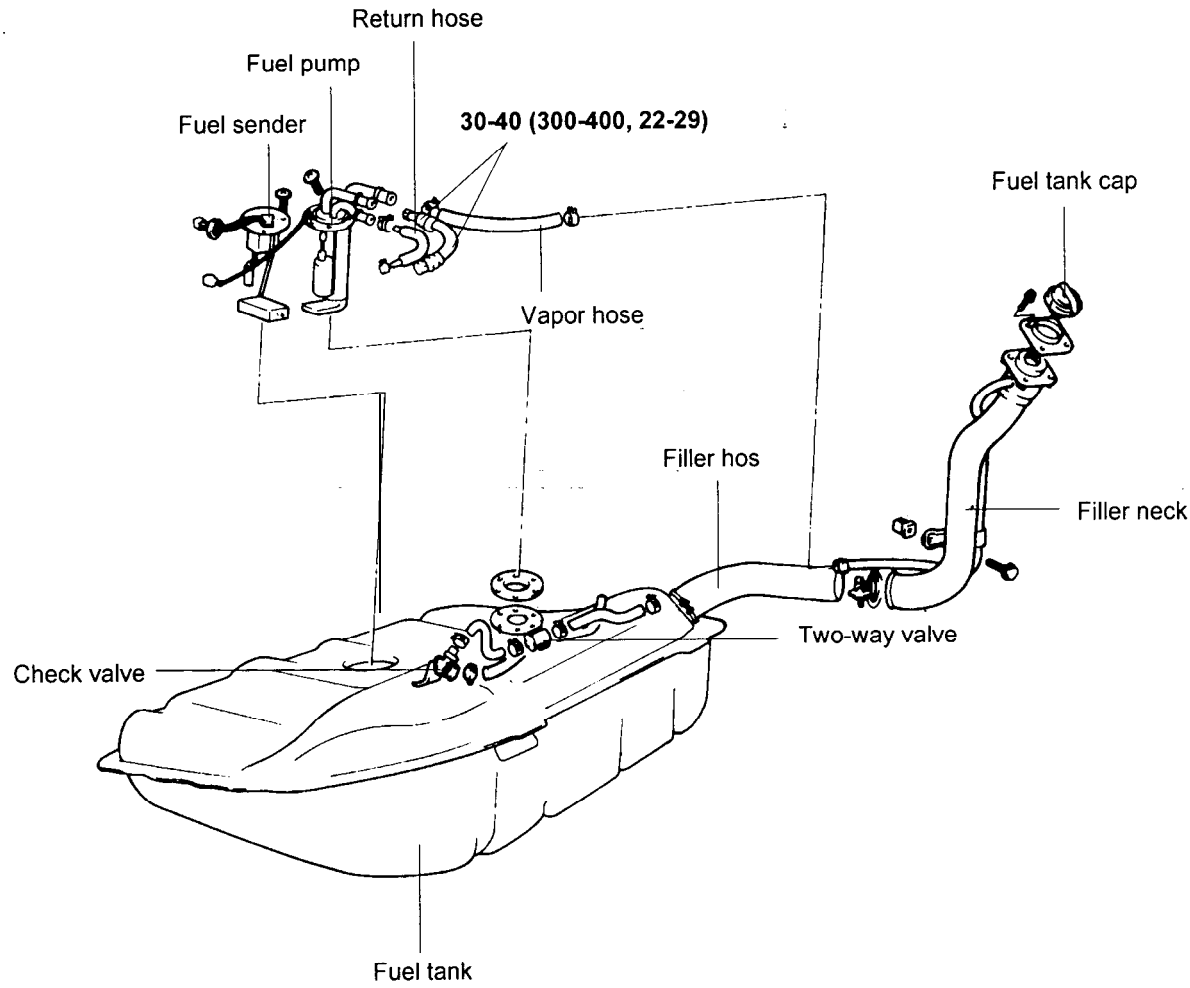
Cleaning Throttle Body Components

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

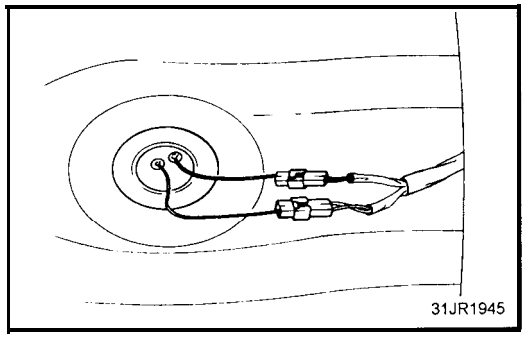


TORQUE ; Nm (kg.cm, lb.ft)

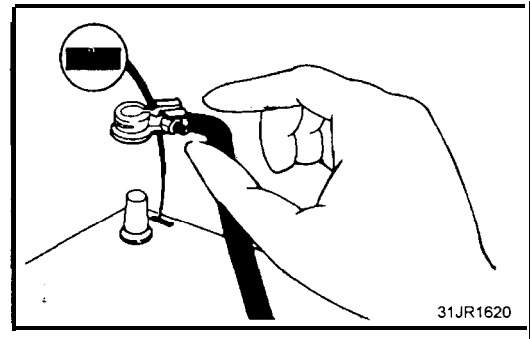
REMOVAL

1. Remove the rear seat cushion.
2. 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.

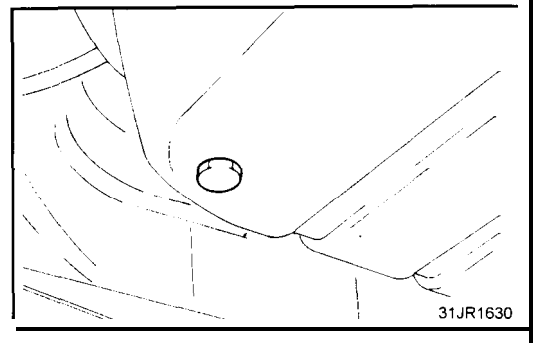
CAUTION
Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose otherwise fuel will spill out.



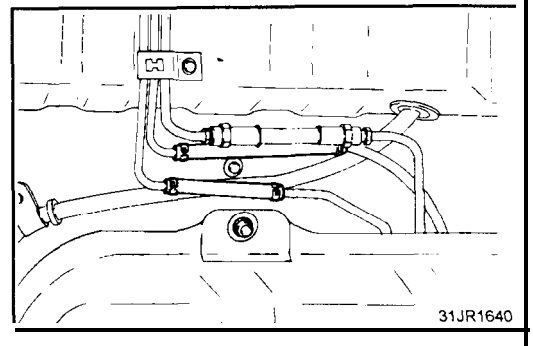
3. Disconnect the battery cable form the negative terminal of the battery.



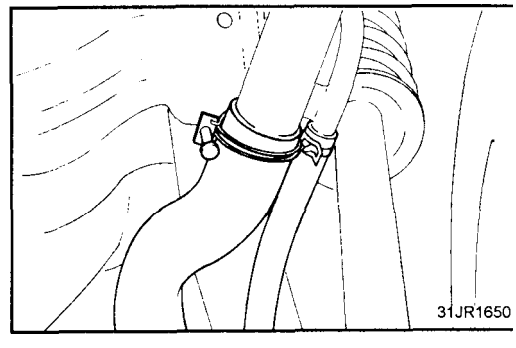
4. Remove the fuel tank cap.
5. Remove the drain plug and drain the fuel.



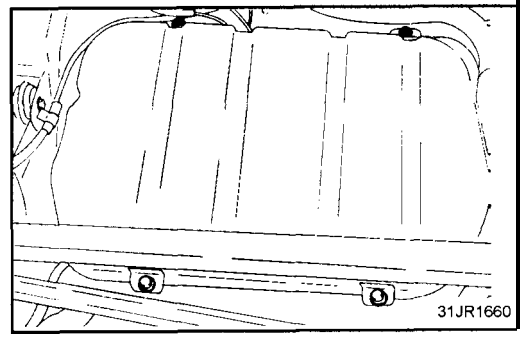
6. Disconnect the return hose and vapor hose.
7. Disconnect the fuel high pressure hose.



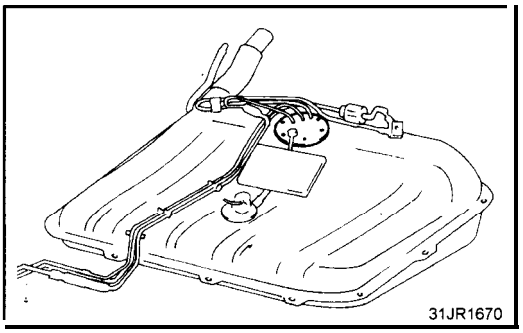
8. Detach the fuel filler hose and leveling hose.



9. Loosen the self locking nuts.



10. Disconnect the high pressure hose and pipe from the fuel pump.
11. Remove the fuel vapor hose and pipe from the fuel pump.
12. Remove the fuel return hose and pipe from the fuel pump.
13. Remove the fuel pump from the fuel tank.
14. Remove the fuel sender from the fuel tank.

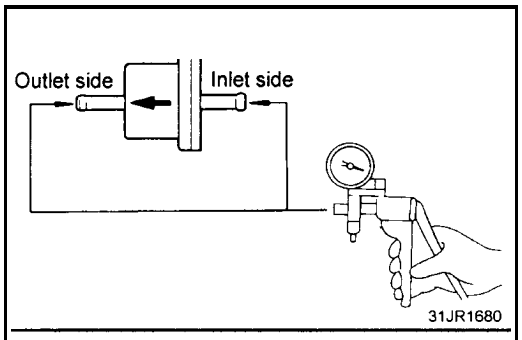


INSPECTION

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.

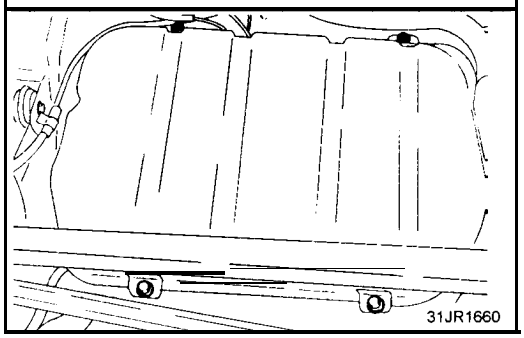
6. Test the two-way valve for proper operation.
7. Using a vacuum hand pump, check the operation of the two-way valve.

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

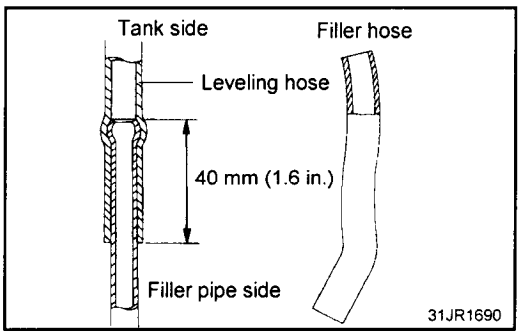


INSTALLATION

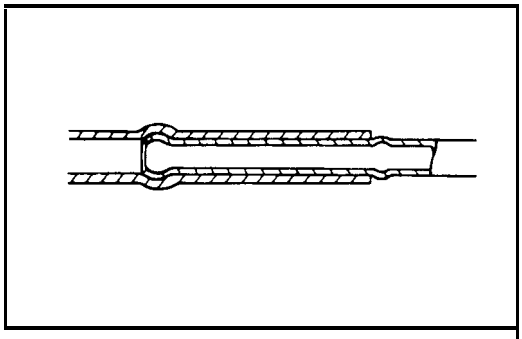
1. Install the fuel tank by tightening the self locking nuts.



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.

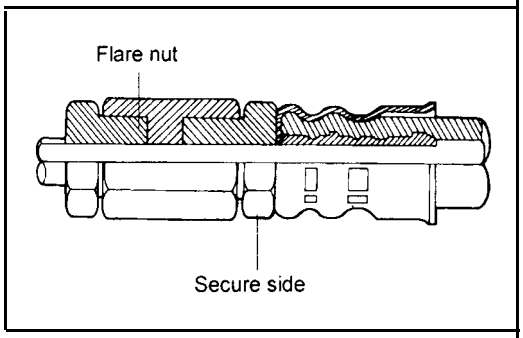


4. Connect the vapor hose and return hose.
   When attaching the fuel hose to the line, be sure that the hose is attached as shown in the illustration.



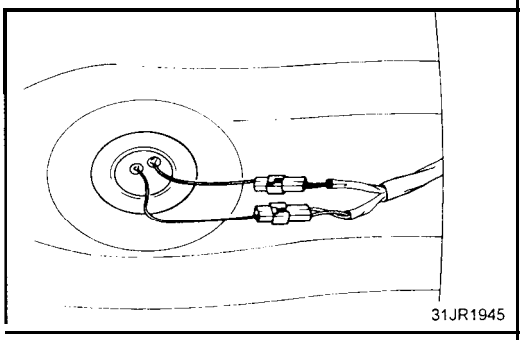
5. To connect the high pressure hose to the fuel pump, temporarily the flare nut by hand, and then tighten it to the specified torque. Be careful that the fuel hose does not twist.

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



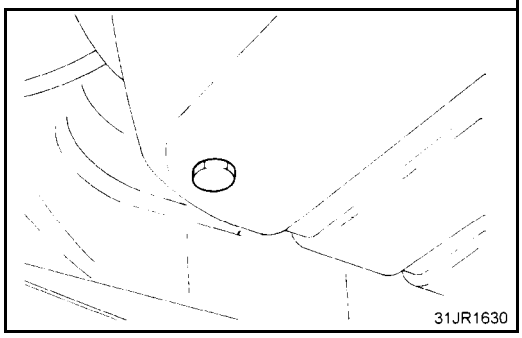
NOTE
When tightening the flare nut, be careful not to bend or twist the line to prevent damage to the fuel pump connection.

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



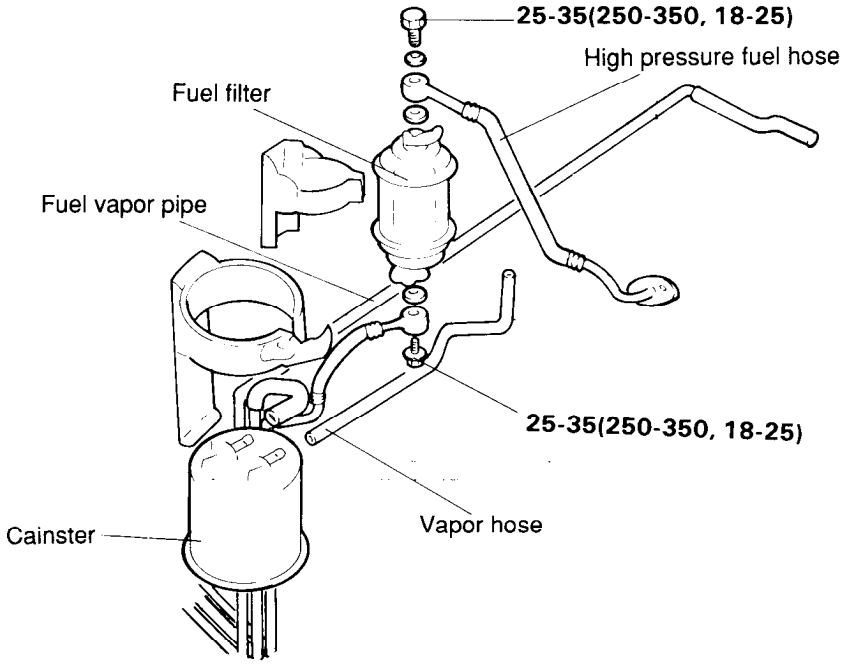
7. Tighten the drain plug to the specified torque.

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



FUEL LINE AND VAPOR LINE

COMPONENTS

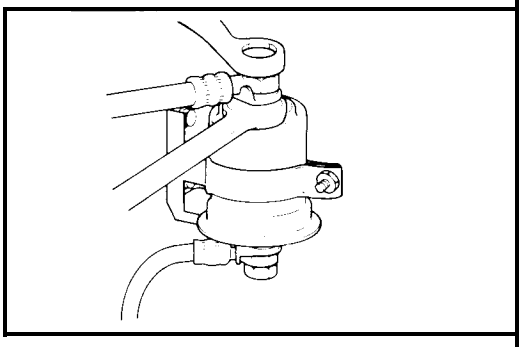


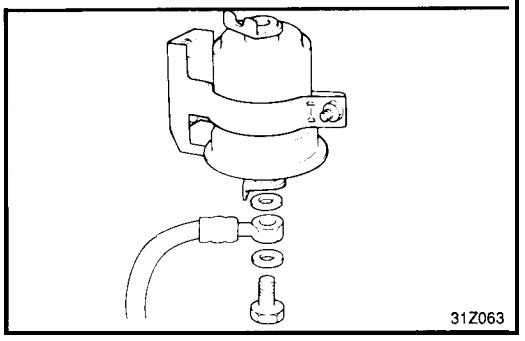
TORQUE : Nm (kg.cm, lb.ft)

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.



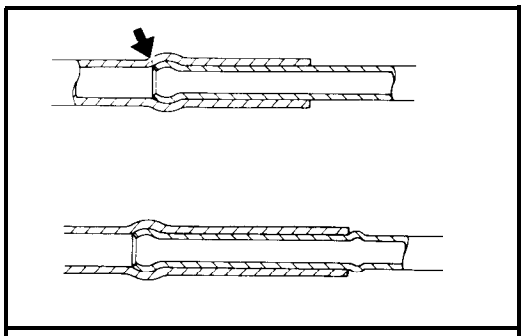


INSPECTION

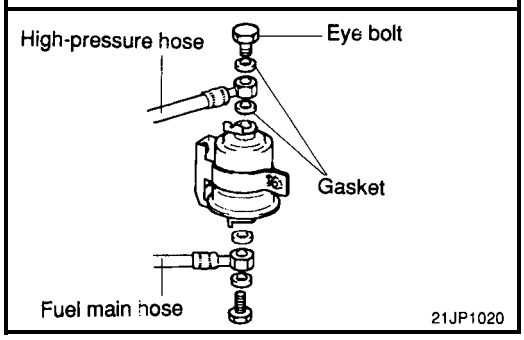
1. Check the hoses and pipes for cracking bending, deformation or restrictions.
2. Check the canister for restrictions.
3. Check the fuel filter for restrictions and damage.

INSTALLATION

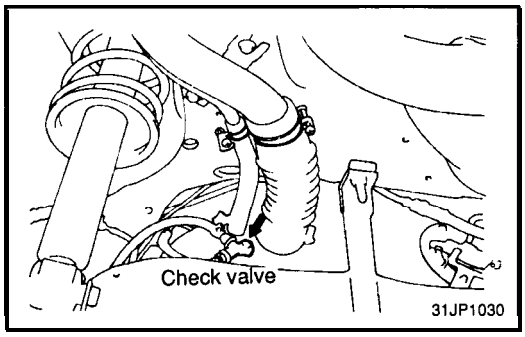
1. Install the fuel vapor hose and return hoses.
   - o If the fuel line has a stepped section, connect the fuel hose to the line securely, as shown in the illustration.
   - o If the fuel line does not have a stepped section, connect the fuel hose to the line securely.



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.

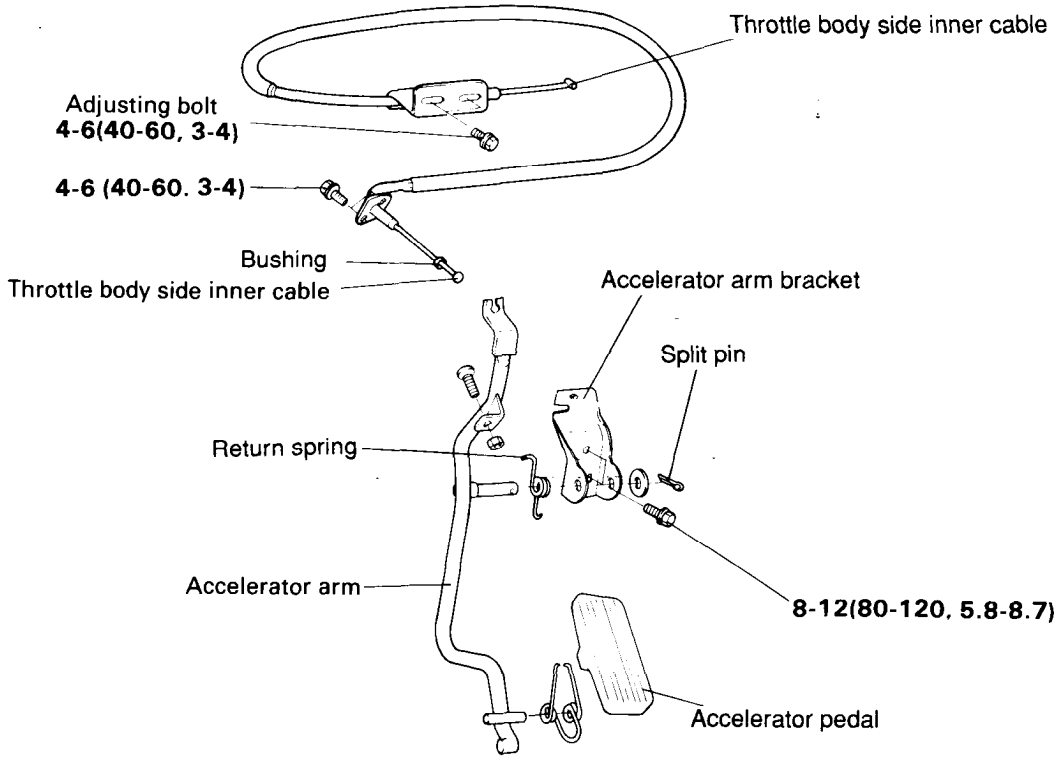


4. Install the clips and make sure that they do not interfere with other components.



ENGINE CONTROL

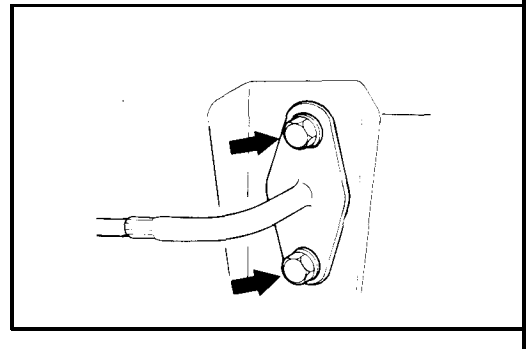
COMPONENTS



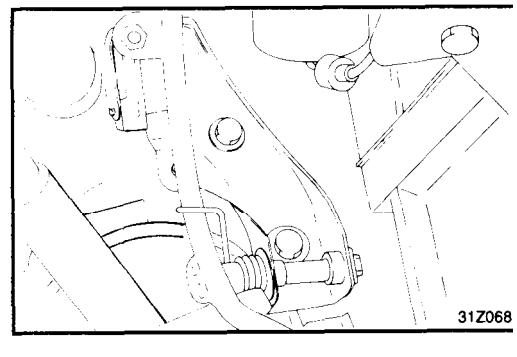
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the bushing and inner cable of the accelerator arm side.



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

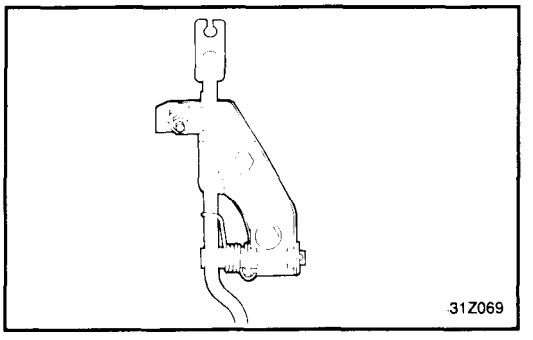


INSPECTION

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.

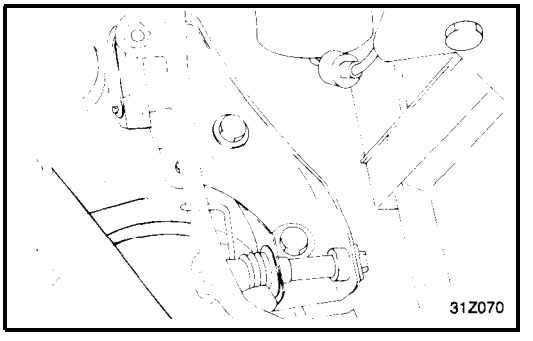
INSTALLATION

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.