# SECTION 6E1

# ELECTRONIC FUEL INJECTION SYSTEM

**WARNING:**
**For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:**
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **SDM can maintain sufficient voltage to cause a deployment of air bags for up to 10 seconds after ignition switch is turned to "LOCK" position, battery is disconnected or fuse powering SDM is removed. Work must be started after 10 seconds from the time.**



**NOTE:**
**Whether following systems (parts) are used in the particular vehicle or not depends on specification. Be sure to bear this in mind when performing service work.**
- **EGR control system (EGR valve, pressure transducer, solenoid vacuum valve and etc.)**
- **EVAP canister and vacuum hoses**
- **EVAP canister purge valve**
- **Oxygen sensor or CO adjusting resistor**
- **Three-way catalytic converter**

## CONTENTS

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# GENERAL DESCRIPTION

The Electronic Fuel Injection system in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions. It uses the multi-port fuel injection system which injects fuel into the each intake port of the cylinder head.

This system has 3 major sub-systems: air intake system, fuel delivery system and electronic control system. Air intake system includes air cleaner, throttle body, MAP sensor, IAC valve and intake manifold.
Fuel delivery system includes fuel pump, delivery pipe fuel pressure regulator, etc.. Electronic control system includes ECM, various sensors and controlled devices.

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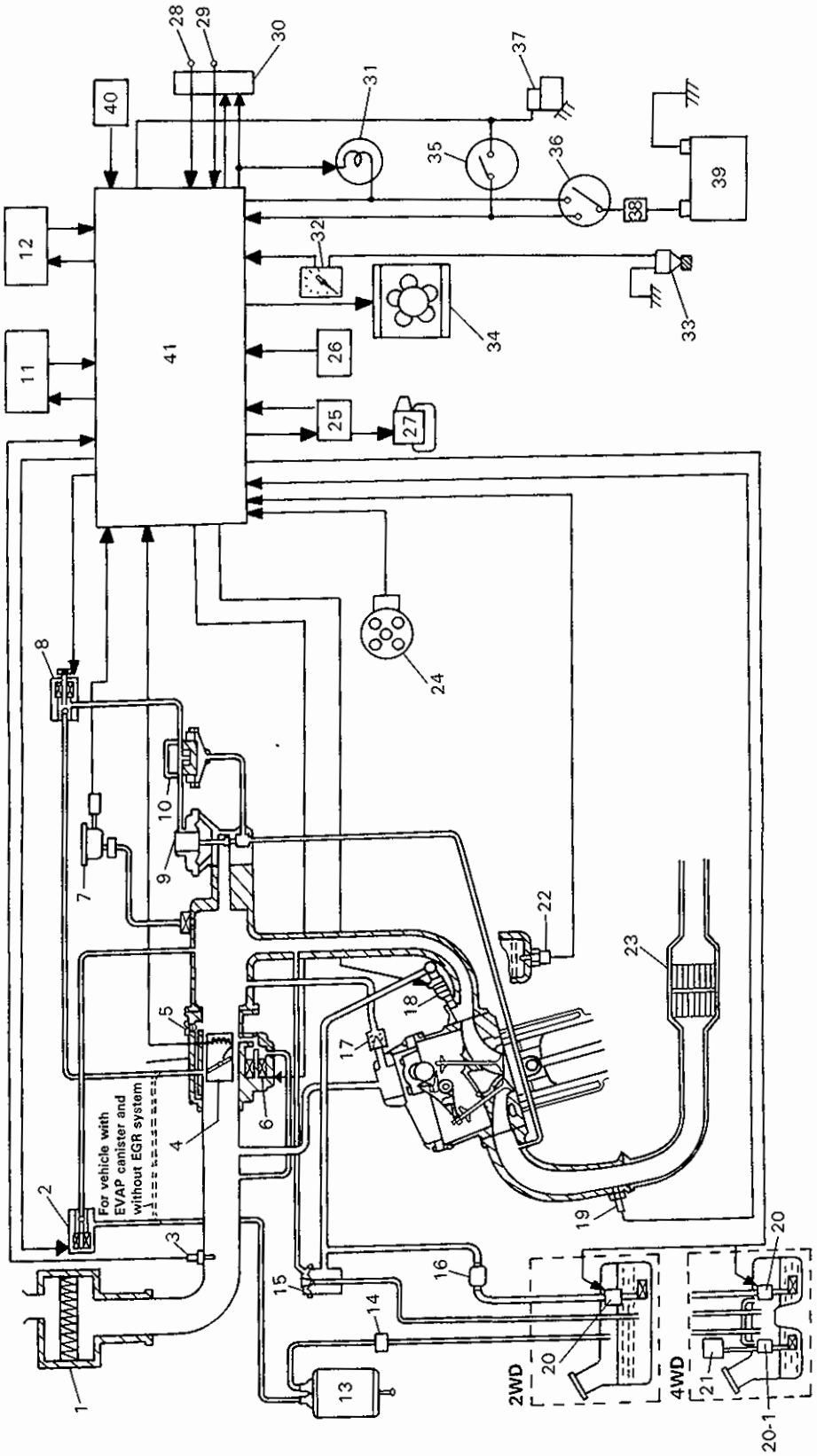
This section explains the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR system (if equipped)
- Evaporative emission control system (if equipped)
- Throttle valve opening signal output for A/T (3 A/T)
- Throttle valve opening signal and engine coolant temp. signal output for A/T (4 A/T)
- Ignition control system
- Radiator fan control system
- A/C ON/OFF control system (vehicle with A/C only)


For vehicle with EVAP canister and without EGR system
2WD
4WD

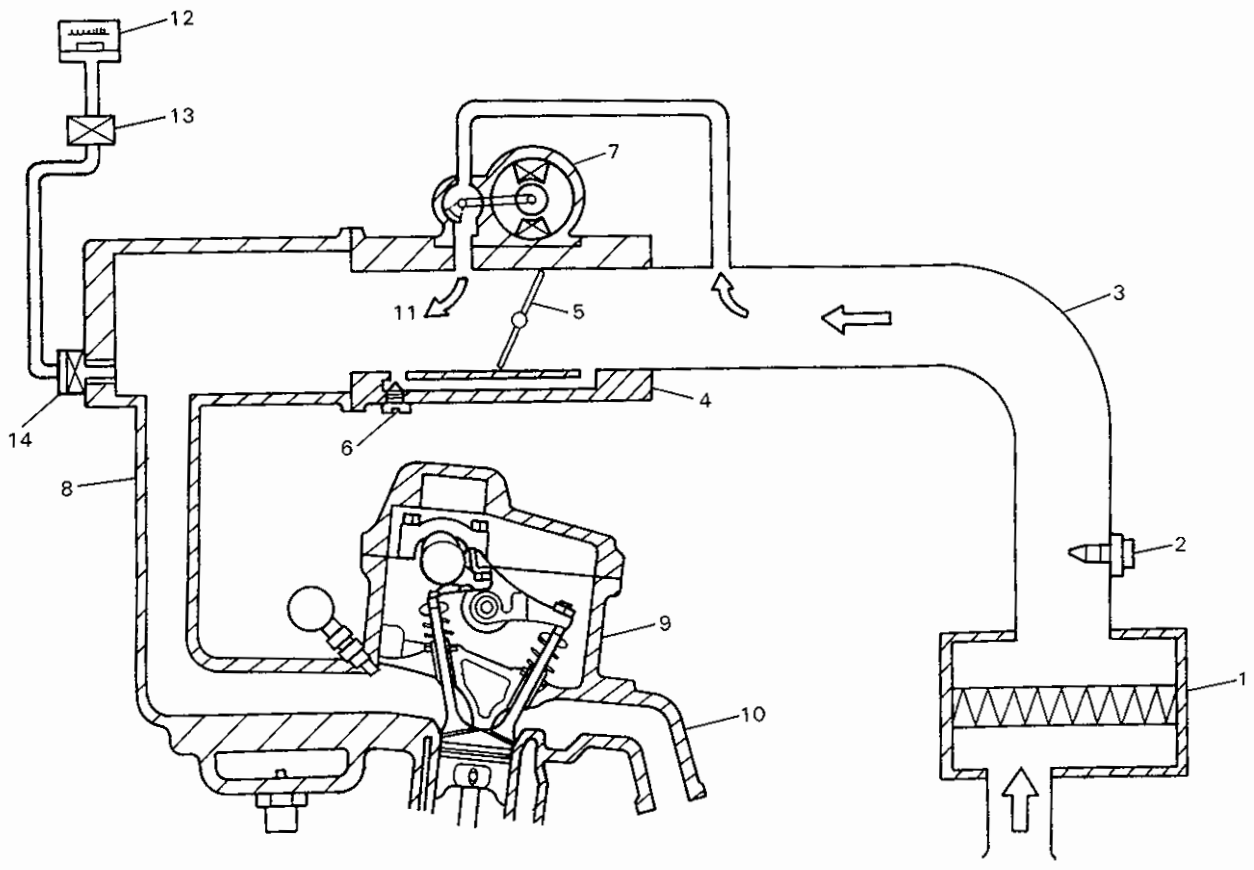
1. Air cleaner
2. EVAP canister purge valve (if equipped)
3. Intake air temperature sensor
4. Throttle position sensor
5. Idle speed adjusting screw
6. Idle air control valve
7. Manifold absolute pressure sensor
8. EGR solenoid vacuum valve (if equipped)
9. EGR valve (if equipped)
10. EGR pressure transducer (if equipped)
11. Transmission control module (A/T)
12. A/C amplifier (if equipped)
13. EVAP canister (if equipped)
14. Tank pressure control valve
15. Fuel pressure regulator
16. Fuel filter
17. PCV valve
18. Fuel injector
19. Oxygen sensor (if equipped)
20. Fuel pump
20-1. Sub fuel pump (4WD only)
21. Fuel pump controller
22. Engine coolant temperature sensor
23. Three way catalytic convertor (if equipped)
24. Camshaft position sensor
25. Ignitor
26. Electric load (blower fan, small light, rear defogger)
27. Ignition coil
28. Diagnosis switch terminal
29. Test switch terminal
30. Diagnosis connector 1
31. Malfunction indicator lamp (''CHECK ENGINE'' light)
32. Speedometer
33. Vehicle speed sensor
34. Radiator fan
35. Transmission range switch (A/T)
36. Ignition switch
37. Starter magnetic switch
38. Main fuse
39. Battery
40. CO adjusting resistor (vehicle without oxygen sensor only)
41. Engine control module

## AIR INTAKE SYSTEM

The main components of the air intake system are air cleaner, air cleaner outlet hose, throttle body, idle air control valve and intake manifold.

The air (by the amount corresponding to the throttle valve opening and engine speed) is filtered by the air cleaner, passes through the throttle body, is distributed by the intake manifold and finally drawn into each combustion chamber.

When the engine is idling, when it is cold or when the idle air control valve is opened according to the signal from ECM, the air bypasses the throttle valve through bypass passage which varies in each case and is finally drawn into the intake manifold.




1. Air cleaner
2. Intake air temperature sensor (IAT sensor)
3. Air cleaner outlet hose
4. Throttle body
5. Throttle valve
6. Idle speed adjusting screw
7. Idle air control valve (IAC valve)
8. Intake manifold
9. Cylinder head
10. Exhaust manifold
11. Air flow
12. MAP sensor
13. Gas filter (if equipped)
14. Gas filter

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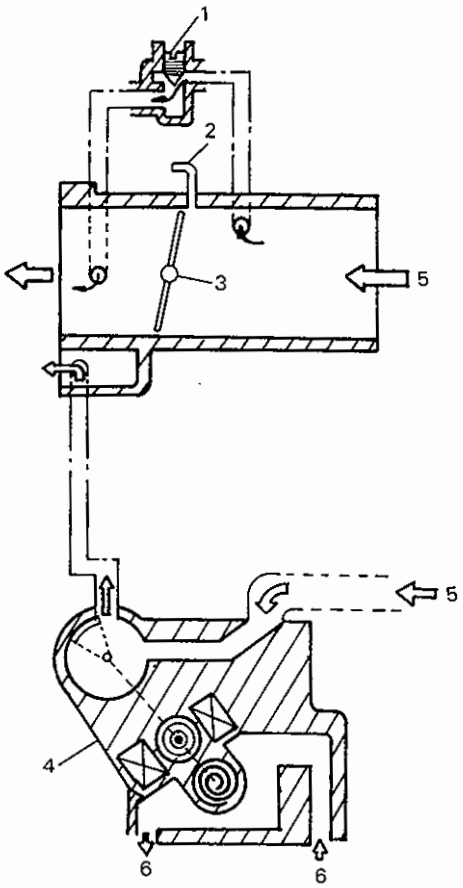


1. Idle speed adjusting screw
2. Vacuum passage
3. Throttle valve
4. Idle air control valve
5. Air
6. Engine coolant

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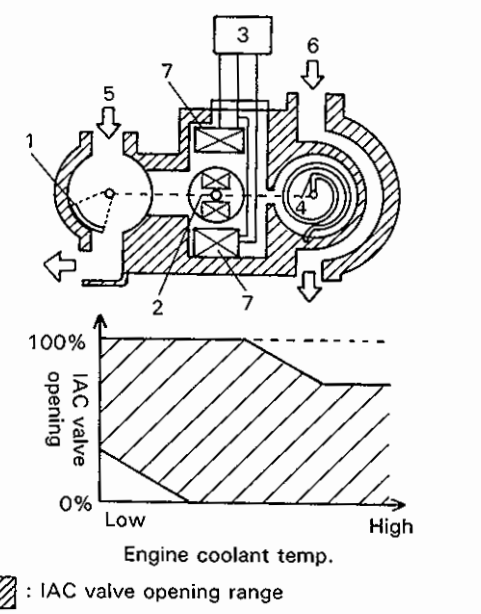
## THROTTLE BODY

The throttle body consists of the main bore, air bypass passage, vacuum passage (for EGR system, if equipped) and the following parts.

- Throttle valve which is interlocked with the accelerator pedal and controls the amount of the intake air
- Idle speed adjusting screw which controls the amount of bypass air to adjust idle air control duty (engine idle speed) (REFERENCE: Idle speed adjusting screw of new vehicle is adjusted full closed position.)
- TP sensor which detects the throttle valve opening and sends a signal to ECM
- Idle air control valve which supplies the bypass air depending on engine condition.

1. IAC valve (valve)
2. IAC valve (magnet)
3. ECM
4. Bimetal
5. Bypass air
6. Engine coolant
7. IAC valve coil

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## IDLE AIR CONTROL VALVE

The IAC valve controls opening of the bypass air passage (i.e., bypass air flow). Opening and closing of the valve itself is determined by operation of the magnet and bimetal which are connected to it. The magnet operates according to electric current from ECM and the bimetal according to the temperature of the engine coolant that passes around it.

## FUEL DELIVERY SYSTEM

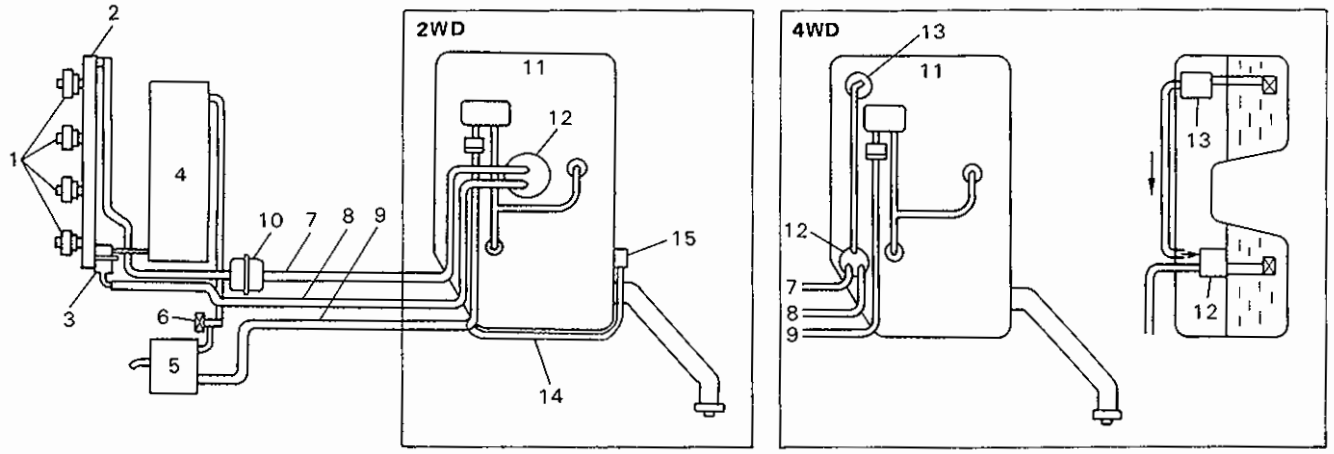
The fuel delivery system consists of the fuel tank, fuel pump, fuel filter, fuel pressure regulator, delivery pipe and fuel injectors.

The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to each injector through the delivery pipe. As the fuel pressure applied to the injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the intake manifold by the fuel pressure regulator, the fuel is injected into the intake port of the cylinder head when the injector opens according to the injection signal from ECM.

The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.

Also for 4WD vehicle, sub fuel pump pumps fuel from right side of fuel tank to left side of fuel tank (main pump side).

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL".




1. Fuel injector
2. Delivery pipe
3. Fuel pressure regulator
4. Intake manifold
5. EVAP canister (if equipped)
6. EVAP canister purge valve (if equipped)
7. Fuel feed line
8. Fuel return line
9. Fuel vapor line (vehicle with EVAP canister only)
10. Fuel filter
11. Fuel tank
12. Fuel pump (main fuel pump for 4WD vehicle)
13. Sub fuel pump (4WD vehicle only)
14. Fuel vapor line (vehicle without EVAP canister only)
15. Fuel breather vessel (vehicle without EVAP canister only)

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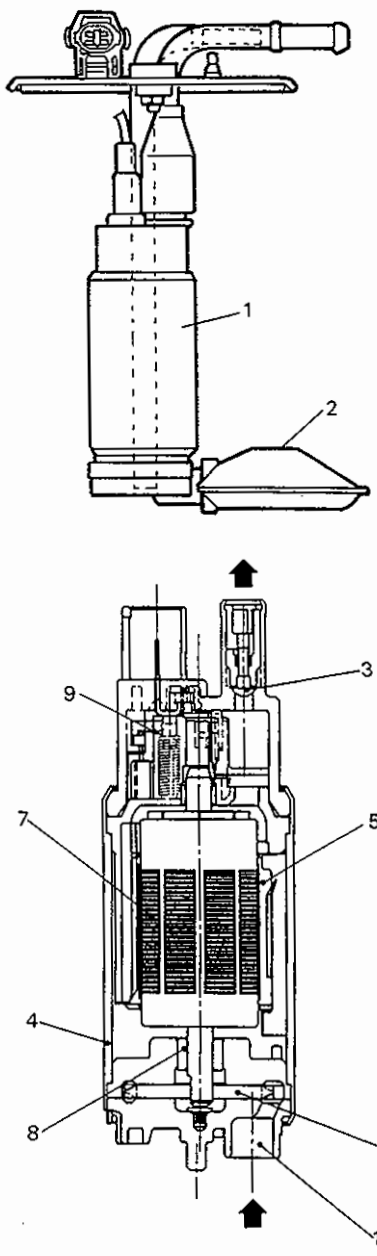


1. Fuel pump
2. Filter
3. Check valve
4. Housing
5. Magnet
6. Impeller
7. Armature
8. Bearing
9. Choke coil
10. Pump cover

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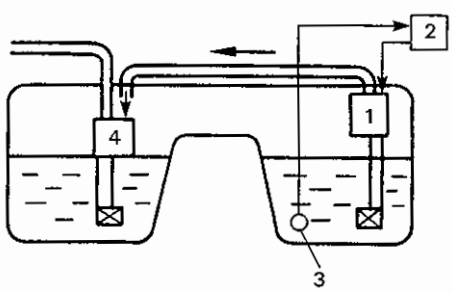
## FUEL PUMP (MAIN FUEL PUMP FOR 4WD VEHICLE)

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, etc.. The ECM controls its ON/OFF operation as described under "Fuel Pump Control System" included in later part of this section.

### Operation

When power is supplied to the fuel pump, the motor in the pump runs and so does the impeller.
This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and with its pressure increases, it is discharged through the outlet port.
The fuel pump also has a check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.




1. Sub fuel pump
2. Fuel pump controller
3. Fuel level switch (reed switch)
4. Main fuel pump

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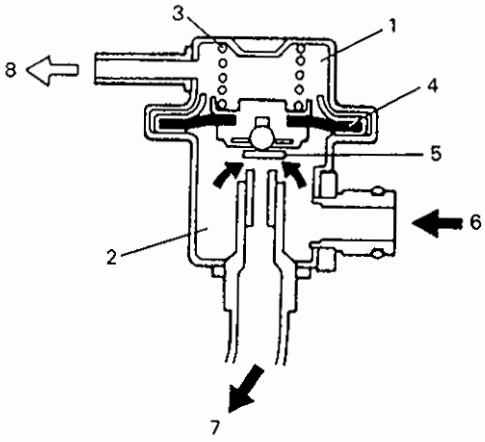
## SUB FUEL PUMP (4WD ONLY)

The electric fuel pump located in the right side of fuel tank consists of armature, magnet, inpeller, brush, etc.. The fuel pump controller located on the right side rear strut controls its ON/OFF operation as described below.

### Sub Fuel Pump Control System

The fuel pump controller turns ON sub fuel pump when the fuel level switch turned ON (Fuel level of right side fuel tank becomes higher than fuel level switch). And then, the fuel pump controller turns OFF sub fuel pump when the fuel level switch turned OFF (Fuel level of right side fuel tank becomes lower than fuel level switch. i.e. the fuel in right side fuel tank is pumped completely by sub fuel pump).




1. Chamber "A"
2. Chamber "B"
3. Spring
4. Diaphragm
5. Valve
6. From fuel pump
7. To fuel tank
8. To intake manifold

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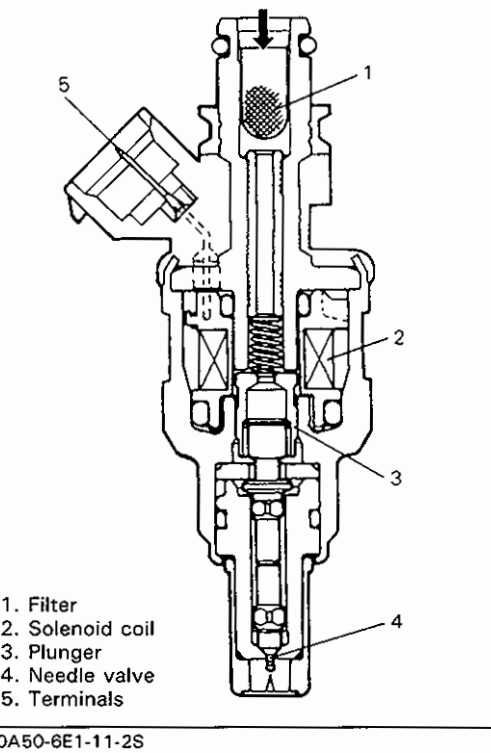
## FUEL PRESSURE REGULATOR

The fuel pressure regulator is diaphragm-operated relief valve consisting of diaphragm, spring and valve. It keeps the fuel pressure applied to the injector 2.9 kg/cm² (290 kPa, 41.2 psi) higher than that in the intake manifold at all times.
The pressure applied to the chamber "A" of fuel pressure regulator is intake manifold pressure and that to the chamber "B" is fuel pressure.
When the fuel pressure rises more than 2.9 kg/cm² (290 kPa, 41.2 psi) higher than the intake manifold pressure, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return line.




1. Filter
2. Solenoid coil
3. Plunger
4. Needle valve
5. Terminals

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## FUEL INJECTOR

There are 4 injectors (one for each cylinder), each of which is installed between the intake manifold and delivery pipe. It is an electromagnetic type injection nozzle which injects fuel into the intake port of the cylinder head according to the signal from ECM.

### Operation

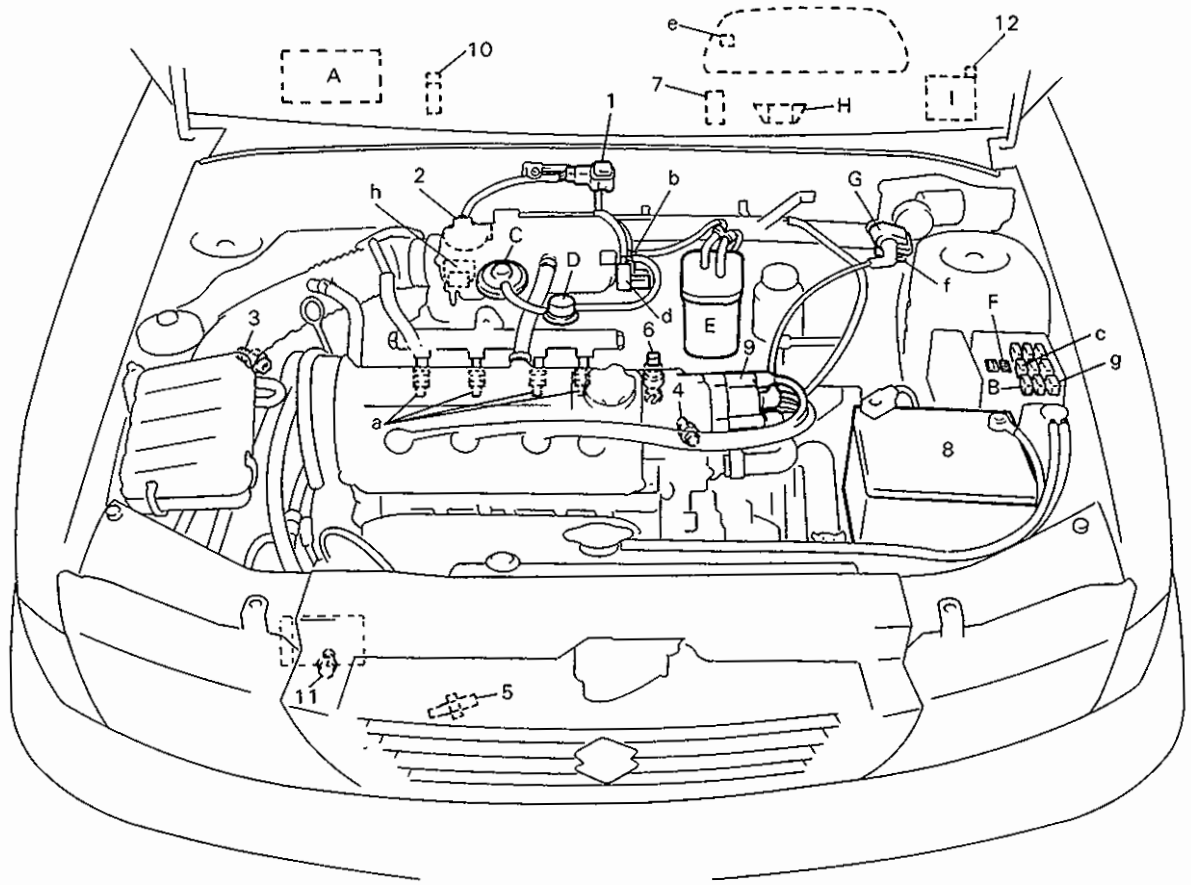
When the solenoid coil of the injector is energized by ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve which is incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel. As the lift stroke of the needle valve of the injector is set constant, the amount of fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).

## ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.
Functionally, it is divided into nine sub systems:

- Fuel injection control system
- Idle speed control system
- Fuel pump control system
- A/C control system (if equipped)
- Radiator fan control system
- EGR system
- Evaporative emission control system
- Oxygen sensor heater control system
- Ignition control system

Also, with A/T model, ECM sends throttle valve opening signal and coolant temp. signal to transmission control module to control A/T.

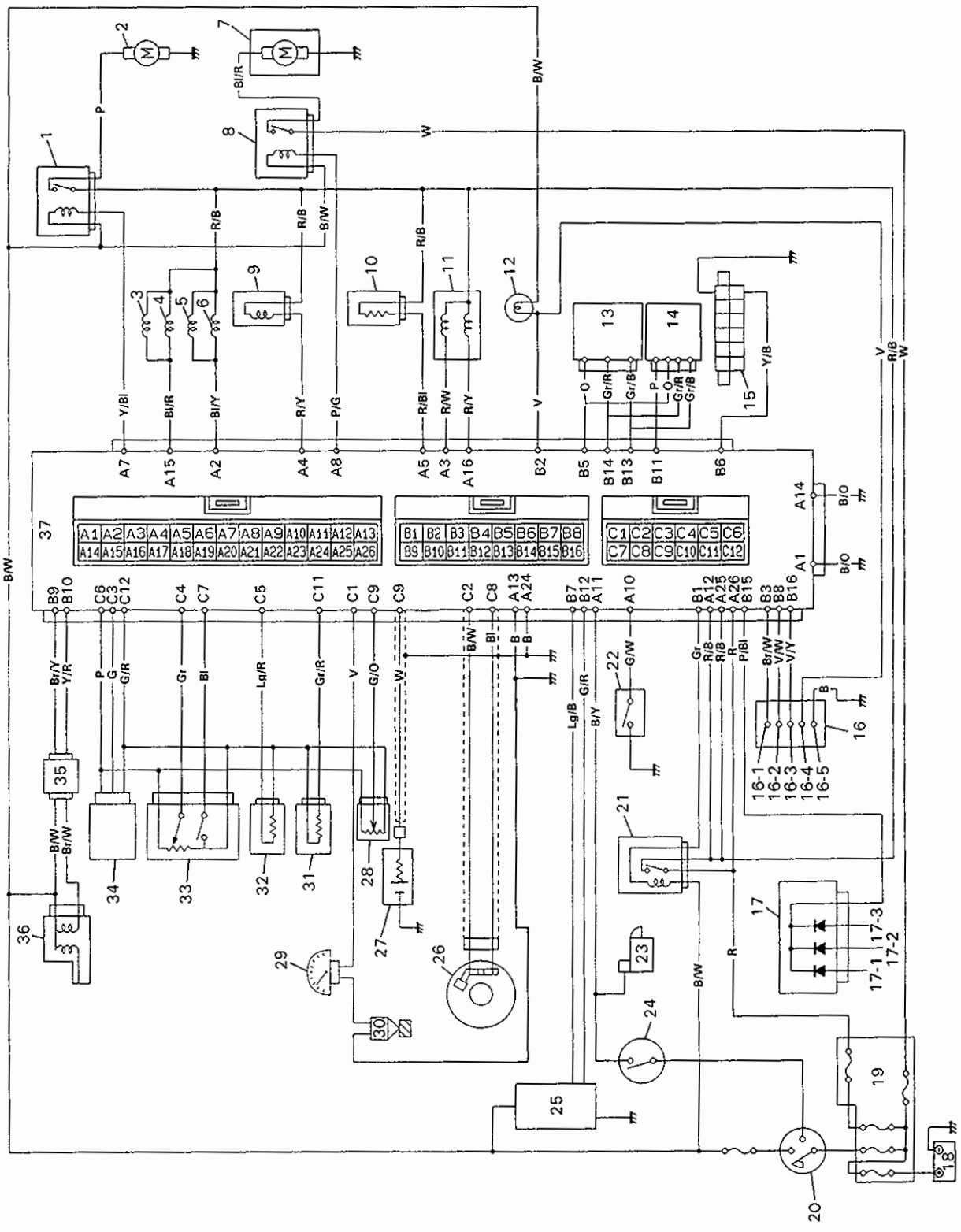



**NOTE:**
**Above figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the other side.**

INFORMATION SENSORS
1. MAP sensor
2. TP sensor
3. IAT sensor
4. ECT sensor
5. Oxygen sensor (if equipped)
6. VSS
7. Transmission control module (A/T) (*)
8. Battery
9. Distributor (CMP sensor)
10. A/C amplifier (if equipped) (*)
11. PSP switch (if equipped)
12. CO adjusting resistor (vehicle without oxygen sensor only) (*)

CONTROL DEVICES
a : Fuel injector
b : EVAP canister purge valve (if equipped)
c : Fuel pump relay
d : EGR solenoid vacuum valve (if equipped)
e : Malfunction indicator lamp ("CHECK ENGINE" light) (*)
f : Ignitor
g : Radiator fan control relay
h : IAC valve

OTHERS
A : ECM (*)
B : Main relay
C : EGR valve (if equipped)
D : EGR pressure transducer (if equipped)
E : EVAP canister (if equipped)
F : Diagnosis connector 1
G : Ignition coil
H : Data link connector (*)
I : Electric load diodes (in J/B) (*)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A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13
A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A25 A26
B1 B2 B3 B4 B5 B6 B7 B8
B9 B10 B11 B12 B13 B14 B15 B16
C1 C2 C3 C4 C5 C6
C7 C8 C9 C10 C11 C12
B/W
P
Bl/R
W
R/B
B/W
Y/Bl
Bl/R
Bl/Y
R/Y
P/G
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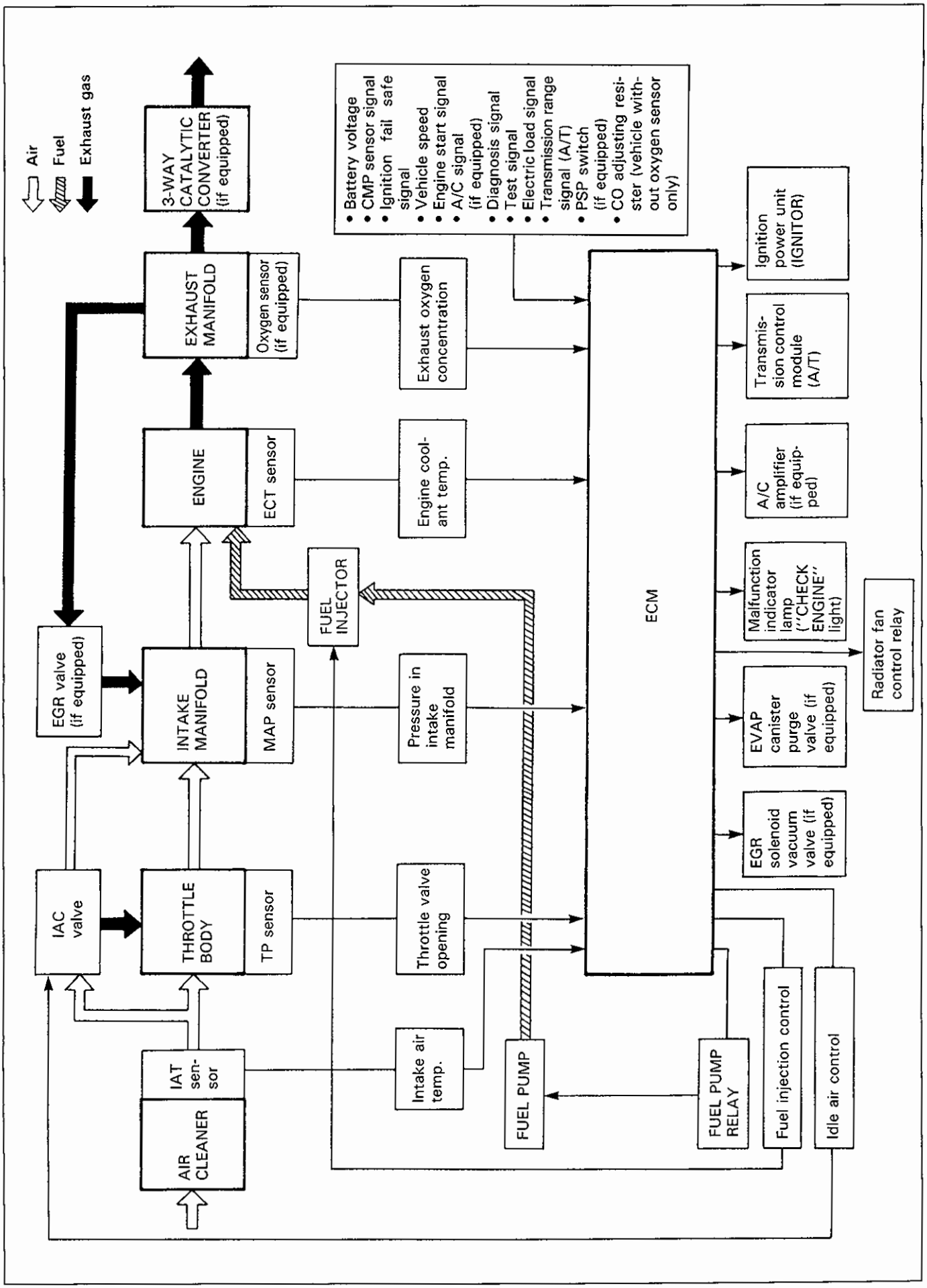
1. Fuel pump relay
2. Fuel pump
3. No.1 injector
4. No.2 injector
5. No.3 injector
6. No.4 injector
7. Radiator fan motor
8. Radiator fan control relay
9. EGR solenoid vacuum valve (if equipped)
10. EVAP canister purge valve (if equipped)
11. Idle air control valve
12. Malfunction indicator lamp ("CHECK ENGINE" light)
13. Transmission control module (4 A/T)
14. Transmission control module (3 A/T)
15. Data link connector
16. Diagnosis connector 1
16-1. Duty output terminal
16-2. Test switch terminal
16-3. Diag. switch terminal
16-4. Diag. output terminal
16-5. Ground terminal
17. Diodes (For electric loads)
17-1. Lighting switch
17-2. Rear window defogger switch
17-3. Heater blower switch
18. Battery
19. Main fuse box
20. Main switch
21. Main relay
22. Power steering pressure switch (if equipped)
23. Starter magnetic switch
24. Transmission range switch (A/T)
25. A/C amplifier (if equipped)
26. Camshaft position sensor
27. Oxygen sensor (if equipped)
28. CO adjusting resistor (vehicle without oxygen sensor only)
29. Speedometer
30. Vehicle speed sensor
31. Intake air temperature sensor
32. Engine coolant temperature sensor
33. Throttle position sensor
34. Manifold absolute pressure sensor
35. Ignition coil
36. Ignition coil
37. Engine control module

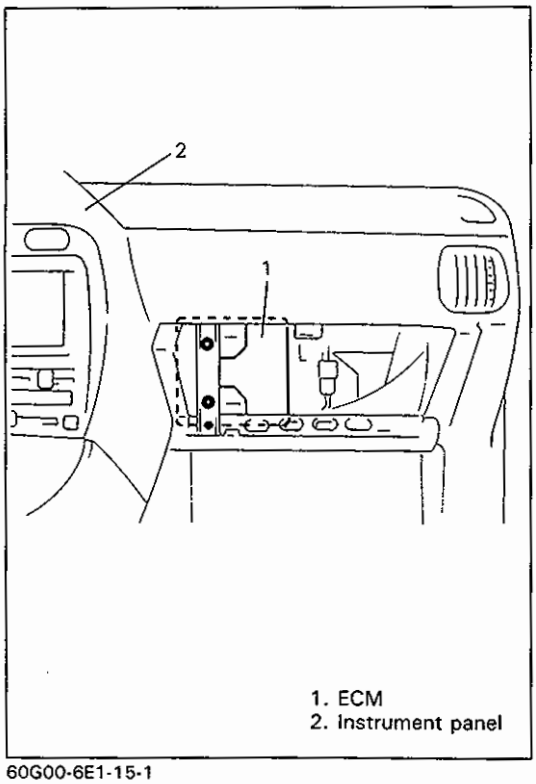
**Wire color**

B : Black
B/G : Black/Green
B/O : Black/Orange
B/R : Black/Red
B/W : Black/White
B/Y : Black/Yellow
Bl : Blue
Bl/O : Blue/Orange
Bl/R : Blue/Red
Br/B : Brown/Black
Br/W : Brown/White
Br/Y : Brown/Yellow
G : Green
G/R : Green/Red
G/W : Green/White
Gr : Gray
Gr/B : Gray/Black
Gr/R : Gray/Red
Gr/W : Gray/White
Lbl : Lightblue
Lg : Lightgreen
Lg/B : Lightgreen/Black
Lg/R : Lightgreen/Red
O : Orange
P : Pink
P/Bl : Ping/Blue
P/G : Pink/Green
V : Violet
V/W : Violet/White
V/Y : Violet/Yellow
W : White
R : Red
R/B : Red/Black
R/Y : Red/Yellow
R/W : Red/White
Y/B : Yellow/Black
Y/Bl : Yellow/Blue
Y/R : Yellow/Red

| TERMINAL | CIRCUIT |
|---|---|
| A1 | Ground |
| A2 | Injector (No.3 and No.4) |
| A3 | IAC valve (open) |
| A4 | EGR solenoid vacuum valve (if equipped) |
| A5 | EVAP canister purge valve (if equipped) |
| A6 | Blank |
| A7 | Fuel pump relay |
| A8 | Radiator fan control relay |
| A9 | Blank |
| A10 | Power steering pressure switch |
| A11 | Engine start signal |
| A12 | Power source |
| A13 | Ground |
| A14 | Ground |
| A15 | Injector (No.1 and No.2) |
| A16 | IAC valve (close) |
| A17, A18, A19, A20, A21, A22, A23 | Blank |
| A24 | Ground |
| A25 | Power source |
| A26 | Power source for back-up |
| | |
| B1 | Main relay |
| B2 | Malfunction indicator lamp ("CHECK ENGINE" light) |
| B3 | Duty output terminal |
| B4 | Blank |
| B5 | Transmission control module (throttle valve opening signal, A/T) |
| B6 | Data link connector |

| TERMINAL | CIRCUIT |
|---|---|
| B7 | A/C ON signal from A/C amplifier (if equipped) |
| B8 | Test switch terminal |
| B9 | Ignitor (IGt) |
| B10 | Ignitor (IGf) |
| B11 | Transmission control module (throttle valve opening signal, 3 A/T) |
| B12 | A/C cut signal for A/C amplifier (if equipped) |
| B13 | Transmission control module (throttle valve opening signal, 3 A/T) |
| | Transmission control module (coolant temp. signal, 4 A/T) |
| B14 | Transmission control module (transmission range switch, A/T) |
| B15 | Diodes for electric load |
| B16 | Diag. switch terminal |
| | |
| C1 | Vehicle speed sensor |
| C2 | Camshaft position sensor (positive) |
| C3 | Manifold absolute pressure sensor |
| C4 | Throttle position sensor |
| C5 | Engine coolant temperature sensor |
| C6 | Power source for sensors |
| C7 | Idle switch |
| C8 | Camshaft position sensor (negative) |
| C9 | Oxygen sensor (if equipped) |
| | CO adjusting resistor (vehicle without oxygen sensor only) |
| C10 | Blank |
| C11 | Intake air temperature sensor |
| C12 | Ground for sensors |


Air
Fuel
Exhaust gas
3-WAY CATALYTIC CONVERTER (if equipped)
EXHAUST MANIFOLD
Oxygen sensor (if equipped)
ENGINE
ECT sensor
INTAKE MANIFOLD
MAP sensor
EGR valve (if equipped)
IAC valve
THROTTLE BODY
TP sensor
IAT sensor
AIR CLEANER
FUEL INJECTOR
FUEL PUMP
FUEL PUMP RELAY
• Battery voltage
• CMP sensor signal
• Ignition fail safe signal
• Vehicle speed
• Engine start signal
• A/C signal (if equipped)
• Diagnosis signal
• Test signal
• Electric load signal
• Transmission range signal (A/T)
• PSP switch (if equipped)
• CO adjusting resister (vehicle without oxygen sensor only)
Exhaust oxygen concentration
Engine coolant temp.
Pressure in intake manifold
Throttle valve opening
Intake air temp.
ECM
Ignition power unit (IGNITOR)
Transmission control module (A/T)
A/C amplifier (if equipped)
Malfunction indicator lamp ("CHECK ENGINE" light)
EVAP canister purge valve (if equipped)
EGR solenoid vacuum valve (if equipped)
Radiator fan control relay
Fuel injection control
Idle air control




1. ECM
2. Instrument panel

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**Engine Control Module (ECM)**

ECM is installed to the underside of the instrument panel at the passenger's seat side.

ECM is a precision unit consisting of microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit, etc..

It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, IAC valve, fuel pump relay, etc. but also on-board diagnostic system (self-diagnosis function) and fail-safe function as described in the following section.

**On-board diagnostic system (Self-diagnosis function)**

ECM diagnosis troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on or flashing malfunction indicator lamp (''CHECK ENGINE'' light).

- Oxygen sensor
- Engine coolant temp. sensor
- Throttle postion sensor
- Intake air temp. sensor
- Manifold absolute pressure sensor
- Camshaft position sensor
- Ignition fail-safe signal
- Vehicle speed sensor
- CPU (Central Processing Unit) of ECM

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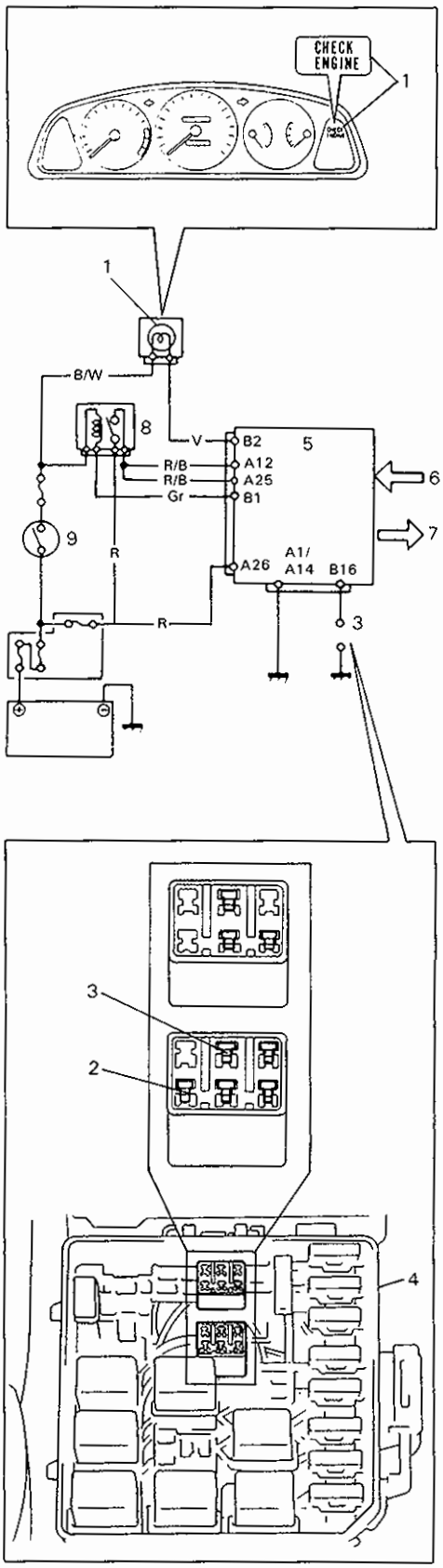
ECM and malfunction indicator lamp (''CHECK ENGINE'' light) operate as follows.

- Malfunction indicator lamp (''CHECK ENGINE'' light) lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the malfunction indicator lamp (''CHECK ENGINE'' light) bulb and its circuit.




1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Ground terminal
3. Diagnosis switch terminal
4. Relay box
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp ("CHECK ENGINE" light) turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp ("CHECK ENGINE" light) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for specified time below.)
  ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp ("CHECK ENGINE" light) at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON.)

**NOTE:**

- **When a trouble occurs in the above areas and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, malfunction indicator lamp ("CHECK ENGINE" light) lights and remains ON as long as the trouble exists but it turns OFF when the normal condition is restored.**
- **Only ignition circuit trouble (code No.41) is not stored in back-up memory of ECM. (in other words, even if ECM has detected a trouble in ignition circuit, once ignition switch is turned OFF, code No.41 will not be indicated even when diagnosis switch terminal is grounded and ignition switch is turned ON.).**
  **Therefore, to check diagnostic trouble code when engine fails to start, crank engine and then ground diagnostic switch terminal with ignition switch ON.**
- **Time required to erase diagnostic trouble code memory thoroughly varies depending on ambient temperature as follows.**

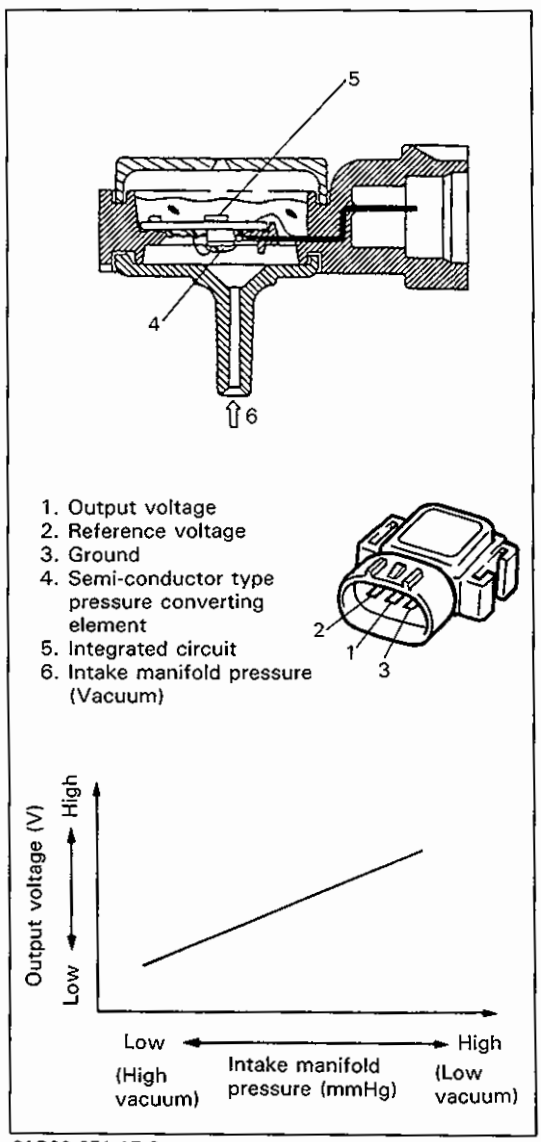
| AMBIENT TEMPERATURE | TIME TO CUT POWER TO ECM |
|---|---|
| Over 0°C (32°F) | 60 sec. or longer |
| Under 0°C (32°F) | Not specifiable.<br>Select a place with higher than 0°C (32°F) temperature. |

### Fail-safe function

Even when a trouble has occurred in such area of Electronic Fuel Injection system that includes the following parts and a failure signal is sent to ECM, control over the injector, idle air control valve and others is maintained on the basis of the standard signals and/or back-up program prestored in the ECM while ignoring that failure signal and/or CPU. This function is called "fail-safe function". Thus, with this function, a certain level of engine performance is available even when some failure occurs in such area and disability in running is avoided.

- Engine coolant temp. sensor
- Throttle position sensor
- Vehicle speed sensor
- Intake air temp. sensor
- Manifold absolute pressure sensor
- CPU in ECM

60G00-6E1-17-1



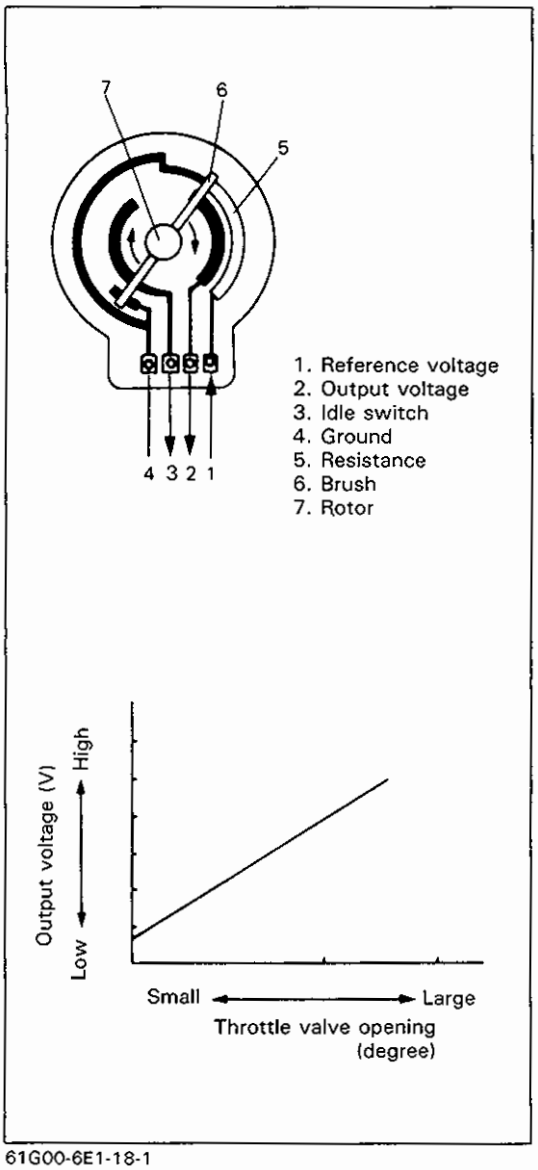

61G00-6E1-17-3

### Manifold Absolute Pressure Sensor (MAP Sensor)

This sensor senses pressure change in the intake manifold and converts it into voltage change. It consists of a semiconductor type pressure converting element which converts a pressure change into an electrical change and an electronic circuit which amplifies and corrects the electric change. The ECM sends a 5-volt reference voltage to the pressure sensor. As the manifold pressure changes, the electrical resistance of the sensor also changes.

By monitoring the sensor output voltage, ECM knows the manifold pressure (intake air volume).

ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injector, EVAP canister purge valve (if equipped) and EGR solenoid vacuum valve (if equipped).




61G00-6E1-18-1

**Throttle Position Sensor (TP Sensor)**

The throttle position sensor is connected to the throttle valve shaft on the throttle body, and detects the throttle valve opening.

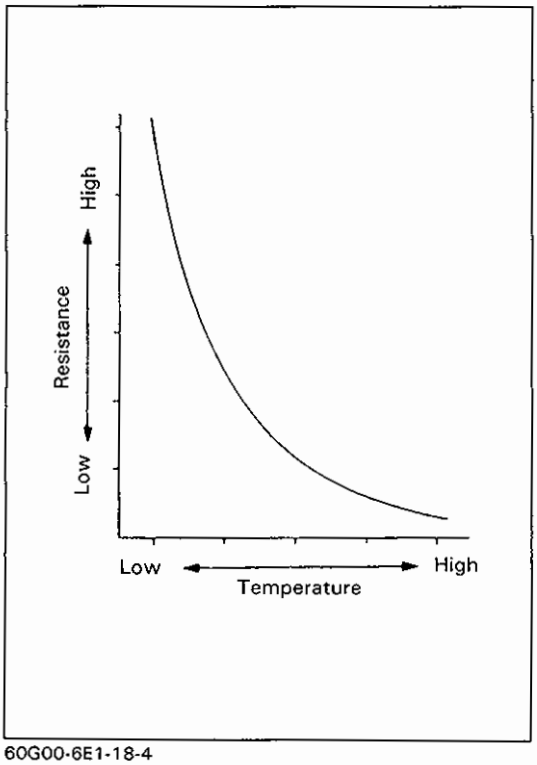
The throttle opening is detected by the potentiometer as follows.

A 5-volt reference voltage is applied to the sensor from ECM and as its brush moves over the print resistance according to the throttle valve opening, the output voltage varies accordingly.

By monitoring sensor output voltage, ECM detects the throttle valve opening.

ECM uses the signal from TP sensor as one of the signals to control fuel injector, idle air control valve and EGR solenoid vacuum valve (if equipped).

Also, ECM converts the voltage signal from TP sensor into ON/OFF signal and sends it to transmission control module, where it is used as one of the signals to control the automatic transmission.




60G00-6E1-18-4

**Intake Air Temperature Sensor (IAT Sensor)**

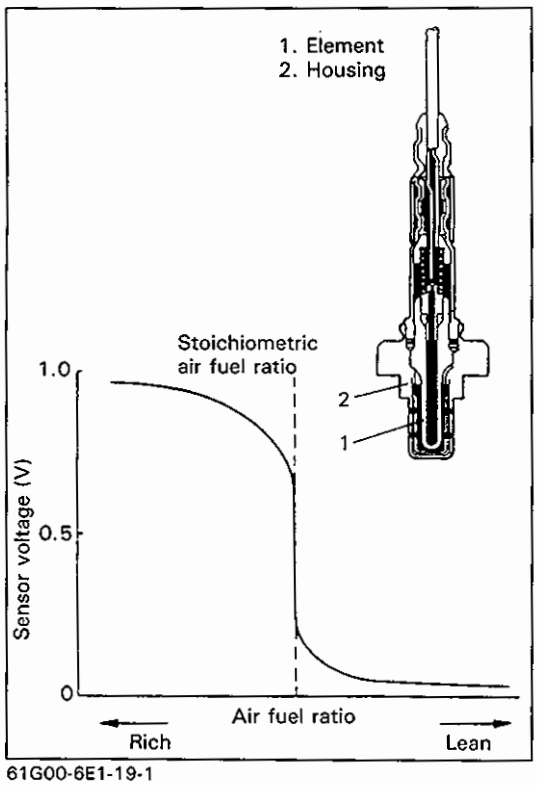
Located on the air cleaner outlet hose, this sensor constantly measures the temperature of the air entering there and converts a change in the air temperature into that in resistance through its thermistor. That is, as air temperature lowers, resistance increases and as it rises, resistance decreases. As air density of the intake air varies with variation in temperature, ECM, by monitoring the resistance, adjusts the amount of fuel injection according to the air temperature.

**Engine Coolant Temperature Sensor (ECT Sensor)**

Incorporated with coolant temp. gauge and installed to thermostat case, this sensor measures the temperature of the engine coolant and converts its change into that in resistance through the thermistor like the air temperature sensor.

That is, as coolant temperature lowers, resistance increases and as it rises, resistance decreases.

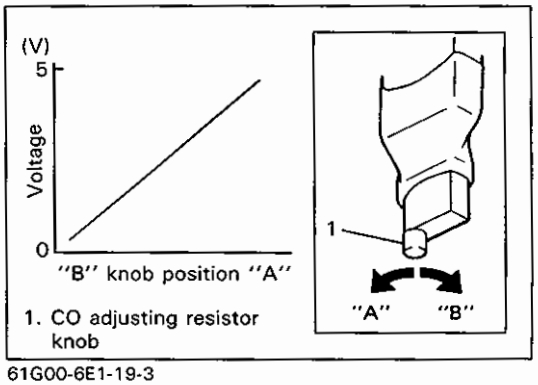
By monitoring the resistance of the coolant temperature sensor, ECM detects the engine coolant temperature and that affects most systems under the control of ECM.




61G00-6E1-19-1

### Oxygen Sensor ($O_2S$) (if equipped)

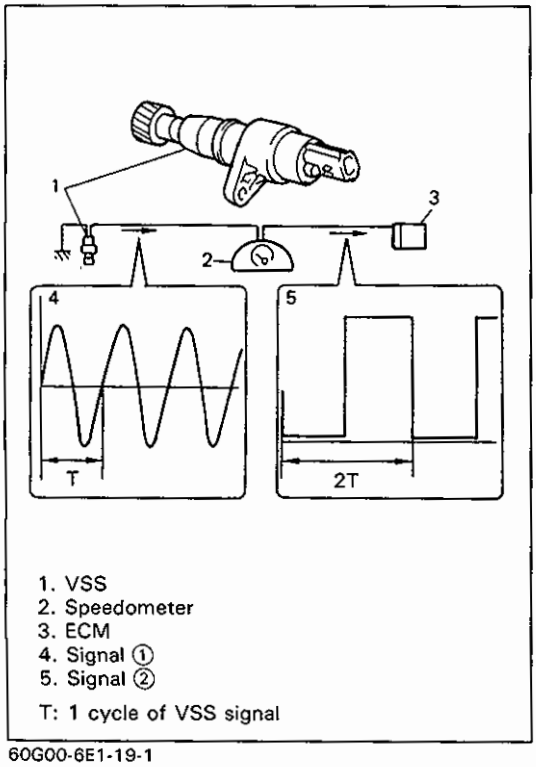
The oxygen sensor is installed on the exhaust manifold to detect the concentration of oxygen in the exhaust gases.




61G00-6E1-19-3

### CO Adjusting Resistor (Vehicle without Oxygen Sensor Only)

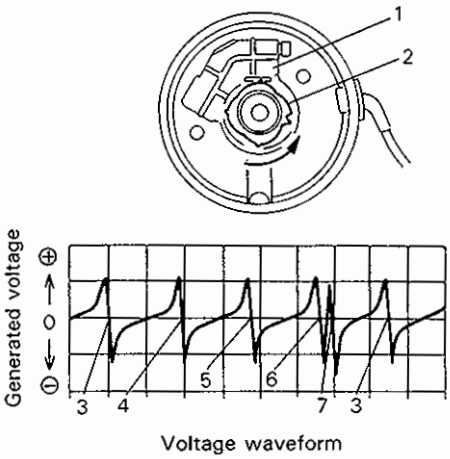
Variation of the base air/fuel ratio due to such factors of the engine as aging can be adjusted by turning the CO adjusting resistor.




60G00-6E1-19-1

### Vehicle Speed Sensor (VSS)

The vehicle speed sensor, located on the transmission, generates a signal in proportion to the vehicle speed (Signal ① ). Receiving this signal, the speedometer uses it for operation of its indicator and also converts it into the ON/OFF signal by doubling the cycle (Signal ② ). This signal is sent to ECM where it is used as one of the signals to control various devices.




Voltage waveform

1. Pick-up coil
2. Rotor
3. BTDC 5° of No.1 piston
4. BTDC 5° of No.3 piston
5. BTDC 5° of No.4 piston
6. BTDC 5° of No.2 piston
7. Detecting signal of each piston position

60G00-6E1-20-1

**Camshaft Position Sensor (CMP Sensor)**

The camshaft position sensor located in the distributor consists of the signal generator (pick-up coil and magnet) and signal rotor.

As the signal rotor turns, AC voltage is generated in the pick-up coil which varies in pulsatory way as shown. This pulse signal (5 pulses/revolution) is sent to ECM where it is used to calculate the engine speed and the piston position of each cylinder and that information is also used as one of the signals to control various devices.

**Ignition Fail Safe Signal**

This signal is sent from ignitor.

By monitoring this signal, ECM detects whether the ignition spark is emitted or not and stops injector operation when this signal is not inputted.

60G00-6E1-20-3

**Engine Start Signal**

This signal is sent from the engine starter circuit.

By receiving it, ECM judges whether the engine is cranking or not and uses it as one of the signals to control the fuel injector and fuel pump relay.

64B40-6E-20-4

**Transmission Range Signal**
**("R", "D", "2" or "L" Range Signal, A/T model only)**

This signal is sent from transmission control module as a battery voltage signal only when A/T is in "R", "D", "2" or "L" range. Thus, ECM judges whether A/T is in one of the above range or otherwise (i.e. in "P" or "N" range) and uses it as one of the signals to control the fuel injector, idle speed control valve and ignition control.

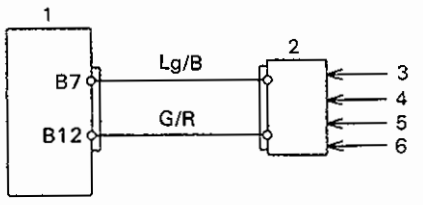
60G00-6E1-20-5

**Electric Load Signal**

This signal is sent from each circuit of head & small (or clearance) lights, heater fan and rear window defogger.

ECM uses it as one of the factors for controlling idle air control valve.

60G00-6E1-21-1




1. ECM
2. A/C amplifier
3. A/C switch
4. Heater fan switch
5. Evaporator thermistor
6. Dual pressure switch

60G00-6E1-21-2

**Air Conditioning (A/C) Signal (Vehicle with A/C only)**

This signal is sent from the A/C amplifier.

The A/C amplifier outputs this signal to ECM when A/C ON conditions are satisfied on the A/C amplilfier side. (The air conditioner does not turn ON in this state.) When ECM detects through the A/C signal that A/C ON conditions are satisfied on the A/C amplifier side, it uses the A/C signal as one of the factors to output A/C ON signal and to control idle air control valve.

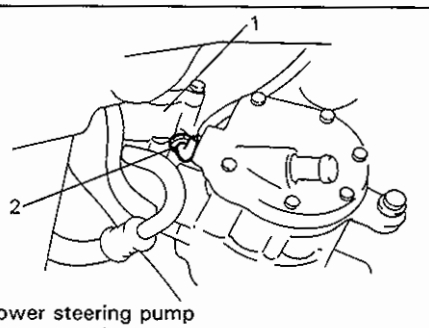
**Battery Voltage**

The fuel injector is driven by its solenoid coil based upon the ECM output signal.

There is some delay called as ''Ineffective injection time'', which doesn't provide fuel, between ECM signal and valve action.

As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.

64B40-6E-21-3




1. Power steering pump
2. Power steering pressure switch

61G00-6E1-21-4

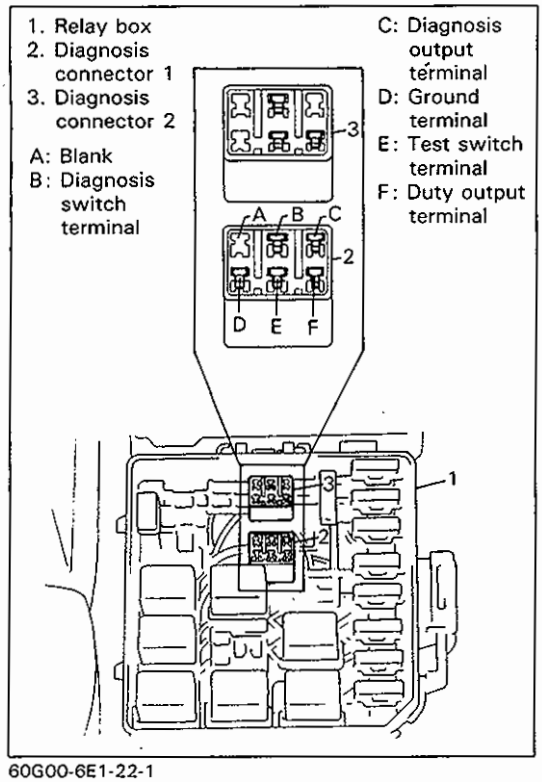
**Power Steering Pressure Signal**
**(Vehicle with Power Steering System Only)**

This signal is sent from the power steering pressure switch.

The power steering pressure switch is installed on the power steering pump body.

The switch turns ON when the oil pressure is higher than 3100—3900 kPa (31—39 kg-cm$^2$, 440—555 psi).

The turning of the steering wheel causes oil pressure to increase. ECM uses it for controlling idle air control valve.



60G00-6E1-22-1

### Diagnosis Switch Terminal

The diagnosis switch terminal is included in the diagnosis connector 1 in the relay box. When diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs diagnostic trouble code and at the same time outputs idle air control duty through duty output terminal.

### Test Switch Terminal

The test switch terminal is included in the diagnosis connector 1 in relay box.

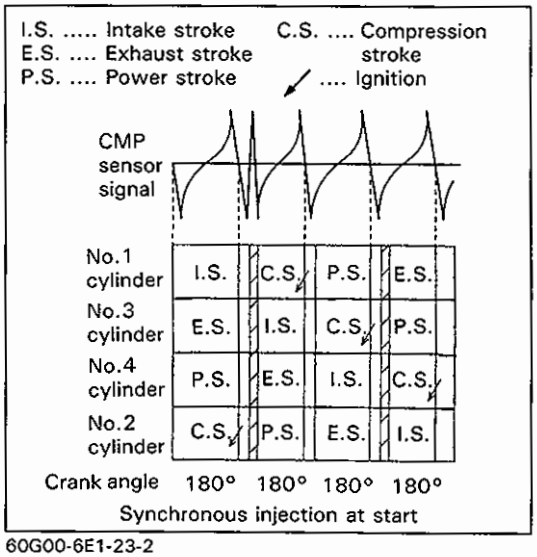
When this terminal is grounded, ECM fix the ignition timing to initial one.

When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty output terminal.

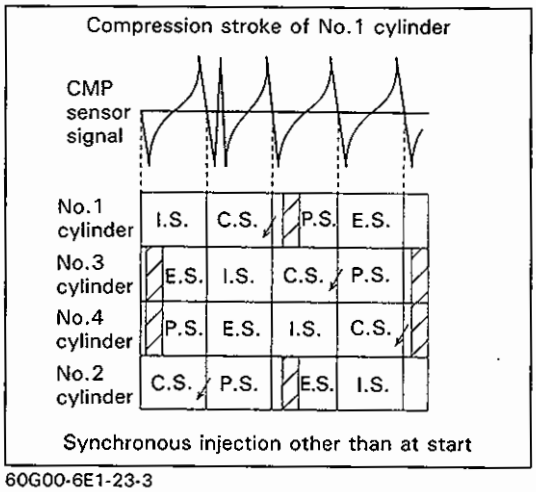
## FUEL INJECTION CONTROL SYSTEM

In this system, ECM controls the time (amount) and timing of the fuel injection from the fuel injector into the cylinder head intake port according to the signals from the various sensors so that suitable air/fuel mixture is supplied to the engine in each driving condition.

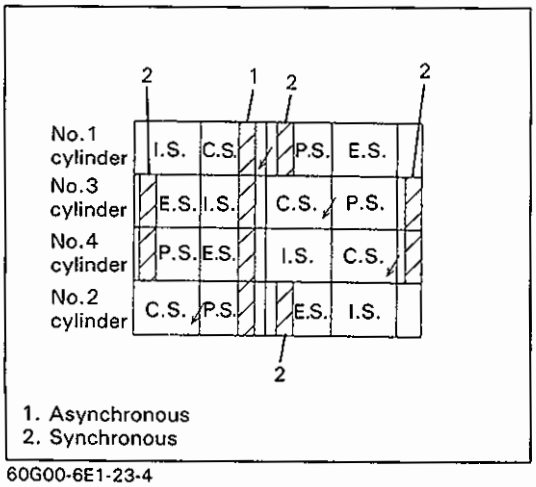
60A70-6E1-23-1S




60G00-6E1-23-2




60G00-6E1-23-3




60G00-6E1-23-4

### Injection Timing

There are two types of injection timinig. One is ''synchronous injection'' in which injection takes place at the same crank angle all the time and the other is ''asynchronous injection'' in which the fuel is injected according to sensor signals other than the CMP sensor signal.

### Synchronous injection

At start

When the engine speed is lower than 500 r/min, all four injectors inject fuel simultaneously at every two signals (once every revolution of the engine.)

When the engine is started from its very cold state, however, the amount of fuel determined by the engine coolant temperature is divided and injected.

After engine start

After the engine started and the piston position of each cylinder was judged by ECM through the CMP sensor signal, two of four injectors (No.1 and No.2 cylinder injectors and No.3 and No.4 cylinder injectors) inject fuel simultaneously.

### Asynchronous injection

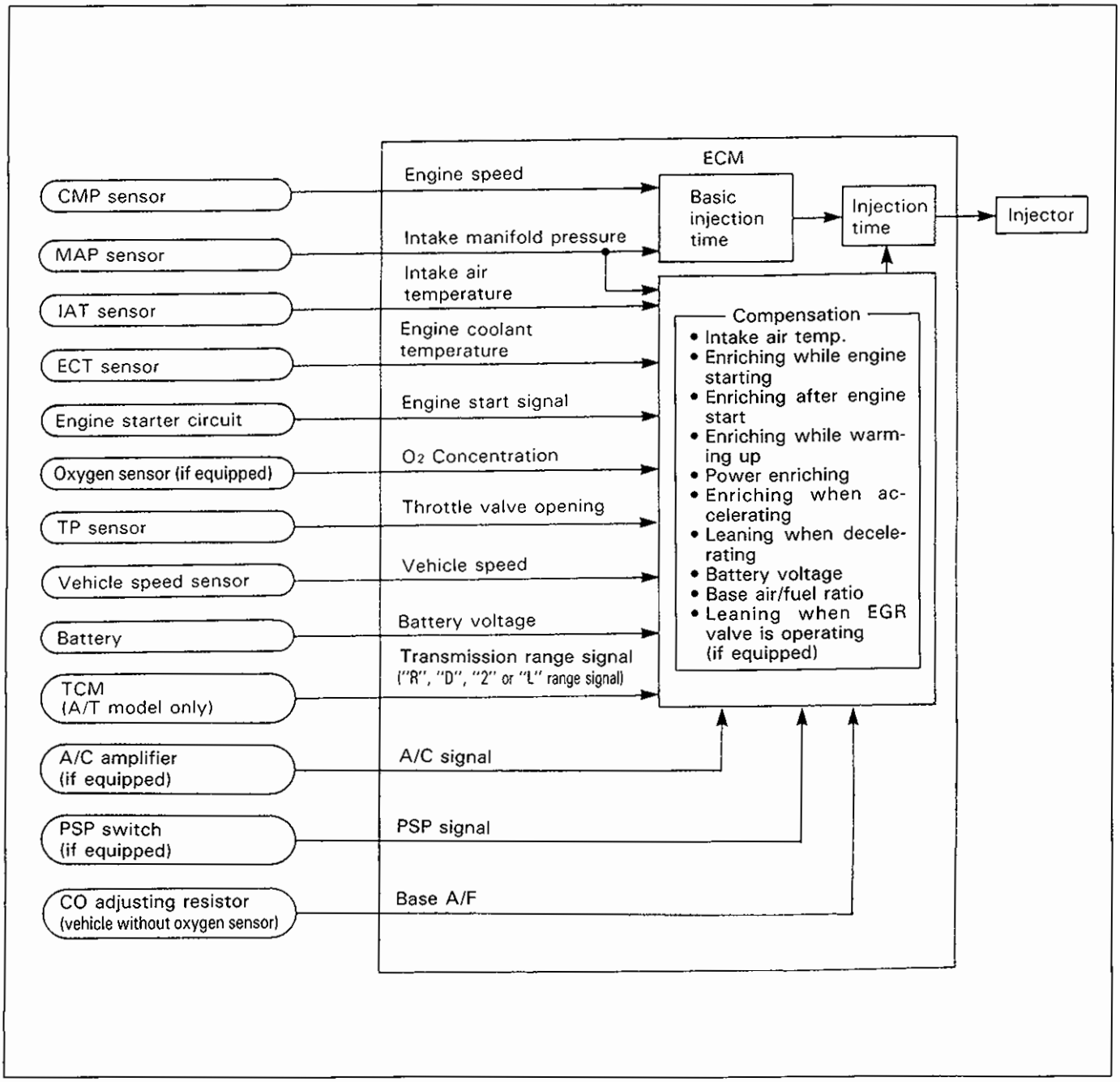
After the engine was started and both of the following conditions are satisfied, all injectors inject fuel regardless of the CMP sensor signal.

- When the fuel injection system starts to inject fuel from the fuel cut state
- When the throttle valve opens at a larger change rate than the specified value (when the throttle valve is opened quickly)

Asynchronous injection takes place immediately when above conditions are met.

**Injection Time (amount of injection)**

The factors to determine the injection time are the basis injection time which is calculated on the basis of the engine speed and the intake manifold pressure (amount of the intake air) and various compensations which are determined according to the signals from various sensors that detect the state of the engine and driving conditions.




61G00-6E1-24-1

**Fuel cut**

Fuel injection stops (with operation of the injector prevented) when decelerating (i.e. when the throttle valve is at idle position and the engine speed is high), so that unburned gas will not be exhausted and it starts again when above conditions are not met.

The fuel injection also stops when the engine speed exceeds about 6,800 r/min to prevent over-run which affects the engine adversely and it starts again when the engine speed reduces to less than about 6,600 r/min.

50G00-6E-24-5

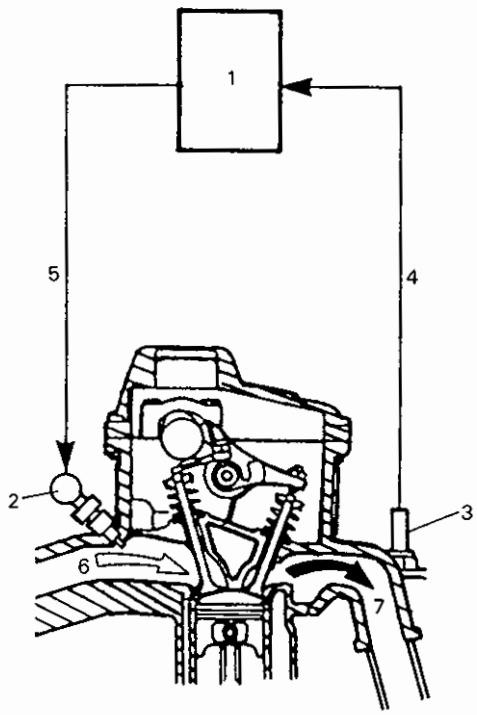
**Air/fuel ratio feed back compensation (Closed loop system) (vehicle with oxygen sensor only)**

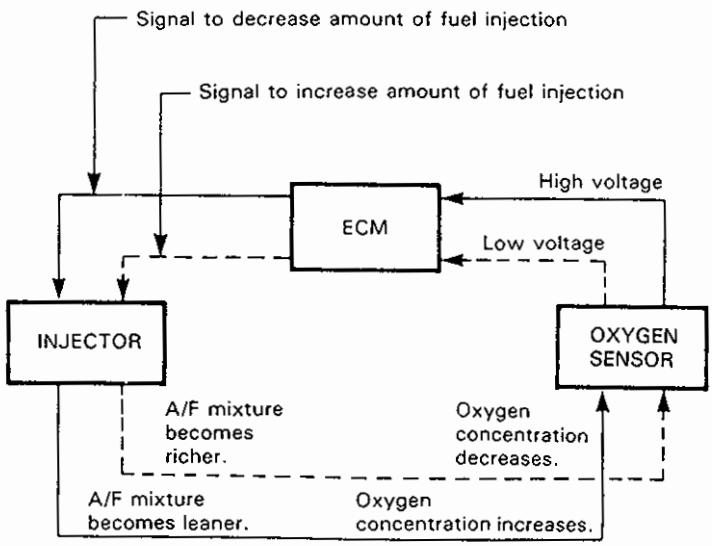
It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the 3-way catalytic converter and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. It first compares the signal from the oxygen sensor with a specified reference voltage and if the signal is higher, it detects that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces fuel. On the other hand, if the signal is lower, it detects that the air/fuel ratio is leaner and increases fuel. By repeating these operations, it adjusts the air/fuel ratio closer to the theoratical air/fuel ratio.

1) When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller than the theoretical air/fuel ratio (fuel is richer), electromotive force of the oxygen sensor increases and a rich signal is sent to ECM.
2) Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the oxygen sensor to decrease. Then a lean signal is sent to ECM.
3) As ECM increases the amount of fuel injection according to the lean signal, oxygen concentration in the exhaust gas decreses and the situation is back to above 1).

This control process, however, will not take place under any of the following conditions.

- At engine start and when fuel injection is increased after engine start
- When engine coolant temperature is low
- When highly loaded and fuel injection is increased
- At fuel cut
- When oxygen sensor is cold
- When engine is running at high speed (higher than about 4000 r/min).



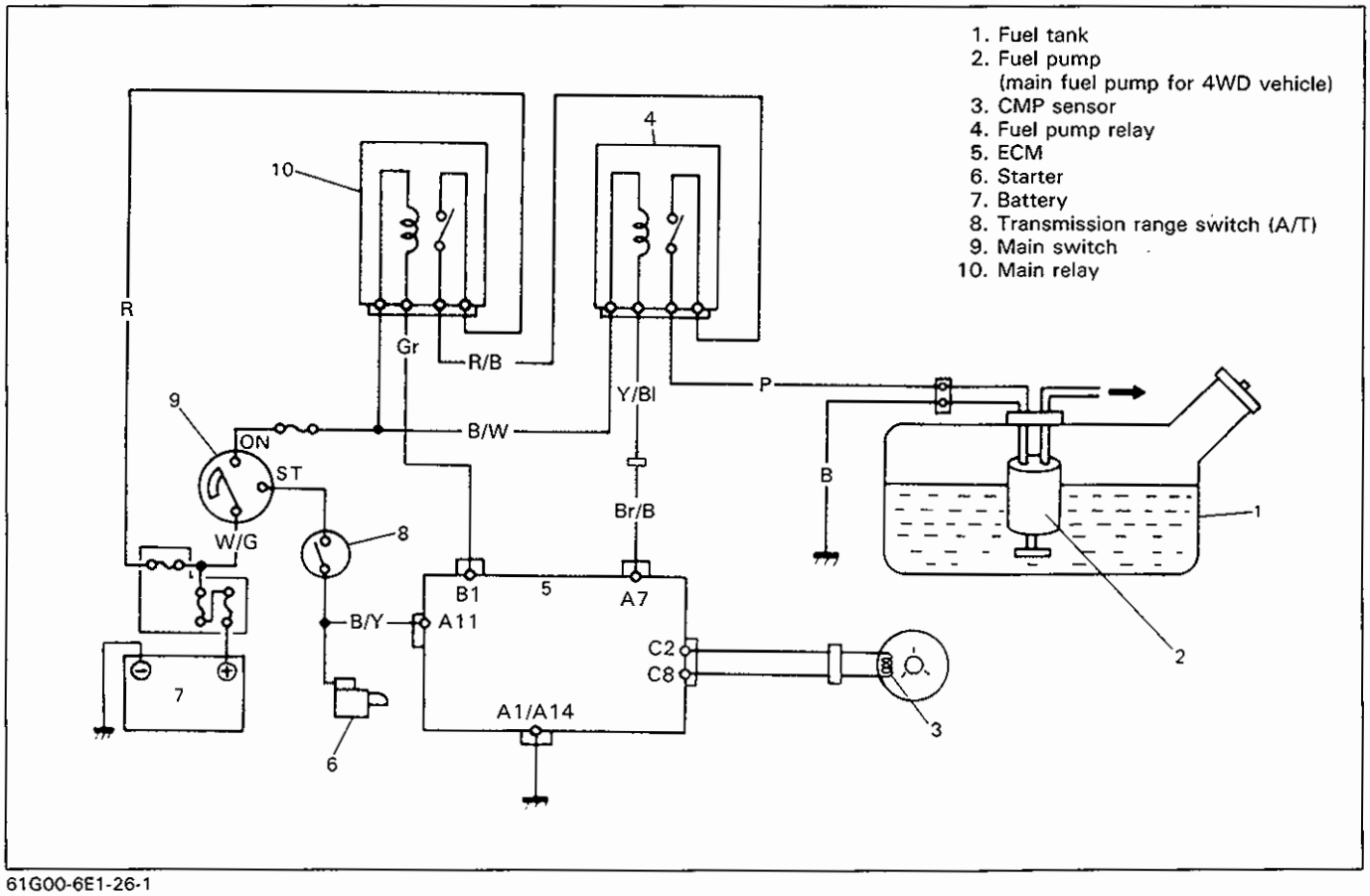

1. ECM
2. Injector
3. Oxygen sensor
4. Voltage signal
5. Injection signal
6. Air/fuel mixture
7. Exhaust gas
8. Sensed information

61G00-6E1-25-1

## FUEL PUMP (MAIN FUEL PUMP FOR 4WD VEHICLE) CONTROL SYSTEM

ECM controls ON/OFF operation of the fuel pump by turning it ON via the fuel pump relay under any of the following conditions.

- For 2 seconds after ignition switch ON.
- While cranking engine (while engine start signal is inputted to ECM).
- While camshaft position sensor (CMP sensor) signal is inputted to ECM.




61G00-6E1-26-1

## IDLE AIR CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and idle air control valve (IAC valve) for the following four purposes.

- To keep the engine idle speed as specified at all times.
  The engine idle speed can vary due to following reasons.
  * Load applied to engine (when electric load is applied, automatic transmission is shifted to "R", "D", "2" or "L" range, A/C is turned ON, etc.)
  * Variation in atmospheric pressure
  * Change in engine itself with passage of time
  * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)
- To improve driveability when while engine is warmed up.

60G00-6E1-26-2

### Operation

Opening of IAC valve is controlled according to IAC valve opening signal (A3 ON) and closing signal (A16 ON) sent from ECM.
ECM detects the engine condition by using the signals from various sensors and switches and controls the bypass air flow by changing the ratio between the time (To) within a cycle during which electricity flows through the IAC valve coil (open) (i.e., A3 ON time = IAC valve moves in its opening direction) and the time (Tc) during which electricity flows through the IAC valve coil (close) (i.e., A16 ON time = IAC valve moves in its closing direction).

When the vehicle is at a stop, the throttle valve is at the idle position and the engine is running, the engine speed is kept at a specified idle speed.

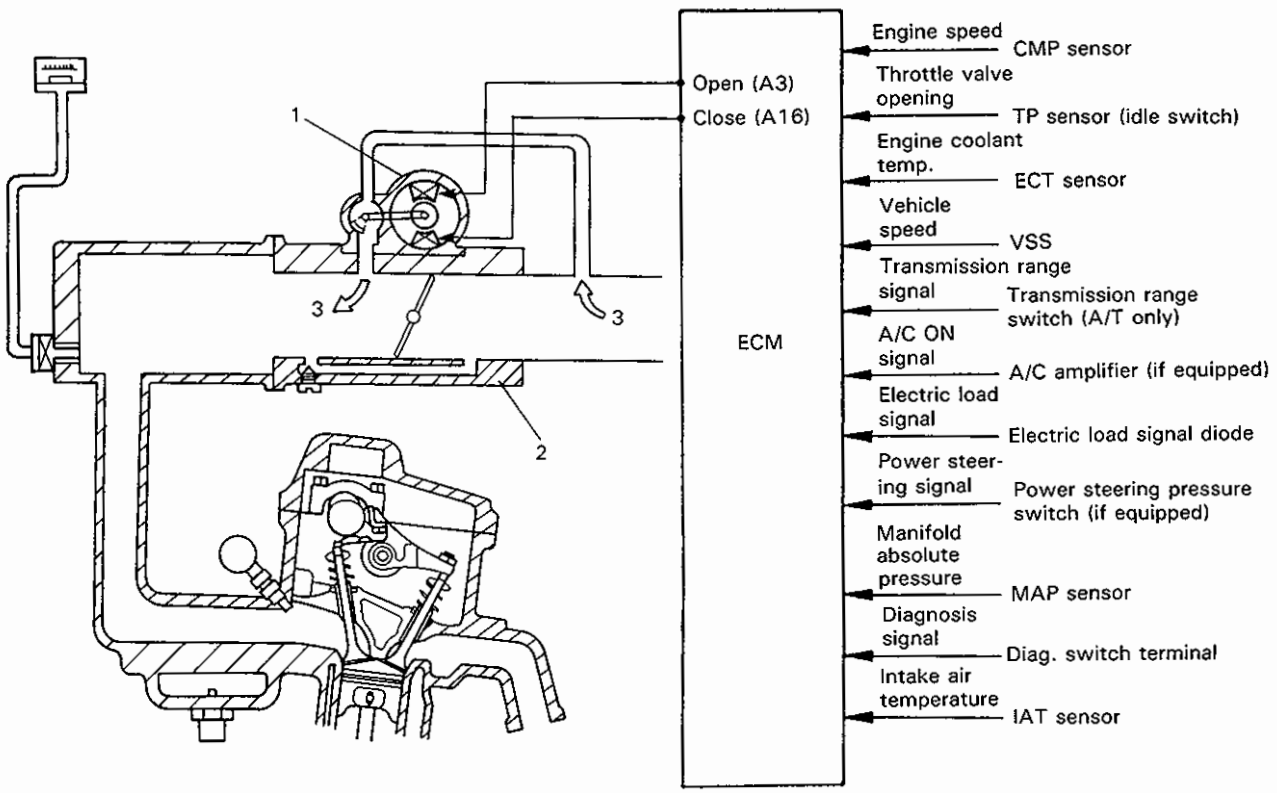
M/T vehicle

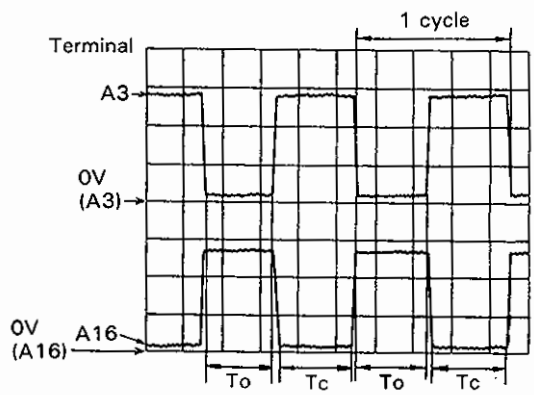
| | A/C OFF | A/C ON |
|---|---|---|
| Engine idle speed specification | 750±50 r/min. | 900±50 r/min. |

A/T vehicle

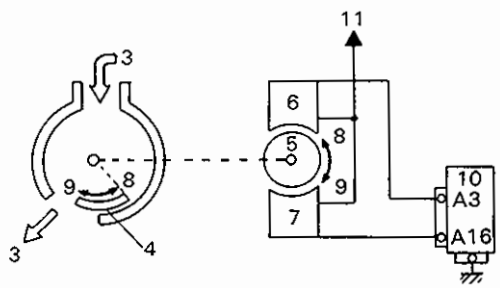
| | | A/C OFF | A/C ON |
|---|---|---|---|
| Engine idle speed specification | "P" or "N" range | 800±50 r/min. | 900±50 r/min. |
| | "R", "D" "2" or "L" range | 750±50 r/min. | 800±50 r/min. |

61G00-6E1-27-1




Voltage wave form of IAC valve terminals (ECM)




To: Time during which IAC valve moves in opening direction
Tc: Time during which IAC valve moves in closing direction

1 cycle: 4 ms (250 Hz)

1. IAC valve
2. Throttle body
3. Bypass air
4. IAC valve (valve)
5. IAC valve (magnet)
6. IAC valve coil (open)
7. IAC valve coil (close)
8. At A3 ON (ground)
9. At A16 ON (ground)
10. ECM
11. From main relay

60G00-6E1-27-3

## EXHAUST GAS RECIRCULATION (EGR) SYSTEM (if equipped)

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold. The EGR valve is controlled by EGR pressure transducer and solenoid vacuum valve controlled by ECM according to signals from various sensors.

The diaphragm mounted in the EGR pressure transducer is operated by back pressure of the exhaust gas to open and close the valve. By this opening and closing action of the valve, the EGR pressure transducer controls the vacuum transmitted to the EGR valve.

Under a low load condition such as low speed driving, the exhaust pressure is low. In this state, the diaphragm in the EGR pressure transducer is pushed down by the spring force and the pressure transducer valve opens to allow the air into the vacuum passage from the outside.

As a result, the vacuum transmitted to the EGR valve becomes smaller and so does the opening of the EGR valve.

Thus, less amount of exhaust gas is recirculated to the intake manifold.

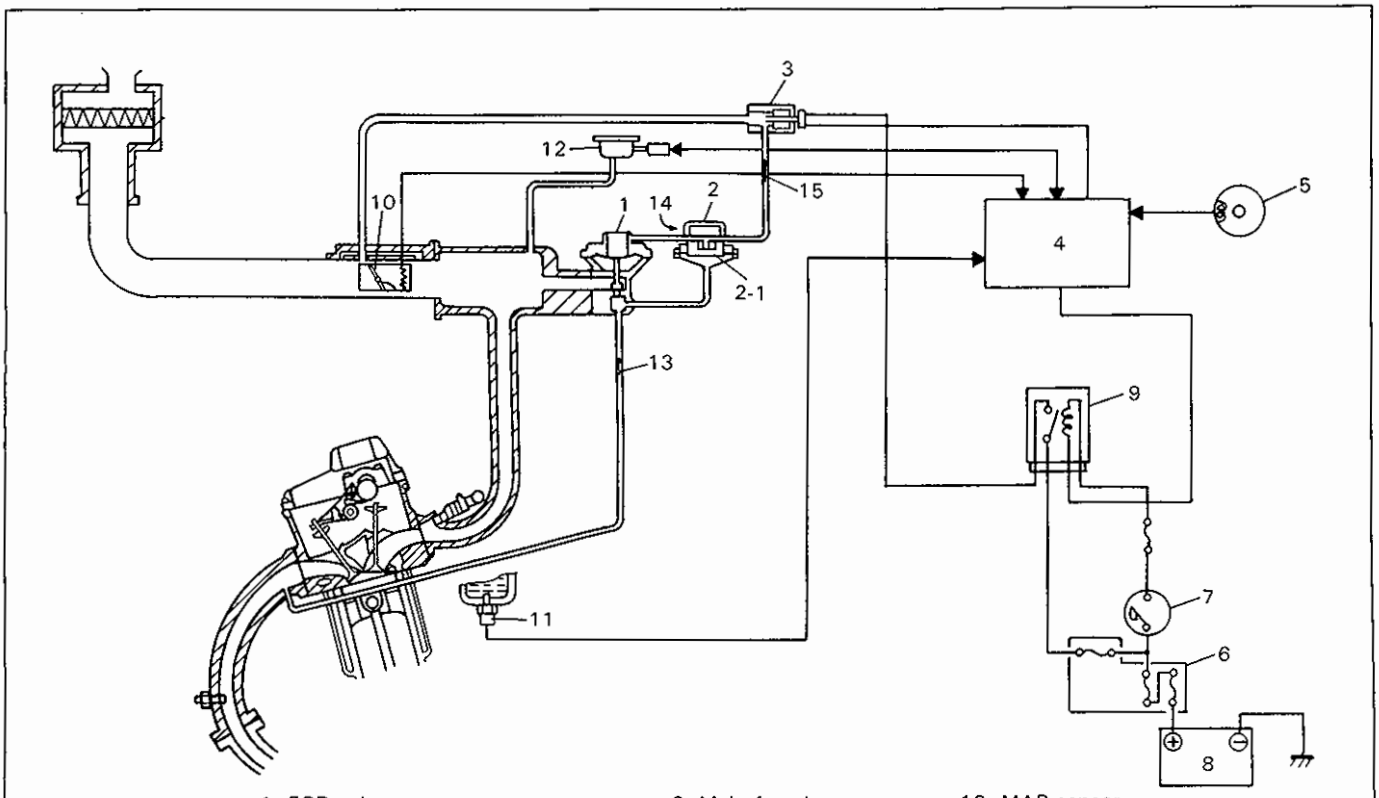
Under a high load condition such as high speed driving, on the other hand, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the pressure transducer is pushed up and closes its valve. As the air does not enter the vacuum passage in this state, the vacuum transmitted to the EGR valve grows larger and so does the opening of the EGR valve.

Thus, larger amount of exhaust gas is recirculated to the intake manifold.

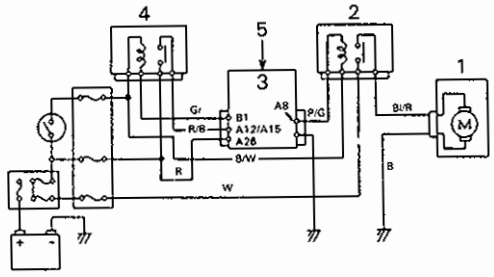
Under any one of the following conditions, ECM closes the vacuum passage of solenoid vacuum valve. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- When engine coolant temperature is low.
- When throttle valve is at idle position.
- When engine is running under high load.
- When intake manifold pressure is low.

Other than the above, EGR valve opens and closes in accordance with the EGR pressure transducer operation.




1. EGR valve
2. EGR pressure transducer
2-1. Pressure transducer valve
3. Solenoid vacuum valve
4. ECM
5. CMP sensor
6. Main fuse box
7. Main switch
8. Battery
9. Main relay
10. TP sensor
11. ECT sensor
12. MAP sensor
13. Exhaust gas
14. Air
15. Vacuum




1. Radiator fan motor
2. Radiator fan control relay
3. ECM
4. Main relay
5. Engine coolant temp. (ECT sensor)

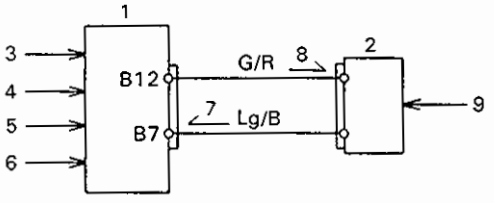
60G00-6E1-29-3

## RADIATOR FAN CONTROL SYSTEM

This system controls operation (ON/OFF) of the radiator fan motor. Radiator fan motor is turned ON and OFF by its relay which ECM controls.

Radiator fan motor is turned ON/OFF under following engine coolant temp.

| Radiator fan motor | Engine coolant temperature |
|---|---|
| OFF→ON | above 96~98°C (205~208°F) |
| ON→OFF | below 91~93°C (196~199°F) |




1. ECM
2. A/C amplifier
3. TP sensor
4. CMP sensor
5. ECT sensor
6. Engine start signal
7. A/C signal
8. A/C ON signal
9. Sensed information

60G00-6E1-30-1

## AIR CONDITIONING (A/C) ON SIGNAL OUTPUT FOR A/C AMPLIFIER (VEHICLE WITH A/C ONLY)

ECM outputs A/C ON signal (one of the signals for A/C amplifier to control the air conditioner) to A/C amplifier when A/C signal inputted to ECM and conditions listed below are satisfied.

**Throttle valve opening: below 65°**
**Engine coolant temp. : below 110°C (230°F)**
**Engine speed : between 500 r/min and 6,600 r/min.**

## EVAPORATIVE EMISSION CONTROL SYSTEM (if equipped)

An evaporative emission control system is used to prevent emission of fuel vapor.

The vapor generated in the fuel tank while driving or the engine at a stop passes through a tank pressure control valve and enters the EVAP canister where the charcoal absorbs and stores the fuel vapor.

The EVAP canister purge valve (if equipped) is controlled by ECM according to signals from various sensors.

Only when the following conditions are satisfied, ECM opens vacuum passage of EVAP canister purge valve.

1) When engine is normal operating temperature.
2) When engine speed is higher than specified.
3) When throttle valve opens wider than idle position (idle switch OFF)
4) When engine is running within specified load.

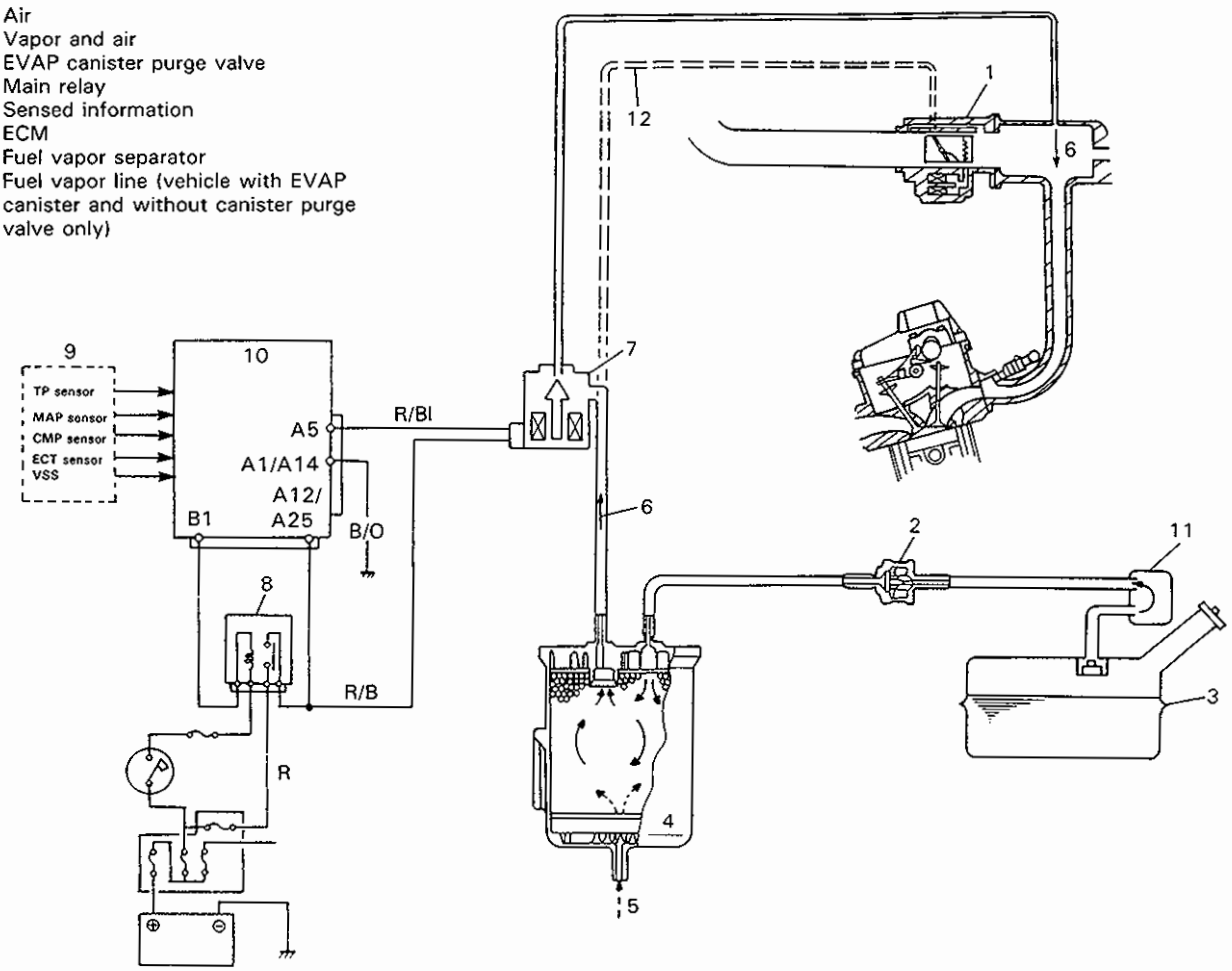
For vehicle without canister purge valve, the opening of EVAP canister vacuum passage depending on throttle valve opening.

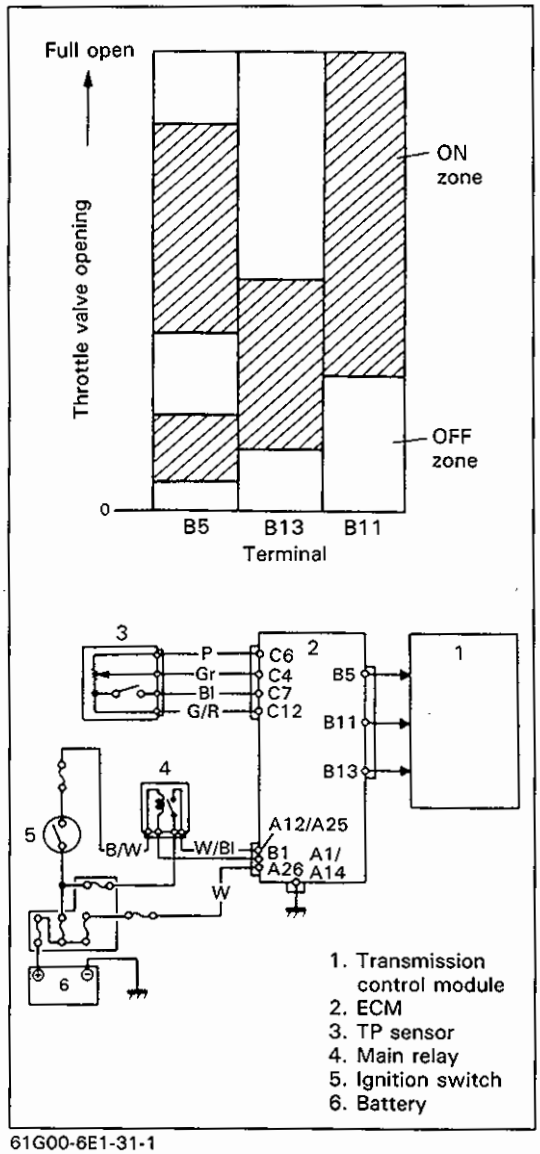
As a result, fuel vapor in the canister is sucked into intake manifold.

In this state, the canister is purged or cleaned by air drawn through the filter at the bottom of the canister.

The tank pressure control valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the EVAP canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.

1. Throttle body
2. Tank pressure control valve
3. Fuel tank
4. EVAP canister
5. Air
6. Vapor and air
7. EVAP canister purge valve
8. Main relay
9. Sensed information
10. ECM
11. Fuel vapor separator
12. Fuel vapor line (vehicle with EVAP canister and without canister purge valve only)

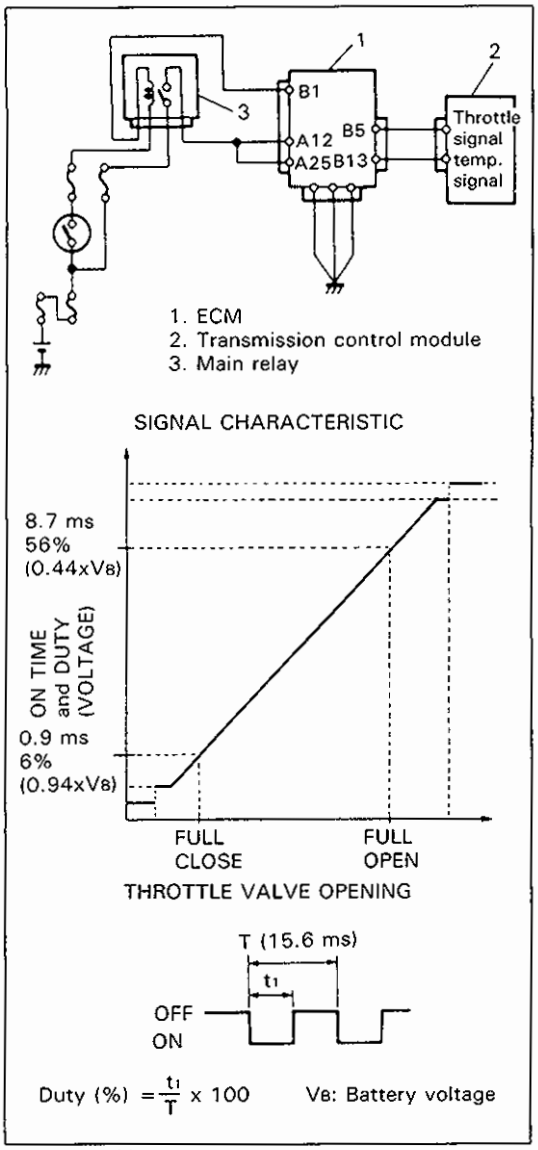





61G00-6E1-31-1

## THROTTLE VALVE OPENING SIGNAL OUTPUT FOR A/T (3 A/T)

Receiving the throttle valve opening signal from the throttle position sensor, ECM converts it into the three ON/OFF signals and sends their signals to transmission control module through B5, B13 and B11 terminals. Then transmission control module uses them as the signals to control the automatic transmission.

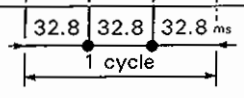



61G00-6E1-32-1

## THROTTLE VALVE OPENING SIGNAL OUTPUT FOR A/T (4 A/T)

Receiving the throttle valve opening signal from the throttle position sensor, ECM converts it into the duty signal (voltage signal) and sends it to transmission control module. Then transmission control module uses it as the signal to control the automatic transmission.

| Engine coolant temp. | B13 terminal voltage |
|---|---|
| Below 0°C (32°F) | +B<br>GND |
| Between 0°C and 50°C (32°F and 122°F) | +B<br>GND |
| Above 50°C (122°F) | +B<br>GND |

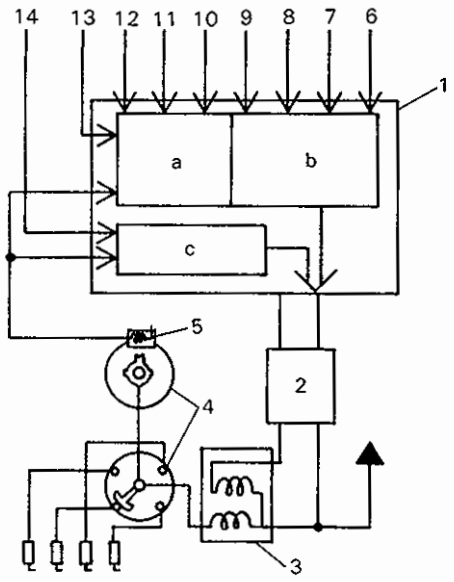



+B : Battery voltage
GND: About 0V

61G00-6E1-32-4

## ENGINE COOLANT TEMP. SIGNAL OUTPUT FOR A/T (4 A/T)

ECM transmits the engine coolant temperature signal to TCM by grounding B13 terminal which receives battery voltage from TCM. TCM uses this signal as one of the factors to control shift to the 4th (O/D) gear, lock-up and T/M throttle pressure.




1. ECM
2. Ignitor
3. Ignition coil
4. Distributor
5. CMP sensor
6. TP sensor (idle switch)
7. ECT sensor
8. MAP sensor
9. Test switch terminal
10. Diag. switch terminal
11. P/N range switch (A/T)
12. A/C signal (if equipped)
13. VSS
14. Battery voltage

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## IGNITION CONTROL SYSTEM

This system controls electronically the time of electric current flow to ignition primary coil as well as ignition timing.

ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those prestored in its memory and sends an ignition signal to the igniter (power unit).

Control of this system includes three different types as follows.

a) Ignition timing control at engine start (initial ignition timing)
b) Ignition timing control after engine start
c) Electric current flow time control

**Ignition Timing Control at Engine Start (Initial Ignition Timing)**

To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.), IC system sets the ignition timing to the initial ignition timing (5° BTDC.)

Also, the initial ignition timing (5° BTDC) is restored when all of the following conditions are met.

- Diag. switch terminal not gounded
- Test switch terminal grounded
- Idle switch ON
- Engine speed lower than 2,000 r/min (rpm)

60G00-6E1-33-4

### Ignition Timing Control After Engine Start

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

| Ignition timing | = | Initial ignition timing | + | Basic ignition advance | + | Various compensating advance |
|---|---|---|---|---|---|---|

64B40-6E-30-5

When the idle switch is ON, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed, coolant temperature compensating advance and compensating advance for idle speed stability to the initial ignition timing.

When the idle switch is OFF, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed and intake manifold pressure and coolant temperature compensating advance to the initial ignition timing.

64B40-6E-31-1

- **Coolant temperature compensating advance**
  This compensation is added according to the signal from the engine coolant temperature sensor which detects the engine coolant temperature.
- **Compensating advance for idle speed stability**
  This compensation is carried out to stabilize the engine idle speed.

64B40-6E-31-2

### Electric Current Flow Time Control

To stabilize the secondary voltage generated in the ignition coil to a proper level, ignition control system controls the time of primary current flow to the ignition coil.

**NOTE:**
**The ignition timing is controlled by ECM as described above. Therefore, when checking or adjusting the ignition timing, the ignition timing must be fixed to the initial one by grounding the test switch terminal.**

60G00-6E1-34-4

# DIAGNOSIS

ECM has on-board diagnostic system (a system self-diagnosis function) as described previously (p. 6E1-15). Investigate where the trouble is by referring to "Diagnostic Flow Chart" and "Diagnostic Trouble Code" in this section.

## PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

- Before identifying diagnostic trouble code indicated by malfunction indicator lamp ("CHECK ENGINE" light), don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse.
  Such disconnection will erase memorized trouble in ECM memory.
- If abnormality of malfunction lies in two or more areas, malfunction indicator lamp ("CHECK ENGINE" light) indicates applicable codes three times each.
  And flashing of these codes is repeated as long as diagnosis switch terminal is grounded (spare fuse is connected) and ignition switch is held at ON position.
- Take a note of diagnostic trouble code indicated first.

[INTERMITTENT TROUBLE] and [NOTES ON SYSTEM CIRCUIT INSPECTION]
Refer to SECTION 0A.

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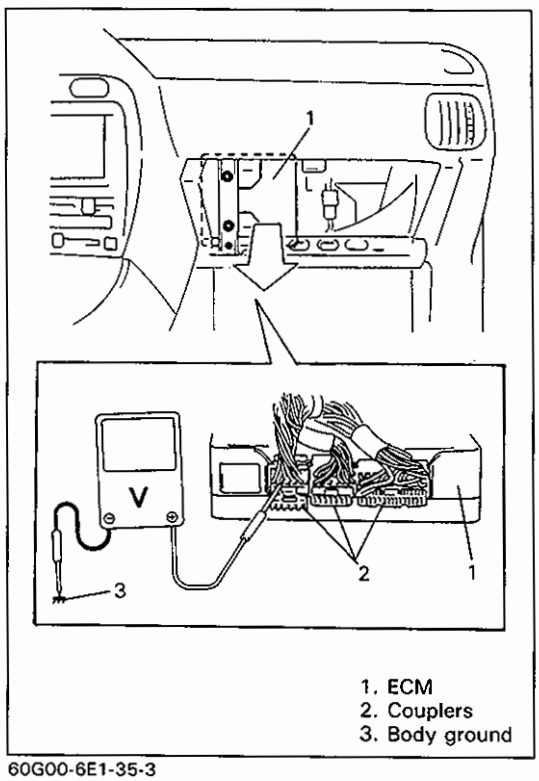
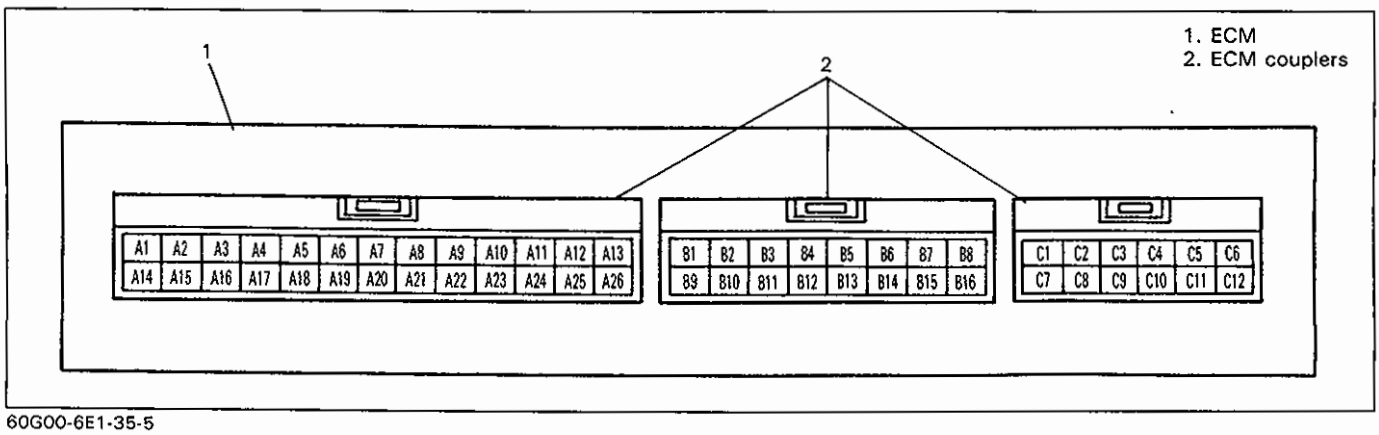



1. ECM
2. Couplers
3. Body ground

60G00-6E1-35-3

- When checking voltage at each terminal of the coupler which is connected to ECM, be sure to connect negative probe to body ground as shown. Any other way is prohibited even by accident.
  Applying probes of voltmeter improperly may cause the sensor or ECM to be shorted and damaged.



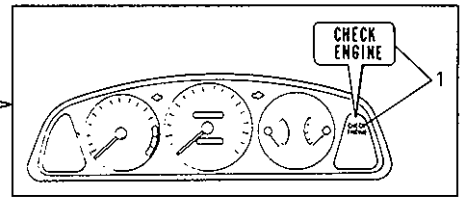

1. ECM
2. ECM couplers

60G00-6E1-35-5

## DIAGNOSTIC TROUBLE CODE(S) CHECK

START

Does malfunction indicator lamp ("CHECK ENGINE" light) turn ON when ignition switch is turned ON (without starting engine.)?




NO → Does engine start?

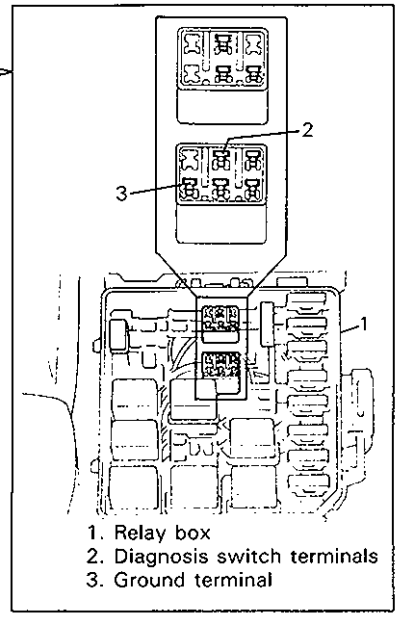
NO → Proceed to chart A-1. (ECM power and ground circuit check.)

YES → Proceed to chart A-2. (Malfunction indicator lamp ("CHECK ENGINE" light) circuit check.)

YES

Connect service wire to diagnosis switch terminal and ground terminal of diagnosis connector 1 and observe malfunction indicator lamp ("CHECK ENGINE" light).

**NOTE:**
**If engine fails to start, crank it for 2 seconds and then while keeping ignition switch ON (Don't turn it OFF), ground diagnosis switch terminal.**




Proceed to chart A-3. (Malfunction indicator lamp ("CHECK ENGINE" light) circuit check.)

Flashes — Remains ON

1. Record all of diagnostic trouble code(s) indicated.
2. Disconnect spare fuse from diagnosis switch terminal.

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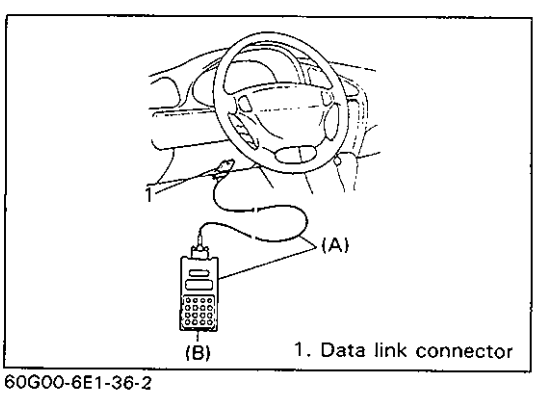
## DIAGNOSTIC TROUBLE CODE(S) CLEAR

1) Turn OFF ignition switch.
2) Disconnect battery negative cable for specified time below to erase diagnostic trouble code stored in ECM memory and reconnect it.

TIME REQUIRED TO ERASE DTC

| AMBIENT TEMPERATURE | TIME TO CUT POWER TO ECM |
|---|---|
| Over 0°C (32°F) | 60 sec. or longer |
| Under 0°C (32°F) | Not specifiable.<br>Select a place with higher than 0°C (32°F) temperature. |



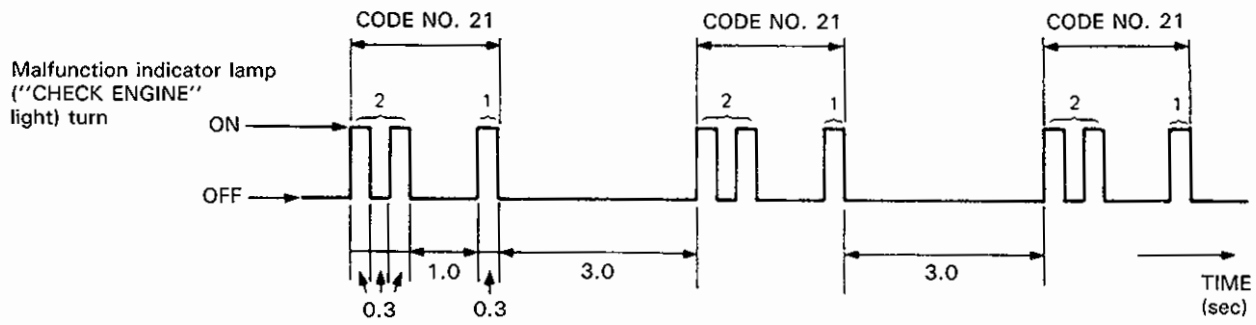

60G00-6E1-36-2

**NOTE:**
**If Tech-1 and cartridge are available, it is possible to check and clear diagnostic trouble code(s) by using trouble code check and clear function in trouble code mode of Tech-1 without disturbing memories for clock, audio equipment and other devices.**

**Special Tool**
**(A): 09931-76011 (Tech-1)**
**(B): 09932-66010-001 ('91—'94 ECM cartridge, English)**
**(B): 09932-66010-003 ('91—'94 ECM cartridge, Germany)**
**(B): 09932-66010-004 ('91—'94 ECM cartridge, French)**

## DIAGNOSTIC TROUBLE CODE TABLE

**EXAMPLE:** THROTTLE POSITION SENSOR FAILURE (CODE NO.21)




| DIAGNOSTIC TROUBLE CODE NO. | DIAGNOSTIC TROUBLE CODE MODE | DIAGNOSTIC AREA | DIAGNOSIS |
|---|---|---|---|
| 12 | 1 2 | Normal | This code appears when none of the other codes are identified. |
| 13 | 1 3 | Heated oxygen sensor | Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No. |
| 14 | 1 4 | Engine coolant temperature sensor (ECT sensor) | |
| 15 | 1 5 | | |
| 21 | 2 1 | Throttle position sensor (TP sensor) | |
| 22 | 2 2 | | |
| 23 | 2 3 | Intake air temperature sensor (IAT sensor) | |
| 25 | 2 5 | | |
| 24 | 2 4 | Vehicle speed sensor | |
| 31 | 3 1 | Manifold absolute pressure sensor (MAP sensor) | |
| 32 | 3 2 | | |
| 41 | 4 1 | Ignition fail safe signal | |
| 42 | 4 2 | Camshaft position sensor (CMP sensor) | |
| ON | | ECM | ECM failure |

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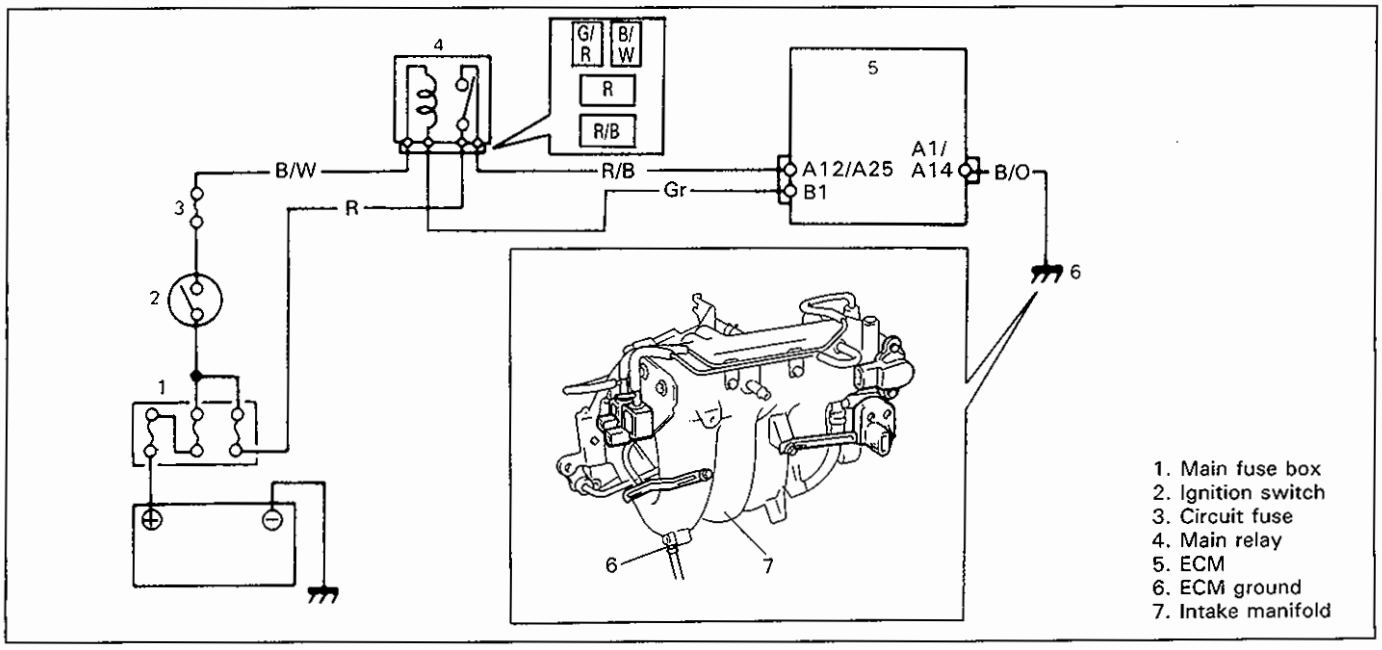
## A-1 ECM POWER AND GROUND CIRCUIT CHECK

(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)




1. Main fuse box
2. Ignition switch
3. Circuit fuse
4. Main relay
5. ECM
6. ECM ground
7. Intake manifold

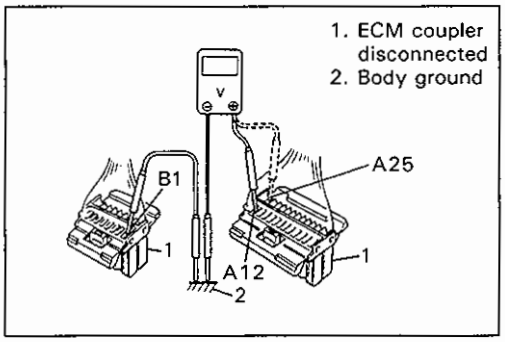
Is operation of main relay heard at ignition switch ON?

YES

Is 15A main fuse in good condition?

YES

1. Disconnect ECM coupler with ignition switch OFF.
2. Using service wire, ground B1 terminal.
3. Is battery voltage applied to A12/A25 terminal at ignition switch ON?




YES

- Poor "A12" and "A25" or "A1" and "A14" connection,
- "B/O" wire open or
- Poor "B/O" wire grounding.

If wire and connections are OK, substitute a known-good ECM and recheck.

NO

Repair or replace.

NO

Are main and circuit fuses in good condition?

YES

Is main relay in good condition? (Check main relay referring to p. 6E-102.)

YES

- Poor relay-to-coupler connection,
- "B/W" wire open,
- "Gr" wire open or
- Poor B1 or A1 and A14 connection or
- Poor engine ground.

If all above are OK, substitute a known-good ECM and recheck.

NO

Repair or replace.

NO

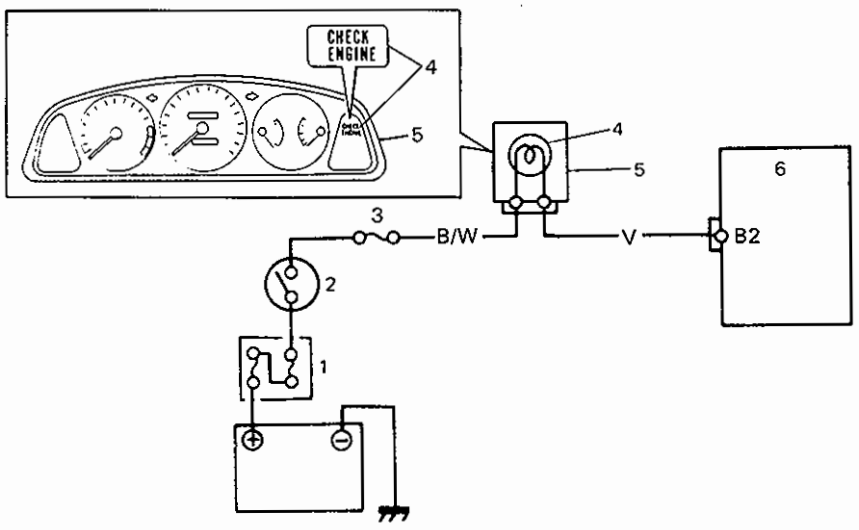
Replace.

NO

- "R" wire open,
- Poor relay-to-coupler connection or
- "R/B" wire open.

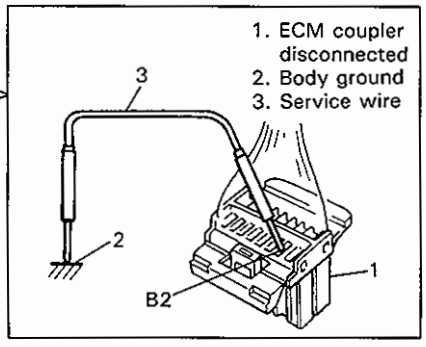
If wire and connection are OK, check main relay referring to p. 6E1-102.)

## A-2 MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) CIRCUIT CHECK
("CHECK ENGINE" LIGHT DOES NOT LIGHT BUT ENGINE STARTS.)




1. Main fuse
2. Ignition switch
3. Circuit fuse
4. Malfunction indicator lamp ("CHECK ENGINE" light)
5. Combination meter
6. ECM

1. With ignition switch turned OFF, disconnect couplers from ECM.
2. Body-ground terminal "B2" in coupler disconnected.
3. Does malfunction indicator lamp ("CHECK ENGINE" light) turn ON at ignition switch ON?




NO → Bulb burned out, "V" wire circuit open or "B/W" wire circuit open.

YES

Is coupler connected to ECM properly?

NO → Poor connection.

YES

Substitute a known-good ECM and recheck.

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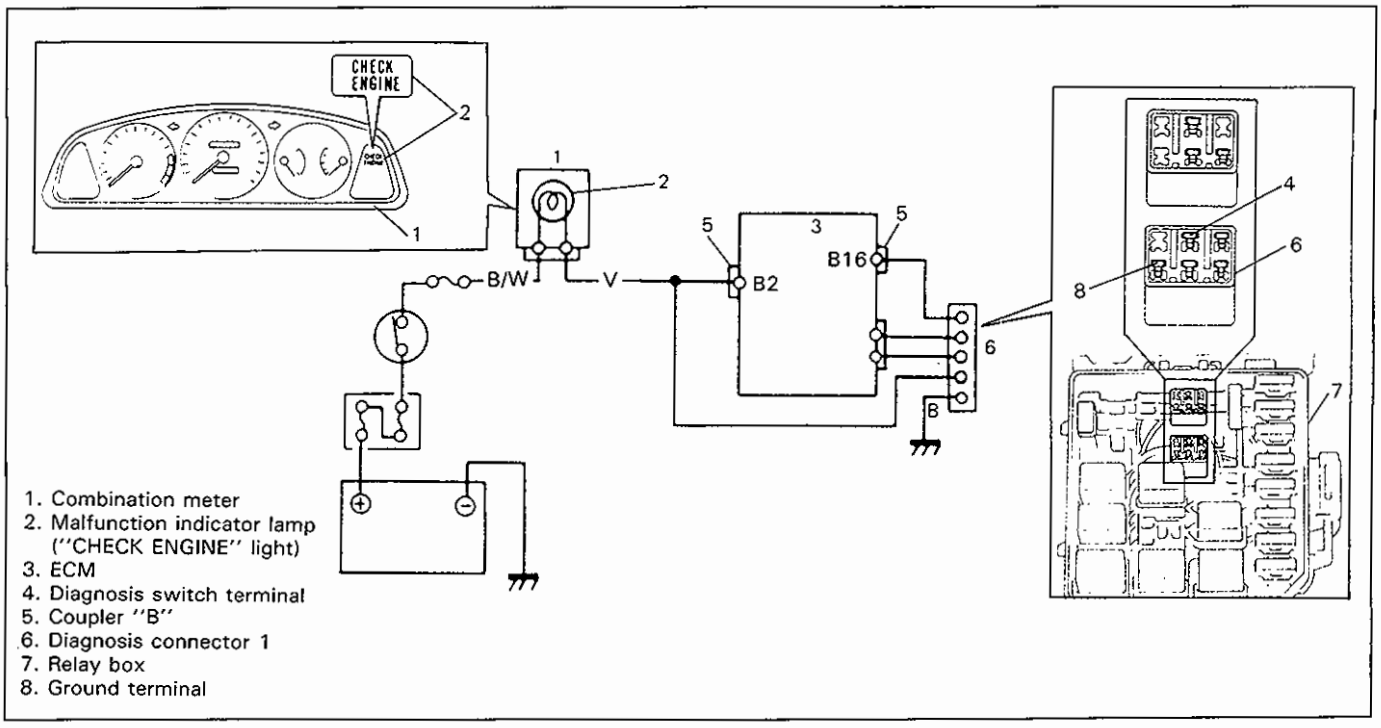
## A-3 MALFUNCTION INDICATOR LAMP (''CHECK ENGINE'' LIGHT) CIRCUIT CHECK

(''CHECK ENGINE'' LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH SERVICE WIRE CONNECTED TO DIAGNOSIS SWITCH TERMINAL AND GROUND TERMINAL.)




1. Combination meter
2. Malfunction indicator lamp (''CHECK ENGINE'' light)
3. ECM
4. Diagnosis switch terminal
5. Coupler ''B''
6. Diagnosis connector 1
7. Relay box
8. Ground terminal

1. Disconnect ECM couplers with ignition switch turned OFF.
2. Does malfunction indicator lamp (''CHECK ENGINE'' light) turn ON at ignition switch ON?

YES → ''V'' wire circuit shorted to ground.

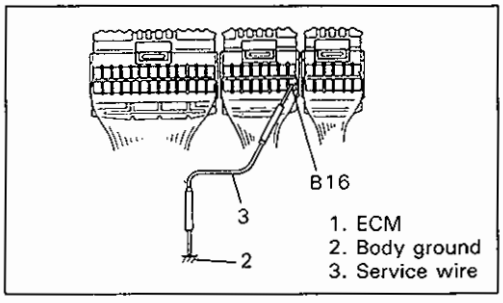
NO

Is coupler ''B'' (terminal ''B16'') connected to ECM properly?

NO → Poor connection.

YES

1. Using service wire, ground terminal ''B16'' with coupler connected to ECM.
2. Does malfunction indicator lamp (''CHECK ENGINE'' light) flash at ignition switch ON?

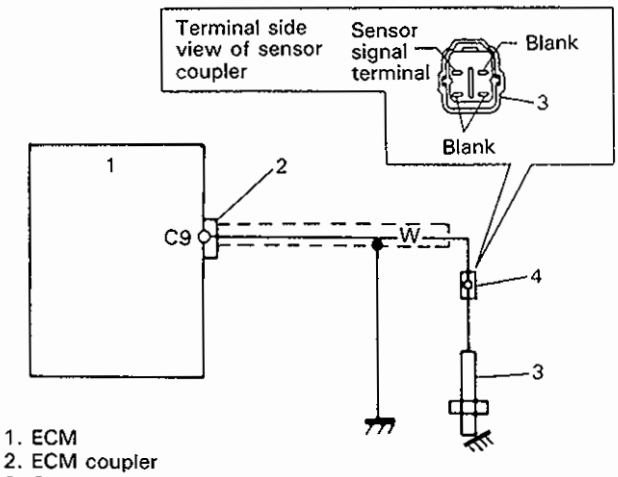



YES → Service wire open, ''V/Y'' wire circuit open or poor ''B'' wire grounding.

NO

Substitute a known-good ECM and recheck.

## CODE NO.13 OXYGEN SENSOR CIRCUIT (SIGNAL VOLTAGE DOESN'T CHANGE) (if equipped)

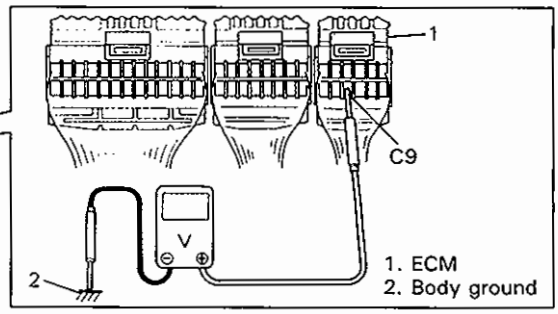



1. ECM
2. ECM coupler
3. Oxygen sensor
4. Coupler

**NOTE:**

- **Before diagnosing trouble according to flow chart given below, check to make sure that following system and parts other than Electronic Fuel Injection system are in good condition.**
  - **— Air cleaner (clogged)**
  - **— Vacuum leaks (air inhaling)**
  - **— Spark plugs (contamination, gap)**
  - **— High-tension cords (crack, deterioration)**
  - **— Distributor rotor or cap (wear, crack)**
  - **— Ignition timing**
  - **— Engine compression**
  - **— Any other system and parts which might affect A/F mixture or combustion.**
- **If code No.13 and another code No. are indicated together, the latter has priority. Therefore, check and correct what is represented by that code No. first and then proceed to the following check.**
- **Be sure to use a voltmeter with high impedance (MΩ/V minimum) or digital type voltmeter for accurate measurement.**

1. Remove ECM and connect couplers to ECM.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between "C9" terminal of ECM coupler and body ground.
4. Maintain engine speed at 2000 r/min. After 60 seconds, check voltmeter.

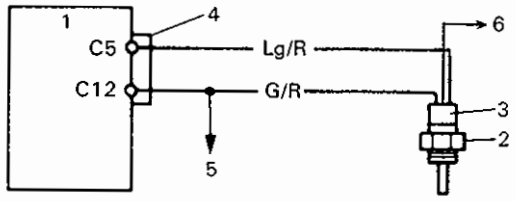



1. ECM
2. Body ground

| 0V | Remains unchanged at below 0.45V. | Remains unchanged at above 0.45V. | Deflects between above and below 0.45V repeatedly. |
|---|---|---|---|
| Wire between sensor and ECM open or poor connection.<br>• If wire and connection are OK, replace oxygen sensor and recheck. | Maintain engine speed at 2000 r/min.<br>After 60 sec., disconnect vacuum hose from MAP sensor and check voltmeter.<br>Is voltage 0.45V or more? | Poor C9 connection or rich A/F mixture.<br>• Check TP sensor, clogged MAP sensor hose, MAP sensor, IAT sensor, ECT sensor, fuel pressure and injector.<br>If all above are OK, check ECM and its circuit referring to p. 6E1-71. | Oxygen sensor and its circuit (Air/fuel ratio feed back system) are in good condition.<br>Intermittent trouble or faulty ECM.<br>Recheck referring to "Intermittent trouble" on p. 6E1-35. |
| | NO: Faulty oxygen sensor. | YES: Poor C9 connection or lean A/F mixture.<br>• Check MAP sensor, ECT sensor, IAT sensor, fuel pressure and injector.<br>If all above are OK, check ECM and its circuit referring to p. 6E1-71. | |

**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

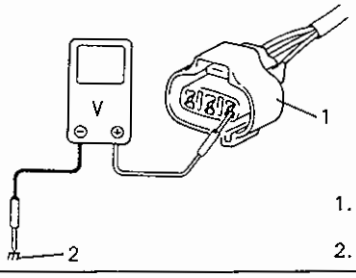
## CODE NO.14 ECT SENSOR (ENGINE COOLANT TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)




1. ECM
2. ECT sensor
3. ECT sensor coupler
4. ECM coupler
5. To other sensors
6. To combination meter

**NOTE:**
**When Code Nos. 14, 21, 23 and 32 are indicated together, it is possible that "G/R" wire is open or C12 terminal connection is poor.**

1. Disconnect ECT sensor coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Lg/R" wire terminal of ECT sensor coupler.
   Is it about 4—5V?



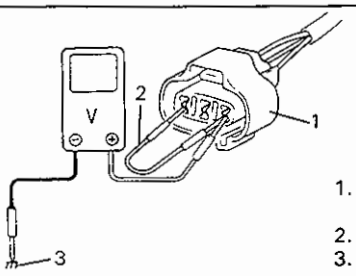

1. ECT sensor coupler disconnected
2. Engine ground

**YES**

1. Using service wire, connect ECT sensor coupler terminals.
2. Check voltage at "Lg/R" wire terminal of ECT sensor coupler with ignition switch ON.
   Is it below 0.15V?

**NO**

"Lg/R" wire open, poor C5 connection or "Lg/R" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.




1. ECT sensor coupler disconnected
2. Service wire
3. Engine ground

**NO**

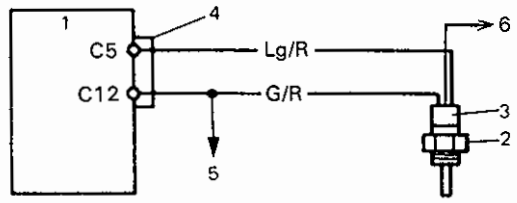
"G/R" wire open or poor C12 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

**YES**

Poor ECT sensor-to-coupler connection or faulty ECT sensor.
If connection and ECT sensor are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E1-35.

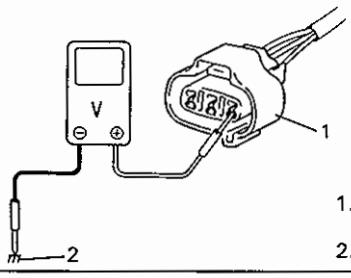
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.15 ECT SENSOR (ENGINE COOLANT TEMP. SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)




1. ECM
2. ECT sensor
3. Coupler
4. ECM coupler
5. To other sensors
6. To combination meter

1. Disconnect ECT sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg/R" wire terminal of ECT sensor coupler 4V or more?




1. Sensor coupler disconnected
2. Engine ground

**YES**

Check ECT sensor referring to p. 6E1-100.
Is it in good condition?

**NO**

"Lg/R" wire shorted to "G/R" wire or ground circuit. If wire is OK, substitute a known-good ECM and recheck.

**YES**

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

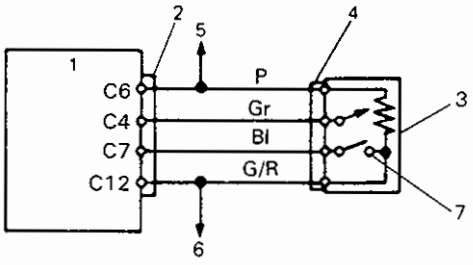
**NO**

Faulty ECT sensor.

**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

61G00-6E1-43-1

## CODE NO.21 TP SENSOR (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH)



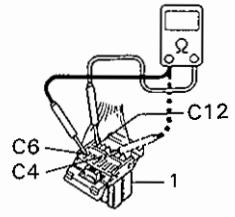

1. ECM
2. ECM coupler
3. TP sensor
4. TP sensor coupler
5. To MAP sensor
6. To other sensor
7. Idle switch

**NOTE:**
**Be sure to turn OFF ignition switch for this check.**

1. Disconnect MAP sensor coupler.
2. Disconnect ECM couplers.
3. Check resistance between terminals under each conditions below.

| | |
|---|---|
| Between C6 and C12 | 2.87 – 5.33 kΩ |
| Between C4 and C12 | 100 Ω – 100 kΩ |

Are they within specifications?




1. ECM coupler disconnected

**NO**

Faulty TP sensor, "Gr" wire open, "G/R" wire open or poor TP sensor connection.

**YES**

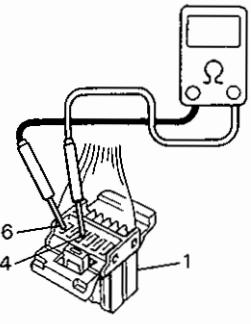
1. Disconnect TP sensor coupler.
2. Is there continuity between ECM coupler terminals C6 and C4?

**NO**

Poor C12 connection or poor C4 connection.
If connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**YES**

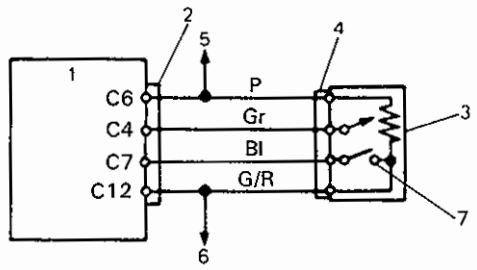
"P" wire shorted to "Gr" wire.




1. ECM coupler disconnected

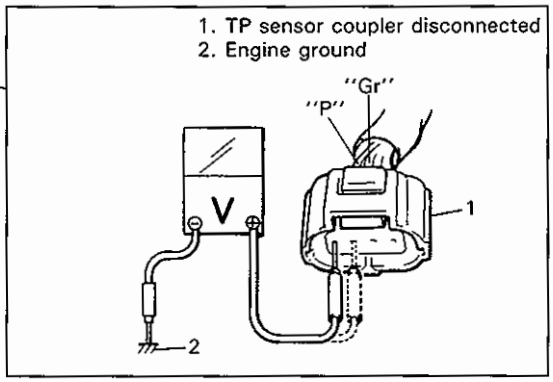
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.22 TP SENSOR (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW)




1. ECM
2. ECM coupler
3. TP sensor
4. TP sensor coupler
5. To MAP sensor
6. To other sensors
7. Idle switch

1. Disconnect coupler from TP sensor with ignition switch OFF.
2. With ignition switch ON, check voltage at each of "P" and "Gr" wire terminals.
   Is voltage about 4—5V at each terminal?




1. TP sensor coupler disconnected
2. Engine ground

**NO**

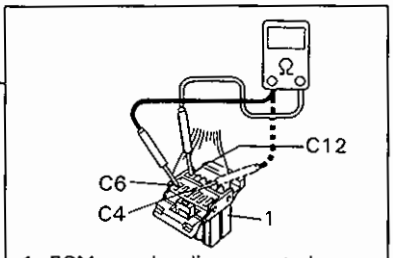
"P" wire open, "P" wire shorted to ground circuit or "G/R" wire, "Gr" wire shorted to ground circuit or poor C6 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

**YES**

1. Connect TP sensor coupler.
2. Disconnect MAP sensor coupler.
3. Disconnect ECM couplers.
4. Check resistance between terminals under each condition below.

| | |
|---|---|
| Between C6 and C12 | 2.87—5.33 kΩ |
| Between C4 and C12 | 100 Ω—100 kΩ |

Are they within specifications?




1. ECM coupler disconnected

**YES**

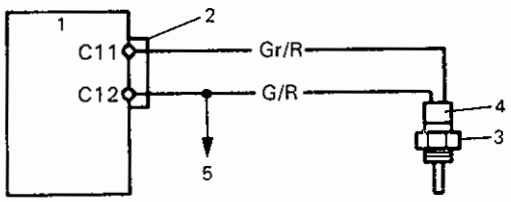
Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

Faulty TP sensor or poor TP sensor-to-coupler connection.

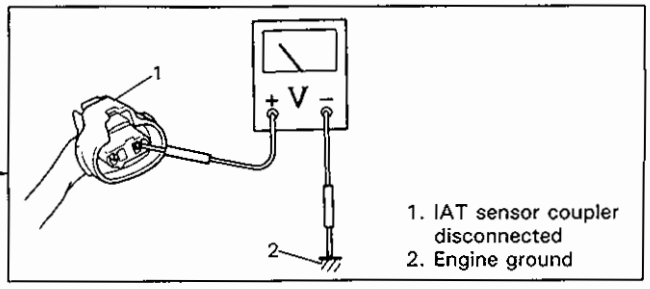
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.23 IAT SENSOR (INTAKE AIR TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)




1. ECM
2. ECM coupler
3. IAT sensor
4. IAT sensor coupler
5. To other sensors

1. Disconnect IAT sensor coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Gr/R" wire terminal of IAT sensor coupler.
   Is it about 4—5V?



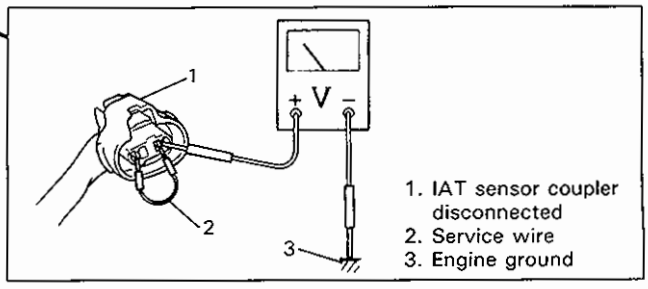

1. IAT sensor coupler disconnected
2. Engine ground

**YES**

1. Using service wire, connect IAT sensor coupler terminals.
2. Check voltage at "Gr/R" wire terminal of IAT sensor coupler with ignition switch ON.
   Is it below 0.15V?

**NO**

"Gr/R" wire open, poor C11 connector or "Gr/R" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.




1. IAT sensor coupler disconnected
2. Service wire
3. Engine ground

**YES**

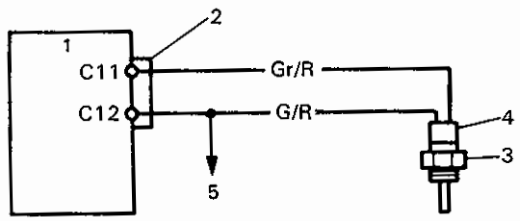
Faluty IAT sensor or poor IAT sensor-to-coupler connection.
If IAT sensor and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

"G/R" wire open or poor C12 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

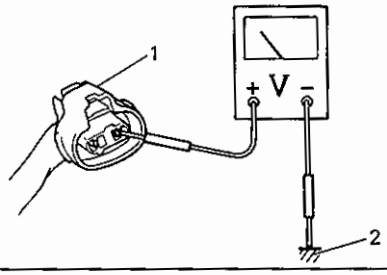
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.25 IAT SENSOR (INTAKE AIR TEMP. SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)




1. ECM
2. ECM coupler
3. IAT sensor
4. IAT sensor coupler
5. To other sensor

1. Disconnect IAT sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr/R" wire terminal of IAT sensor coupler 4V or more?




1. Sensor coupler disconnected
2. Engine ground

**YES**

Check IAT sensor referring to p. 6E1-99.
Is it in good condition?

**NO**

"Gr/R" wire shorted to ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

**YES**

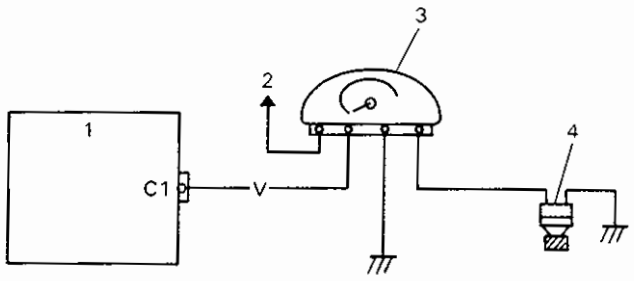
Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

Faulty IAT sensor.

**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.24 VSS (VEHICLE SPEED SENSOR) CIRCUIT (SPEED SENSOR SIGNAL NOT INPUTTED ALTHOUGH FUEL IS KEPT CUT AT LOWER THAN 4000 r/min FOR LONGER THAN 3 SECONDS)




1. ECM
2. To ignition switch
3. Speedometer
4. Vehicle speed sensor

Does speedometer indicate vehicle speed?

**YES**

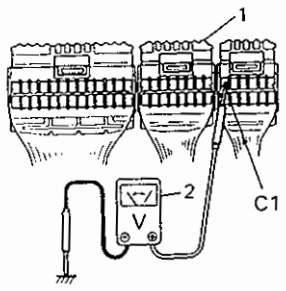
1. Remove ECM and connect coupler to ECM with ignition switch OFF.
2. Connect voltmeter between "C1" terminal of ECM coupler and body ground.
3. Hoist front end of vehicle and lock front right tire.
4. Turn front left tire quickly with ignition switch ON. Does voltmeter indicate deflection between 0—1 volt and 4—6 volt a few times while tire is turned one revolution?

**YES**

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

Faulty speedometer, VSS or its wire harness.
Refer to "SPEEDOMETER CONTROL" in Section 8.




1. ECM
2. Voltmeter

**NO**

Voltmeter indicates 0—1V.

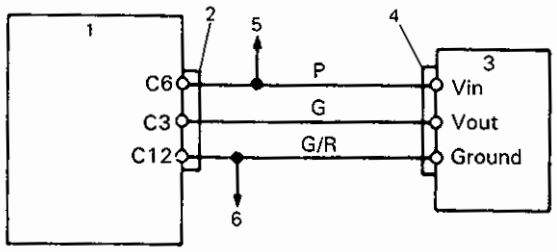
Poor "C1" connection or "V" wire shorted to ground.
If wire and connection are OK,
substitute a known-good speedometer and recheck.

Voltmeter indicates 4—6V.

"V" wire open or poor connection of "V" wire terminal in combination meter.
If wire and connection are OK, substitute a known-good speedometer and recheck.

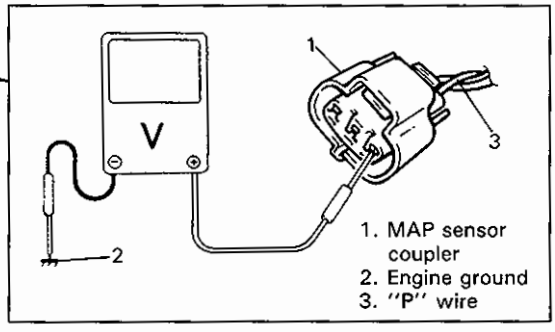
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.31 MAP SENSOR (MANIFOLD ABSOLUTE PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW—LOW PRESSURE—HIGH VACUUM)




1. ECM
2. ECM coupler
3. MAP sensor
4. MAP sensor coupler
5. To TP sensor
6. To other sensors

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "P" wire terminal of MAP sensor coupler about 4—5V?




1. MAP sensor coupler
2. Engine ground
3. "P" wire

**YES**

Check MAP sensor referring to p. 6E1-94. Is it in good condition?

**NO**

"P" wire open, "P" wire shorted to ground circuit or poor C6 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

**YES**

Disconnect MAP sensor hose from MAP sensor. Place finger against the end of disconnected hose and check that vacuum is felt there when engine is running.
Is vacuum felt there?

**NO**

Faulty MAP sensor.

**YES**

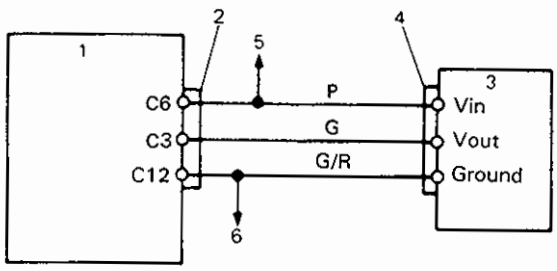
"G" wire shorted to ground circuit or poor MAP sensor-to-coupler connection.
If wire and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

Clogged or broken MAP sensor hose or pipe between throttle body and MAP sensor.

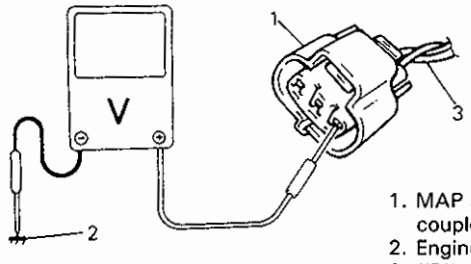
**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.32 MAP SENSOR (MANIFOLD ABSOLUTE PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH—HIGH PRESSURE—LOW VACUUM)




1. ECM
2. ECM coupler
3. MAP sensor
4. MAP sensor coupler
5. To TP sensor
6. To other sensors

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "P" wire terminal of MAP sensor coupler about 4—5V?




1. MAP sensor coupler
2. Engine ground
3. "P" wire

**YES**

Check MAP sensor referring to p. 6E1-94.
Is it in good condition?

**NO**

"P" wire shorted to power circuit.
If wire is OK, substitute a known-good ECM and recheck.

**NOTE:**
**When battery voltage is applied to "P" wire, it is possible that MAP sensor is also faulty.**

**YES**

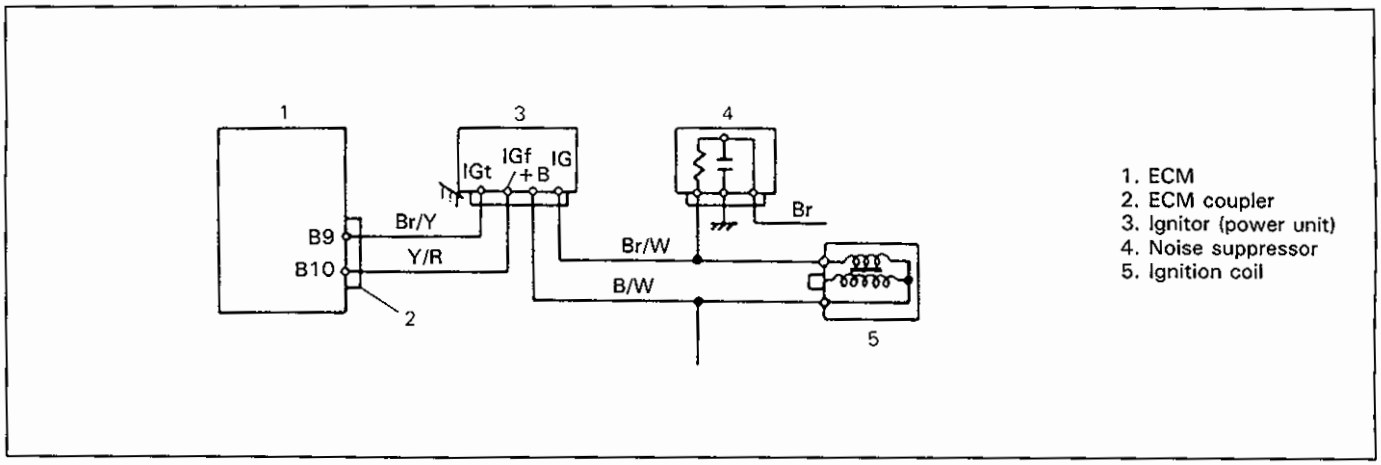
"P" wire shorted to "G" wire, "G/R" wire open, poor C12 connection, poor C3 connection, "G" wire open or poor MAP sensor-to-coupler connection.
If wire and connections are OK, intermittent trouble of faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO**

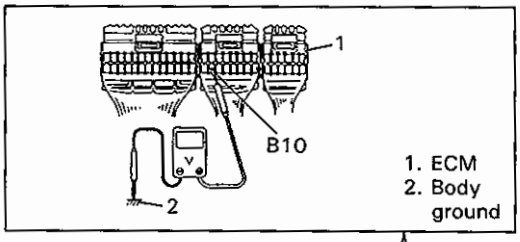
Faulty MAP sensor.

**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## CODE NO.41 IGNITION FAIL SAFE SIGNAL CIRCUIT (IGNITION SIGNAL NOT INPUTTED)




Check ignition spark referring to SECTION 6F.
Is it in good condition?




**NO**

1. Disconnect ignitor coupler.
2. Connect analog type voltmeter between "IGt" terminal of ignitor coupler and engine ground.
3. Is voltage pulse output within 0—5V while engine cranking?

**YES**

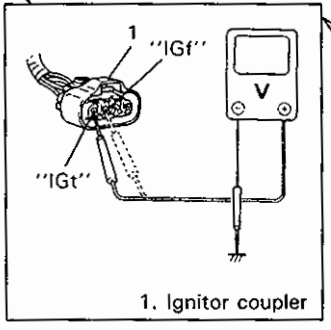
1. Remove ECM.
2. Is 0—2V or 4—5V obtained between B10 terminal (IGf) and ground when ignition switch is ON?
   Also, does voltage at engine cranking vary from that at ignition switch ON?

**NO**

"Br/Y" wire open or poor B9 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

**YES**

1. Check following parts referring to SECTION 6F.
   - Ignition coil
   - Noise suppressor
   - Wire harnesses and couplers
2. If all above are OK, replace ignitor.




**NO**

1. Disconnect ignitor coupler.
2. Is about 5V voltage obtained between "IGf" terminal of ignitor coupler and ground when ignition switch is ON?

**YES**

Substitute a known-good ECM and recheck.

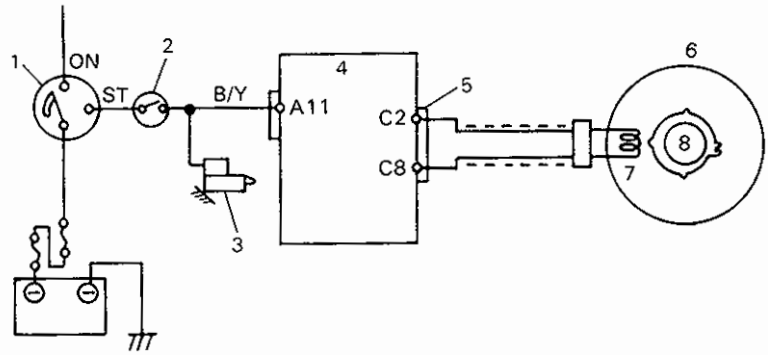
**NO**

"Y/R" wire open or poor B10 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

**YES**

Poor "IGf" connection of ignitor or faulty ignitor.

## CODE NO.42 CMP SENSOR (CAMSHAFT POSITION SENSOR) CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 2 SECONDS AT ENGINE CRANKING)




1. Main switch
2. Transmission range switch (A/T)
3. Starter
4. ECM
5. ECM coupler
6. Distributor
7. CMP sensor
8. Rotor

**NOTE:**
**If starter circuit is open (i.e., start signal circuit is OK but starter fails to run), code No.42 is stored in memory at starter switch ON, even though CMP sensor is in good condition.**
**When starter motor fails to run and code No.42 appears, check starter circuit first.**

Check signal rotor air gap referring to SECTION 6F.
Is it in good condition?

**YES** → Check CMP sensor referring to SECTION 6F.
Is it in good contion?

**NO** → Mal-adjusted air gap.

**YES** → Open wire between sensor and ECM, poor C2 connection, poor C8 connection or sensor wires shorted to each other.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

**NO** → Faulty CMP sensor.

**NOTE:**
**Upon completion of inspection and repair work, perform FINAL CHECK, referring to page 6E1-53 to confirm that the trouble has been corrected.**

## FINAL CHECK

Upon completion of inspection and repair work related to the above diagnostic trouble code, perform the final check as described below.

Erase Diagnostic. Trouble code stored in ECM memory.

↓

Perform driving test under the following conditions.

↓

1. Check that malfunction indicator light ("CHECK ENGINE" light) does not light during driving test.
2. Then make sure that Diag. Trouble Code No.12 is displayed when diag. switch terminal is grounded.
3. Unground diag. switch terminal.

↓ OK

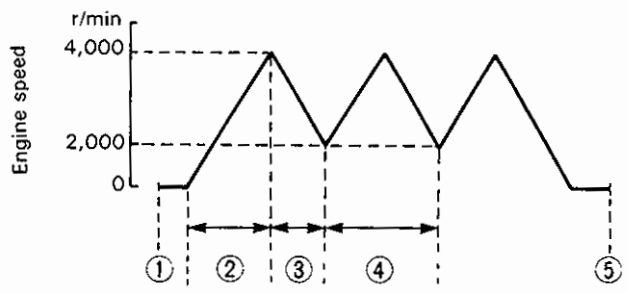
END

NG → Recheck and repair according to previous flow chart corresponding to that code No.

**WARNING:**

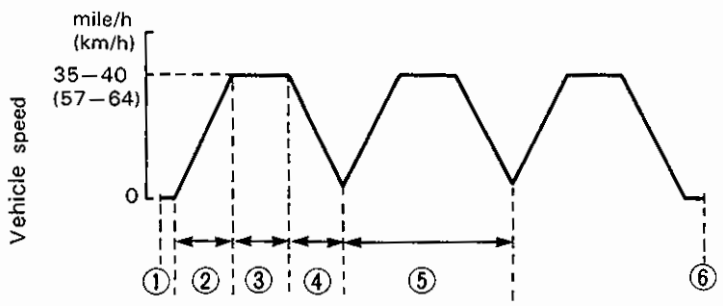
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

### Final Driving Test Condition for Code No.24




① : Start engine and warm up engine to normal operating temperature.
② : Increase engine speed to 4,000 r/min. in 3rd gear in case of M/T model and in "2" range in case of A/T model.
③ : Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 to 8 seconds till engine speed reaches 2,000 r/min.
④ : Repeat above steps ② and ③ 3 times or more.
⑤ : Stop vehicle and then engine.

### Final Driving Test Condition for Other than Code No. 24




① : Start engine and warm up engine to normal operating temperature.
② : Increase vehicle speed to 35 to 40 mile/h (57—64 km/h) in 3rd gear in case of A/T model.
③ : Keep driving at above vehicle speed for 25 to 30 seconds.
④ : Release accelerator pedal and with engine brake applied, keep vehicle coasting for 15 to 20 seconds.
⑤ : Repeat above steps ② to ④ 3 times or more.
⑥ : Stop vehicle and then engine.

## TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnosis function).

When diagnostic trouble code No.12 is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check following Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

| SYMPTOM | POSSIBLE CAUSE | INSPECTION |
|---|---|---|
| **Hard or no starting (Engine cranks OK)** | • Shortage of fuel in fuel tank | |
| | • Injector or its circuit faulty | Diagnostic flow chart B-2. |
| | • Faulty fuel pump or its circuit open | Diagnostic flow chart B-1. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Engine start signal not to fed | Diagnostic flow chart B-7. |
| | • Poor performance of IAT sensor, ECT sensor or MAP sensor | See p. 6E1-99, 6E1-100 or 6E1-94. |
| | • Faulty ECM | See p. 6E1-71. |
| **NOTE:**<br>**If engine is warm and hard to start but starts easily with accelerator pedal depressed, check idle air control valve and its circuit first. (Advance to "Diagnostic Flow Chart B-4".)** | | |
| **Engine fails to idle** | • Shortage of fuel in fuel tank | |
| | • Faulty idle air control valve or its circuit | Diagnostic flow chart B-4. |
| | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Injector or its circuit faulty | Diagnostic flow chart B-2. |
| | • Poor performance of IAT sensor, ECT sensor or MAP sensor | See p. 6E1-99, 6E1-100 or 6E1-94. |
| | • Faulty ECM | See p. 6E1-71. |

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| SYMPTOM | POSSIBLE CAUSE | INSPECTION |
|---|---|---|
| **Improper engine idle speed** | • Maladjusted accelerator cable play | See p. 6E1-77. |
| | • Clogged MAP sensor vacuum passage | Check vacuum hose and filter. |
| | • Vacuum leaks (or air inhaled) in air intake system | |
| | • Maladjusted idle speed adjusting screw | See p. 6E1-78. |
| | • Maladjusted TP sensor installation angle | See p. 6E1-97. |
| | • Faulty idle air control system | Diagnostic flow chart B-4. |
| | • Faulty evaporative emission control system (if equipped) | Diagnostic flow chart B-6. |
| | • Faulty idle switch in TP sensor | See p. 6E1-97 |
| | • Faulty A/C signal circuit (if equipped) | Diagnostic flow chart B-10. |
| | • Faulty electric load signal circuit | Diagnostic flow chart B-11. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Faulty injector(s) | See p. 6E1-91 |
| | • Poor performance of IAT sensor, ECT sensor or MAP sensor | See p. 6E1-99, 6E1-100 or 6E1-94. |
| | • Faulty ECM | See p. 6E1-71. |
| **NOTE:**<br>• **With engine warmed up, if engine idle speed is high even when idle speed adjsuting screw is tightened fully (in other words, if engine idle speed cannot be adjusted as specified with idle speed adjusting screw), check accelerator cable play and idle air control system in that order.**<br>• **If engine idle speed lowers below specification only when electric load is applied (e.g. headlight ON), check idle air control system first.**<br>• **With A/T model, if engine idle speed lowers below specification only when shifted to "R", "D", "2" or "L" range, check if "R", "D", "2" or "L" signal is inputted to ECM first.**<br>• **Idle speed adjusting screw of new vehicle is adjusted full closed position.** | | |
| **Engine has no or poor power** | • Maladjusted accelerator cable play | See p. 6E1-77. |
| | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Fuel pressure out of specification (Low fuel pessure) | Diagnostic flow chart B-3. |
| | • Fuel injector(s) | See p. 6E1-91. |
| | • Poor performance of TP sensor, IAT sensor, ECT sensor or MAP sensor | See p. 6E1-97, 6E1-99, 6E1-100 or 6E1-94. |
| | • Faulty ECM | See p. 6E1-71. |
| **Engine hesistates when accelerating** | • Clogged MAP sensor vacuum passage | Check vacuum hose and filter. |
| | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Fuel pressure out of specification (Low fuel pressure) | Diagnostic flow chart B-3. |
| | • Fuel injector(s) | See p. 6E1-91. |
| | • Poor performance of TP sensor, IAT sensor, ECT sensor or MAP sensor | See p. 6E1-97, 6E1-99, 6E1-100 or 6E1-94. |
| | • Faulty ECM | See p. 6E1-71. |

| SYMPTOM | POSSIBLE CAUSE | INSPECTION |
|---|---|---|
| **Surges (Variation in vehicle speed is felt although accelea-tor pedal is not operated)** | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Variable fuel pressure (Clogged fuel filter, faulty fuel pressure regulator, etc.) | Diagnostic flow chart B-3. |
| | • Poor performance of MAP sensor | See p. 6E1-94. |
| | • Faulty injector(s) | See p. 6E1-91. |
| | • Faulty ECM | See p. 6E1-71. |
| **Poor gasoline mileage** | • High idle speed | Refer to item "Improper engine idle speed" previously outlined. |
| | • Fuel pressure out of specification or fuel leakage | Diagnostic flow chart B-3. |
| | • Poor performance of TP sensor, IAT sensor or ECT sensor | See p. 6E1-97, 6E1-99 or 6E1-100. |
| | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Faulty injector(s) | See p. 6E1-91. |
| | • Faulty ECM | See p. 6E1-71. |
| **Excessive hydro-carbon (HC) emission** | • Engine not at normal operating temperature | |
| | • Clogged air cleaner | |
| | • Faulty ignition system | See section 6F. |
| | • Vacuum leaks | |
| | • Low compression | See section 6. |
| | • Lead contamination of three way catalytic converter | Check for absence of filler neck restrictor. |
| | • Faulty evaporative emission control system | Diagnostic flow chart B-6. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Closed loop system (A/F feed back compensation) fails (vehicle with oxygen sensor only) | |
| | — Faulty TP sensor | See p. 6E1-97. |
| | — Poor performance of ECT sensor or MAP sensor | See p. 6E1-100, or 6E1-94. |
| | • Maladjusted CO adjusting resistor (vehicle without oxygen sensor only) | See p. 6E1-80. |
| | • Poor performance of IAT sensor | See p. 6E1-99. |
| | • Faulty injector(s) | See p. 6E1-91. |
| | • Faulty ECM | See p. 6E1-71. |

| SYMPTOM | POSSIBLE CAUSE | INSPECTION |
|---|---|---|
| **Excessive carbon monoxide (CO)** | • Engine not at normal operating temperature | |
| | • Clogged air cleaner | |
| | • Faulty ignition system | See section 6F. |
| | • Low compression | See section 6. |
| | • Lead contamination of three way catalytic converter | Check for absence of filler neck restrictor. |
| | • Faulty evaporative emission control system if equipped) | Diagnostic flow chart B-6. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Closed loop system (A/F feed back compensation) fails (vehicle with oxygen sensor only) | |
| | — Faulty TP sensor | See p. 6E1-97. |
| | — Poor performance of ECT sensor or MAP sensor | See p. 6E1-100 or 6E1-94. |
| | • Maladjusted CO adjusting resistor (vehicle without oxygen sensor only) | See p. 6E1-80. |
| | • Poor performance of IAT sensor | See p. 6E1-99. |
| | • Faulty injector(s) | See p. 6E1-91. |
| | • Faulty ECM | See p. 6E1-71. |
| **Excessive nitrogen oxides (NOx) emission** | • Improper ignition timing | See section 6F. |
| | • Lead contamination of catalytic converter | Check for adsence of filler neck restrictor. |
| | • Faulty EGR system (if equipped) | Diagnostic flow chart B-5. |
| | • Fuel pressure out of specification | Diagnostic flow chart B-3. |
| | • Closed loop system (A/F feed back compensation) fails (vehicle with oxygen sensor only) | |
| | — Faulty TP sensor | See p. 6E1-97. |
| | — Poor performance of ECT sensor or MAP sensor | See p. 6E1-100 or 6E1-94. |
| | • Maladjusted CO adjusting resistor (vehicle without oxygen sensor only) | See p. 6E1-80. |
| | • Poor performance of IAT sensor | See p. 6E1-99. |
| | • Faulty injector(s) | See p. 6E1-91. |
| | • Faulty ECM | See p. 6E1-71. |

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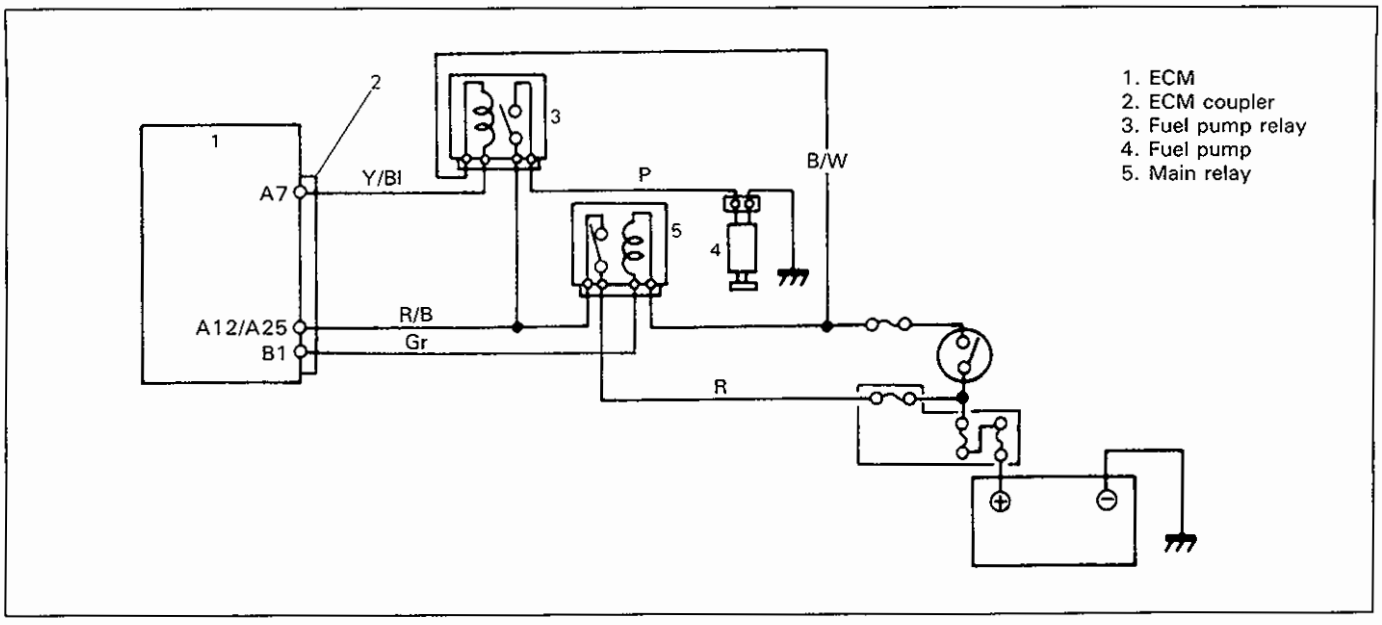
## B-1 FUEL PUMP AND ITS CIRCUIT CHECK




Is fuel pump heard to operate 2 sec. after ignition switch ON?

**YES**

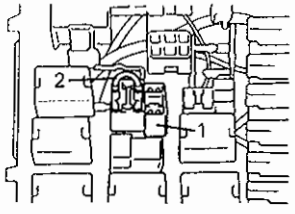
Fuel pump circuit in good condition.

**NO**

1. Remove fuel pump relay from relay box.
2. Using service wire, connect two terminals of relay box as shown in figure.

**CAUTION:**
**Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.**

3. Is fuel pump heard to operate at ignition switch ON.




1. Fuel pump relay coupler
2. Service wire

**YES**

Check fuel pump relay referring to p. 6E1-103.
Is it in good condition?

**NO**

"R/B" or "P" wire open, poor fuel pump coupler connection or faulty fuel pump.

**YES**

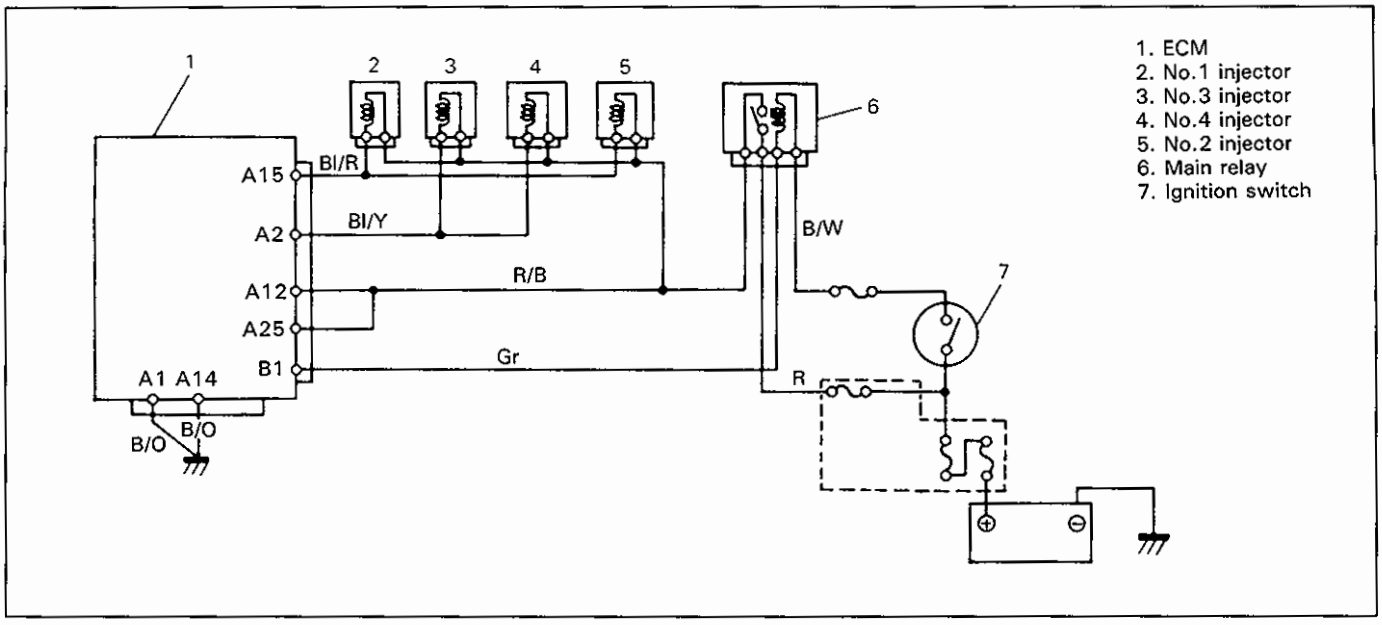
Poor relay coupler connection, "B/W" wire or "Y/Bl" wire open or poor A7 connection. If wire and connection are OK, substitute a known-good ECM and recheck.

**NOTE:**
**Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.**

**NO**

Faulty fuel pump relay.

## B-2 FUEL INJECTOR CIRCUIT CHECK




Using sound scope, check each injector for operating sound at engine cranking.
Do all 4 injectors make operating sound?

**YES** → Fuel injector circuit is in good condition.

**NO** →

- None of 4 injectors makes operating sound. To ① on next page.
- 2 of 4 injectors make no operating sound. To ② on next page.
- One of 4 injectors makes no operating sound. → Check coupler connection of injector not making operating sound and injector itself (Refer to p. 6E1-91.)

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①

None of 4 injectors makes operating sound.

↓

Check power circuit for open or short.
Is it normal?

↓ YES

Check all 4 injectors for resistance respectively.
If resistance is OK, substitute a known-good ECM and recheck.

NO →

Power circuit open or short.

②

2 of 4 injectors make no operating sound.

↓

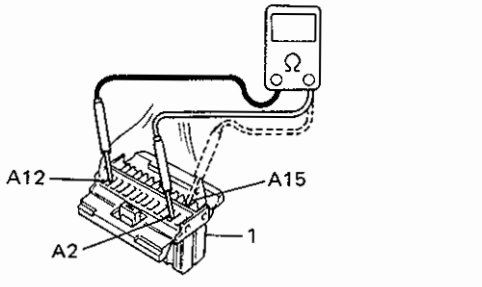
1. Disconnect ECM couplers with ignition switch OFF.
2. Is resistance between A2 (or A15) and A12 6—8 Ω?

↓ YES

Poor A2 or A15 connection.
If connection is OK, substitute a known-good ECM and recheck.

NO →

"Bl/R" or "Bl/Y" circuit open.



1. ECM coupler disconnected

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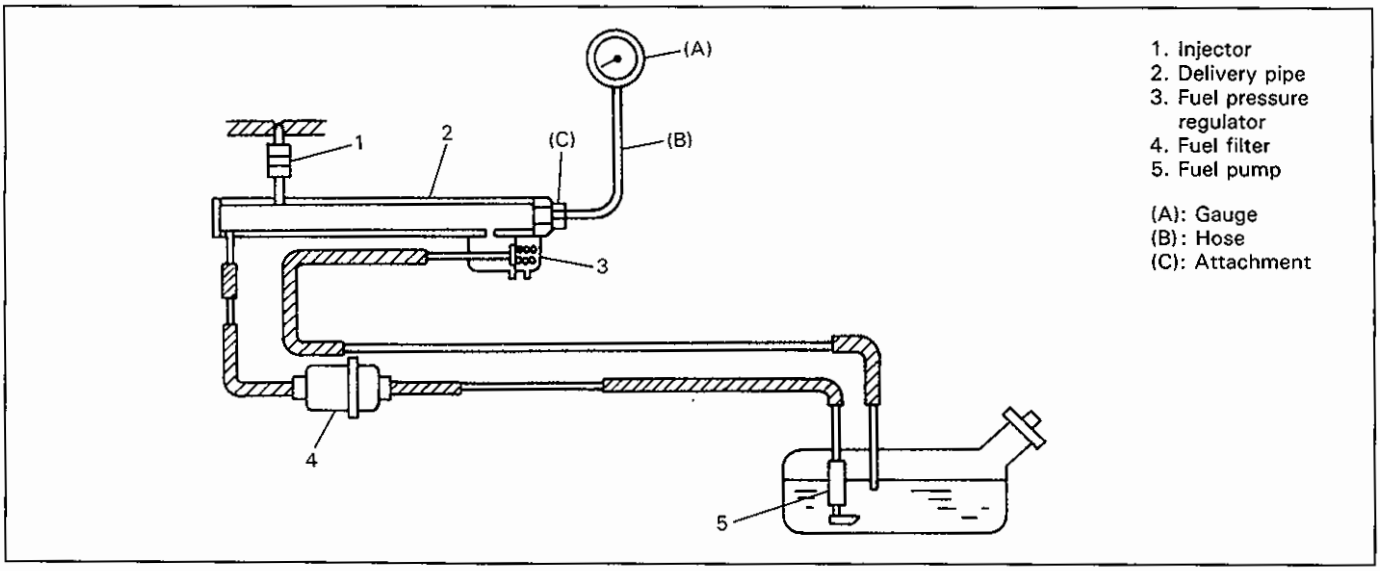
## B-3 FUEL PRESSURE CHECK




1. Install fuel pressure gauge referring to p. 6E1-86.
2. Operate fuel pump according to procedure described on p. 6E1-87.
   Is fuel pressure then 270—310 kPa (2.7—3.1 kg/cm², 38.4—44.0 psi)? Also, is 200 kPa (2.0 kg/cm², 28.4 psi) or higher fuel pressur retained for 1 minute after fuel pump is stopped?

NO → No pressure
To ① on next page

NO → Pressure within spec. but not retained
To ② on next page

NO → Low pressure
To ③ on next page

NO → High pressure
To ④ on next page

YES

1. Start engine and warm it up to normal operating temperature.
2. Keep it to specified idle speed.
   Is fuel pressure then 200—240 kPa (2.0—1.4 kg/cm², 28.4—34.1 psi)?

YES → Normal fuel pressure.

NO →
- Clogged vacuum passage for fuel pressure regulator or
- Faulty fuel pressure regulator.

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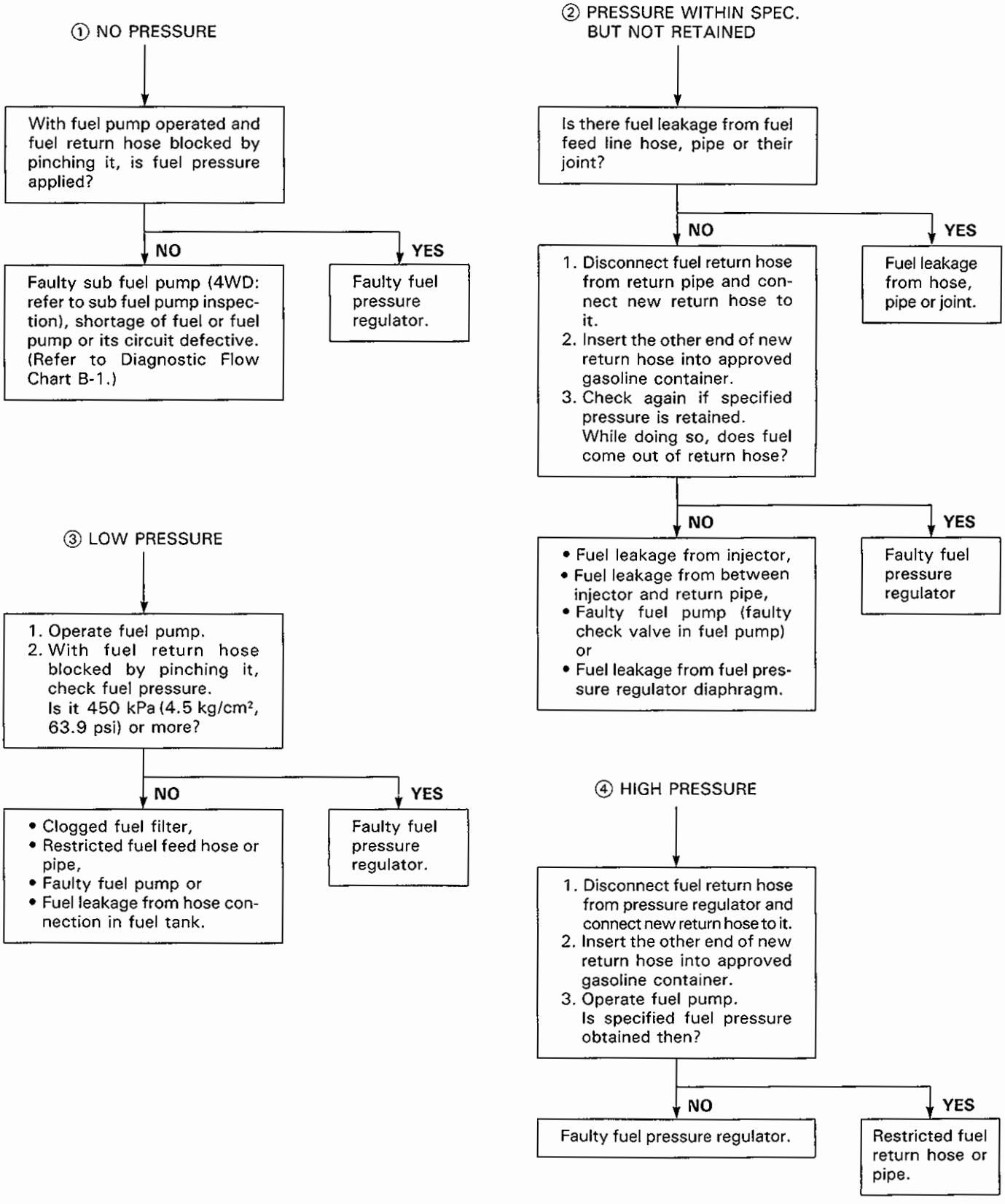
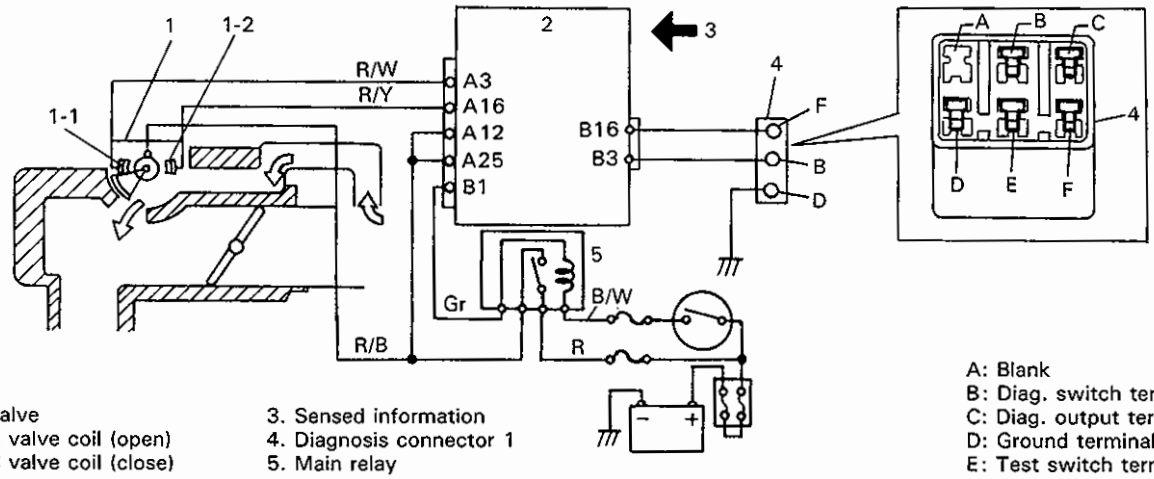
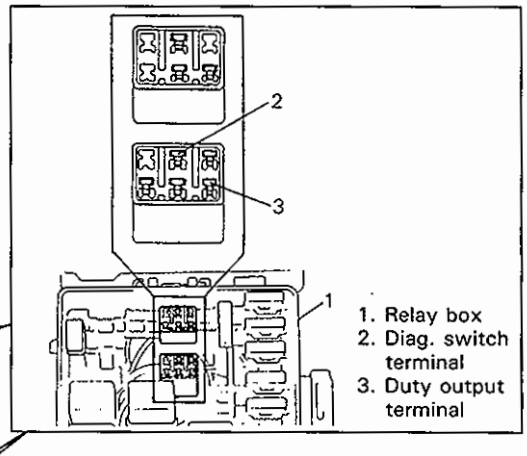
## B-3 FUEL PRESSURE CHECK (continued)



## B-4 IDLE AIR CONTROL SYSTEM CHECK




1. Warm up engine to normal operating temperature and keep it idling.
2. Using service wire, ground diagnosis switch terminal.
3. Is diagnostic trouble code No.12 indicated.

YES

Check idle air control duty (IAC duty) and idle speed referring to p. 6E1-78.
Are they within specification?

NO

Go back to Diagnostic Flow Chart in Section 6.

NO

High idle speed
To ① on next page

NO

Low idle speed
To ② on next page

YES

Idle speed is within specification but duty is not.
1. Adjust IAC duty to specification referring to p. 6E1-78.
2. Proceed to next step.

Is engine idle speed kept specified speed (refer to p. 6E1-27) even with headlights turned ON.

YES

System is in good condition.

NO

Check IAC valve for its resistance and/or operation. (Refer to p. 6E1-84.)
Is it in good condition?

NO

Faulty IAC valve.

YES

Proceed to system circuit check ③ on next page.

## B-4 IDLE AIR CONTROL SYSTEM CHECK (continued)

① HIGH IDLE SPEED

Check IAC valve for its resistance and/or operation. (Refer to p. 6E1-84.) Is it in good condition?

YES → Does duty meter indicate less than about 3% (or more than about 97% for OFF duty meter)?

NO → Faulty IAC valve.

NO → Faulty idle switch, ECT sensor or its circuit. If all above are OK, substitute a known-good ECM and recheck.

YES → Adjust idle speed and duty referring to p. 6E1-78.

**NOTE:**
**If not adjustable with idle speed adjusting screw, check "R/W" circuit for short, "R/Y" circuit open or abnormal air inhaling from air intake system.**

② LOW IDLE SPEED

Check IAC valve for its resistance and/or operation. (Refer to p. 6E1-84.) Is it in good condition?

YES → Does duty meter indicate more than about 20% or *30% (or less than about 80% or *70% for OFF duty meter)?

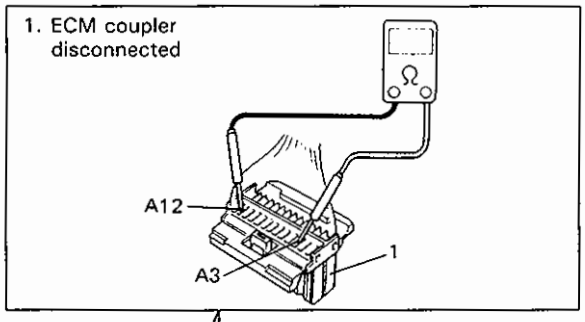
**NOTE:**
**Duty values with (*) are applicable to vehicle used at high place (higher than 2,000 m or 6,560 ft).**

NO → Faulty IAC valve.

NO → Substitute a known-good ECM and recheck.

YES → Proceed to system circuit check ③ .

③ SYSTEM CIRCUIT CHECK




1. Disconnect ECM couplers with ignition switch OFF.
2. Is resistance between A3 and A12, 18.8–22.8 Ω?

YES →
1. Connect ECM couplers with ignition switch OFF.
2. Check voltage at "A16" terminal with ignition switch ON. Is it 10–14V?

YES → Poor ECM coupler connection, faulty idle switch or its circuit. If all above are OK, substitute a known-good ECM and recheck.

NO → "R/Y" wire short to ground or "R/B" wire open. If wires are OK, substitute a known-good ECM and recheck.

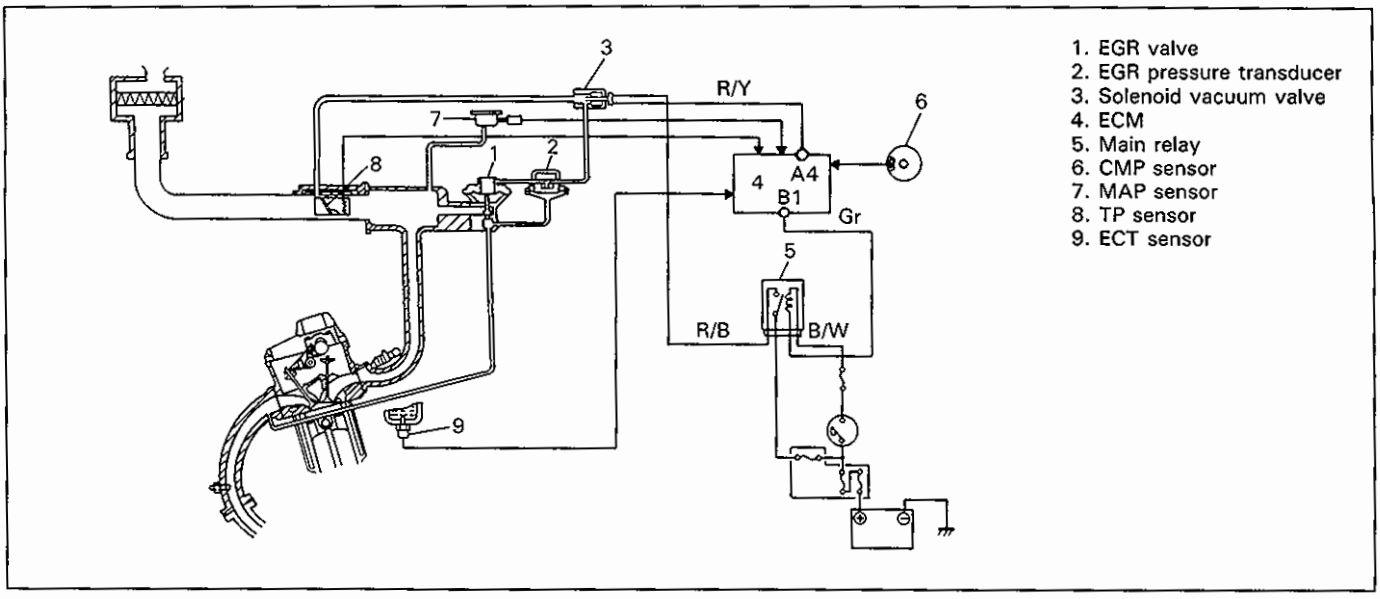
NO →
- "R/W" wire open or
- Poor IAC valve or ECM coupler connection.

**NOTE:**
**IAC duty can be checked by using analog type voltmeter with high impedance (MΩ/V minimum), although not accurate. IAC duty to voltage relation is as follows.**

| ON DUTY METER INDICATION | OFF DUTY METER INDICATION | VOLTMETER INDICATION |
|---|---|---|
| 0 (%) | 100 (%) | 0 (V) |
| 3 | 97 | 0.03 x $V_B$ |
| 20 | 80 | 0.20 x $V_B$ |
| 30 | 70 | 0.30 x $V_B$ |

- **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".**
- **"$V_B$" represents battery voltage while engine of vehicle being checked is running.**

## B-5 EGR SYSTEM (FAULTY EGR SYSTEM) (if equipped)




Check EGR system referring to p. 6E1-104.
Is it in good contion?

**NO**

Check vacuum hose, EGR valve and EGR pressure transducer referring to p. 6E1-104.
Are they in good condition?

**YES**

Intermittent trouble or faulty ECM.
Recheck referring to "intermittent trouble" on p. 6E1-35.

**YES**

Check solenoid vacuum valve referring to p. 6E1-106.
Is it in good condition?

**NO**

- Vacuum hose misconnection, leakage, clog or deterioration.
- Faulty EGR valve or
- Faulty EGR pressure transducer.

**YES**

- "R/Y" wire open,
- "R/B" wire open,
- "R/Y" wire shorted to ground or power circuit,
- Poor solenoid vacuum valve coupler connection or
- Poor A4 connection.

If wire and connection are OK, substitute a known-good ECM and recheck.

**NO**

Faulty solenoid vacuum valve.

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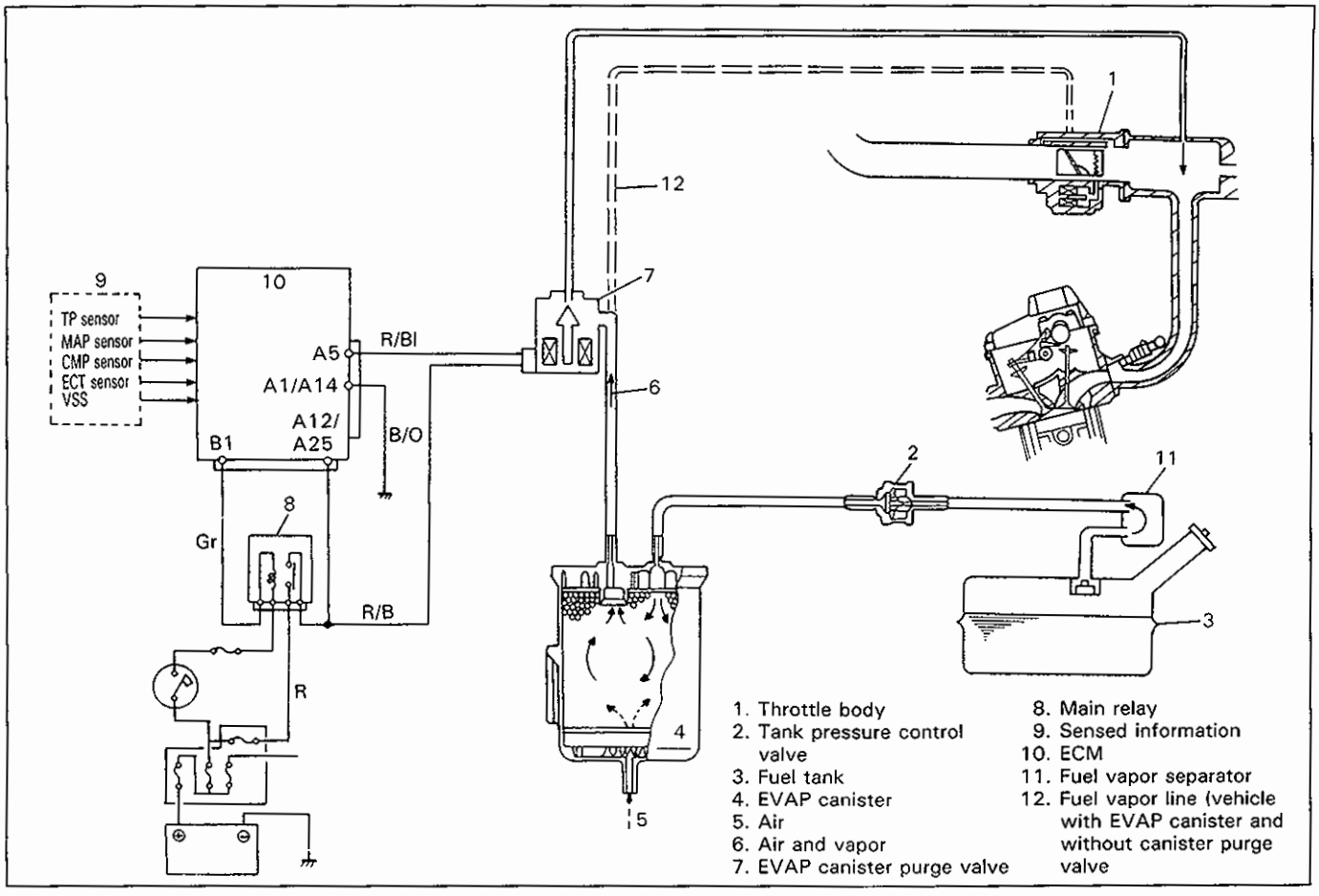
## B-6 EVAPORATIVE EMISSION CONTROL SYSTEM CHECK (if equipped)




1. Throttle body
2. Tank pressure control valve
3. Fuel tank
4. EVAP canister
5. Air
6. Air and vapor
7. EVAP canister purge valve
8. Main relay
9. Sensed information
10. ECM
11. Fuel vapor separator
12. Fuel vapor line (vehicle with EVAP canister and without canister purge valve

Check canister purge system for operation referring to p. 6E1-110.
Is it in good condition?

**NO**

Check vacuum passage, hoses and EVAP canister purge valve referring to p. 6E1-110.
Are they in good condition?

**YES**

- "R/Bl" wire open,
- "R/Bl" wire shorted to ground,
- Poor EVAP canister purge valve coupler connection,
- Poor A5 connection,
- Poor performance of ECT sensor or MAP sensor or
- Faulty idle switch

If none of the above exists, substitute a known-good ECM and recheck.

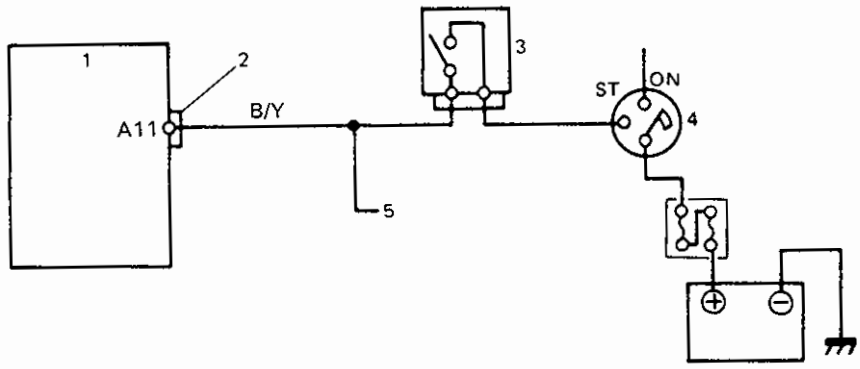
**NO**

- Vacuum passage clogged,
- Vacuum leakage or
- Faulty EVAP canister purge valve

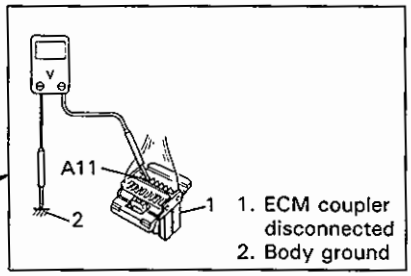
**YES**

Check EVAP canister, tank pressure control valve and fuel filler cap.

## B-7 ENGINE START SIGNAL CHECK




1. ECM
2. ECM coupler
3. Transmission range switch (A/T)
4. Main switch
5. To starting motor




1. ECM coupler disconnected
2. Body ground

1. With ignition switch OFF, disconnect couplers from ECM.
2. Is 6—12V voltage applied to A11 terminal of coupler only when cranking engine.

YES → Engine start signal circuit is in good condition.

NO → • Wire open
• Poor connection or
• Faulty transmission range switch (A/T).

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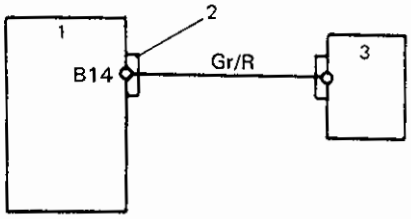
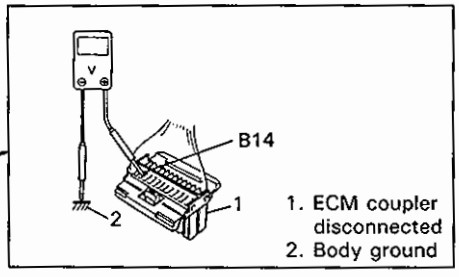
## B-8 TRANSMISSION RANGE SIGNAL ("R", "D", "2" OR "L" RANGE SIGNAL) CHECK (A/T MODEL ONLY)




1. ECM
2. ECM coupler
3. Transmission control module




1. ECM coupler disconnected
2. Body ground

1. With ignition switch OFF, disconnect couplers from ECM.
2. Turn ignition switch ON and check voltage at B14 terminal of coupler under each condition give in table below.

| | |
|---|---|
| Selector lever in "P" or "N" range position | 0V |
| Selector lever in "R", "D", "2" or "L" range position | 10—14V |

Is check result satisfactory?

YES → Signal circuit is in good condition.

NO → • Wire open or
• Poor connection
If wire and connection are OK, check A/T control system referring to Section 7B or 7B1.

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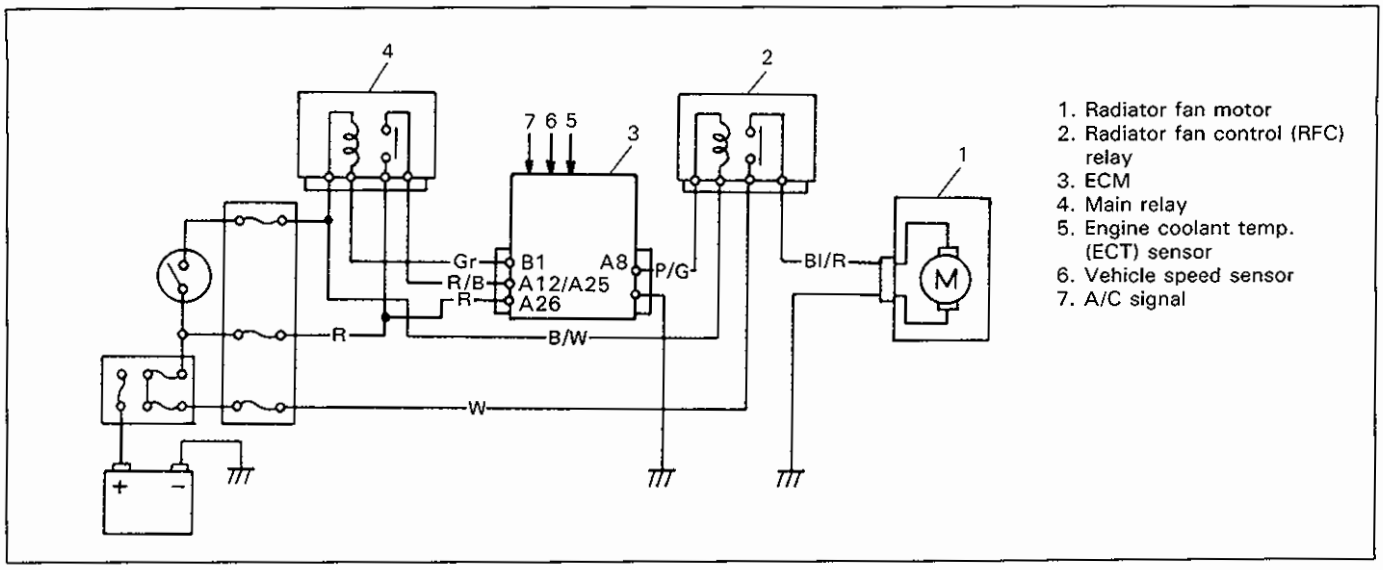
## B-9 RADIATOR FAN CONTROL SYSTEM CHECK




1. Radiator fan motor
2. Radiator fan control (RFC) relay
3. ECM
4. Main relay
5. Engine coolant temp. (ECT) sensor
6. Vehicle speed sensor
7. A/C signal

Check radiator fan control system referring to p. 6E1-109.
Is it in good condition?

YES → RFC system is in good condition.

NO → Check RFC relay referring to p. 6E1-109.
Is it in good condition?

YES → Check wire harnesses and connections for open or short.
Are they in good condition?

YES → Poor performance of ECT sensor. If ECT sensor is OK, substitute a known-good ECM and recheck.

NO → • Wire open or short,
• Poor connection.

NO → Faulty RFC relay.

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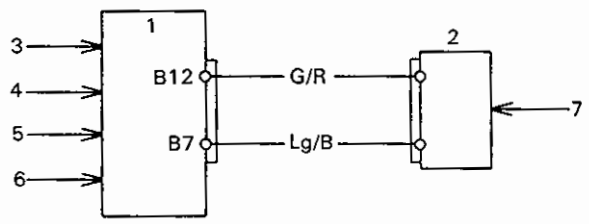
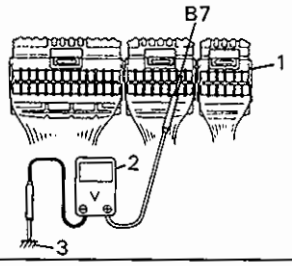
## B-10 A/C ON SIGNAL CHECK (VEHICLE WITH A/C ONLY)




1. ECM
2. A/C amplifier
3. TP sensor signal
4. ECT sensor signal
5. CMP sensor signal
6. Engine start signal
7. Sensed information (Refer to Section 1B)

| Check voltage at B7 terminal. Are check results as specified below? | |
|---|---|
| While engine running and A/C switch ON | About 0V |
| While engine running and A/C switch OFF | 10—14V |

**NOTE:**
**When evaporator thermister temp. is below 1°C (34°F), A/C is not turn ON (B7 terminal voltage is not become about 0V). It is not abnormal.**



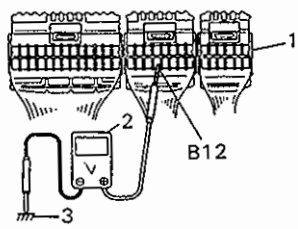

1. ECM
2. Voltmeter
3. Body ground

**YES**

**NO**

- "Lg/B" wire open or short,
- Poor B7 connection,
- Poor A/C Amplifier coupler connection or faulty A/C system.

| Check voltage at B12 terminal. Are check results as specified below? | |
|---|---|
| While engine running and A/C switch ON | about 5V |
| While engine running and A/C switch OFF | About 0V |




1. ECM
2. Voltmeter
3. Body ground

**YES**

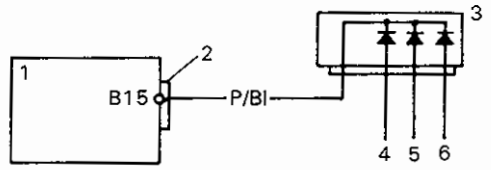
A/C control signal circuit is in good condition.

**NO**

- "G/R" wire open or short,
- Poor performance of ECT sensor, TP sensor,
- Engine start signal inputted or
- Poor B12 connection.

If none of the above exists, substitute a known-good ECM and recheck.

## B-11 ELECTRIC LOAD SIGNAL CIRCUIT

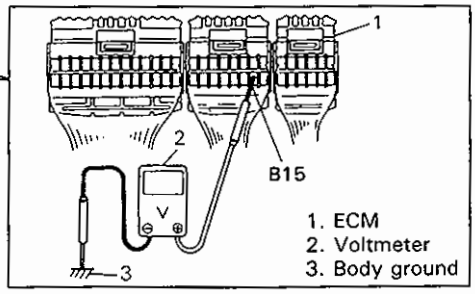



1. ECM
2. ECM coupler
3. Electric load signal diodes (in junction/fuse block)
4. From lighting switch (small)
5. From rear defogger switch
6. From heater blower switch

Check voltage at B15 terminal under each condition given in table below.

| | |
|---|---|
| Ignition switch ON<br>Small light, heater blower fan and rear defogger all turned OFF | 0V |
| Ignition switch ON<br>Small light, heater blower fan or rear defogger turned ON | 10—14V |

Is check result satisfactory?




1. ECM
2. Voltmeter
3. Body ground

YES

Electric load signal circuit is in good condition.

NO

- P/BI wire open or short,
- Electric load signal diodes faulty or
- Electric load signal wire (electric load to junction/fuse block) open or short.

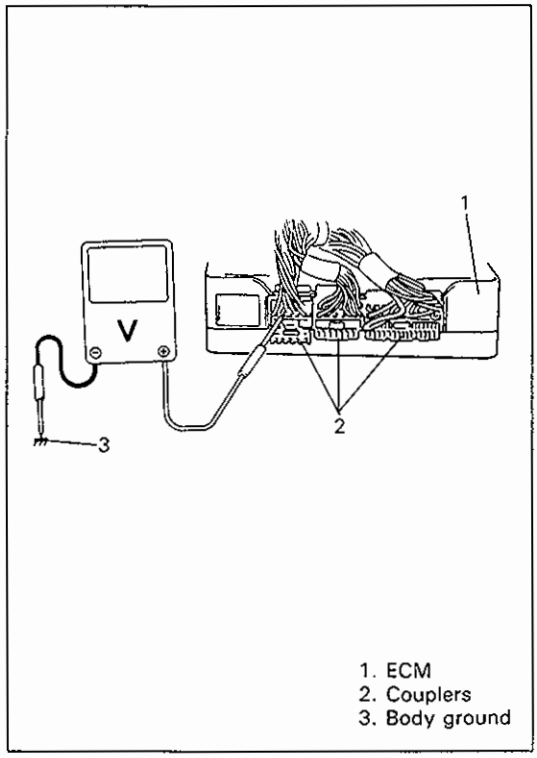
60G00-6E1-72-1

## INSPECTION OF ECM AND ITS CIRCUITS

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

**CAUTION:**
**ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with coupler disconnected from it.**

64B40-6E-65-1



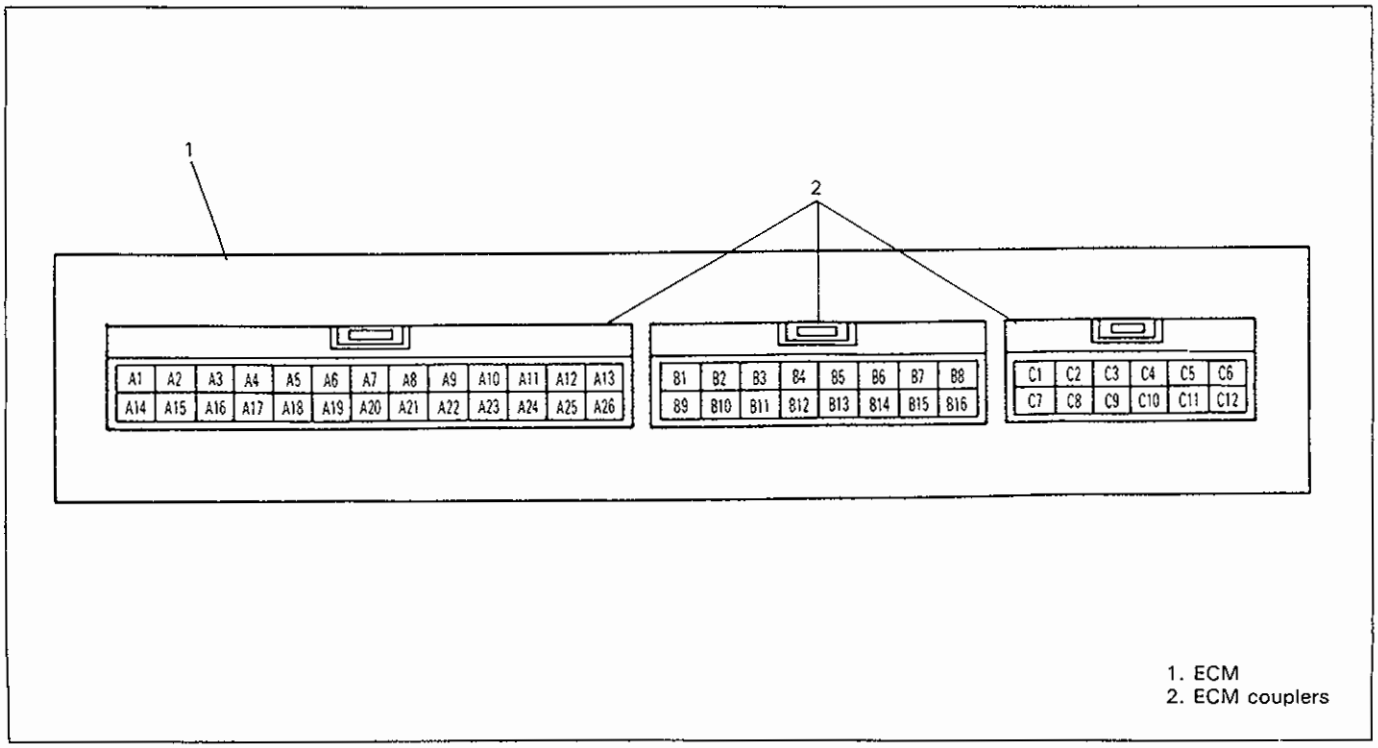

1. ECM
2. Couplers
3. Body ground

61G00-6E1-71-2

### Voltage Check

1) Remove ECM from body with ignition switch OFF referring to p. 6E1-94.
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal of couplers connected.

**NOTE:**
**As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.**



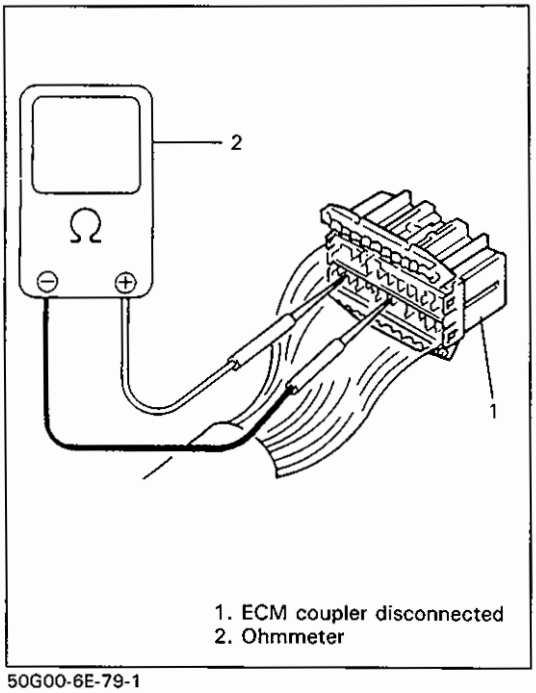

1. ECM
2. ECM couplers

50G00-6E-75-4

| TER-MINAL | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|
| A1 | Ground | ——— | ——— |
| A2 | Injector (No.3 and No.4) | 10—14V | Ignition switch ON |
| A3 | IAC valve (open) | 9.8—14V | Warmed up engine running at idle speed |
| A4 | EGR solenoid vacuum valve (if equipped) | 10—14V | Ignition switch ON |
| A5 | EVAP canister purge valve (if equipped) | 10—14V | Ignition switch ON |
| A6 | Blank | ——— | ——— |
| A7 | Fuel pump relay | 0.5—1.8V | For 2 seconds after ignition switch ON |
| | | 10—14V | After the above time |
| A8 | Radiator fan control relay | 10—14V | Ignition switch ON |
| | | 0.3—1.0V | Ignition switch ON<br>When engine cooling fan ON |
| A9 | Blank | ——— | ——— |
| A10 | Power steering pressure switch (if equipped) | 10—14V | Ignition switch ON |
| | | 0—1V | With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times |
| A11 | Engine start switch (Engine start signal) | 6—12V | While engine cranking |
| | | about 0V | Other than above |
| A12 | Power source | 10—14V | Ignition switch ON |
| A13<br>A14 | Ground | ——— | ——— |
| A15 | Injector (No.1 and No.2) | 10—14V | Ignition switch ON |
| A16 | IAC valve (close) | 0—4.2V | Warmed up engine running at idle speed |
| A17<br>A18<br>A19<br>A20<br>A21<br>A22<br>A23 | Blank | ——— | ——— |
| A24 | Ground | ——— | ——— |
| A25 | Power source | 10—14V | Ignition switch ON |
| A26 | Power source for back-up circuit | 10—14V | Ignition switch ON and OFF |

| TER-MINAL | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|
| B1 | Main relay | 0.4—1.0V | Ignition switch ON |
| B2 | Malfunction indicator lamp (''CHECK ENGINE'' light) | 0.5—2.0V | Ignition switch ON |
| | | 10—14V | When engine running |
| B3 | Duty output terminal | 0V | Ignition switch ON |
| B4 | Blank | —— | —— |
| B5 (A/T only) | Transmission control module (Throttle valve opening signal) | Ignition switch ON<br>Voltage varies as specified in figure in p. 6E1-107 (3 A/T) or 6E1-108 (4 A/T) while throttle valve is opened gradually. | |
| B6 | Data link connector (serial data terminal) | 4—5V | Ignition switch ON |
| B7 | A/C amplifier (A/C ON signal) (if equipped) | 10—14V | While engine running and A/C OFF |
| | | 0—0.6V | While engine running and A/C ON |
| B8 | Test switch terminal | 10—14V | Ignition switch ON |
| B9 | Ignition trigger signal | 0—1V | Ignition switch ON |
| B10 | Ignition fail safe signal | 0—1V | Ignition switch ON |
| B11 (3 A/T only) | Transmission control module (Throttle valve opening signal, 3 A/T) | Ignition switch ON<br>Voltage varies as specified in figure in p. 6E1-107 while throttle valve is opened gradually. | |
| B12 | A/C amplifier (A/C cut signal) (if equipped) | about 0V | While engine running and A/C OFF |
| | | 10—14V | While engine running and A/C ON |
| B13 (A/T only) | Transmission contro module (Throttle valve opening signal, 3 A/T) | Ignition switch ON<br>Voltage varies as specified in figure in p. 6E1-107 with throttle valve is opened gradually. | |
| | Transmission control module (Engine coolant temp. signal, 4 A/T) | 0—1V (0% ON duty) | Engine coolant temp.: Below 0°C |
| | | 3.4—4.6V (33% ON duty) | Engine coolant temp.: Between 0°C—50°C |
| | | 6.7—9.3V (67% ON duty) | Engine coolant temp.: Above 50°C |
| B14 (A/T only) | Transmission control module (Transmission range switch signal) | About 0V (3 A/T) | Ignition switch ON, selector lever in ''P'' or ''N'' range position. |
| | | 10—14V (4 A/T) | |
| | | 10—14V (3 A/T) | Ignition switch ON, selector lever in ''R'', ''D'', ''2'' or ''L'' range position. |
| | | About 0V (4 A/T) | |
| B15 | Electric load signal | About 0V | Ignition switch ON<br>Headlight, small light, heater fan or rear defogger turned ON |
| | | 10—14V | Ignition switch ON<br>Headlight, small light, heater fan or rear defogger turned ON |
| B16 | Diagnosis switch terminal | 10—14V | Ignition switch ON |

| TER-MINAL | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|
| C1 | Vehicle speed sensor | Indicator deflection repeated 0—1V and 4—6V | Ignition switch ON<br>Front left tire turned quickly with front right tire locked |
| C2 | Camshaft position sensor (positive) | 0.4—0.8V | Ignition switch ON |
| C3 | Manifold absolute pressure sensor | 3.3—4.0V | Ignition switch ON<br>Barometric pressure = 760 mmHg |
| C4 | Throttle position sensor | 0.18—1.03V | Ignition switch ON<br>Throttle valve at idle position |
| | | 3.27—4.58V | Ignition switch ON<br>Throttle valve at full open position |
| C5 | Engine coolant temp. sensor | 0.55—0.95V | Ignition switch ON<br>Engine coolant temp.: 80°C (176°F) |
| C6 | Power source for sensors (MAP sensor and TP sensor) | 4.75—5.25V | Ignition switch ON |
| C7 | Idle switch (in TP sensor) | about 0V | Ignition switch ON<br>Throttle valve at idle position |
| | | 10—14V | Ignition switch ON<br>Throttle valve opens larger than idle position |
| C8 | Camshaft position sensor (negative) | 0.4—0.8V | Ignition switch ON |
| C9 | Oxygen sensor (if equipped) | Indicator deflection repeated between over and under 0.45V | While engine running at 2,000 r/min for 1 minute or longer after warmed up |
| | CO adjusting resistor (vehicle without oxygen sensor) | Ignition switch ON<br>Voltage varies as specified in figure in p. 6E1-19 while CO adjusting resistor knob is turned gradually. | |
| C10 | Blank | ——— | ——— |
| C11 | Intake air temp. sensor | 2.0—2.7V | Ignition switch ON<br>Sensor ambient temp. (Intake air temp.): 20°C (68°F) |
| C12 | Ground for sensors | 0V | Ignition switch ON |




1. ECM coupler disconnected
2. Ohmmeter

50G00-6E-79-1

**Resistance Check**

1) Disconnect ECM couplers from ECM with ignition switch OFF.

> **CAUTION:**
> **Never touch terminals of ECM itself or connect voltmeter or ohmmeter.**

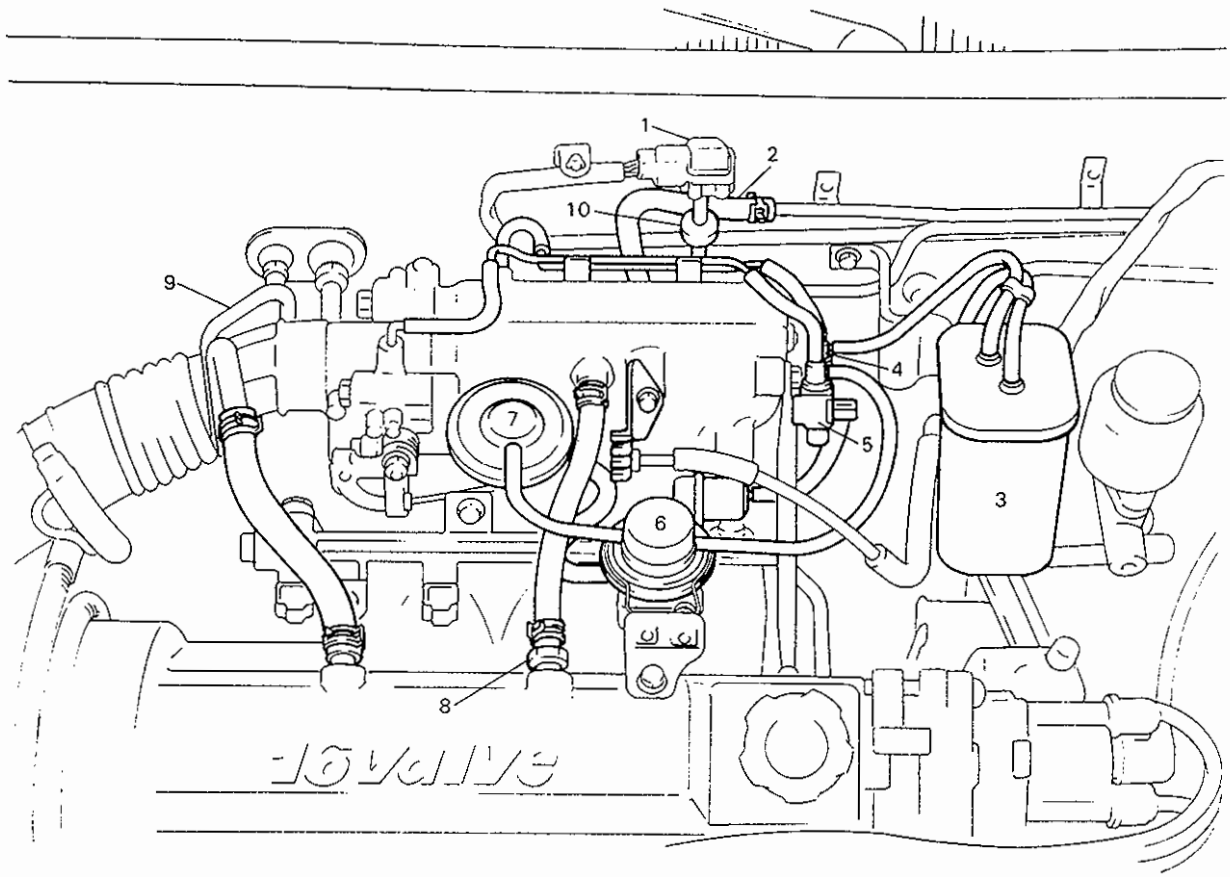
2) Check resistance between each terminal of couplers disconnected.

> **CAUTION:**
> - **Be sure to connect ohmmeter probe from wire harness side of coupler.**
> - **Be sure to turn OFF ignition switch for this check.**
> - **Resistance in table below represents that when parts temperature is 20°C (68°F).**

| TERMINALS | CIRCUIT | NORMAL RESISTANCE | CONDITION |
|---|---|---|---|
| A2 —A12/A25 | Injector (No.3 and No.4) | 6.0—8.0 Ω | ——— |
| A3 —A12/A25 | IAC valve (open) | 19.3—22.3 Ω | ——— |
| A4 —A12/A25 | EGR solenoid vacuum valve (if equipped) | 33—39 Ω | ——— |
| A5 —A12/A25 | EVAP canister purge valve (if equipped) | 33—39 Ω | ——— |
| A7 —B1 | Fuel pump relay and main relay | 140—220 Ω | ——— |
| A8 —B1 | Radiator fan control relay and main relay | 140—220 Ω | ——— |
| A15—A12/A25 | Injector (No.1 and No.2) | 6.0—8.0 Ω | ——— |
| A16—A12/A25 | IAC valve (close) | 18.8—22.8 Ω | ——— |
| C2 —C8 | Camshaft position sensor | 205—255Ω | ——— |
| C5 —C12 | ECT sensor | 305—331 Ω | Engine coolant temp.: 80°C (176°F) |
| C7 —C12 | Idle swith in TP sensor | Continuity | Throttle valve at idle position |
| | | ∞ (Infinity) | Throttle valve opens lager than idle position |
| C9 —C12 | CO adjusting resistor (vehicle without oxygen sensor) | 0—50 kΩ with MAP sensor and TP sensor coupler disconnected | Resistance depending on CO adjusting resistor knob position |
| C11—C12 | IAT sensor | 2.21—2.69 kΩ | Intake air temp.: 20°C (68°F) |

61G00-6E1-75-1

# ON-VEHICLE SERVICE

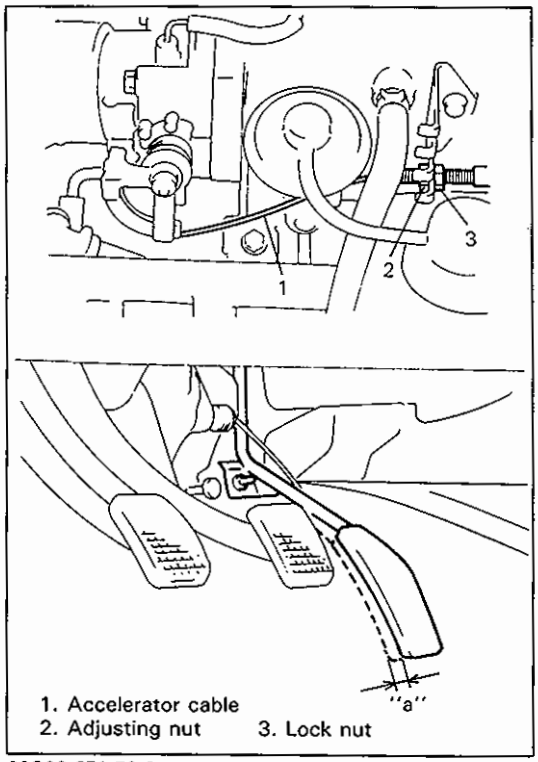



1. MAP sensor
2. Brake booster vacuum hose (if equipped)
3. EVAP canister
4. EVAP canister purge valve (if equipped)
5. EGR solenoid vacuum valve
6. EGR pressure transducer — (if equipped)
7. EGR valve
8. PCV valve
9. Breather heater pipe
10. Gas filter — (if equipped)

## GENERAL

When hoses are disconnected and system components are removed for service, reinstall components properly, and route and connect hoses correctly after service. Refer to figure on prervious page for proper routing of hoses.

60A70-6E1-78-1S




1. Accelerator cable
2. Adjusting nut
3. Lock nut

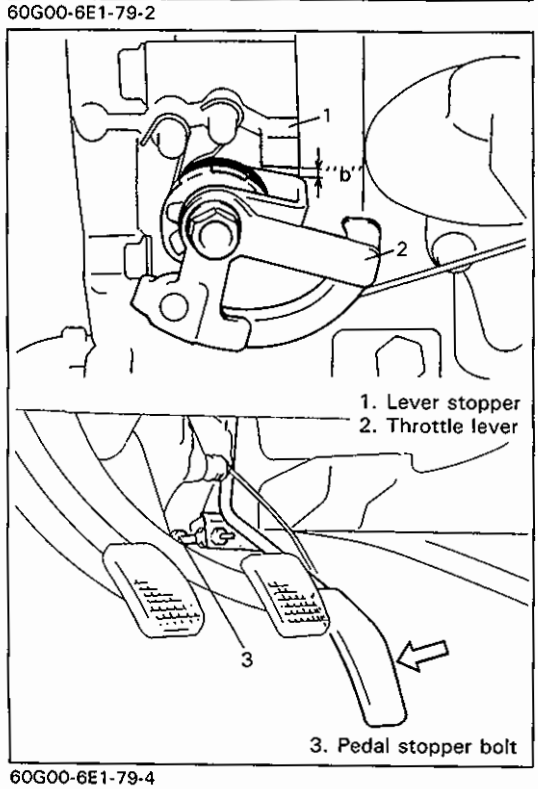
60G00-6E1-79-2

## ACCELERATOR CABLE ADJUSTMENT

1) With throttle valve closed, check accelerator pedal play which should be within following specification.

**Pedal play "a": 2—7 mm (0.08—0.27 in.)**

If measured value is out of specification, adjust it to specification with cable adjusting nut.




1. Lever stopper
2. Throttle lever
3. Pedal stopper bolt

60G00-6E1-79-4

2) With accelerator pedal depressed fully, check clearance between throttle lever and lever stopper (throttle body) which should be within following specification.

**Clearance "b" : 0.5—2.0 mm (0.02—0.07 in.)**
**(With pedal depressed fully)**

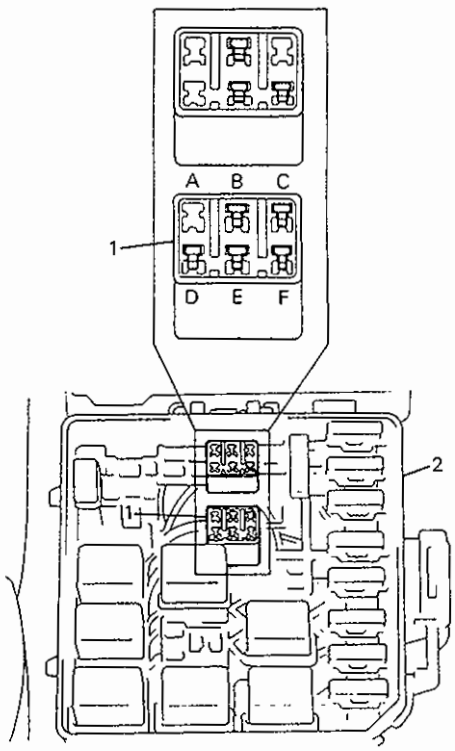
If measured value is out of specification, adjust it to specification by changing height of pedal stopper bolt.

## IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION

Before idle speed/IAC duty check and adjustment, make sure of the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked and adjusted according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air inhalling from air intake system.

60G00-6E1-80-1




1. Diagnosis connector 1
2. Relay box

A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

60G00-6E1-80-3

After above items are all confirmed, check idle speed and IAC duty as follows.

**NOTE:**
**Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.**

1) Warm up engine to normal operating temperature.
2) Using service wire, ground diagnosis switch terminal in diagnosis connector 1 and make sure that malfunction indicator lamp ("CHECK ENGINE" light) indicate diagnostic trouble code No.12.
   The diagnosis connector 1 is located in the relay box.
3) Stop engine and connect duty meter between duty output terminal and ground terminal in diagnosis connector 1.
4) Set tachometer.

5) Start engine and warm it up completely.
6) Check IAC duty and idle speed. If duty and/or idle speed is out of specifications, inspect idle air control system referring to B-4 IDLE AIR CONTROL SYSTEM CHECK in this section.

| ENGINE IDLE SPEED AND IAC DUTY | | |
|---|---|---|
| A/C | OFF | ON |
| M/T model | 750 r/min (rpm)<br>3—20 or *30% | 900 r/min (rpm) |
| A/T model<br>P/N range | 800 r/min (rpm)<br>3—20 or *30% | 900 r/min (rpm) |
| A/T model<br>D, 2, L or R range | 750 r/min (rpm) | 800 r/min (rpm) |

**NOTE:**

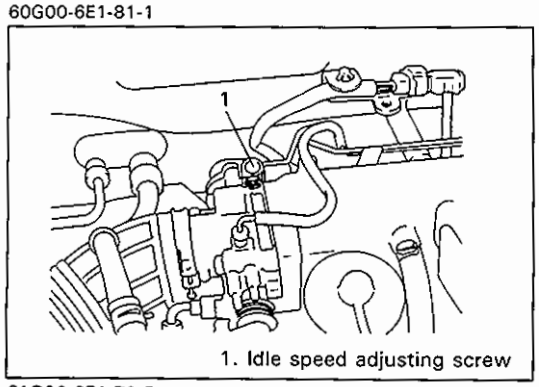
- **Above duty values are ON duty meter indications.**
- **Duty values with (*) are applicable to vehicle used at high place (higher than 2,000 m or 6,560 ft).**
- **IAC duty can be checked by using analog type voltmeter. IAC duty to voltage relation is as follows.**

| ON DUTY METER INDICATION | OFF DUTY METER INDICATION | VOLTMETER INDICATION (V) |
|---|---|---|
| 3 | 97 | 0.03 x $V_B$ |
| 20 | 80 | 0.20 x $V_B$ |
| 30 | 70 | 0.30 x $V_B$ |
| 97 | 3 | 0.97 x $V_B$ |

— **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".**
— **"$V_B$" represents battery voltage while engine of vehicle being checked is running.**

7) Remove service wire from monitor coupler.
8) Install cover to relay box.
9) Check that specified engine idle speed is obtained with A/C ON if vehicle is equipped with A/C.
If not, check A/C ON signal circuit and idle air control system.

60G00-6E1-81-1




1. Idle speed adjusting screw

61G00-6E1-79-5

**IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY ADJUSTMENT**

1) Check idle speed/idle air control (IAC) duty referring to IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION.
2) Adjust duty and/or idle speed to specified value (Refer to IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION.) by turning idle speed adjusting screw.
3) Upon completion of adjustment, install adjusting screw cap to throttle body.
4) Remove service wire from diagnosis connector 1 and install cover to relay box.

## IDLE MIXTURE ADJUSTMENT

**(For vehicle without oxygen sensor)**

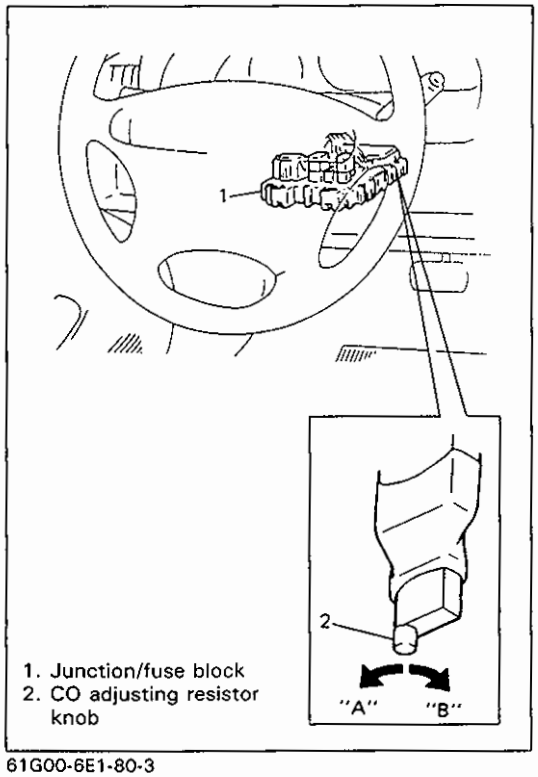
All vehicles not equipped with oxygen sensor are shipped with their CO% factory adjusted as follows.

| | |
|---|---|
| Engine idle mixture CO% | 0.8—1.3 |
| Engine idle speed (r/min) | Refer to "IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION" |
| IAC duty at specified idle speed | |

Idle mixture adjustment should never be changed from the original factory setting. However, if during diagnosis, the check indicates idle mixture to be the cause of a driver performance complaint or emission failure, the idle mixture can be adjusted using the following procedures.

**NOTE:**
**For this inspection and adjustment, exhaust gas tester (CO meter) and engine tachometer are necessary.**

61G00-6E1-80-1




1. Junction/fuse block
2. CO adjusting resistor knob

61G00-6E1-80-3

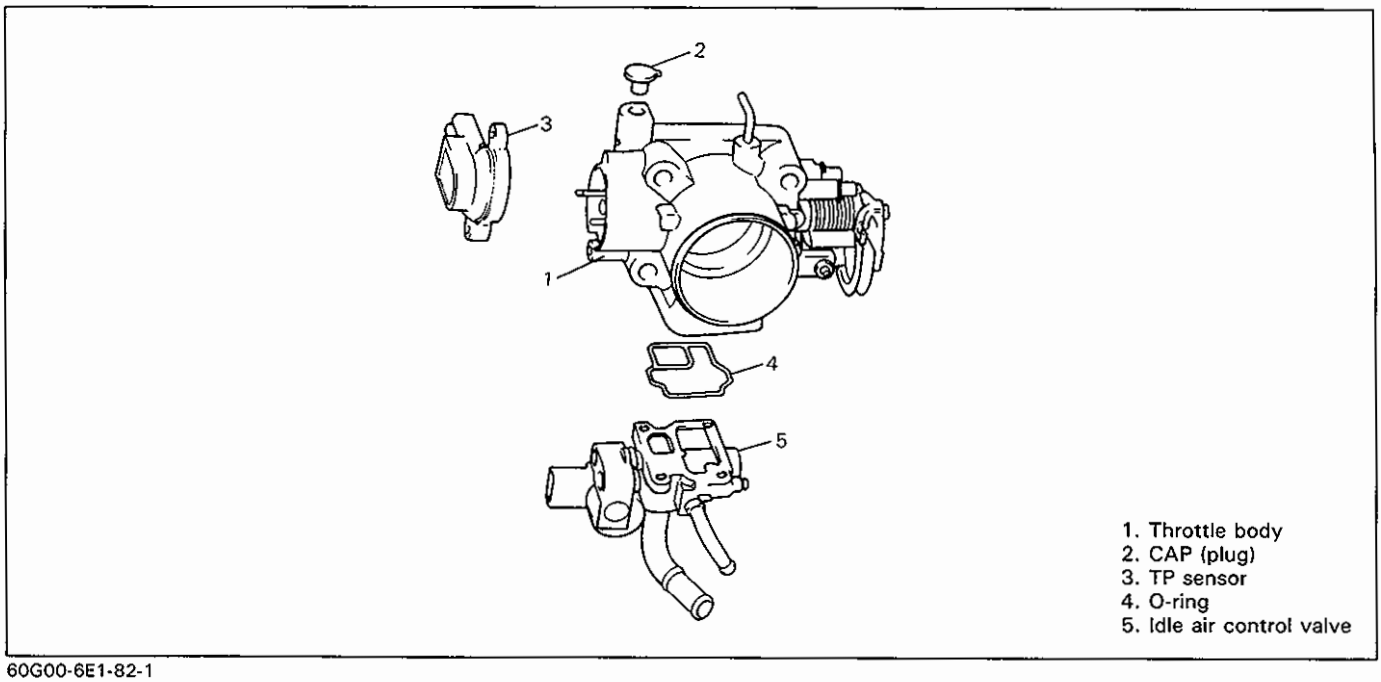
1) Check idle speed/idle air control (IAC) duty according to "IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION" described above.
2) Using exhaust gas tester, check that idle mixture CO% is within above specification. If it is out of specification, adjust it to specification by turning mixture adjusting knob.

   **NOTE:**
   **Turning idle mixture adjusting knob to "A" increases CO% (A/F mixture becomes rich) and turning it to "B" decreases CO% (A/F mixture becomes lean).**

3) If idle mixture has been adjusted, check idle speed and IAC duty.
4) Repeat Step 2) and 3) to adjust idle mixture and idle speed as specified.

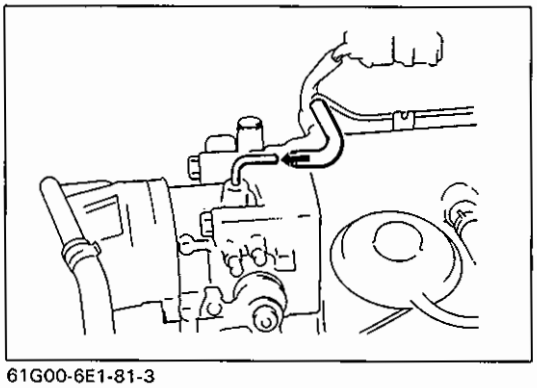
# AIR INTAKE SYSTEM

## THROTTLE BODY




1. Throttle body
2. CAP (plug)
3. TP sensor
4. O-ring
5. Idle air control valve

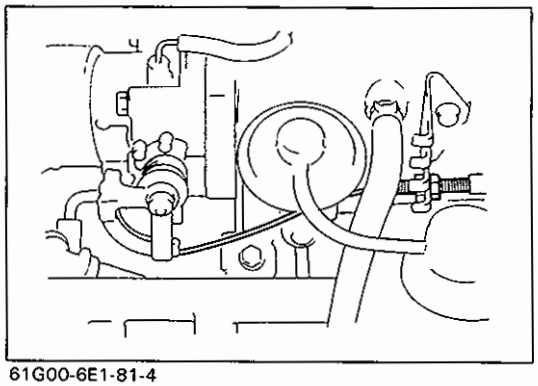
60G00-6E1-82-1



61G00-6E1-81-3

### On-Vehicle Inspection

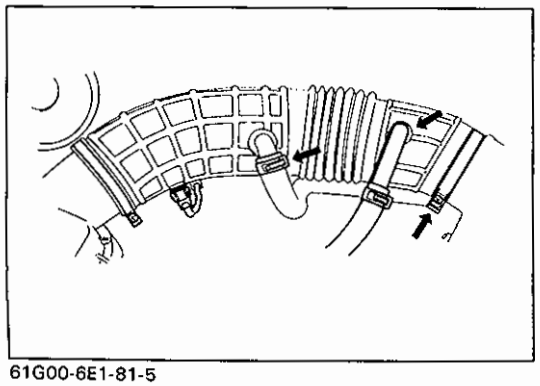
- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection.
  With finger placed against vacuum nozzle, increase engine speed a little and check that vacuum is applied.



61G00-6E1-81-4

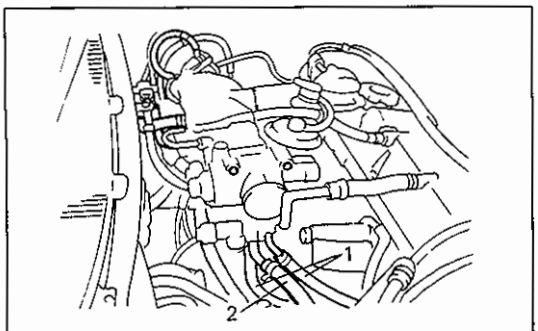
### Removal

1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Disconnect accelerator cable and A/T throttle pressure control cable (3 A/T) from throttle body.



61G00-6E1-81-5

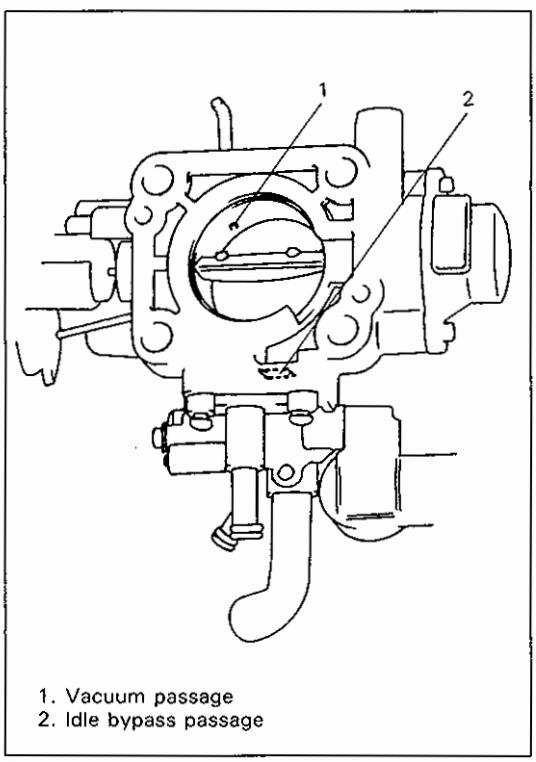
4) Remove air cleaner outlet hose from throttle body.




1. Engine coolant hose 2. IAC valve hose

61G00-6E1-82-1

5) Disconnect electric coupler from TP sensor and IAC valve.
6) Disconnect vacuum hose from throttle body.
7) Disconnect engine coolant and IAC valve hoses from throttle body.
8) Remove throttle body from surge tank (intake manifold).




1. Vacuum passage
2. Idle bypass passage

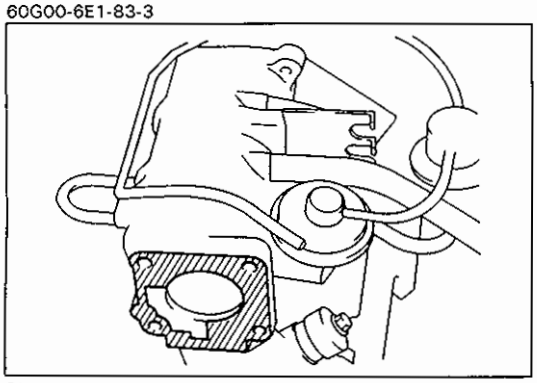
60G00-6E1-83-3

**Cleaning**

Clean passages by blowing compressed air.

**NOTE:**

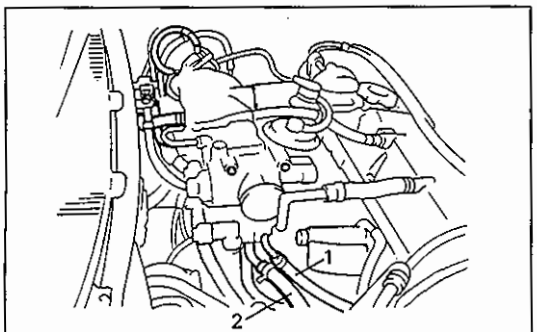
- **TP sensor, idle air control valve or other components containing rubber must not be placed in a solvent or cleaner bath. A chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damages in passages.**



60G00-6E1-83-5

**Installation**

1) Clean mating surfaces and install throttle body gasket to surge tank. (intake manifold.)
   Use new gasket.



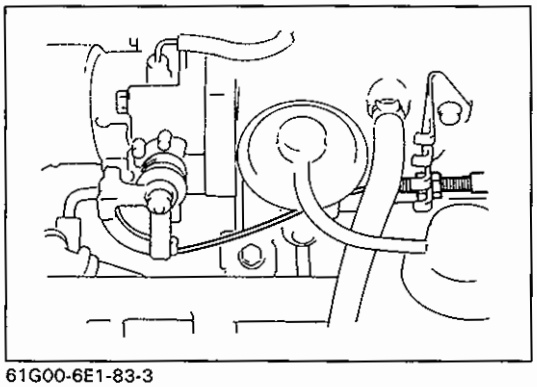

1. Engine coolant hose 2. IAC valve hose

61G00-6E1-83-1

2) Install throttle body to surge tank.
3) Connect engine coolant hoses and IAC valve hose.
4) Connect coupler to TP sensor and IAC valve securely.

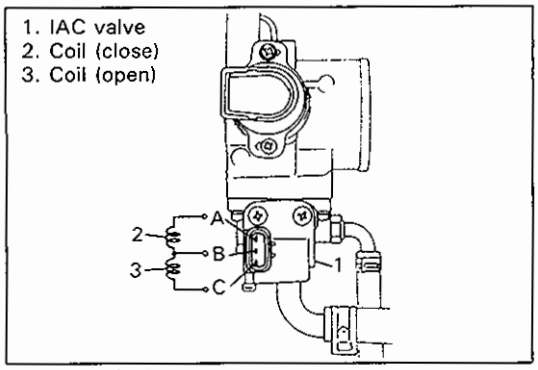
5) Install air cleaner outlet pipe and hose.

60G00-6E1-84-2



61G00-6E1-83-3

6) Connect accelerator cable and adjust cable play to specification.
7) Connect A/T throttle pressure control cable and adjust cable play to specification, referring to Section 7B.
8) Refill cooling system.
9) Connect negative cable at battery.




61G00-6E1-84-1

## IDLE AIR CONTROL VALVE (IAC VALVE)

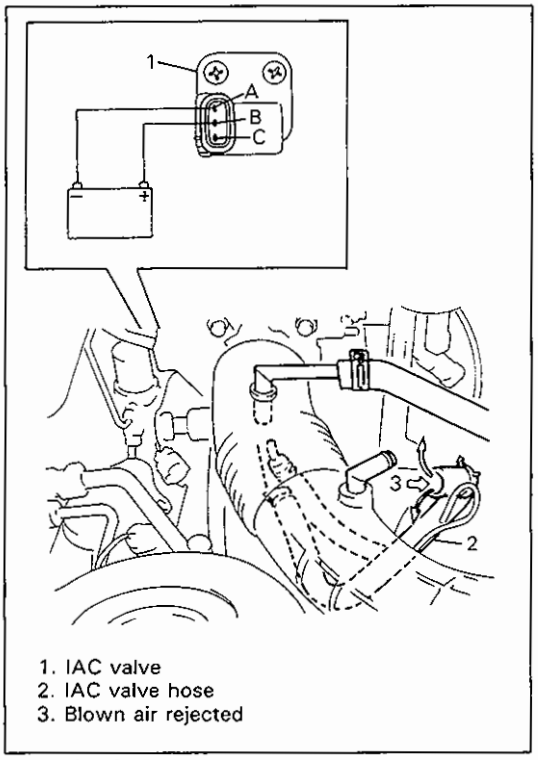
### On-Vehicle Inspection

1) With ignition switch "OFF", disconnect IAC valve coupler.
2) Check resistance between A and B / B and C terminal.

   **Resistance: 18.8—22.8 Ω at 20°C (68°F)**

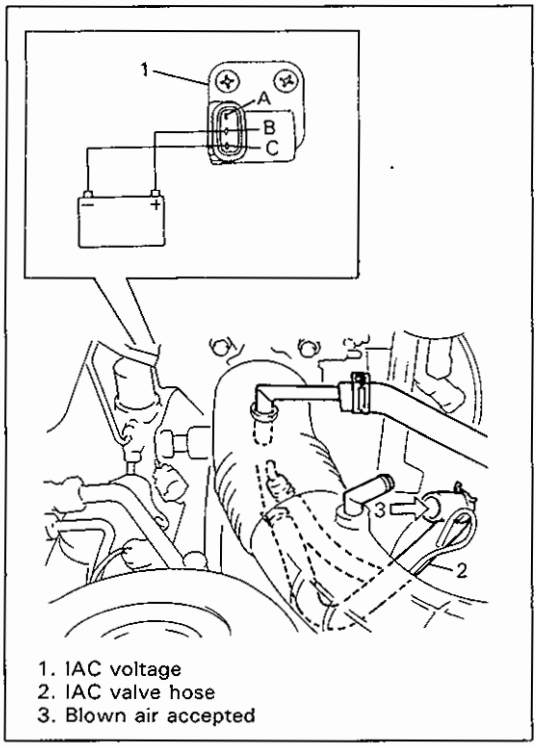
   If it is within specification, proceed to next operation check. If not, replace.

3) Connect IAC valve coupler and warm up engine.



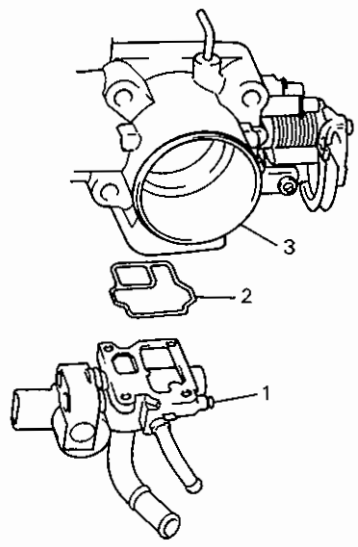

61G00-6E1-84-2

4) Stop engine and disconnect IAC valve coupler with ignition switch OFF.
5) Disconnect IAC valve air hose from air cleaner outlet hose.
6) Connect 12V-battery positive cable to IAC valve B terminal and negative cable to IAC valve A terminal. Try blowing air into air hose and check that air will not go in (hard to blow).
   If check result is not satisfactory, replace IAC valve.




61G00-6E1-84-4

7) Connect 12V-battery positive cable to IAC valve B terminal and negative cable to IAC valve C terminal and check that air can be blown into air hose.
   If check result is not satisfactory, check IAC valve air passage. If air passage is OK, replace IAC valve.




1. IAC valve
2. O-ring
3. Throttle body

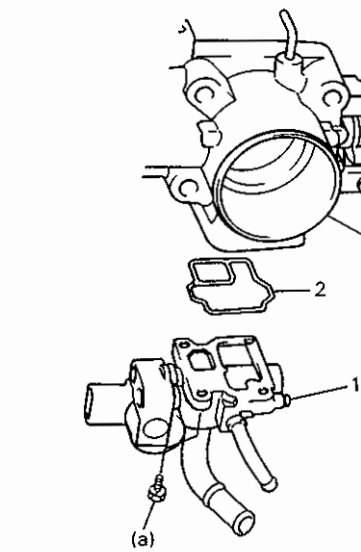
60G00-6E1-86-1

### Removal

1) Disconnect negative cable at battery.
2) Drain cooling system.

**WARNING:**
**To help avoid danger of being burned, do not remove radiator cap, drain plug, coolant hoses etc. while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap, plug, hose, etc. is taken off too soon.**

3) Remove throttle body. (Refer to throttle body removal.)
4) Remove IAC valve from throttle body.




1. IAC valve
2. O-ring
3. Throttle body

60G00-6E1-86-2

### Installation

For installation, reverse removal procedure and note following precautions.

- Use new gasket (throttle body) and O-ring (IAC valve).
- Tighten IAC valve screws to specified torque.

**Tightening Torque**
**(a): 3.4 N·m (0.34 kg-m, 2.5 lb-ft)**

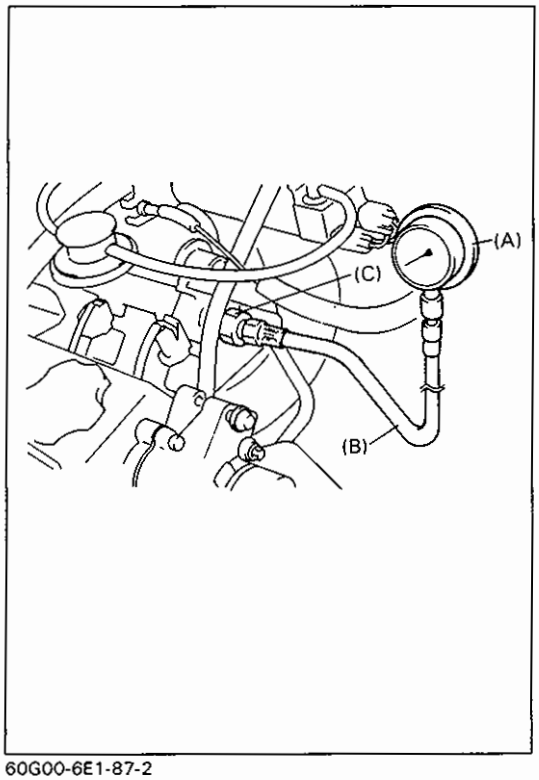
- Refill cooling system referring to Section 6B.
- Adjust accelerator cable play to specification.

# FUEL DELIVERY SYSTEM

## FUEL PRESSURE INSPECTION

1) Relieve fuel pressure in fuel feed line referring to p. 6-4.

60G00-6E1-87-1




2) Using backup wrench, loosen plug bolt on fuel delivery pipe and remove it. Connect special tools (fuel pressure gauge) to delivery pipe.

**CAUTION:**
**A small amount of fuel may be released when plug bolt is loosened. Place container under the bolt or cover bolt hole with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place that cloth in an approved container.**

**Special Tool**
**(A): 09912-58441**
**(B): 09912-58431**
**(C): 09919-46010**

3) Check that battery voltage is above 11V.

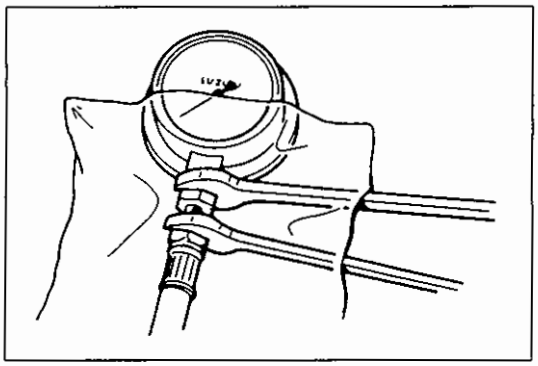
60G00-6E1-87-2

| CONDITION | FUEL PRESSURE |
|---|---|
| With fuel pump operating and engine stopped | 270—310 kPa<br>2.7—3.1 kg/cm²<br>38.4—44.0 psi |
| At specified idle speed | 200—240 kPa<br>2.0—2.4 kg/cm²<br>28.4—34.1 psi |
| With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes) | over 200 kPa<br>2.0 kg/cm²<br>28.4 psi |

4) Turn ignition switch ON to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
5) Start engine.
6) Measure fuel pressure at idling.

If measured pressure doesn't satisfy specification, refer to "Diagnostic Flow Chart B-3" and check each possibly defective part. Replace if found defective.

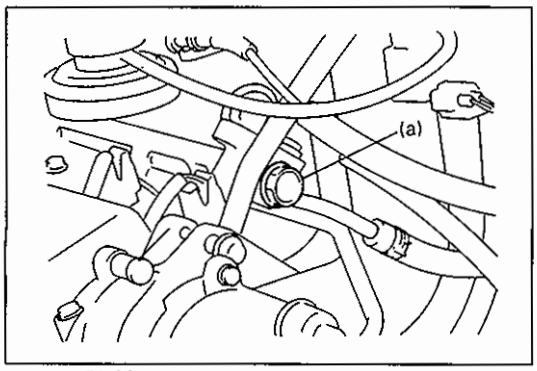
60G00-6E1-87-4



7) After checking fuel pressure, remove fuel pressure gauge.

**CAUTION:**
**As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to following procedures.**
- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly to release fuel pressure gradually.**

60G00-6E1-87-5




60G00-6E1-88-1

8) Install plug bolt to fuel delivery pipe.
Use new gasket.
Tighten it to specified torque, using backup wrench.

**Tightening Torque**
**(a): 30 N·m (3.0 kg-m, 22.0 lb-ft)**

9) With engine "OFF" and ignition switch "ON", check for fuel leaks.

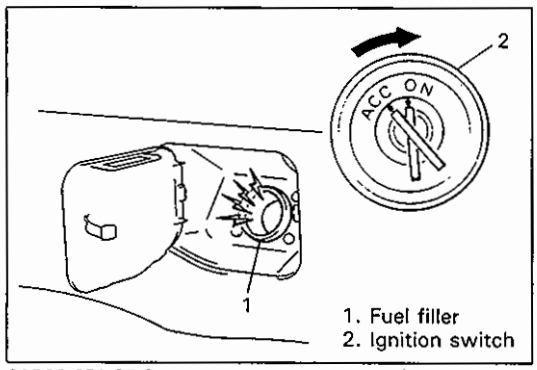
## FUEL PUMP (MAIN FUEL PUMP FOR 4WD VEHICLE)

### On-Vehicle Inspection

**CAUTION:**
**When fuel filler cap is removed in any procedure, work must be done in a well-ventilated area, keep away from any open flames and without smoking.**

1) Remove fuel pump controller, referring to Fuel Pump Controller Removal (4WD vehicle only).

61G00-6E1-87-2

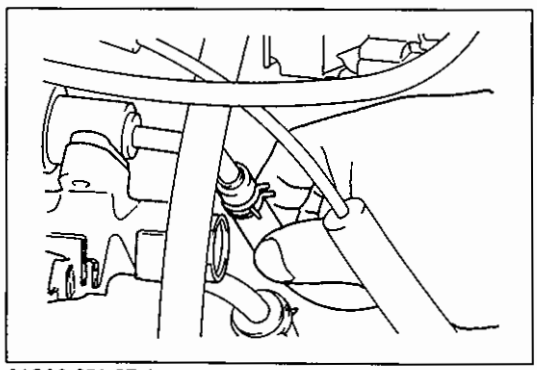



61G00-6E1-87-3

2) Remove filler cap and turn ON ignition switch. Then fuel pump operating sound should be heard from fuel filler for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.

If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-1".

3) Install fuel pump controller, referring to Fuel Pump Controller Installation (4WD vehicle only).



61G00-6E1-87-4

4) Fuel pressure should be felt at fuel return hose for 2 seconds after ignition switch ON.

If fuel pressure is not felt, advance to "Diagnostic Flow Chart B-3".

### Removal

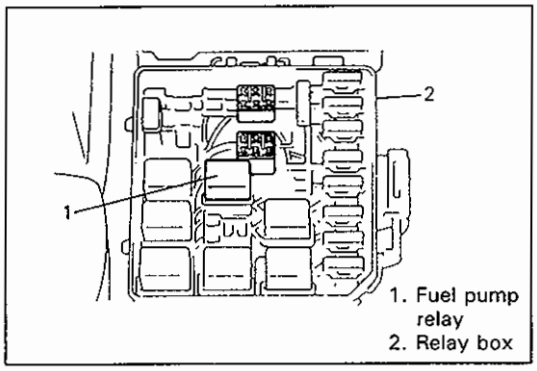
1) Remove fuel tank from body according to procedure described in Section 6C and remove fuel pump from fuel tank.

### Inspection

Check fuel pump filter for evidance of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

### Installation
1) Install fuel pump to its bracket.
2) Install fuel pump to fuel tank and then install fuel tank to body according to procedure described in Section 6C.

60G00-6E1-89-1



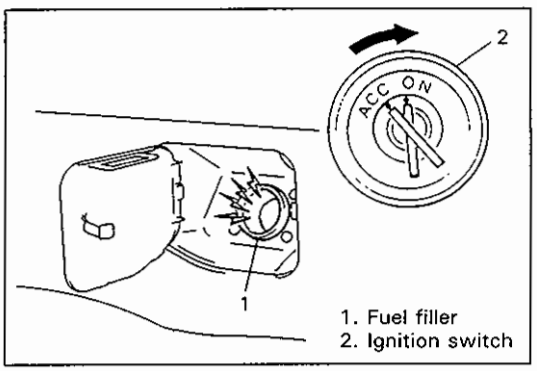

## SUB FUEL PUMP (4WD VEHICLE ONLY)

### On-Vehicle Inspection

**CAUTION:**
**When fuel filler cap is removed in any procedure, work must be done in a well-ventilated area, keep away from any open flames and without smoking.**

1) Remove fuel pump relay with ignition switch OFF.

61G00-6E1-88-2




61G00-6E1-88-3

2) Remove fuel filler cap and turn ON ignition switch. Then sub fuel pump operating sound should be heard from fuel filler for about 5 seconds or more.
Be sure to reinstall fuel filler cap after checking.

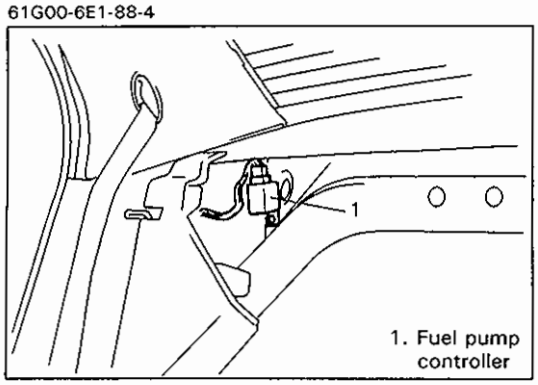
If above check result is not satisfactory, inspect fuel pump controller and wire harness.
If all abves are OK, replace sub fuel pump.

### Removal
Remove fuel tank from body according to procedure described in Section 6C and remove sub fuel pump with fuel level switch and sub fuel level gauge from fuel tank.

### Inspection
Check fuel pump filter for evidance of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

### Installation
Install fuel pump with fuel level switch and sub fuel level gauge to fuel tank and then install fuel tank to body according to procedure described in Section 6C.

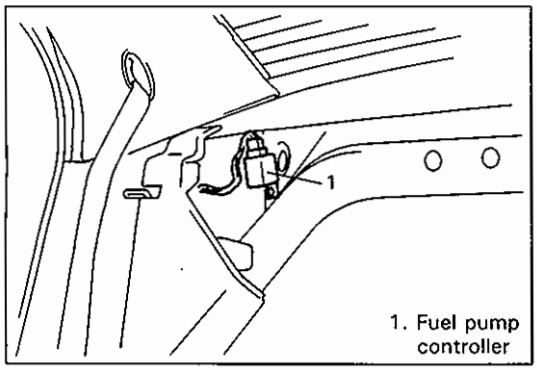
61G00-6E1-88-4




61G00-6E1-88-5

## FUEL PUMP CONTROLLER (4WD VEHICLE ONLY)

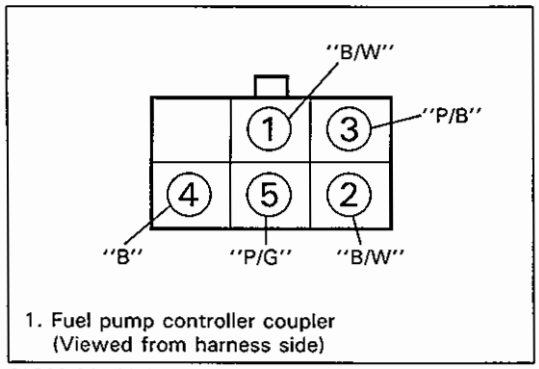
### Removal
1) Fold rear seat back.
2) Remove right front partition trim.
3) Remove fuel controller and disconnect coupler with ignition switch OFF.




61G00-6E1-89-1

**Installation**

1) Connect coupler to fuel pump controller with ignition switch OFF.
2) Install fuel controller with ground wire to body.
3) Install right front partition trim.
4) Raise rear seat back.




61G00-6E1-89-2

**Inspection**

1) Remove fuel pump controller.
2) Connect coupler to fuel controller with ignition switch OFF.
3) Check voltage at each terminal.

**NOTE:**
**As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.**

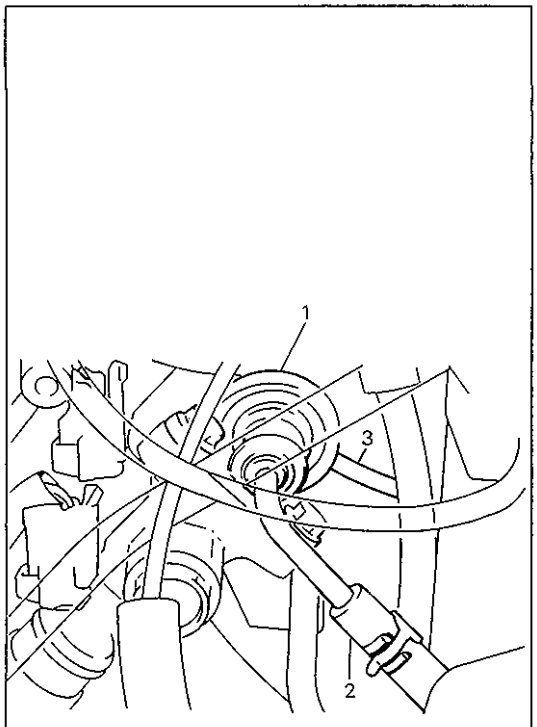
| Terminal | Standard voltage | Condition | Possible cause of out of standard voltage |
|---|---|---|---|
| ①, ② | 10—14V | Ignition switch ON | "B/W" wire open. |
| ③ | 10—14V | For 5 seconds after ignition switch is turned ON. | "B" wire open or faulty fuel pump controller |
| | | Ignition switch ON and ⑤ terminal grounded by service wire. | |
| | About 0V | After 5 seconds from ignition switch is turned ON and fuel of right side fuel tank is empty. | "P/G" wire shorted to ground, fuel level switch or fuel pump controller faulty. |
| | 10—14V | After 5 seconds from ignition switch is turned ON and fuel of right side fuel tank is full. | "P/G" wire open, fuel level switch faulty or fuel pump controller faulty. |

61G00-6E1-89-3

4) Disconnect fuel pump controller with ignition switch OFF.
5) Check resistance between following terminal.

| Terminal | Standard resistance | Condition | Possible cause of out of standard resistance |
|---|---|---|---|
| ⑤— body ground | Continuity | Fuel of right side fuel tank is not empty. | Faulty fuel level switch or "P/G" wire open. |
| | Infinity | Fuel of right side fuel tank is empty. | Faulty fuel level switch or "P/G" wire shorted to ground. |
| ④— body ground | Continuity | ——— | "B" wire open. |

61G00-6E1-89-4




1. Fuel pressure regulator
2. Return hose
3. Vacuum hose

60G00-6E1-89-2

## FUEL PRESSURE REGULATOR

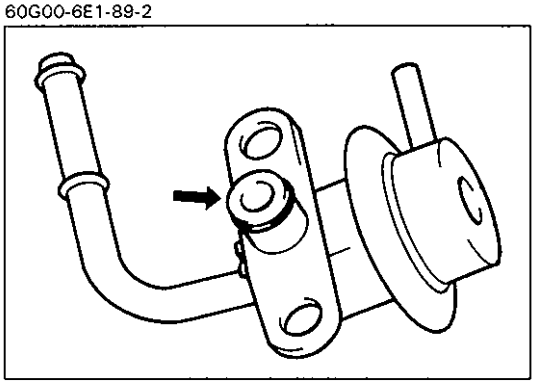
### Removal

1) Relieve fuel pessure according to procedure described on p. 6-4.
2) Disconnect battery negative cable from battery.
3) Disconnect vacuum hose from fuel pressure regulator.
4) Disconnect fuel return hose from fuel pressure regulator.

**CAUTION:**
**A small amount of fuel may be released when hose is disconnected. Cover hose to be disconnected with a shop cloth.**

5) Remove pipe clamp bolts.
6) Remove fuel pressure regulator.

**CAUTION:**
**A small amount of fuel may be released when it is from delivery pipe.**
**Place a shop cloth under delivery pipe so that released fuel is absorbed in it.**

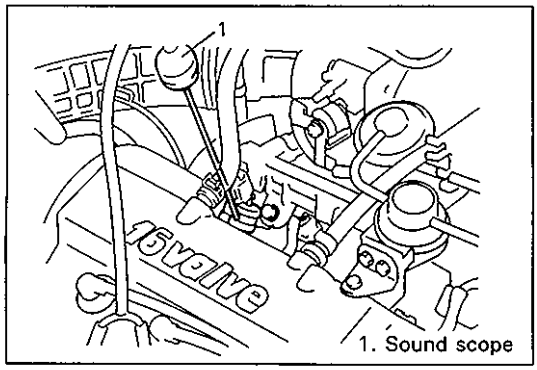


60G00-6E1-89-5

### Installation

For installation, reverse removal procedure and note following precautions.

- Use new O-ring.
- Apply thin coat of spindle oil or gasoline to O-ring to facilitate installation.
- With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.

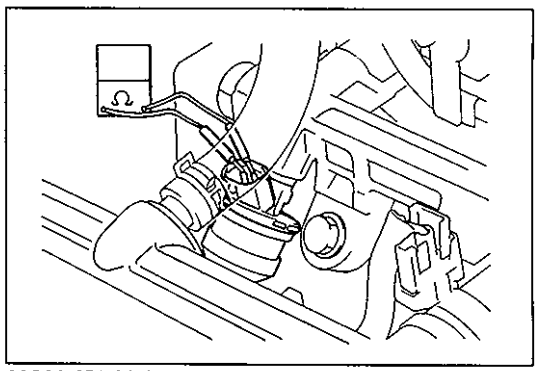



60G000-6E1-90-1

## FUEL INJECTOR

### On-Vehicle Inspection

1) Using sound scope or such, check operating sound of injector when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.

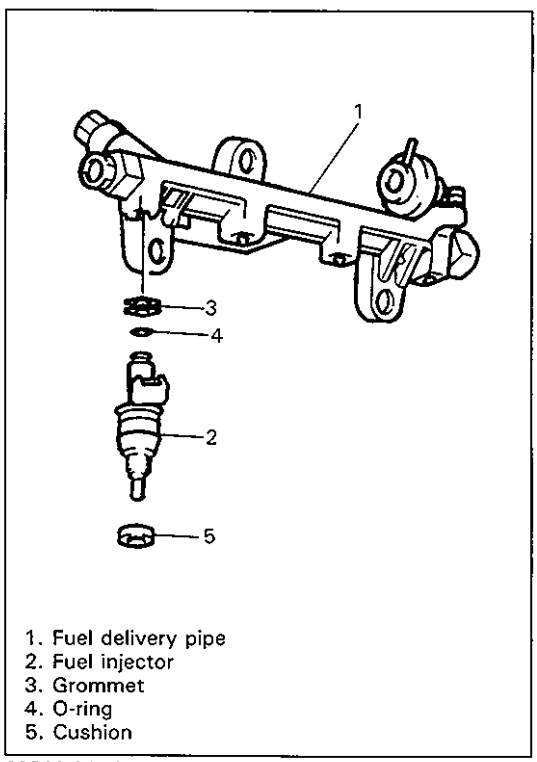



60G00-6E1-90-2

2) Disconnect coupler from injector, connect ohmmeter between terminals of injector and check resistance.

   **Resistance of injector: 12.0—16.0 Ω**

   If resistance is out of specification, replace.
3) Connect coupler to injector securely.




1. Fuel delivery pipe
2. Fuel injector
3. Grommet
4. O-ring
5. Cushion

60G00-6E1-90-3

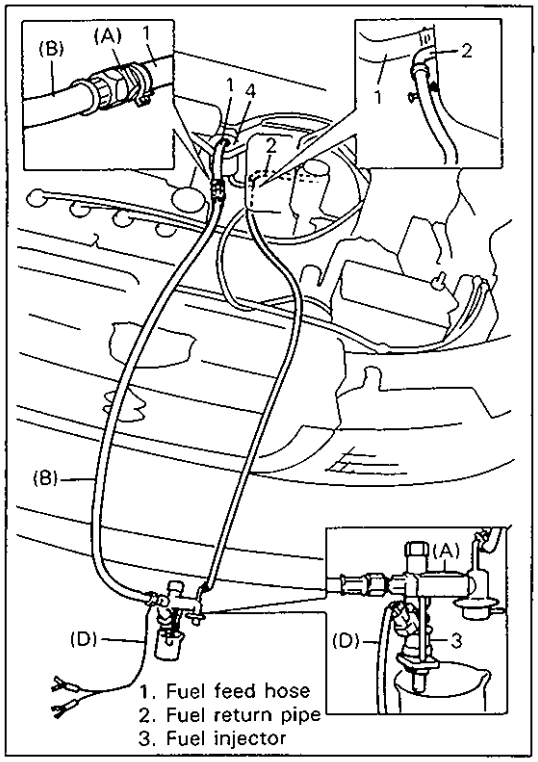
### Removal

1) Relieve fuel pressure according to procedure described on p. 6-4.
2) Disconnect battery negative cable at battery.
3) Disconnect fuel injector couplers.
4) Remove fuel delivery pipe bolts.
5) Remove fuel injector(s).

**CAUTION:**
**A small amount of fuel may come out after removal of fuel injectors, cover them with shop cloth.**

### Inspection

**WARNING:**
**As fuel is injected in this inspection, perform in a well ventilated area and away from open flames.**
**Use special care to prevent sparking when connecting and disconnecting test lead to and from battery.**




60G00-6E1-91-1

1) Install injector and fuel pressure regulator to special tool (injector checking tool).

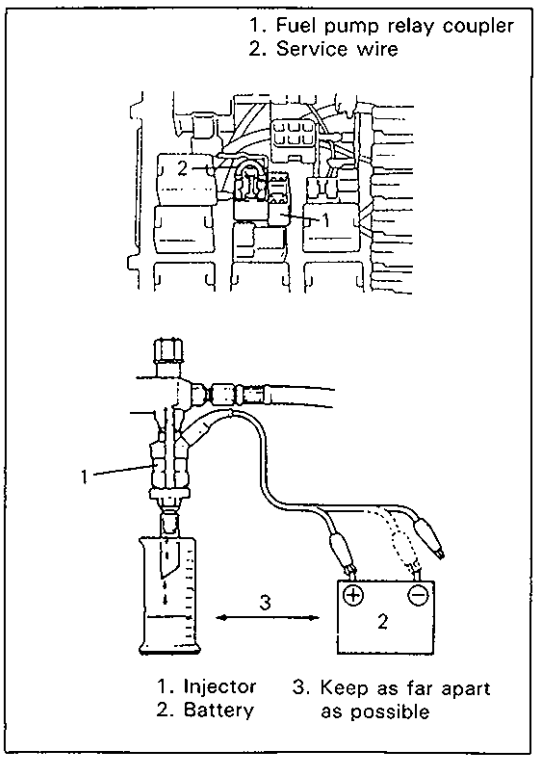
**Special Tool**
**(A): 09912-58421**

2) Connect special tools (hoses and attachment) to pipes of vehicle.

**Special Tool**
**(B): 09912-58431**

3) Connect special tool (test lead) to injector.

**Special Tool**
**(D): 09930-88530**



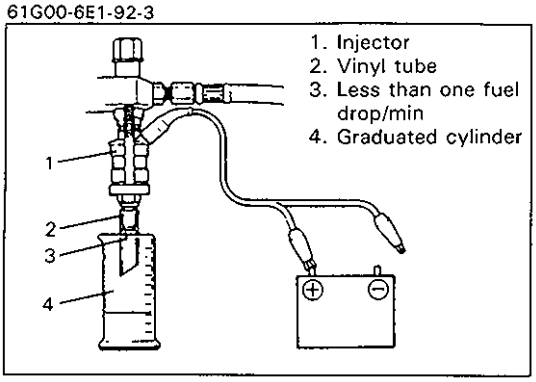

61G00-6E1-92-3

4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector as shown.
6) Disconnect coupler from fuel pump relay.
7) To operate fuel pump and apply fuel pressue to injector, using wire. connect two terminals of relay box as shown in figure.

**CAUTION:**
**Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.**

8) Apply battery voltage to injector for 15 seconds and measure injected fuel volume with graduated cylinder.
Test each injector two or three times.
If not within specification, replace injector.

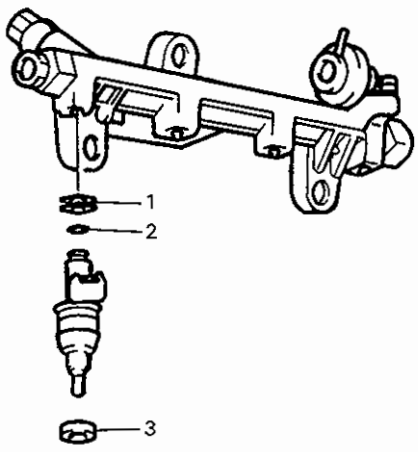
**Injected fuel volume:**
**38—48 cc/15 sec. (1.28/1.34—1.62/1.69 US/Imp. oz/15 sec.) (1.3 liter engine)**
**44—54 cc/15 sec. (1.49/1.55—1.82/1.90 US/Imp. oz/15 sec.) (1.6 liter engine)**



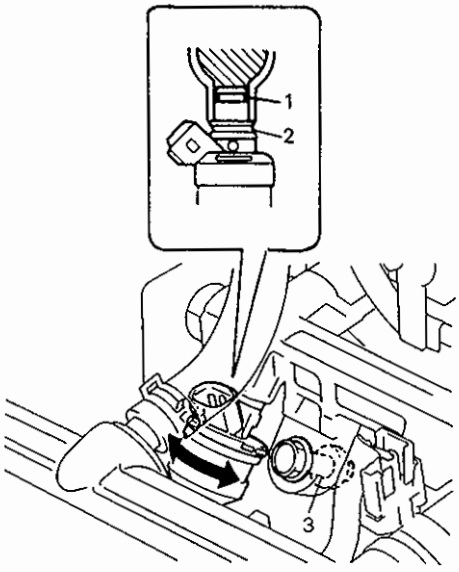

60G00-6E1-91-5

9) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work).
If fuel leaks more than following specifications, replace.

**Fuel leakage: Less than 1 drop/min.**




1. Grommet
2. O-ring
3. Cushion



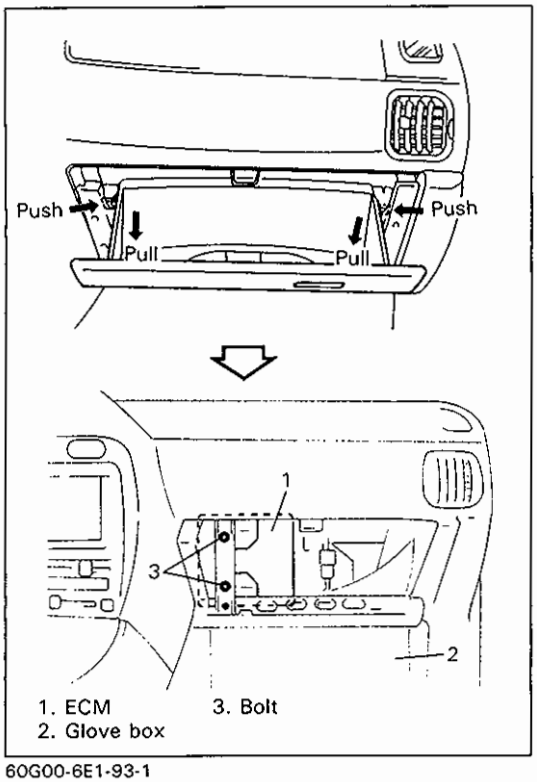

1. O-ring
2. Grommet
3. Insulator

60G00-6E1-92-1

**Installation**

For installation, reverse removal procedure and note following precautions.

- Replace injector O-ring with new one using care not to damage it.
- Check if cushion is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings and then install injectors into delivery pipe and intake manifold.
  Make sure that injectors rotate smoothly. If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.
- Tighten delivery pipe bolts and make sure that injectors rotate smoothly.
- With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.




60G00-6E1-93-1

# ELECTRONIC CONTROL SYSTEM

## ENGINE CONTROL MODULE (ECM)

**CAUTION:**
**As ECM consists of precision parts, be careful not to expose it to excessive shock.**

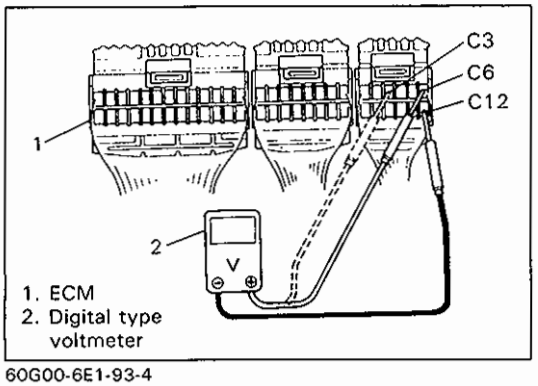
### Removal

1) Disconnect battery negative cable at battery.
2) Disable air bag system, refer to "DISABLING THE AIR BAG SYSTEM" in Section 9J.
3) Open glove box, then while pressing glove box stopper, pull out glove box from instrument panel.
4) Remove ECM from body after removing its bolts.
5) Disconnect couplers from ECM while releasing coupler lock.

### Installation

1) Connect couplers to ECM securely.
2) Install ECM to body.
3) Install glove box.
4) Connect battery negative cable at battery.

50G00-6E-90-1




60G00-6E1-93-4

## MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

### Output Voltage Check

1) Remove ECM according to previously outlined.
2) Connect couplers to ECM securely.
3) With coupler connected to ECM, connect digital type voltmeter as shown and check that ECM supply voltage 4.75—5.25V is applied to coupler terminal C6.

4) Check output voltage at coupler terminal C3.
Note that it varies with atmospheric pressure and altitude. Also, start engine, if it can, and check if output voltage varies.

**Output voltage (ECM supply voltage 4.75—5.25V, ambient temp. 10—40°C, 50—104°F)**

| ALTITUDE (Reference) | | BAROMETRIC PRESSURE | OUTPUT VOLTAGE |
|---|---|---|---|
| (ft) | (m) | (mmHg) | (V) |
| 0 | 0 | 760 | 3.5—3.8 |
| 1 000 | 305 | 733 | 3.4—3.7 |
| 2 000 | 610 | 707 | 3.3—3.6 |
| 3 000 | 914 | 682 | 3.2—3.5 |
| 4 000 | 1 219 | 658 | 3.1—3.4 |
| 5 000 | 1 524 | 634 | 3.0—3.3 |
| 6 000 | 1 829 | 611 | 2.9—3.2 |
| 7 000 | 2 133 | 589 | 2.8—3.1 |
| 8 000 | 2 438 | 567 | 2.7—3.0 |
| 9 000 | 2 743 | 546 | 2.6—2.9 |
| 10 000 | 3 048 | 526 | 2.5—2.8 |

**NOTE:**
**Note that atmospheric pressure varies depending on weather conditions as well as altitude.**
**Take that into consideration when performing above check.**

If check result is not satisfactory in previous step 3) or 4), check MAP sensor and its circuit according to Diagnostic Flow Chart for Code No.31.

60G00-6E1-94-1

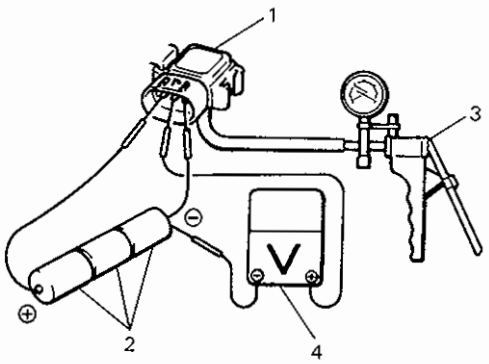
**NOTE:**
**If output voltage does not vary when engine is started, it is possible that vacuum hose and/or filter are clogged. Clean them.**
**Another possibility is that filter in MAP sensor is clogged from freezing. If it is suspected, leave it at room temperature (20°C, 68°F) for a while and recheck.**

5) Upon completion of checking, install ECM and connect ECM coupler securely.

60B40-6E2-85-1S

**MAP Sensor Individual Check**
1) Disconnect MAP sensor vacuum hose from filter.
2) Disconnect coupler from MAP sensor.
3) Remove MAP sensor.

60B40-6E2-85-2S




1. MAP sensor
2. 1.5V battery (4.5V in total)
3. Vacuum pump
4. Digital type voltmeter

60G00-6E1-95-1

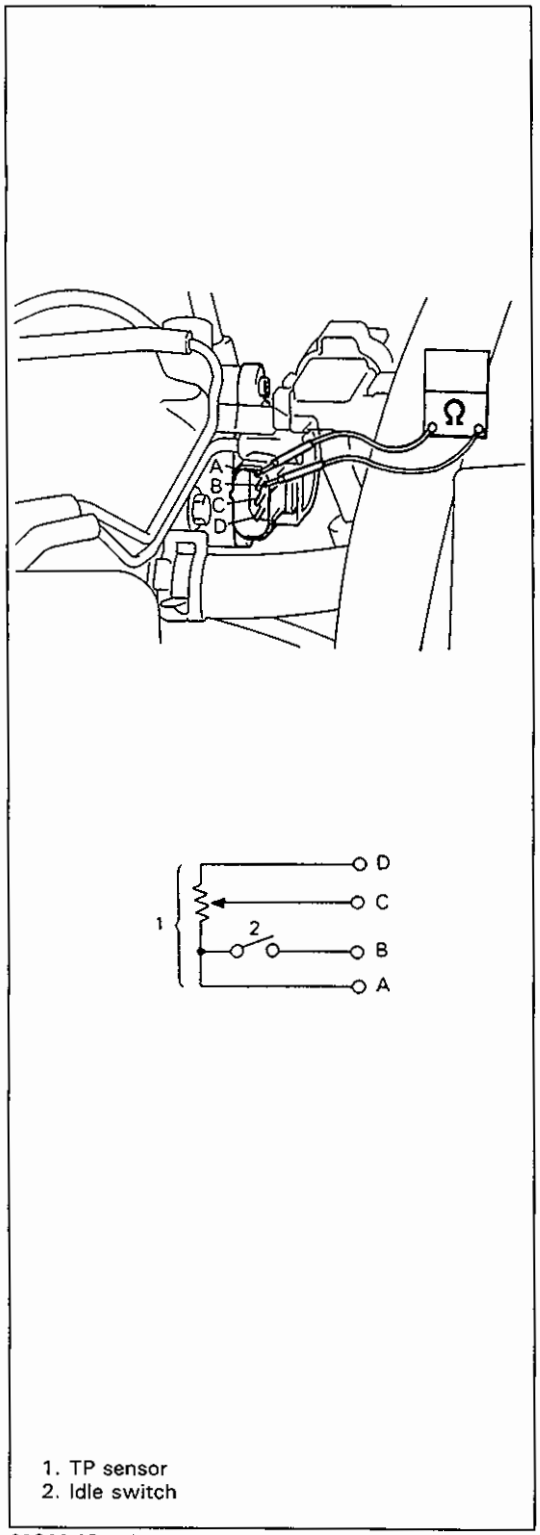
4) Arrange 3 new 1.5V batteries in series (check that total voltage is 4.5—5.0V) and connect its positive terminal to "Vin" terminal of sensor and negative terminal to "Ground" terminal. Then check voltage between "Vout" and "Ground".
Also, check if voltage reduces when vacuum is applied up to 40 cmHg by using vacuum pump.

**Output voltage (Vin voltage 4.5—5.0V, ambient temp. 20—30°C, 68—86°F)**

| ALTITUDE (Referance) | | BAROMETRIC PRESSURE | OUTPUT VOLTAGE |
|---|---|---|---|
| (ft) | (m) | (mmHg) | (V) |
| 0<br>I<br>2 000 | 0<br>I<br>610 | 760<br>I<br>707 | 3.1—3.6 |
| 2 001<br>I<br>5 000 | 611<br>I<br>1 524 | Under 707<br>over 634 | 2.8—3.4 |
| 5 001<br>I<br>8 000 | 1 525<br>I<br>2 438 | Under 634<br>over 567 | 2.6—3.1 |
| 8 001<br>I<br>10 000 | 2 439<br>I<br>3 048 | Under 567<br>over 526 | 2.4—2.9 |

If check result is not satisfactory, replace MAP sensor.

5) Install MAP sensor and connect vacuum hose securely.
6) Connect MAP sensor coupler securely.




1. TP sensor
2. Idle switch

60G00-6E1-96-1

## THROTTLE POSITION SENSOR (TP SENSOR)

### Inspection

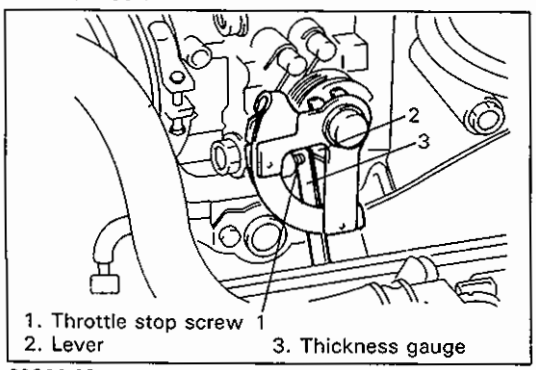
1) Disconnect negative cable at battery and coupler from TP sensor.
2) Using ohmmeter, check resistance between terminals under each condition given in table below.

| TERMINALS | CONDITION | RESISTANCE |
|---|---|---|
| Between A and B terminals (Idle switch) | When throttle lever-to-stop screw clearance is 0.3 mm (0.012 in.) | 0—3 kΩ |
| | When throttle lever-to-stop screw clearance is 0.6 mm (0.024 in.) | ∞ (Infinity) |
| Between A and D terminals | ——— | 2.87—5.33 kΩ |
| Between A and C terminals | Throttle valve is at idle position | 0.13—10.93 kΩ |
| | Throttle valve is fully opened | 2.02—14.64 kΩ |

**NOTE:**
**There should be more than 2 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.**

If idle switch check result is not satisfactory, adjust installation angle of TP sensor and if found defective in the other check, replace TP sensor.

3) Connect TP sensor coupler securely.
4) Connect negative cable to battery.

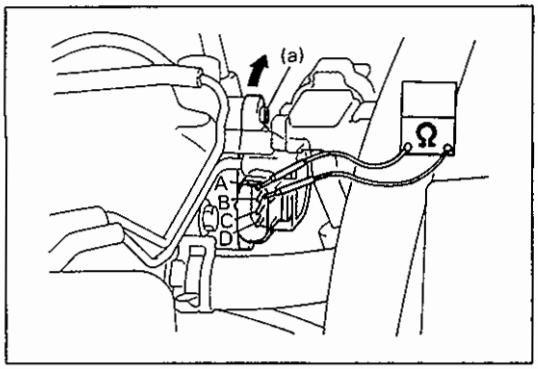



1. Throttle stop screw
2. Lever
3. Thickness gauge

60G00-6E1-96-4

### Adjustment

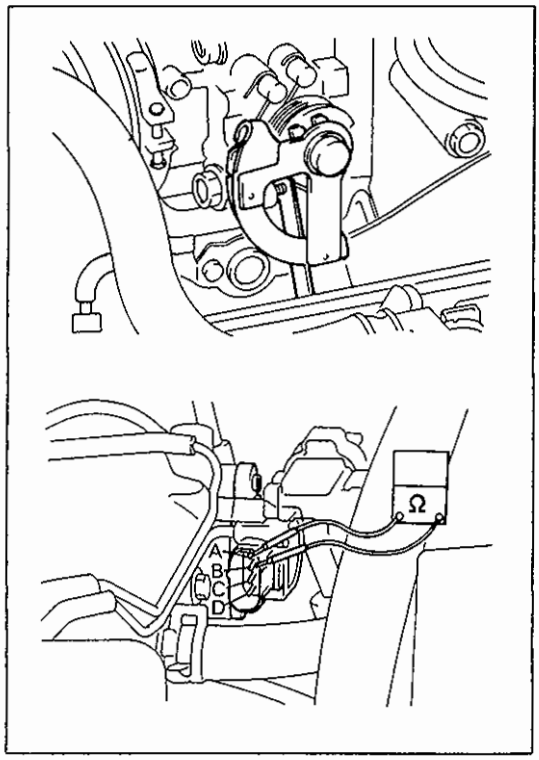
1) Disconnect negative cable at battery and disconnect TP sensor coupler.
2) Insert 0.45 mm (0.018 in) thickness gauge between throttle stop screw and throttle lever.




60G00-6E1-97-1

3) Loosen TP sensor screws.
4) Connect ohmmeter between A and B terminals.
5) First, turn TP sensor counterclockwise fully and then clockwise gradually to find position where ohmmeter reading changes from continuity to ∞ (no continuity).
Then fix TP sensor at that position by tightening screw to specified torque.

**Tightening Torque**
**(a): 2.0 N·m (0.20 kg-m, 1.5 lb-ft)**




60G00-6E1-97-2

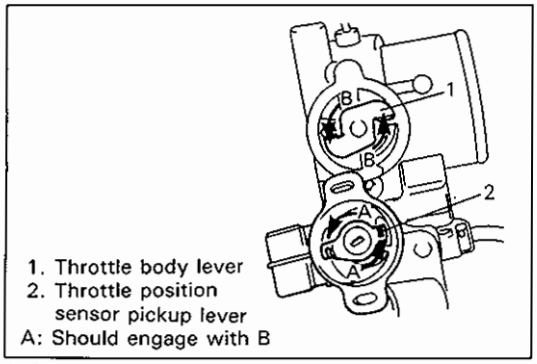
6) Check that there is no continuity between terminals A and B when 0.6 mm (0.024 in) thickness gauge is inserted.
7) Check that there is continuity between terminals A and B when 0.3 mm (0.012 in) thickness gauge is inserted.
If check result is unsatisfactory in steps 6) and 7), it means that installation angle of TP sensor is not adjusted properly. Therefore, start all over again from step 1).

**CAUTION:**
**As throttle stop screw is factory adjusted precisely, don't remove or adjust it.**

8) Connect coupler to TP sensor securely, and connect battery negative cable.

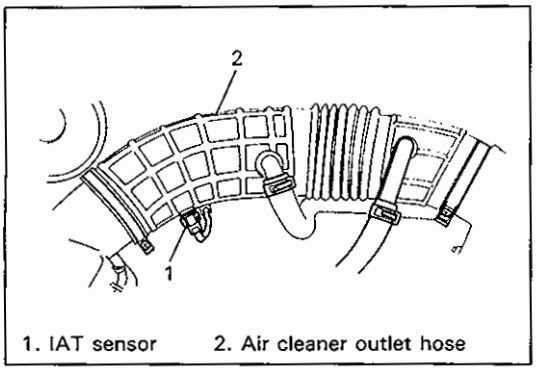
**Removal**
1) Disconnect battery negative cable at battery.
2) Disconnect coupler from TP sensor.
3) Remove TP sensor from throttle body.

60G00-6E1-97-4




60G00-6E1-97-5

**Installation**
1) To install sensor, place it onto throttle body so that sensor pickup lever can engage with throttle body lever.
2) Hand-tighten TP sensor screws.
3) Adjust installation angle of TP sensor according to procedure described in item "Adjustment".
4) Connect coupler to TP sensor securely
5) Connect battery negative cable to battery.



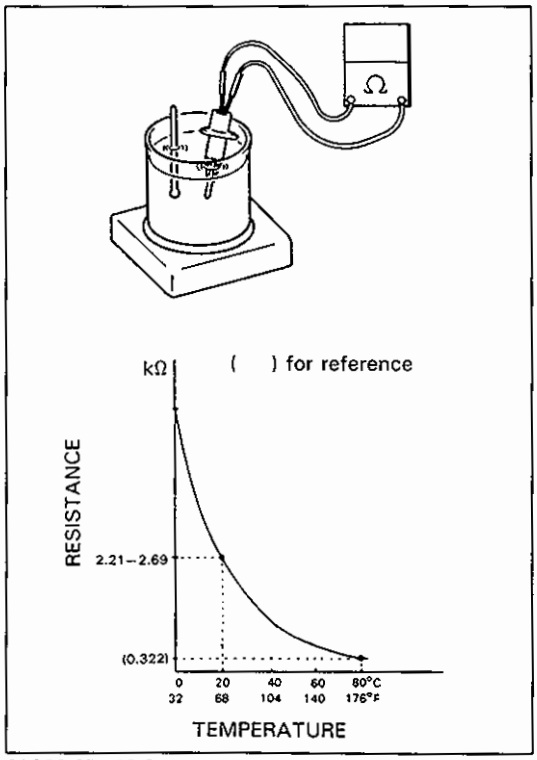

1. IAT sensor 2. Air cleaner outlet hose

61G00-6E1-99-1

## INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

### Removal

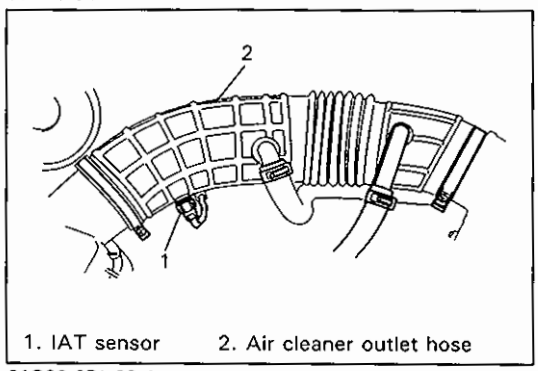
1) Disconnect battery negative cable at battery.
2) Open air cleaner case by unhooking clamps.
3) Disconnect coupler from IAT sensor.
4) Remove IAT sensor from air cleaner outlet hose.




60G00-6E1-98-2

### Inspection

Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in left figure, replace IAT sensor.



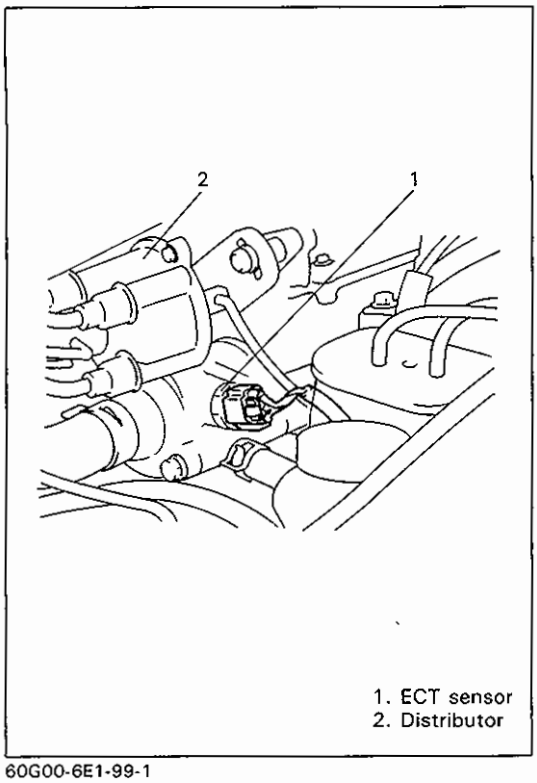

1. IAT sensor 2. Air cleaner outlet hose

61G00-6E1-99-4

### Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of IAT sensor and air cleaner outlet hose.
- Connect IAT sensor coupler securely.




1. ECT sensor
2. Distributor

60G00-6E1-99-1

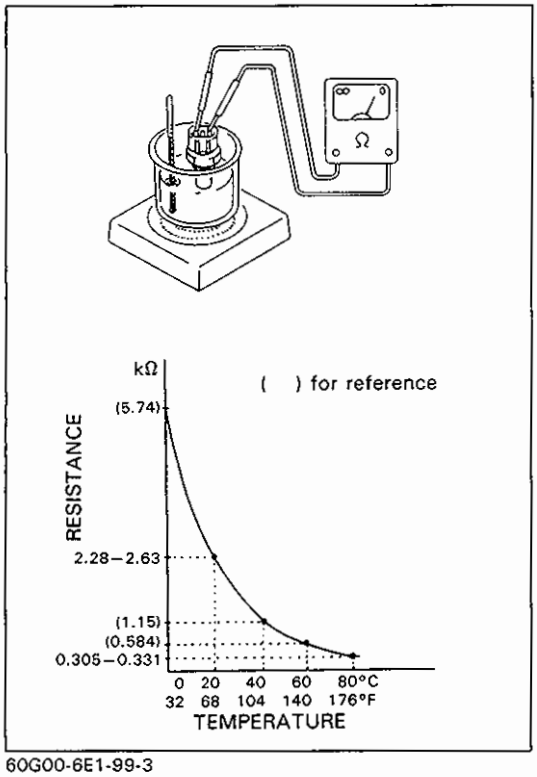
## ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

### Removal

1) Disconnect battery negative cable at battery.
2) Drain coolant referring to Section 6B.

**WARNING:**
**To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

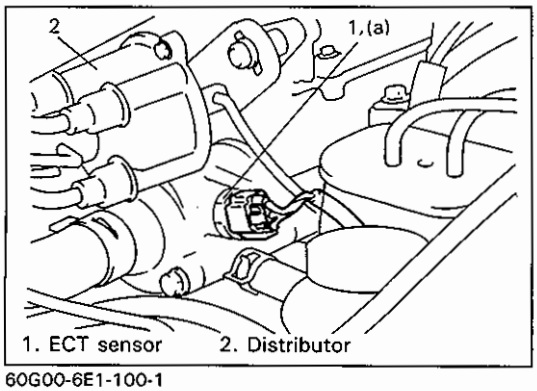
3) Disconnect coupler from ECT sensor.
4) Remove ECT sensor from thermostat case.




60G00-6E1-99-3

### Inspection

Immerse temperature sensing part of ECT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in left figure, replace ECT sensor.




60G00-6E1-100-1

### Installation

Reverse removal procedure noting the following

- Clean mating surfaces of ECT sensor and throttle body.
- Check O-ring for damage and repalce if necessary.
- Tighten ECT sensor to specified torque.

**Tightening Torque**
**(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)**

- Connect coupler to ECT sensor securely.
- Refill coolant referring to Section 6B.

## OXYGEN SENSOR (if equipped)

### Inspection

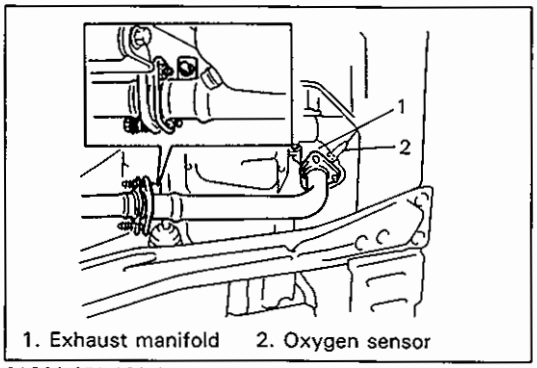
Inspect oxygen sensor referring to flow chart of diagnostic trouble code No.13 in 6E1-41.

61G00-6E1-101-2

### Removal

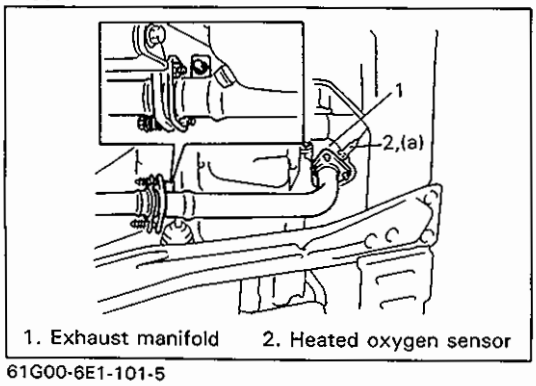
**WARNING:**
**To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.**

60B40-6E2-90-3S




61G00-6E1-101-4

1) Disconnect negative cable from battery.
2) Disconnect coupler of oxygen sensor and release its wire harness from clamps.
3) Remove oxygen sensor from exhaust manifold.




61G00-6E1-101-5

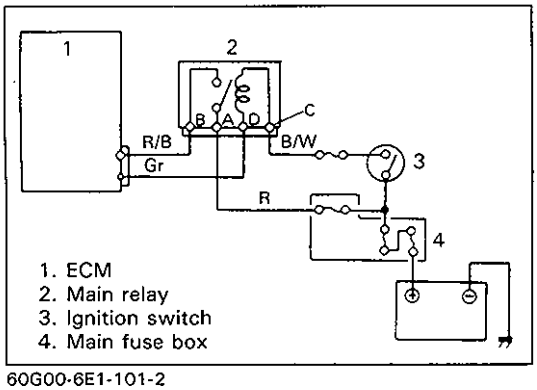
### Installation

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

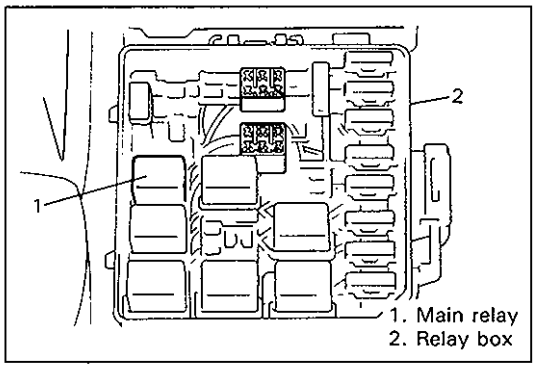
**Tightening Torque**
**(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)**

- Connect coupler of oxygen sensor and clamp wire harness securely.
- After installing oxygen sensor, start engine and check that no exhaust gas leakage exists.




60G00-6E1-101-2

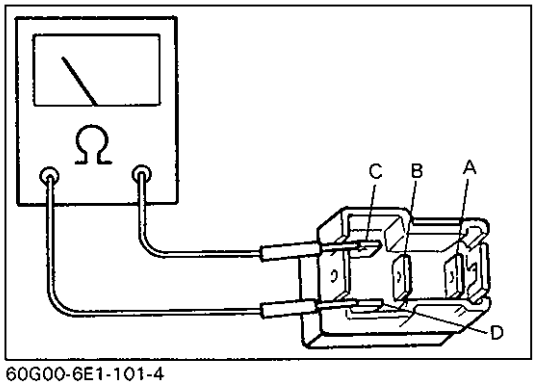
## MAIN RELAY




60G00-6E1-101-3

### Inspection

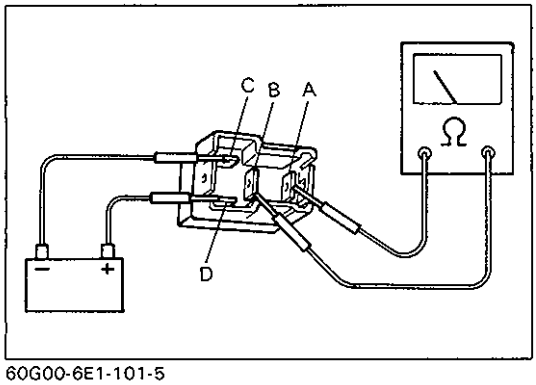
1) Disconnect negative cable at battery.
2) Remove main relay from relay box.




60G00-6E1-101-4

3) Check resistance between each two terminals as in table below.
   If check results are as specified, proceed to next operation check. If not, replace.

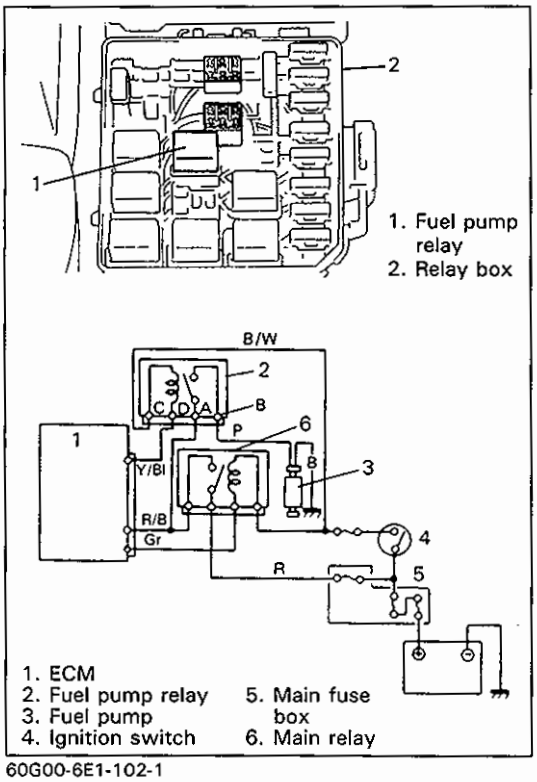
| TERMINALS | RESISTANCE |
|---|---|
| Between A and B | ∞ (infinity) |
| Between C and D | 70—110 Ω |




60G00-6E1-101-5

4) Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".

   If found defective, replace.

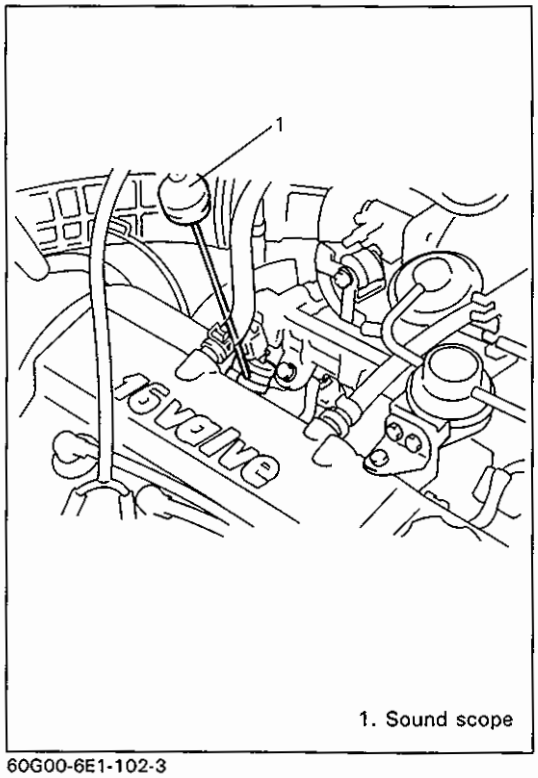



60G00-6E1-102-1

## FUEL PUMP RELAY

### Inspection

1) Disconnect negative cable at battery.
2) Remove fuel pump relay from relay box.
3) Structure of fuel pump relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.
   If found defective, replace.




60G00-6E1-102-3

## FUEL CUT OPERATION

### Inspection

**NOTE:**
**Before inspection, check to make sure that gear shift lever is in neutral position (with A/Tmodel, selector lever in "P" range) and that parking brake lever is pulled all the way up.**

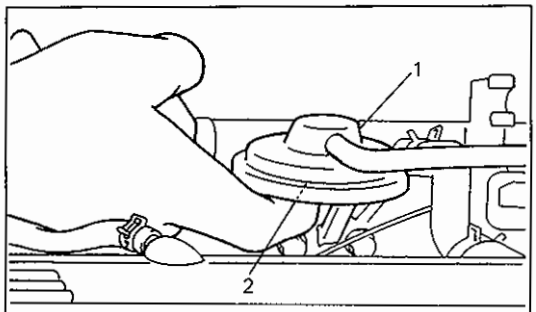
1) Warm up engine to normal operating temperature.
2) While listening to sound of injector by using sound scope or such, increase engine speed to higher than 3,000 r/min.
3) Check to make sure that sound to indicate operation of injector stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to less than about 2,000 r/min.

## EGR SYSTEM (if equipped)

### System Inspection

**NOTE:**
**Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.**

61G00-6E1-104-1

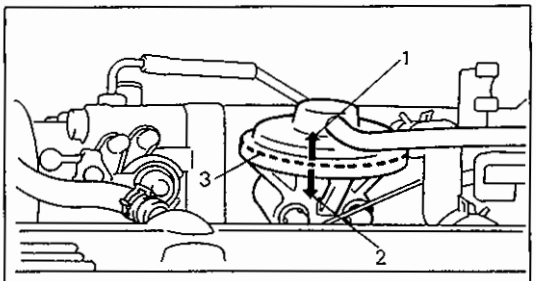



1. EGR valve 2. Diaphragm

1) When engine is cool (coolant temperature is below 40°C, 104°F), start engine and race it (higher than about 3,500 r/min), and check that EGR valve diaphragm is not operating in this state.

> **CAUTION:**
> **If EGR valve is hot, it may be necessary to wear gloves to avoid burning fingers.**

60G00-6E1-103-2




1. During acceleration
2. During deceleration 3. Diaphragm

60G00-6E1-103-3

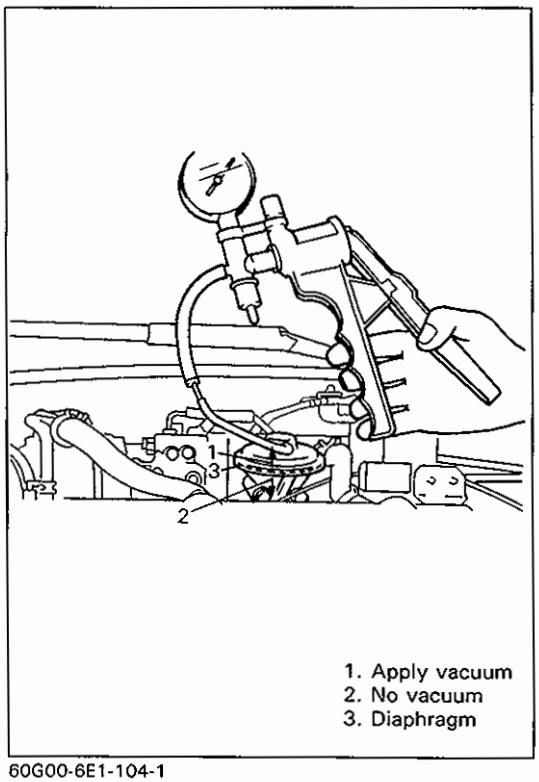
2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward 1 in left figure during acceleration and toward 2 during deceleration.
If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR pressure transducer and EGR solenoid vacuum valve.

3) Keep engine running at idle speed and open EGR valve by hand, and engine should either stop or reduce its speed. If neither occurs, EGR passage is clogged. Clean it.

60B40-6E2-97-2S

### Vacuum Hose Inspection

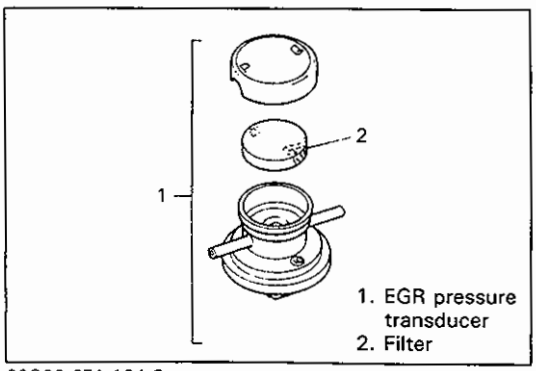
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.




60G00-6E1-104-1

**EGR Valve Inspection**

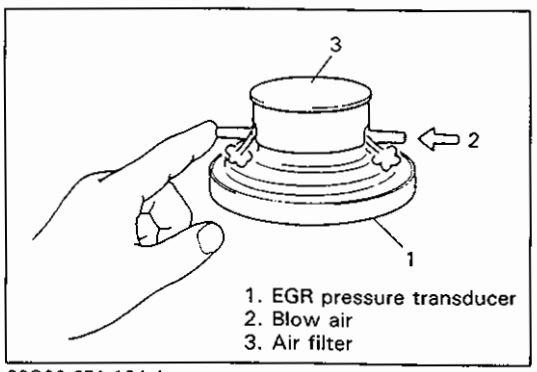
1) Disconnect vacuum hose from EGR pressure transducer.
2) Connect vacuum pump gauge to its hose.
3) Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.
   If diaphragm doesn't move smoothly, or it isn't held at the same position, replace EGR valve.
4) After checking, be sure to connect vacuum hose.




60G00-6E1-104-3

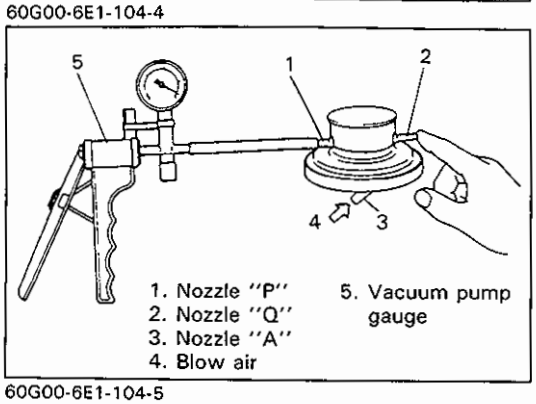
**EGR Pressure Transducer Inspection**

1) Check filter for contamination and damage.
   Using compressed air, clean filter.




60G00-6E1-104-4

2) Remove EGR pressure transducer and plug nozzle with finger. Blow air into another nozzle and check that air passes through to air filter side freely.

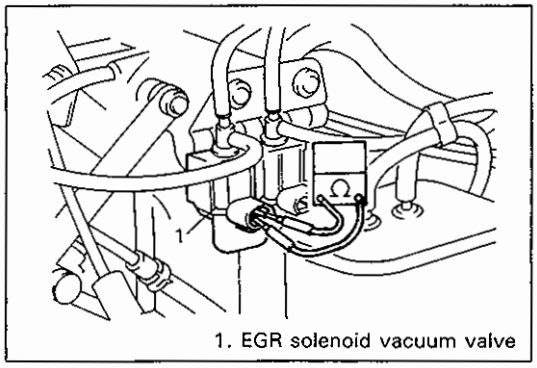



60G00-6E1-104-5

3) Connect vacuum pump gauge to nozzle "P" and plug nozzle "Q" with finger.
   While blowing air into nozzle "A", operate vacuum pump gauge and check that vacuum is applied to pressure transducer.
   Then stop blowing nozzle "A" and check that vacuum pump gauge indicates "0" (zero).
   If check result is not satisfactory, replace EGR pressure transducer.

4) After checking, install modulator and connect hoses securely. Refer to emission control information label for connection.

60B40-6E2-98-4S




1. EGR solenoid vacuum valve

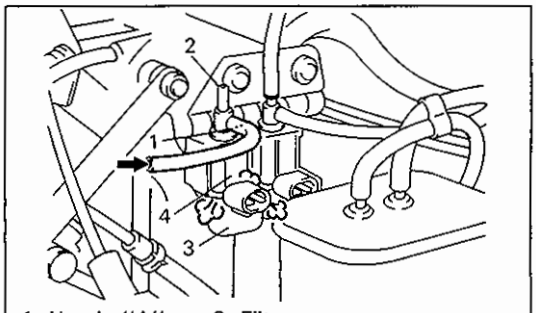
60G00-6E1-105-2

**EGR Solenoid Vacuum Valve Inspection**

1) With ignition switch OFF, disconnect coupler from solenoid vacuum valve.
2) Check resistance between two terminals of solenoid vacuum valve.

   **Resistance: 33—39 Ω**

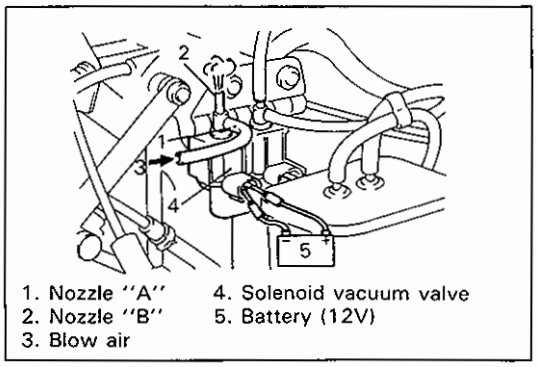
   If resistance is as specified, proceed to next operation check. If not, replace.




1. Nozzle "A"
2. Nozzle "B"
3. Filter
4. Solenoid vacuum valve

60G00-6E1-105-3

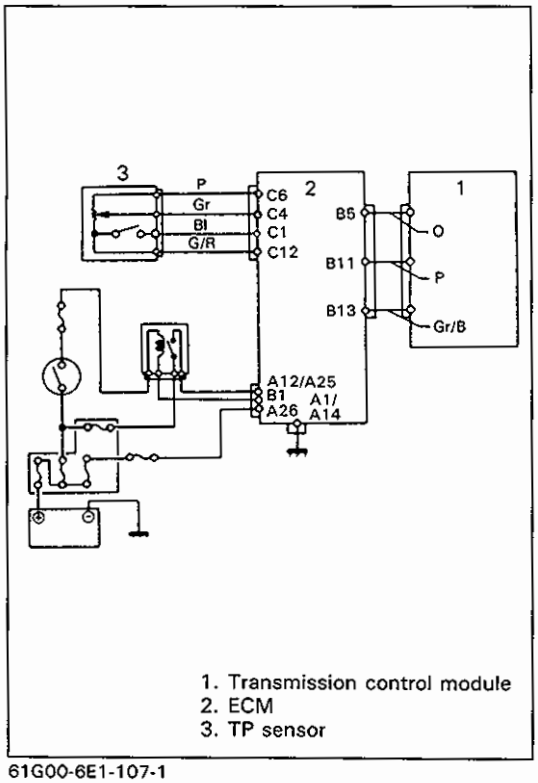
3) Disconnect vacuum hoses from EGR pressure transducer and throttle body.
4) Blow into nozzle "A". Air should come out of filter and not out of nozzle "B".




1. Nozzle "A"
2. Nozzle "B"
3. Blow air
4. Solenoid vacuum valve
5. Battery (12V)

60G00-6E1-105-4

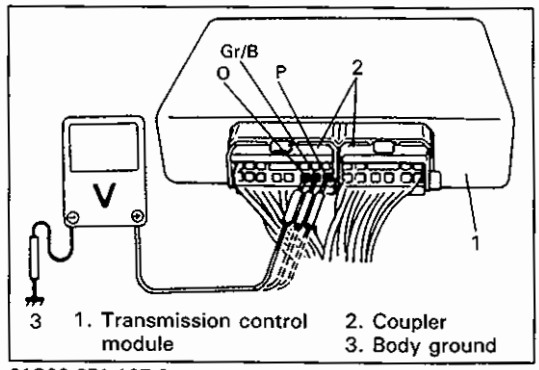
5) Connect 12V-battery to solenoid vacuum valve terminals. In this state, blow nozzle "A".
   Air should come out of nozzle "B" and not out of filter. If check result is not as described above, replace EGR solenoid vacuum valve.
6) Connect solenoid vacuum valve coupler securely.
7) Connect vacuum hose securely.




1. Transmission control module
2. ECM
3. TP sensor

61G00-6E1-107-1

## OUTPUT SIGNAL OF THROTTLE VALVE OPENING (3 A/T Vehicle Only)



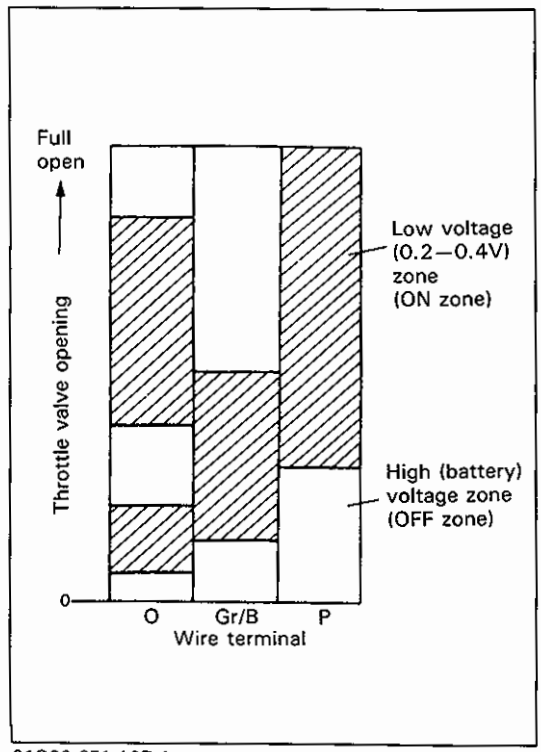

1. Transmission control module
2. Coupler
3. Body ground

61G00-6E1-107-3

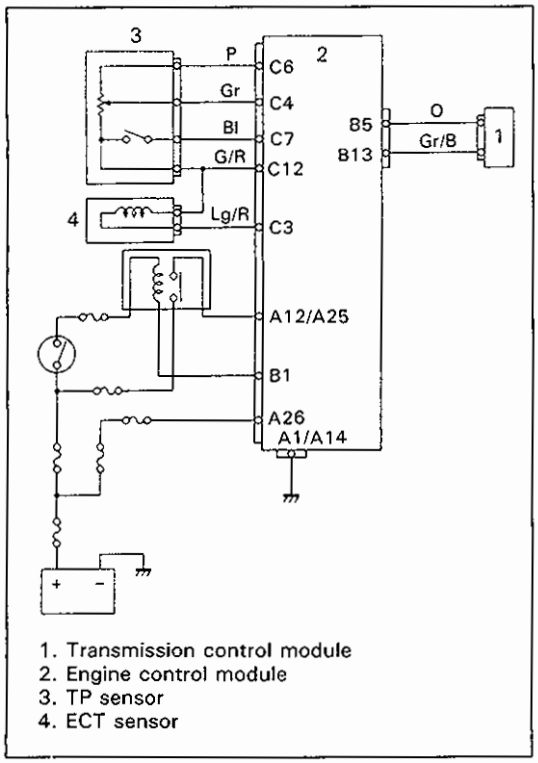
### Inspection

1) Check voltage at each terminal for "P", "Gr/B" and "O" wires of transmission control module.

Voltage at each terminal should vary as shown in following ON/OFF signal diagram.
If check result is not satisfactory, check each wire harness, circuit connections and TP sensor.



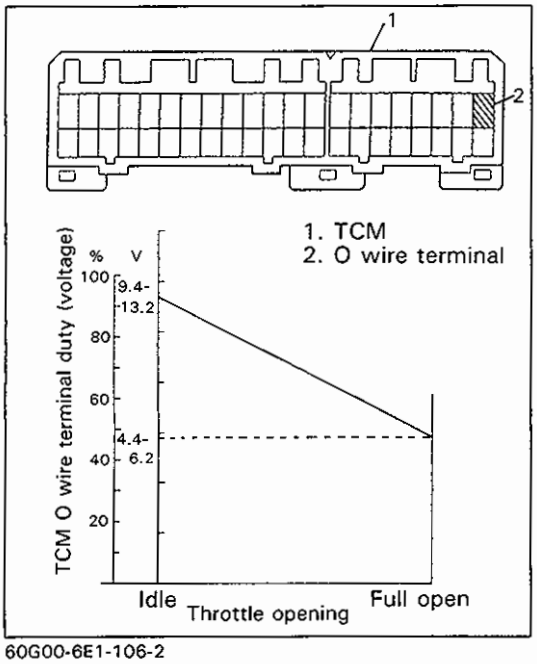

61G00-6E1-107-4




1. Transmission control module
2. Engine control module
3. TP sensor
4. ECT sensor

61G00-6E1-108-1

## OUTPUT SIGNALS OF THROTTLE VALVE OPENING AND ENGINE COOLANT TEMP. (4 A/T vehicle only)

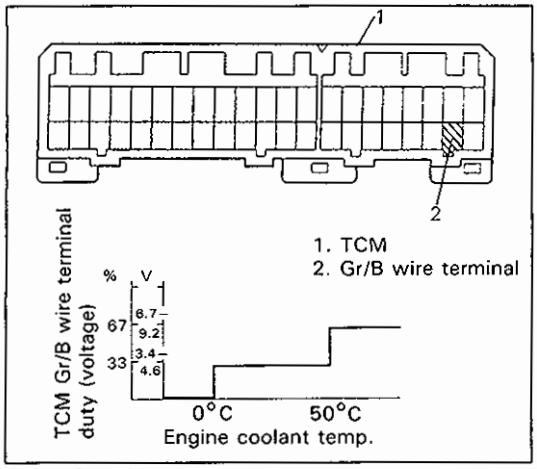



60G00-6E1-106-2

### Throttle Valve Opening Signal Inspection

With throttle valve opening varied, observe duty (voltage) between O wire terminal of TCM and ground and confirm it is as specified.

If check result is not satisfactory, check each wire harness, circuit connections and TP sensor.

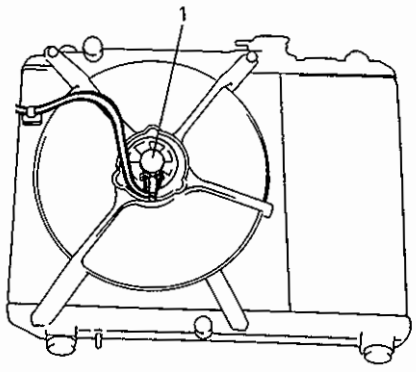



60G00-6E1-106-3

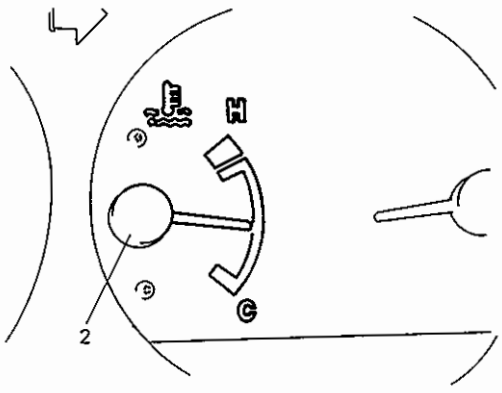
### Engine Coolant Temp. Signal Inspection

Check that specified duty (voltage) is observed between Gr/B wire terminal of TCM and ground as engine coolant temperature changes.

If check result is not satisfactory, check each wire harness, circuit and ECT sensor.




1. Radiator fan motor




2. Coolant temp. meter

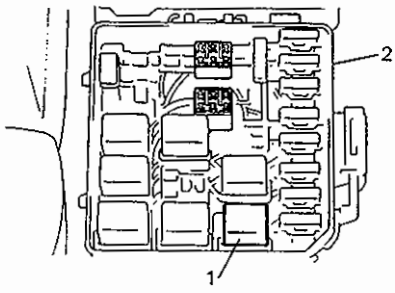
60G00-6E1-107-1

## RADIATOR FAN CONTROL SYSTEM

### System Inspection

**WARNING:**
**Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch in the "ON" position.**

Start engine and keep it running to warm it up.
Now check to ensure that radiator fan is started when indicator of coolant temp. meter moves to as shown in figure.
If check result is not satisfactory, check RFC relay, wire harness, ECT sensor, ECM, coolant temp. meter and sender gauge unit.
Refer to "DIAGNOSTIC FLOW CHART B-9" of this section and "COOLANT TEMP. METER AND SENDER GAUGE INSPECTION" of SECTION 8.




1. RFC relay 2. Relay box

60G00-6E1-107-4

### Radiator Fan Control Relay (RFC Relay)

#### Inspection

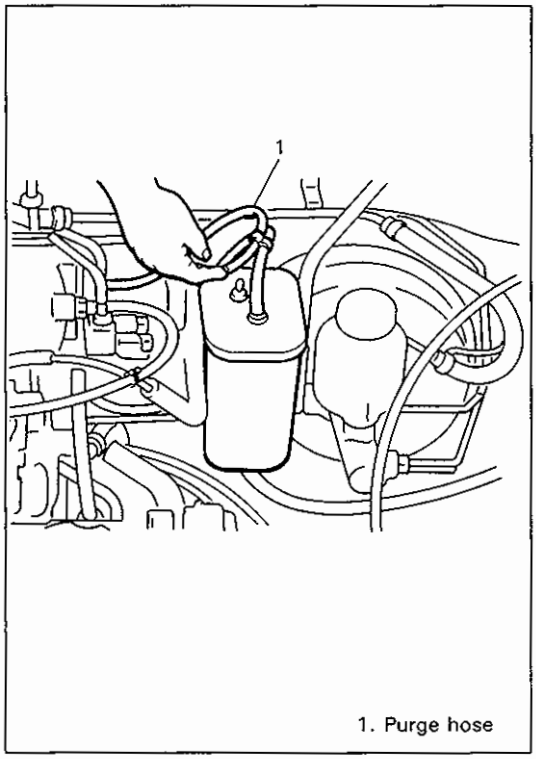
1) Disconnect negative cable at battery.
2) Remove RFC relay from relay box.
3) Structure of RFC relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay. If found defective, replace.

## EVAPORATIVE EMISSION CONTROL SYSTEM

### EVAP Canister Purge Inspection (if equipped)

**NOTE:**
**Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.**

61G00-6E1-110-1




1. Purge hose

1) Warm up engine to normal operating temperature.
2) Disconnect purge hose from EVAP canister.
3) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is running at idle speed.

[For vehicle with EVAP canister purge valve]

4) Also check that vacuum is felt when engine speed is increased to higher than about 3,200 r/min.

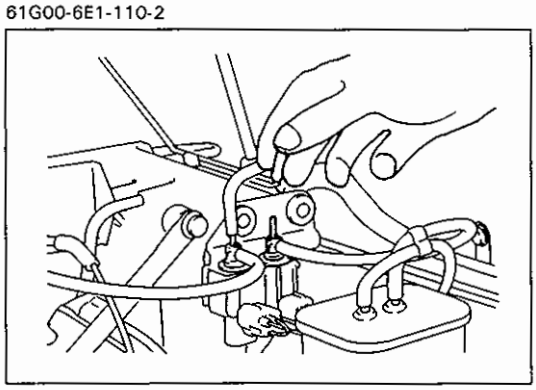
   If check result is not satisfactory, check vacuum passage, hoses, EVAP canister purge valve, wire harness and ECM. Refer to "DIAGNOSTIC FLOW CHART B-6".

[For vehicle with EVAP canister and without canister purge valve]

4) Also check that vacuum is felt when accelerator pedal is depressed.

   If check result is not satisfactory, clean vacuum passage by blowing compressed air.

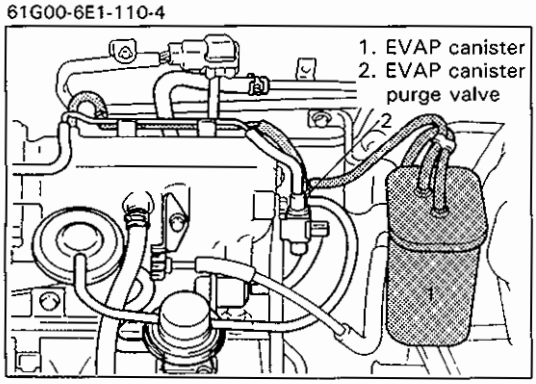
61G00-6E1-110-2



61G00-6E1-110-4

#### Vacuum Passage Inspection
#### (for vehicle with EVAP canister purge valve)

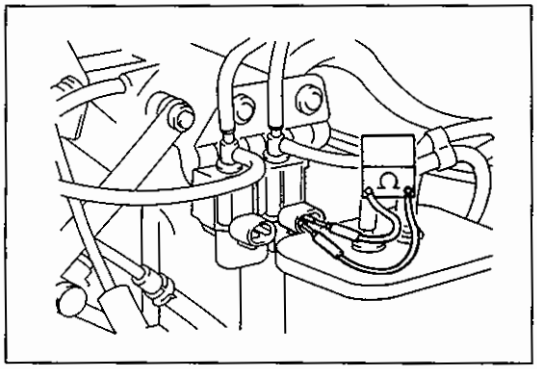
Start engine and run it at idle speed. Disconnect vacuum hose from EVAP canister purge valve. With finger placed against hose disconnected, check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.




61G00-6E1-110-5

#### Vacuum Hose Inspection (if equipped)

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.



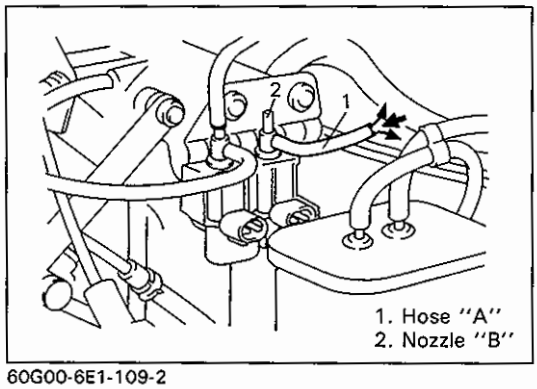
61G00-6E1-111-1

**EVAP Canister Purge Valve Inspection (if equipped)**

1) With ignition switch OFF, disconnect coupler from canister purge valve.
2) Check resistance between two terminals of EVAP canister purge valve.

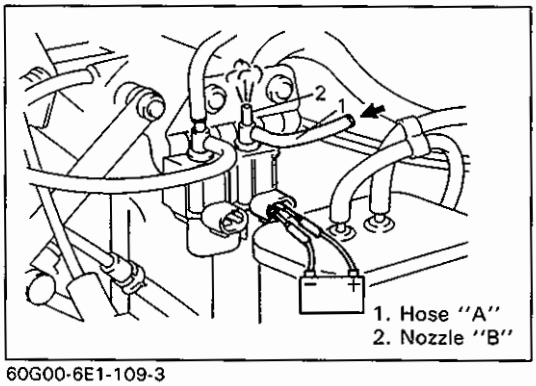
   **Resistance of EVAP canister purge valve:**
   **33—39 Ω at 20°C (68°F)**

   If resistance is as specified, proceed to next operation check. If not, replace.




60G00-6E1-109-2

3) Disconnect vacuum hoses from intake manifold and its pipe.
4) With coupler disconnected, blow into hose "A". Air should not come out of nozzle "B".




60G00-6E1-109-3

5) Connect 12V-battery to EVAP canister purge valve terminals. In this state, blow hose "A".
   Air should come out of nozzle "B".

   **WARNING:**
   **Do not suck the air through valve. Fuel vapor inside valve is harmful.**

   If check result is not as described, replace canister purge valve.

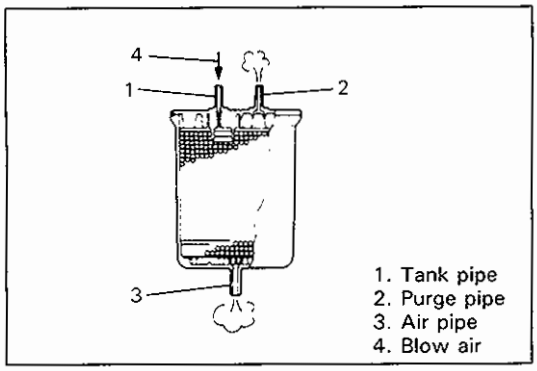
6) Connect vacuum hoses.
7) Connect EVAP canister purge valve coupler securely.

60B40-6E2-104-4S

**EVAP Canister Inspection (if equipped)**

**WARNING:**
**DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.**

1) Disconnect vacuum hoses from EVAP canister.

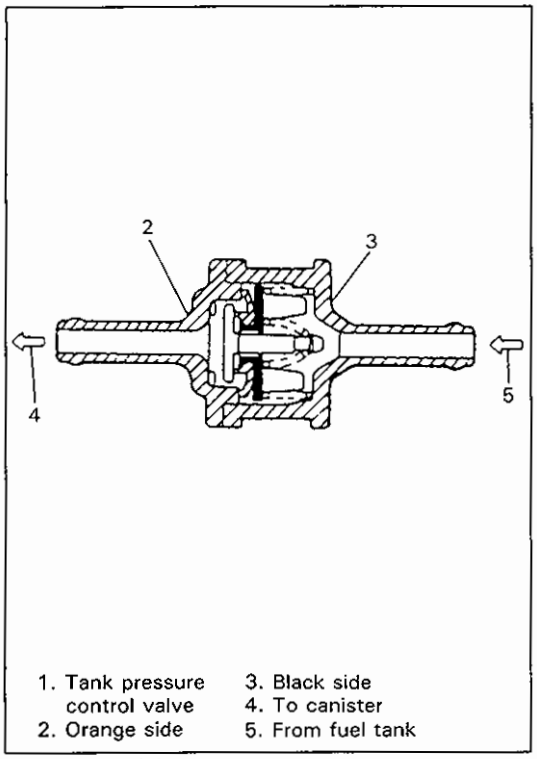



60B40-6E2-105-1S

2) When air is blown into tank pipe, there should be no restriction of flow through purge pipe and air pipe.

3) If operation differs from above description, EVAP canister must be replaced.
4) Connect hoses to canister.

60B40-6E2-105-2S




60G00-6E1-110-3

**Tank Pressure Control Valve Inspection**

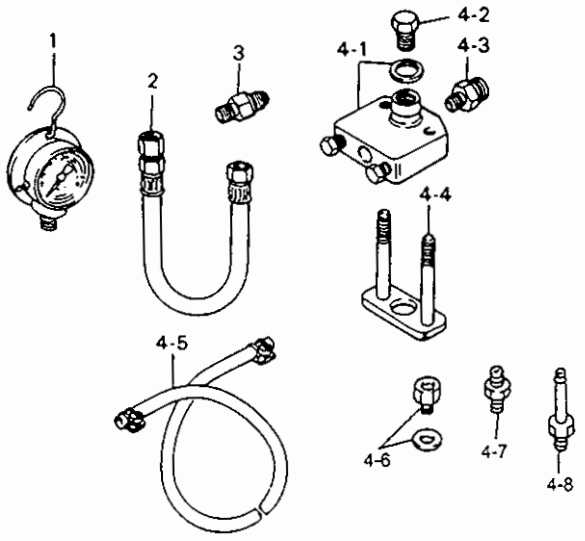
1) Remove tank pressure control valve installed on fuel tank.
2) Air should pass through valve smoothly from fuel tank side (black side of tank pressure control valve) to orange side when blown hard.
3) From orange side, even when blown softly, air should come out of black side.
4) If air doesn't pass through valve in step 2) or hard blow is required in step 3), replace tank pressure control valve.

**WARNING:**
**DO NOT SUCK air through tank pressure control valve. Fuel vapor inside the valve is harmful.**

5) Install tank pressure control valve.

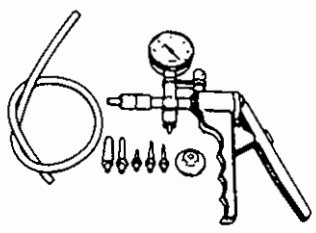
**NOTE:**
**When connecting tank pressure control valve between hoses, refer to figure at the left for installing direction.**

# SPECIAL TOOLS

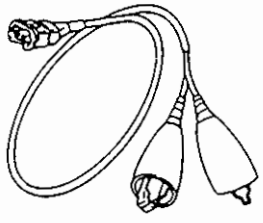



1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. Attachment
   09919-46010
4. Checking tool set
   09912-58421

4-1. Tool body & washer
4-2. Body plug
4-3. Body attachment-1
4-4. Holder
4-5. Return hose & clamp
4-6. Body attachment-2 & washer
4-7. Hose attachment-1
4-8. Hose attachment-2



09917-47910
Vacuum pump gauge



09930-88530
Injector test lead

60A70-6E1-111-2S

# RECOMMENDED TORQUE SPECIFICATIONS

| Fastening parts | Tightening torque | | |
|---|---|---|---|
| | N·m | kg-m | lb-ft |
| TP sensor mounting screw | 2 | 0.2 | 1.5 |
| IAC valve screw | 3.4 | 0.34 | 2.5 |
| Fuel delivery pipe plug bolt | 30 | 3.0 | 22.0 |
| ECT sensor | 15 | 1.5 | 11.0 |
| Heated oxygen sensor | 45 | 4.5 | 32.5 |

60G00-6E1-111-2