SECTION 6B

ENGINE COOLING

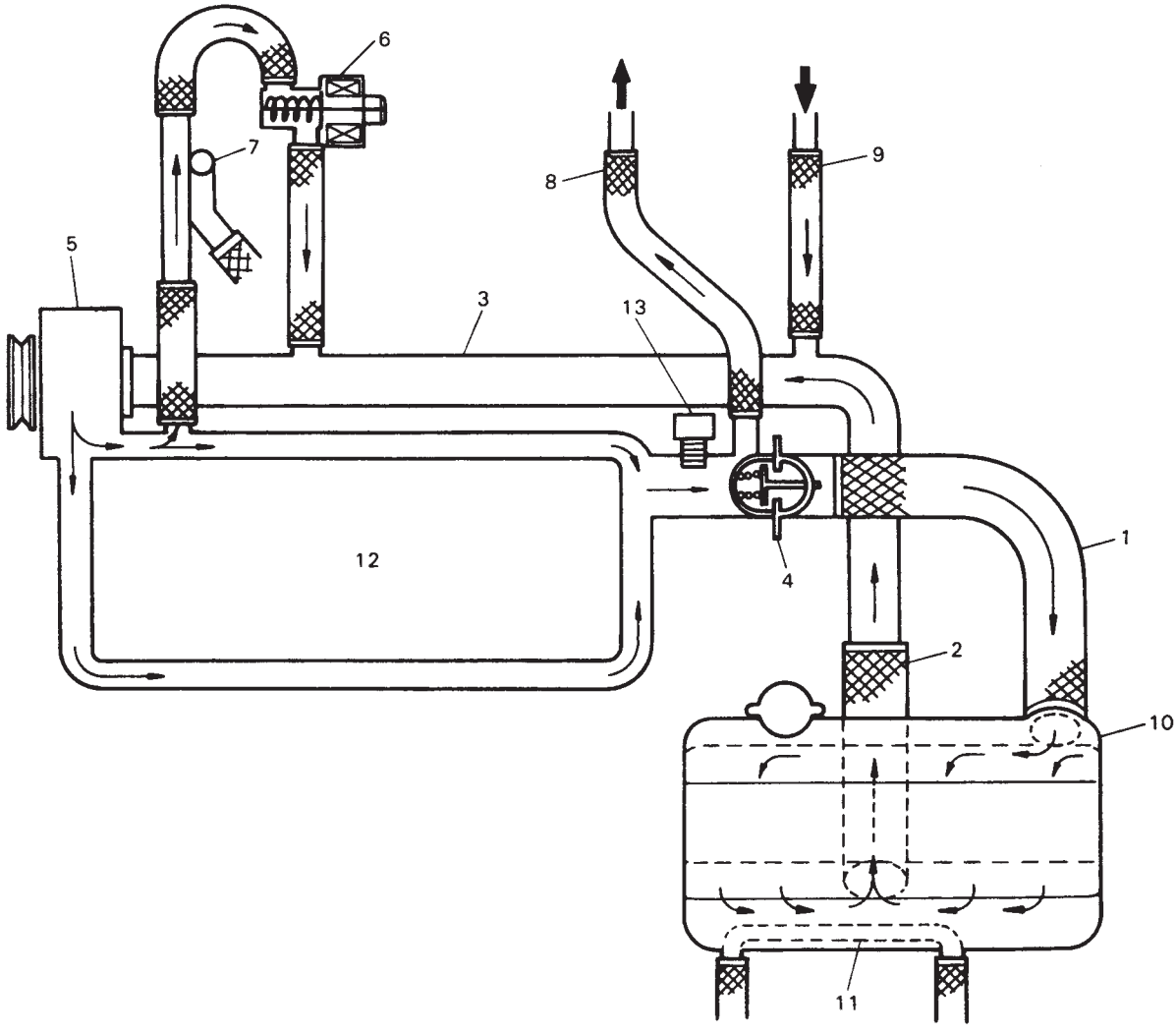
NOTE:
For the descriptions (items) not found in this section, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

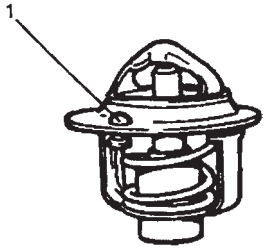
GENERAL DESCRIPTION

COOLING SYSTEM CIRCULATION

During engine warm-up (thermostat closed), the water pump discharges coolant into the water jacket chamber adjacent to No.1 cylinder. Coolant then flows through the cylinder block and the cylinder heat. Coolant then returns to the water pump through intake manifold, heater inlet hose, heater unit, heater outlet hose, and water intake pipe. During normal temperatures (thermostat open), coolant takes the same basic route but is now allowed to flow past the thermostat, the inlet hose and the radiator, and then back to the water pump through the outlet hose and the water intake pipe.



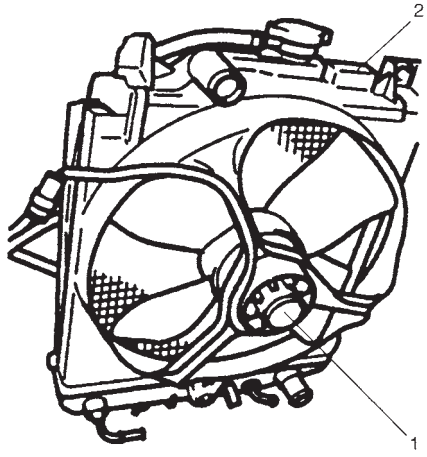
1. Radiator inlet hose
2. Radiator outlet hose
3. Water intake pipe
4. Thermostat
5. Water pump
6. IAC valve (throttle body)
7. Breather pipe (air cleaner outlet hose)
8. Heater inlet hose
9. Heater outlet hose
10. Radiator
11. Oil cooler (A/T only)
12. Engine
13. ECT sensor



THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.
A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.
When the pellet is heated and expands, the metal case pushes down the valve to open it.
As the pellet is cooled, the contraction allows the spring to close the valve.
Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.
At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.
As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.
In the top portion of the thermostat, an air bleed valve (1) is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

Thermostat functional spec. ± 2.8°C (5.0°F)	
Temp. at which valve begins to open	88°C (190°F)
Temp. at which valve become fully open	100°C (212°F)

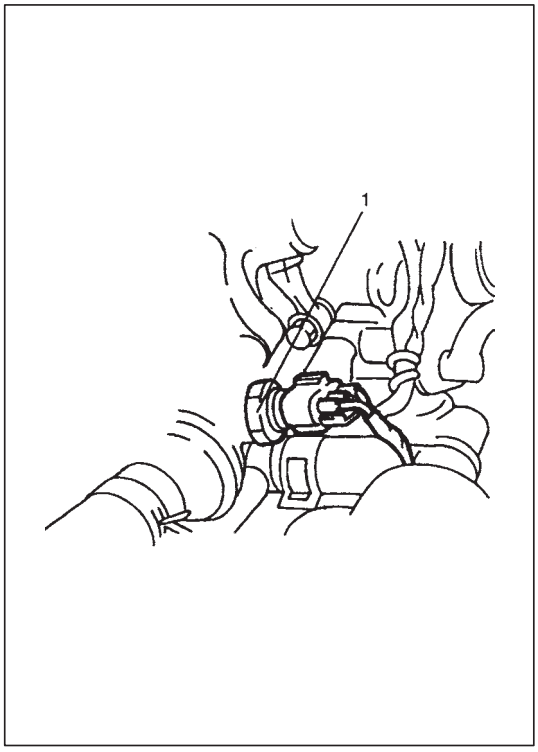


1. Cooling fan motor
2. Radiator

COOLING FAN

The cooling fan is driven by electric motor, and the motor is activated by ECM/PCM (engine coolant temp.). For its details, refer to Section 6E.

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 ECM/PCM (engine coolant temp.) with the ignition switch in the "ON" position.



COOLANT (WATER) TEMP. GAUGE

The coolant temp. gauge is included in engine coolant temp. (ECT) sensor (1). This gauge activates a temp. meter in the instrument cluster.

DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	● Loose or broken water pump belt	Adjust or replace.
	● Not enough coolant	Check coolant level and add as necessary.
	● Faulty thermostat	Replace.
	● Faulty water pump	Replace.
	● Dirty or bent radiator fins	Clean or remedy.
	● Coolant leakage on cooling system	Repair.
	● Defective cooling fan motor	Check and replace as necessary.
	● Plugged radiator	Check and replace radiator as necessary.
	● Faulty radiator cap	Replace.
	● Maladjusted ignition timing	Adjust.
	● Dragging brakes	Adjust brake.
	● Slipping clutch	Adjust or replace.

MAINTENANCE

COOLANT

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank.
When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled at the factory with a quality coolant that is either 50/50 mixture of water and GOLDEN CRUISER 1200 (ethylene glycol antifreeze.) or 30/70 mixture of water and GOLDEN CRUISER 1200. The 50/50 mixture coolant solution provides freezing protection to –36°C (–33°F), the 30/70 mixture coolant solution provides freezing protection to –16°C (3°F).
When changing the engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200 for the market where ambient temperature falls lower than –16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200 for the market where ambient temperature doesn't fall lower than –16°C (3°F).

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze / Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.**

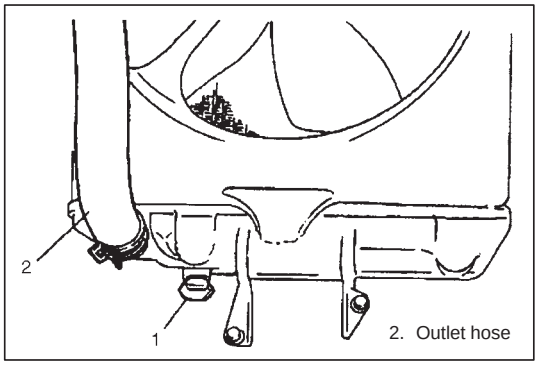
ANTI-FREEZE PROPORTIONING TABLE

					Vehicle with M/T		Vehicle with A/T	
ANTI-FREEZE PROPORTIONING CHART	Freezing temperature			°C	–16	–36	–16	–36
				°F	3	–33	3	–33
	Anti-freeze/Anti-corrosion coolant concentration			%	30	50	30	50
	Ratio of compound to cooling water	G10 engine		ltr.	1.17/2.73	1.95/1.95	1.20/2.80	2.00/2.00
				US pt.	2.47/5.77	4.12/4.12	2.54/5.92	4.23/4.23
				Imp pt.	2.06/4.80	3.43/3.43	2.11/3.70	3.52/3.52
		G13 engine		ltr.	1.38/3.22	2.30/2.30	1.41/3.29	2.35/2.35
				US pt.	2.92/6.80	4.86/4.86	2.98/6.95	4.96/4.96
				Imp pt.	2.43/5.67	4.05/4.05	2.48/5.79	4.13/4.13
COOLANT CAPACITY	G10 engine	Engine radiator and heater			3.3 liters (7.0/5.8 US/Imp pt.)		3.4 liters (7.2/6.0 US/Imp pt.)	
		Reservoir tank			0.6 liters (1.3/1.1 US/Imp pt.)			
		Total			3.9 liters (8.2/6.9 US/Imp pt.)		4.0 liters (8.5/7.0 US/Imp pt.)	
	G13 engine	Engine radiator and heater			4.0 liters (8.5/7.0 US/Imp pt.)		4.1 liters (8.6/7.2 US/Imp pt.)	
		Reservoir tank			0.6 liters (1.3/1.1 US/Imp pt.)			
		Total			4.6 liters (9.7/8.1 US/Imp pt.)		4.7 liters (9.9/8.3 US/Imp pt.)	

COOLING SYSTEM FLUSH AND REFILL

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and 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.

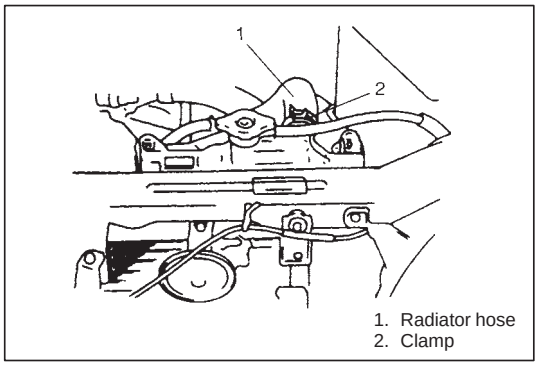
1) Remove radiator cap when engine is cool:
   Turn cap counterclockwise slowly until it reaches a “stop”. (Do not press down while turning it.)
   Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.
2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).



3) Stop engine and open radiator drain plug (1) to drain coolant.
4) Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Drain system and then close radiator drain plug tightly.
7) Disconnect reservoir tank hose from radiator. Remove reservoir tank and pour out any fluid. Scrub and clean inside of tank with soap and water.
   Flush it well with clean water and drain. Reinstall tank and hose.
8) add 50/50 mixture of GOLDEN CRUISER 1200 (Good quality ethylene glycol anti-freeze) and water to radiator and tank.
   Fill radiator to the base of radiator filler neck and reservoir tank to “FULL” level mark. Reinstall reservoir tank cap.
9) Run engine, with radiator cap removed, until radiator upper hose is hot.
10) With engine idling, add coolant to radiator until level reaches the bottom of filler neck. Install radiator cap, making sure that the ear of cap lines up with reservoir tank hose.

ON-VEHICLE SERVICE

WARNING:
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cord from battery terminal before removing any part.**



1. Radiator hose
2. Clamp

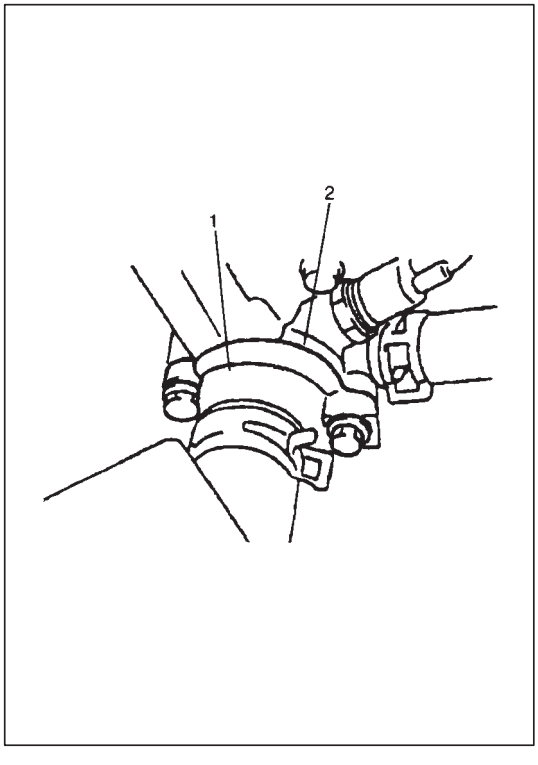
COOLING WATER PIPES OR HOSES

REMOVAL

1) Drain cooling system.
2) To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

INSTALLATION

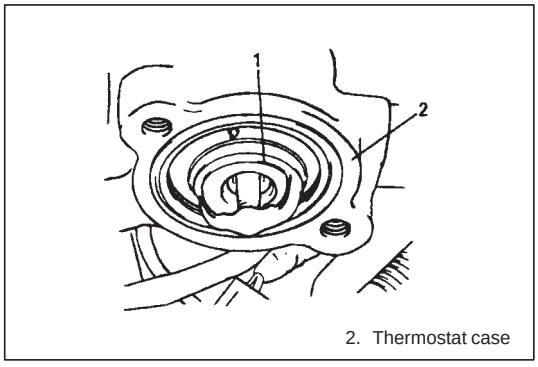
Install removed parts in reverse order of removal procedure, noting the following.
- Tighten each clamp bolt securely.
- Refill cooling system with proper coolant, referring to description on COOLANT of MAINTENANCE.



THERMOSTAT

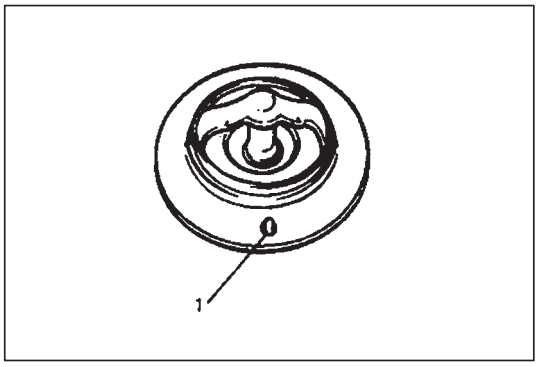
REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system and tighten drain plug.
3) Disconnect thermostat cap (1) from thermostat case (2).



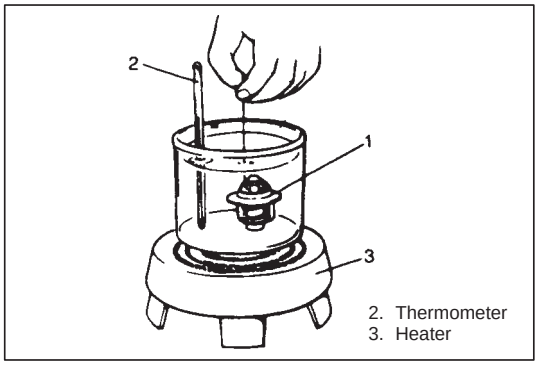
2. Thermostat case

4) Remove thermostat (1).



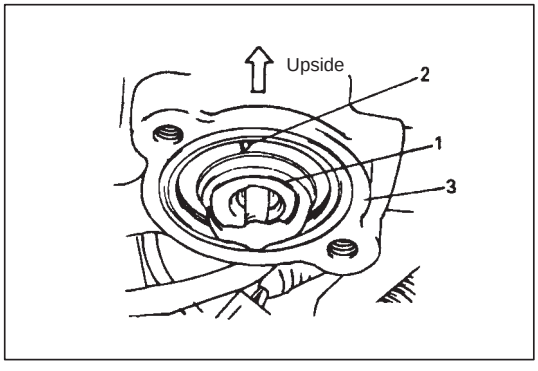
INSPECTION

1) Make sure that air bleed valve (1) of thermostat is clean. Should this valve be clogged, engine would tend to overheat.
2) Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.



2. Thermometer
3. Heater

3) Check thermostatic movement of wax pellet as follows:
   - Immerse thermostat (1) in water, and heat water gradually.
   - Check that valve starts to open at specific temperature.
   - If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.

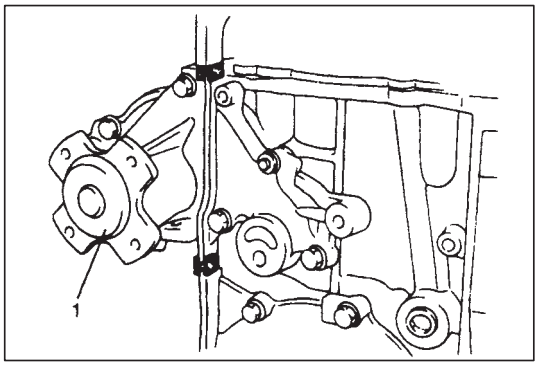


INSTALLATION

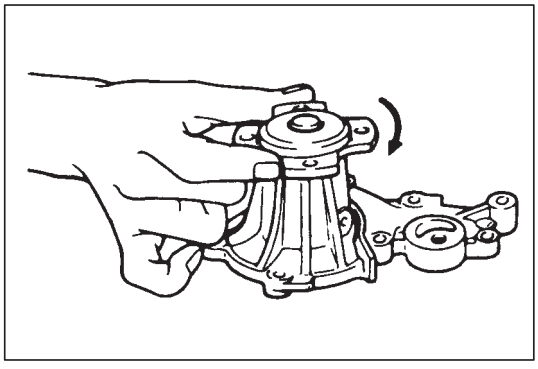
1) When positioning thermostat on thermostat case, be sure to position it so that air bleed valve comes uppermost and into the recession of thermostat case.
2) Install thermostat cap to thermostat case. When installing cap, align arrow marks on cap and case.
3) Fill cooling system.
4) Connect negative cable.
5) After installation, check each part for leakage.

WATER PUMP

1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Remove timing belt and tensioner according to procedure described in “TIMING BELT AND TENSIONER” of Section 6A or 6A1.
4) Remove water pump belt adjusting arm.



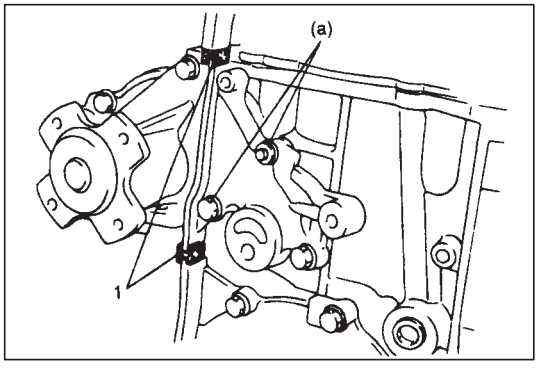
5) Remove water pump assembly (1).



INSPECTION

NOTE:
Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation.
If pump does not rotate smoothly or makes abnormal noise, replace it.



INSTALLATION

1) Install new pump gasket to cylinder block.
2) Install water pump to cylinder block.

Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

3) After installing water pump, install rubber seal (1) between water pump and oil pump, and another between water pump and cylinder head.

4) Install timing belt tensioner, timing belt and timing belt outside covers according to procedure described in “TIMING BELT AND TENSIONER” of Section 6A or 6A1.

NOTE:
- **Special care must be used when installing belt tensioner and timing belt.**
- **Torque each bolt and nut to specification.**
- **Before installing outside covers, check to make sure that cover seal is fitted in groove of each cover properly.**

5) Install crankshaft pulley, water pump pulley, and pump drive belt referring to Section 6A or 6A1.
6) Adjust water pump belt tension.
7) Install fender apron extension on right side.
8) Install air cleaner assembly.
9) Connect negative cable at battery.
10) Fill cooling system.
11) After installation, check each part for leakage.

SECTION 6C

ENGINE FUEL

NOTE:
For the descriptions (items) not found in this section, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

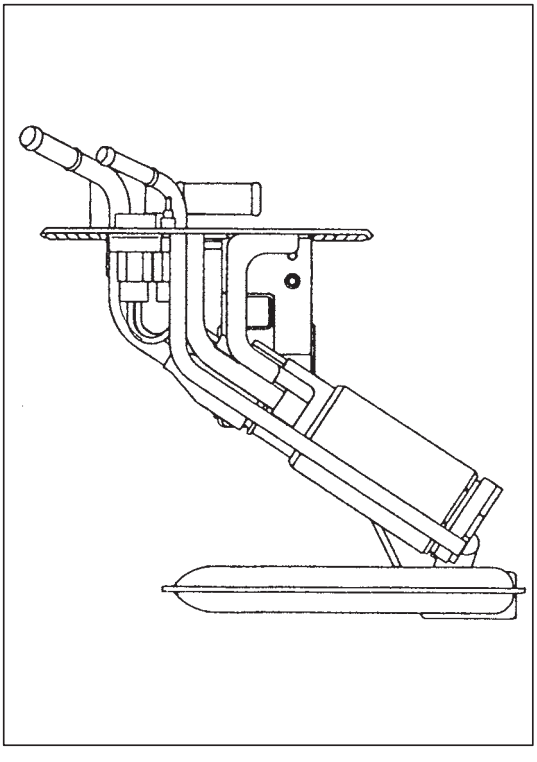
CONTENTS

CAUTION:
BE SURE TO USE UNLEADED FUEL ONLY. USE OF LEADED AND/OR LOW LEAD FUEL CAN RESULT IN ENGINE DAMAGE AND REDUCE THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM.

GENERAL DESCRIPTION

FUEL SYSTEM

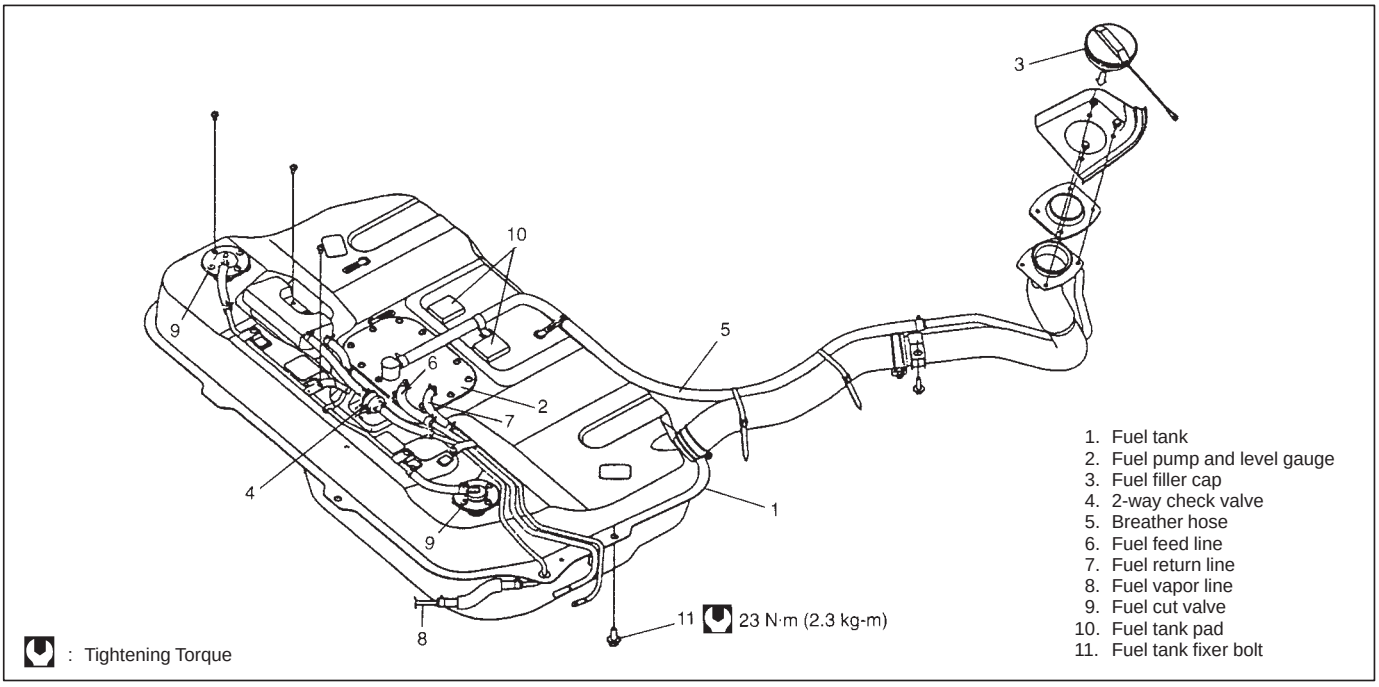
The main components of the fuel system are fuel tank, fuel pump, fuel filter and fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.
For the details of fuel vapor flow, refer to Section 6E “ENGINE AND EMISSION CONTROL SYSTEM”.



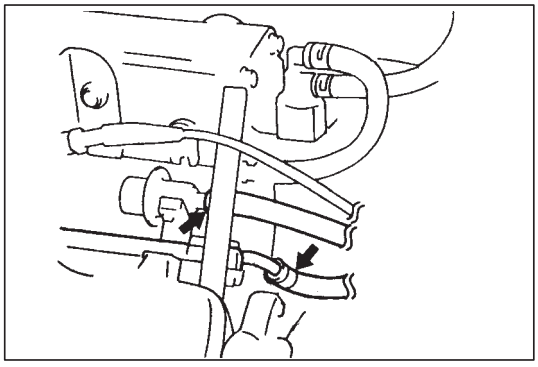
FUEL PUMP ASSEMBLY (WITH FUEL LEVEL GAUGE)

The fuel pump assembly consists of fuel pump and fuel level gauge.
For structure and operation of the fuel pump, refer to Section 6E.

ON-VEHICLE SERVICE



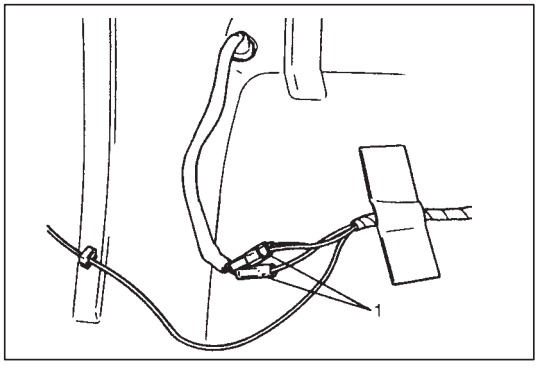
1. Fuel tank
2. Fuel pump and level gauge
3. Fuel filler cap
4. 2-way check valve
5. Breather hose
6. Fuel feed line
7. Fuel return line
8. Fuel vapor line
9. Fuel cut valve
10. Fuel tank pad
11. Fuel tank fixer bolt



FUEL LINES

INSPECTION

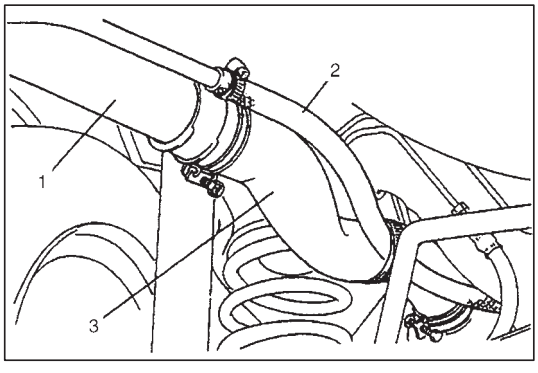
Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration, or damage.
Make sure all clamps are secure.
Replace parts as needed.



FUEL TANK

REMOVAL

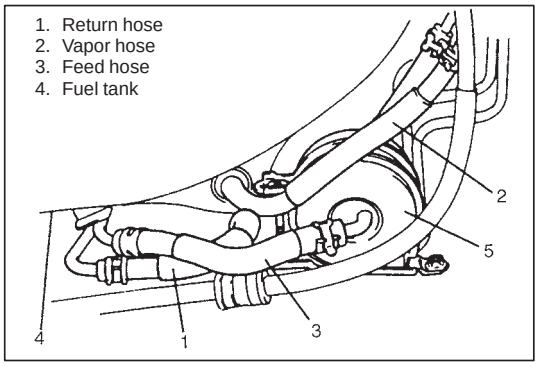
1) Relieve fuel pressure in fuel feed line according to procedure described in Section 6.
2) Disconnect negative cable at battery.
3) Remove rear seat cushion referring to Section 9.
4) Disconnect connectors (1) of fuel tank wire harness.



5) Hoist vehicle.
6) Disconnect fuel filler hose (3) from fuel tank and breather hose (2) from filler neck (1).

7) As fuel tank has no drain plug, drain fuel tank by pumping fuel out through fuel tank filler or fuel tank inlet.
Use hand operated pump to drain fuel tank.

WARNING:
Never drain or store fuel in an open container to avoid possibility of fire or explosion.



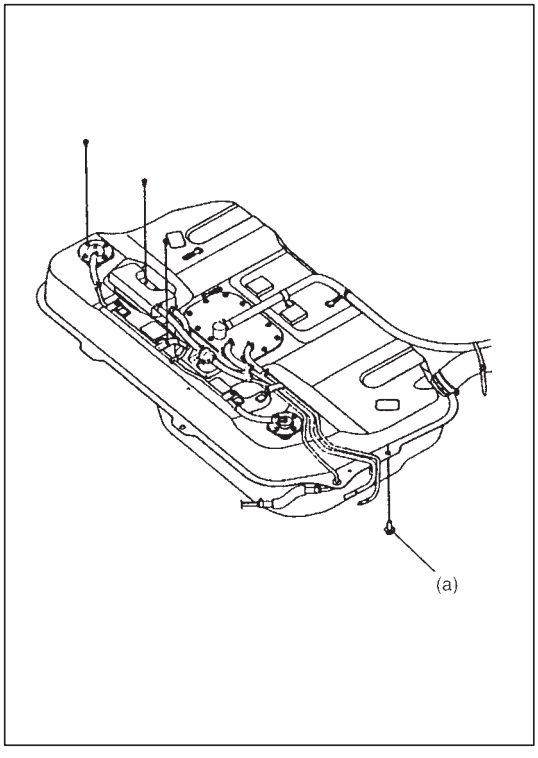
8) Disconnect fuel hoses from filter (5) and pipes.

WARNING:
A small amount of fuel may be released after fuel hose is disconnected. In order reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

9) Remove fuel tank from vehicle.

INSPECTION

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check for leaks from installation face of parts installed on fuel tank, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

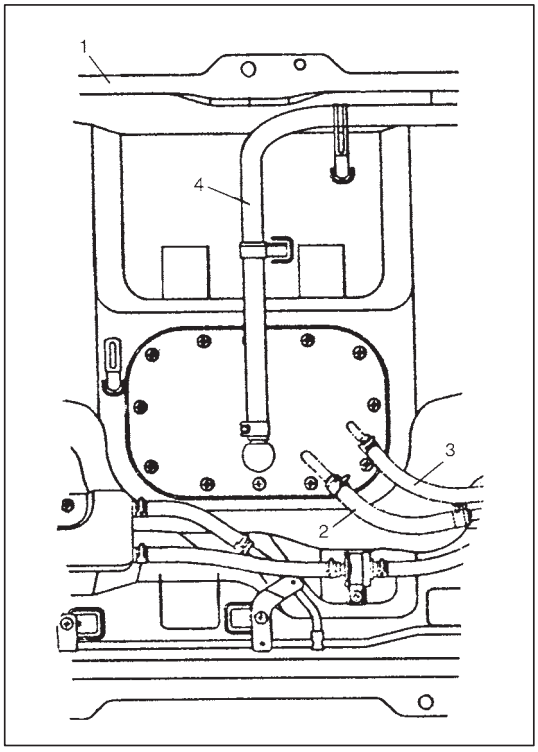


INSTALLATION

1) Install fuel pump assembly to fuel tank.
Use new gasket.
2) Install 2-way check valve to fuel tank directing its black nozzle toward fuel tank.
3) Connect hoses and pipes to fuel tank.
4) Connect breather hose to fuel tank.
5) Install fuel tank to vehicle.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

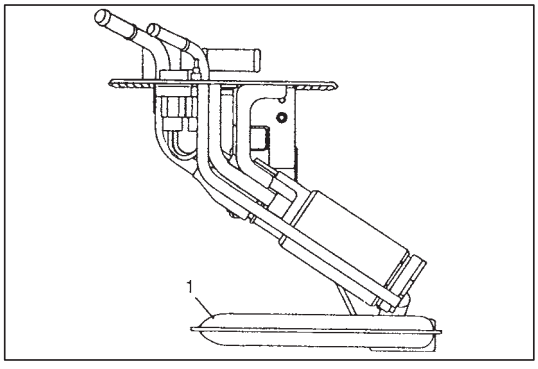
6) Connect fuel filler hose to tank and breather hose to filler neck.
7) Connect fuel hoses to filter and pipes.
8) Connect connectors of fuel tank wire harness.
9) Install rear seat cushion referring to Section 9.
10) Connect negative cable at battery.
11) With engine “OFF” and ignition switch “ON”, check for fuel leaks.



FUEL PUMP ASSEMBLY

REMOVAL

1) Remove fuel tank (1) from vehicle referring to “FUEL TANK” in this section.
2) Disconnect fuel feed hose (2), fuel return hose (3) and breather hose (4) from fuel pump assembly (5).
3) Remove fuel pump assembly from fuel tank by removing screws.



INSPECTION

Check fuel pump assembly for damage.
Check fuel suction filter (1) for evidence of dirt and contamination. If present, replace or clean and check for presence of dirt in fuel tank.

INSTALLATION

Reverse removal procedure for installation noting the followings.

- Use new gasket.
- Clamp hoses securely.

SECTION 6E1

ENGINE AND EMISSION CONTROL SYSTEM (TBI FOR G10)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

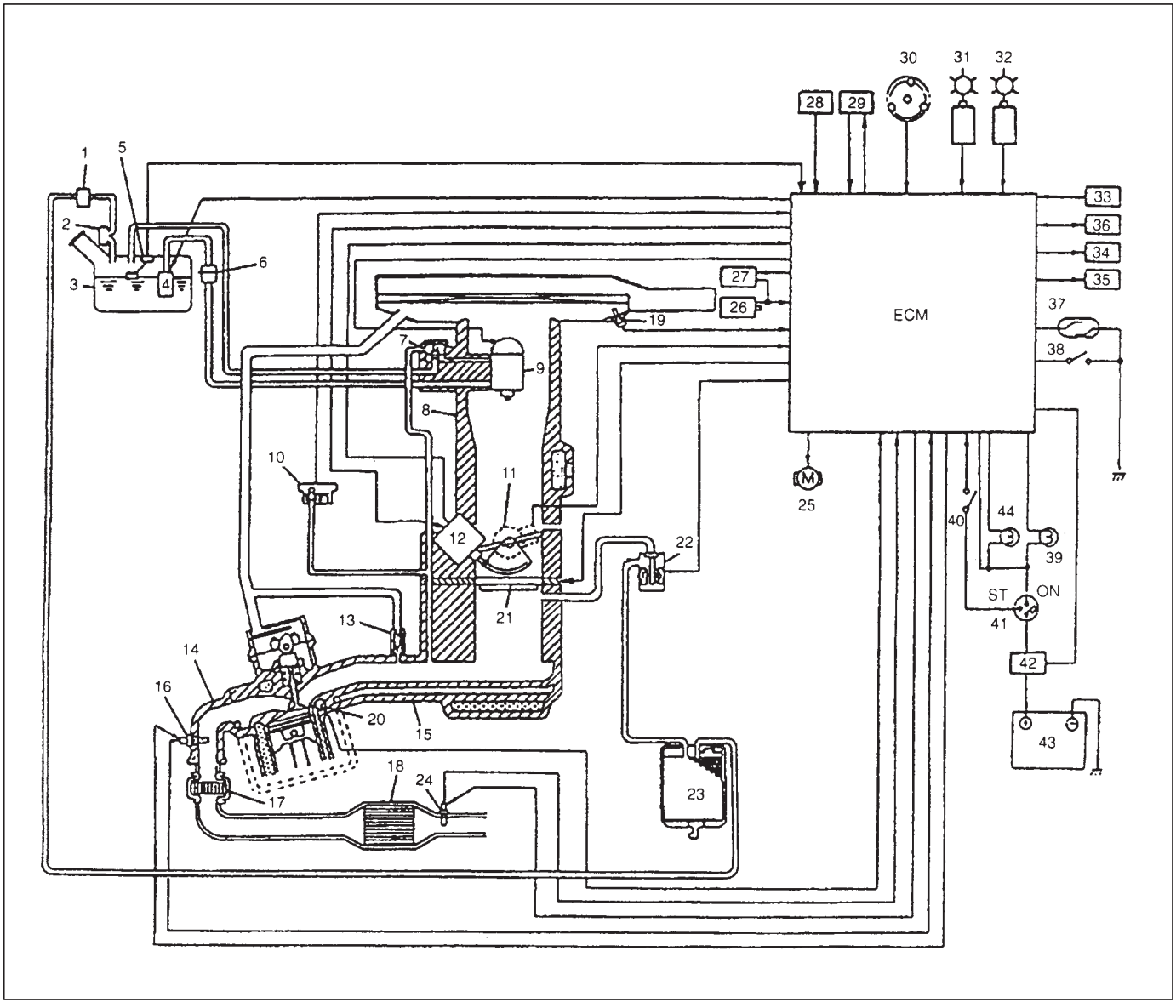
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service 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 15 seconds after ignition switch is turned to "LOCK" position, battery is disconnected or fuse powering SDM is removed. Work must be started after 15 seconds from the time.**

NOTE:
For the descriptions for vehicle without warm up three way catalytic converter (WU TWC), refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

GENERAL DESCRIPTION

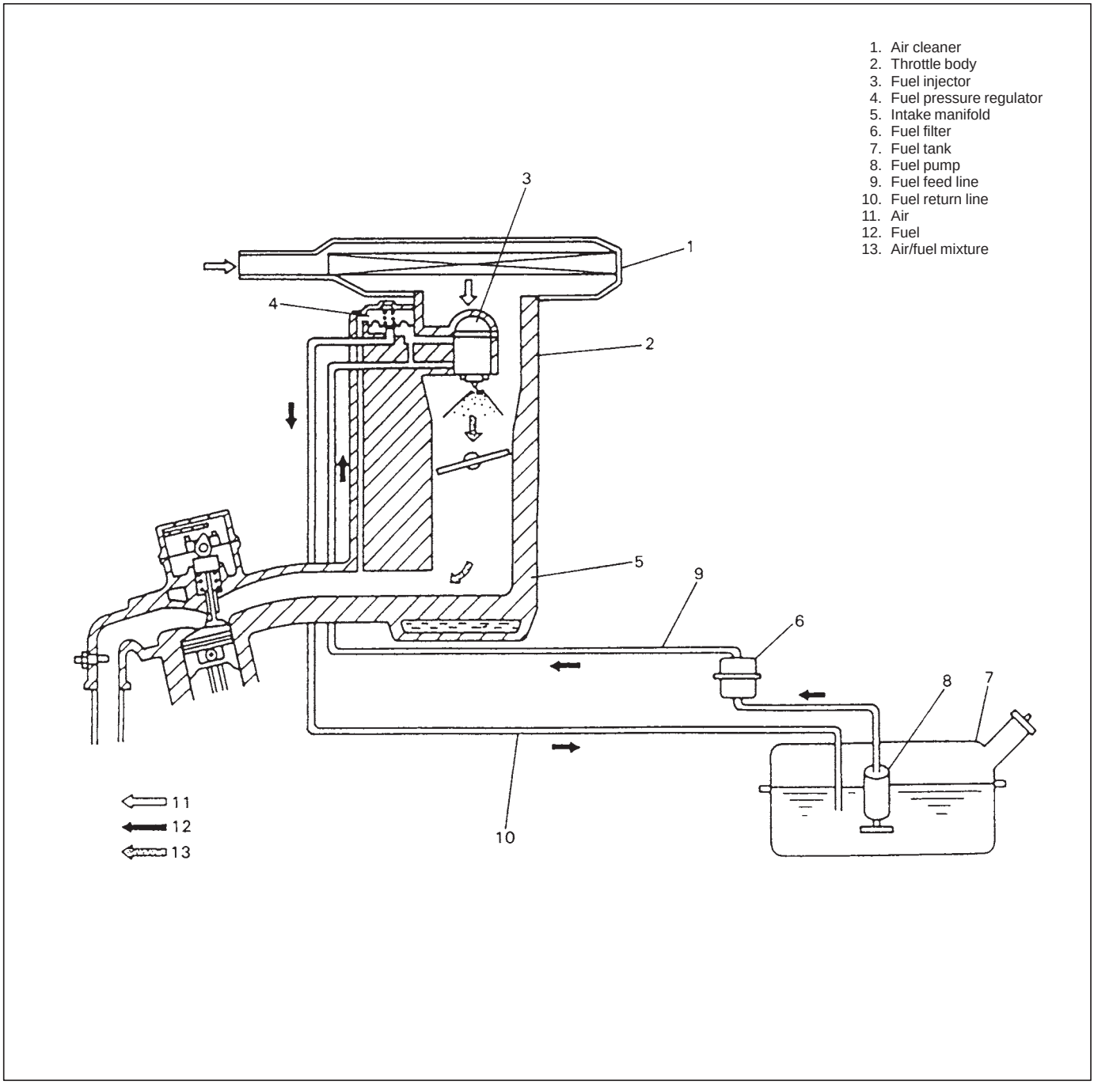
The engine and emission control system is divided into 3 major sub-systems: air/fuel delivery system, electronic control system and emission control system.
Air/fuel delivery system includes fuel pump, throttle body, etc. Electronic control system includes ECM, various sensors and controlled devices.
Emission control system includes EVAP and PCV system.



1. Tank pressure control valve
2. Fuel liquid separator
3. Fuel tank
4. Fuel pump
5. Fuel level sensor (gauge)
6. Fuel filter
7. Fuel pressure regulator
8. Throttle body
9. Fuel injector
10. MAP sensor
11. TP sensor
12. ISC actuator (including CTP switch)
13. PCV valve
14. Exhaust manifold
15. Intake manifold
16. Heated oxygen sensor-1
17. Warm up three way catalytic convertor (WU-TWC) (if equipped)
18. Three way catalytic convertor
19. IAT sensor
20. ECT sensor
21. EFE heater
22. EVAP canister purge valve
23. EVAP canister
24. Heated oxygen sensor-2
25. Radiator fan motor
26. Ignition coil
27. Ignitor
28. Electric load
29. A/C amplifier (if equipped)
30. Camshaft position sensor
31. Crankshaft position sensor
32. VSS (on A/T)
33. Transmission range sensor (switch) (A/T)
34. Shift solenoid-A (A/T)
35. Shift solenoid-B (A/T)
36. Data link connector
37. VSS (in combination meter of M/T vehicle)
38. PSP switch (if equipped)
39. Malfunction indicator lamp
40. Transmission range sensor (switch) (A/T)
41. Main (Ignition) switch
42. Main fuse
43. Battery
44. Immobilizer indicator lamp

AIR AND FUEL DELIVERY SYSTEM

The main components of this system are fuel tank, fuel pump, fuel filter, throttle body (including fuel injector, fuel pressure regulator and idle speed control actuator), fuel feed line, fuel return line and air cleaner.
The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to injector installed in throttle body. As the fuel pressure applied to the fuel 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 throttle body in conic dispersion 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.
The injected fuel is mixed with the air which has been filtered through the air cleaner in the throttle body. The air/fuel mixture is drawn through clearance between throttle valve and bore.
Then the intake manifold distributes the air/fuel mixture to each combustion chamber.
For the structure and operation of the fuel tank and filter, refer to SECTION 6C “ENGINE FUEL”.

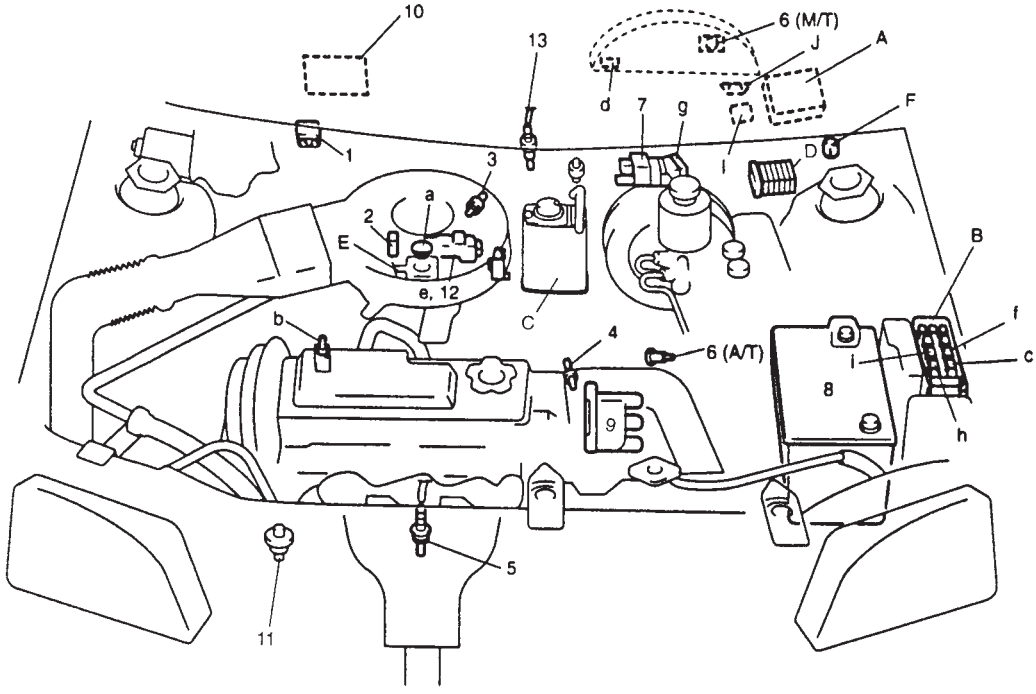


ELECTRONIC CONTROL SYSTEM

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 following sub systems:

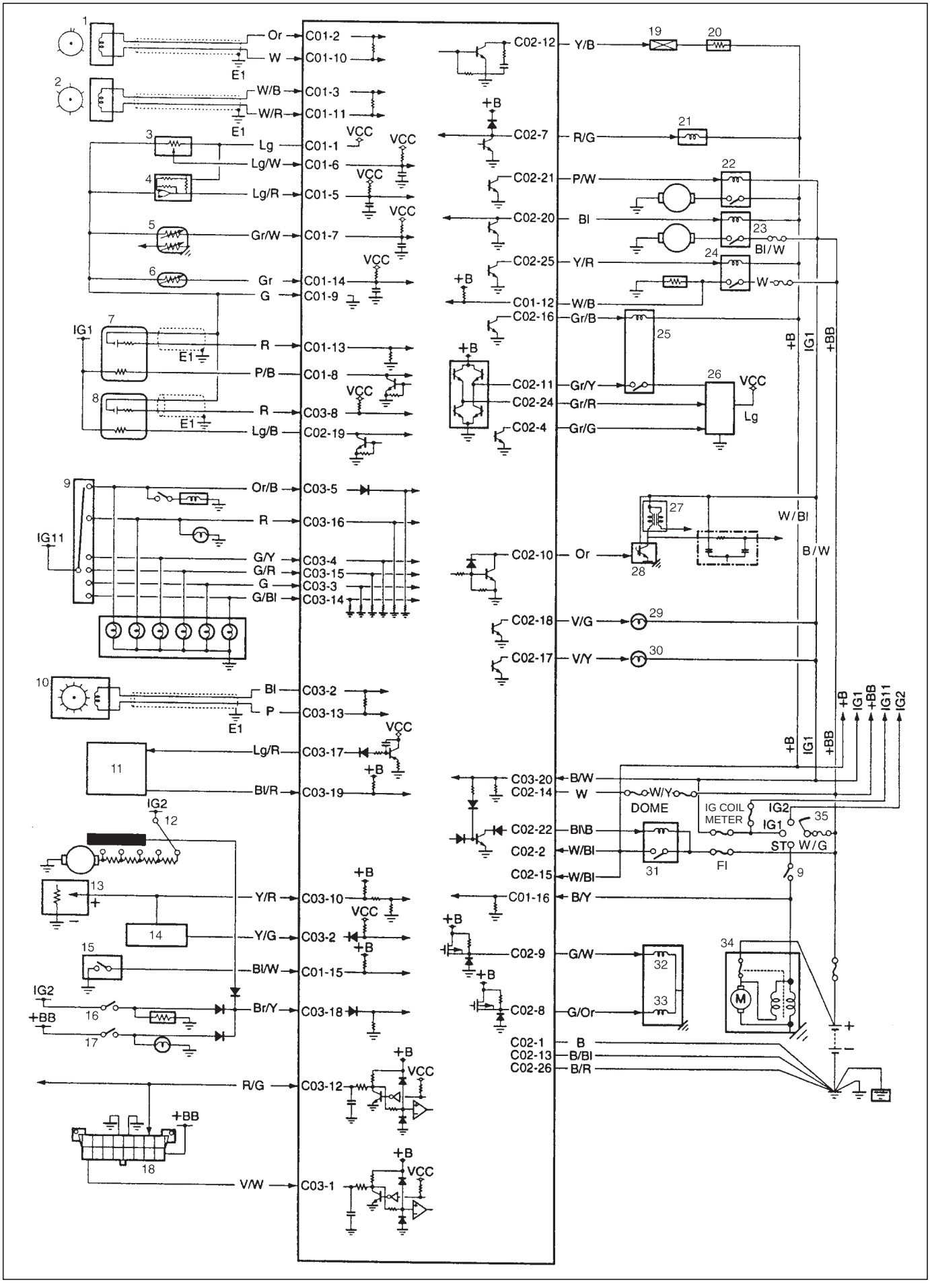
- Fuel injection control system
- Idle speed control system
- Fuel pump control system
- A/C control system (if equipped)
- Radiator fan control system
- Evaporative emission control system
- EFE heater control system
- Oxygen sensor heater control system
- Ignition control system
- A/T control system



INFORMATION SENSORS
1. MAP sensor
2. TP sensor
3. IAT sensor
4. ECT sensor
5. Heated oxygen sensor-1
6. VSS
7. Ignition coil
8. Battery
9. Distributor (CMP sensor)
10. A/C controller (if equipped)
11. CKP sensor
12. CTP switch (in ISC actuator)
13. Heated oxygen sensor-2

CONTROLLED DEVICES
a : Fuel injector
b : EVAP canister purge valve
c : Fuel pump relay
d : Malfunction indicator lamp
e : ISC actuator
f : Radiator fan control relay
g : Ignitor
h : EFE heater relay
i : ISC actuator relay

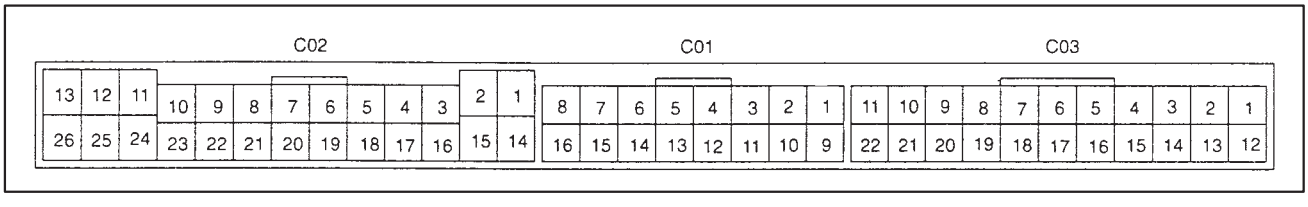
OTHERS
A : ECM (PCM)
B : Main relay
C : EVAP canister
D : Injector resistor
E : EFE heater
F : Electric load diode
G : Data link connector



CON-NECTOR	TERMI-NAL	CIRCUIT
C02	1	ECM ground
	2	Power source (from main relay)
	3	Blank
	4	Blank
	5	Blank
	6	Blank
	7	EVAP canister purge valve
	8	Shift solenoid-B (A/T)
	9	Shift solenoid-A (A/T)
	10	Igniter
	11	Idle speed control actuator
	12	Fuel injector
	13	Injector ground
	14	Power source (from battery)
	15	Power source (from main relay)
	16	Idle speed control actuator relay
	17	Malfunction indicator lamp
	18	Immobilizer indicator lamp
	19	Heater of HO2S-2
	20	Radiator fan relay
	21	Fuel pump relay
	22	Main relay
	23	Blank
	24	Idle speed control actuator
	25	EFE heater relay
	26	Injector ground
C01	1	Power source for sensors
	2	Camshaft position sensor (+)
	3	Crankshaft position sensor (+)
	4	Closed throttle position switch
	5	Manifold absolute pressure sensor
	6	Throttle position sensor
	7	Engine coolant temp. sensor
	8	Heater of HO2S-1
	9	Sensor ground
	10	Camshaft position sensor (–)
	11	Crankshaft position sensor (–)
	12	EFE heater (monitor)
	13	Heated oxygen sensor-1
	14	Intake air temp sensor
	15	Power steering pressure switch (if equipped)
	16	Engine start signal circuit

CON-NECTOR	TERMI-NAL	CIRCUIT
C03	1	Data link connector
	2	Vehicle speed sensor (+) (A/T) Vehicle speed sensor (M/T)
	3	Transmission range sensor (switch) "2"
	4	Transmission range sensor (switch) "N"
	5	Transmission range sensor (switch) "P"
	6	Blank
	7	Blank
	8	Heated oxygen sensor-2
	9	Blank
	10	Fuel level sensor (gauge)
	11	Blank
	12	Data link connector
	13	Vehicle speed sensor (–) (A/T)
	14	Transmission range sensor (switch) "L"
	15	Transmission range sensor (switch) "D"
	16	Transmission range sensor (switch) "R"
	17	A/C ON (output) signal for A/C control module (if equipped)
	18	Electric load signal
	19	A/C (input) signal from A/C control module (if equipped)
	20	Ignition switch
	21	Blank
	22	Blank

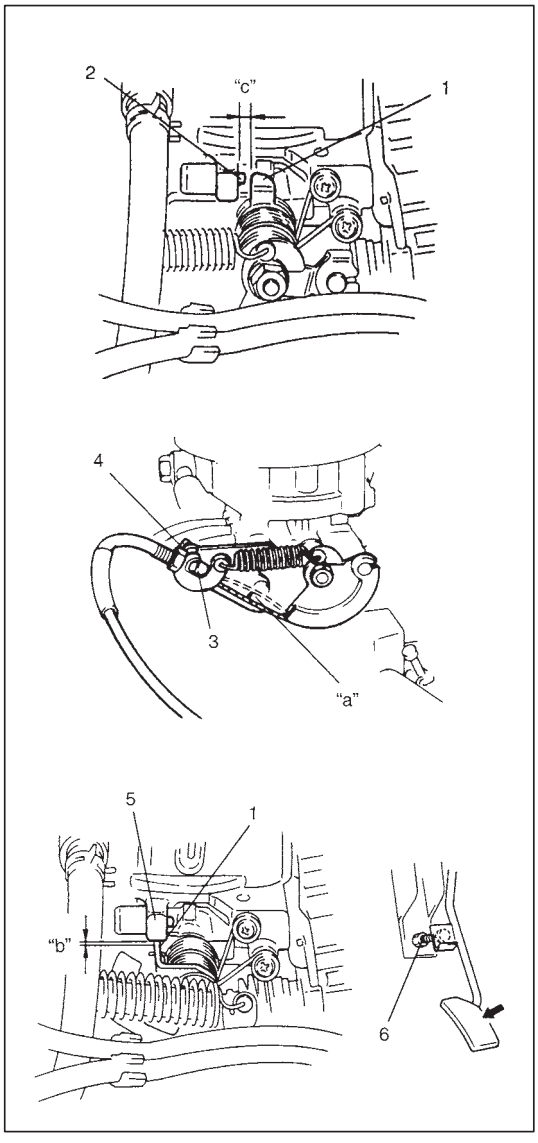
1. CMP sensor (in Distributor)
2. CKP sensor
3. TP sensor
4. MAP sensor
5. ECT sensor
6. IAT sensor
7. HO2S-1
8. HO2S-2
9. Transmission range switch (A/T)
10. VSS (A/T)
11. A/C control module (if equipped)
12. Heater blower switch
13. Fuel level sensor
14. Speedometer
15. P.SP switch
16. Rear defogger switch
17. Light switch
18. DLC
19. Fuel injector
20. Injector resistor
21. Conister purge valve
22. Fuel pump relay
23. Rediator fan relay
24. EFE heater relay
25. ISC actuator relay
26. ISC actuator
27. Ignition coil
28. Igniter
29. Immobilizer indicator lamp
30. MIL
31. Main relay
32. Shift solenoid A (A/T)
33. Shift solenoid B (A/T)
34. Starter motor
35. Ignition switch



ON-VEHICLE SERVICE

GENERAL

When the hoses have been disconnected and system's component removed for service, be sure to reinstall component properly, and route and connect hoses correctly after service. Refer to Emission Control Information Label for proper connection of hoses (if equipped).



ACCELERATOR CABLE ADJUSTMENT

1) Confirm that ambient temperature is higher than 0°C, 32°F.
2) Warm up engine to normal operating temperature with all electric loads OFF and stop engine.
3) Confirm that clearance "c" between throttle lever (1) and stop screw (2) is less than about 1 mm (0.04 in.).
4) Check accelerator cable for play.

   Accelerator cable play "a": 10 – 15 mm (0.4 – 0.6 in.)

   Cable play should be within specification. If out of specification, loosen accelerator cable lock nut and adjust by turning adjusting nut (3). Be sure to tighten lock nut (4) securely after adjustment.
5) With accelerator pedal depressed fully, check clearance between throttle lever and lever stopper (5) (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 (6).

IDLE SPEED INSPECTION

Before inspecting idle speed, make sure to the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- After warming up engine, accelerator cable has some play, that is, it is not tight.
- Ignition timing is within specification.
- All of electrical loads except ignition are switched off.
- Air cleaner has been properly installed and is in good condition.
- Malfunction indicator lamp does not light when engine running.

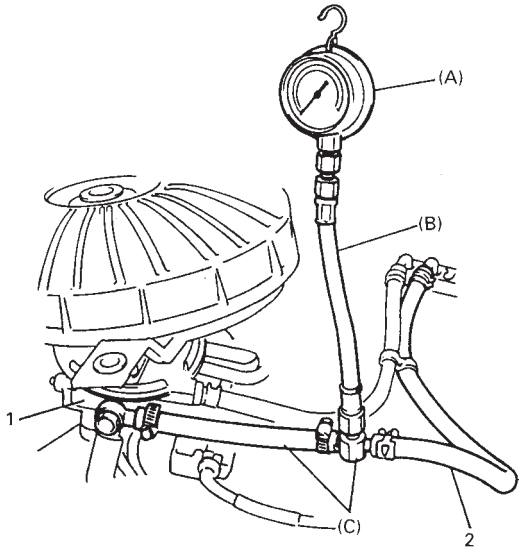
After above items are all confirmed, check idle speed as follows.

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

1) Warm up engine to normal operating temperature.
2) Set tachometer.
3) Check idle speed with A/C OFF.
   If idle speed is not within specified range, check idle speed control system and any other system and parts which might affect idle speed. Refer to "Engine Diagnosis of Section 6" for inspection.

   Engine idle speed: 850 ± 50 r/min

   NOTE:
   Idle speed is not adjustable manually. If it is out of its specified range, there is a faulty condition somewhere. Check each of related systems and parts.



1. Throttle body
2. Fuel feed hose

AIR AND FUEL DELIVERY SYSTEM

FUEL PRESSURE

INSPECTION

1) Relieve fuel pressure, referring to Section 6.
2) Separate air cleaner assembly from throttle body and shift its position.
3) Disconnect fuel feed hose from throttle body.

CAUTION:
A small amount of fuel may be released after fuel line is disconnected.
In order to reduce chance of personal injury, cover fitting to be disconnected with a shop cloth. Place that cloth in an approved container when disconnection is completed.

4) Connect special tools and hose between throttle body and fuel feed pipe as shown in figure, and clamp hoses securely to ensure no leaks occur during checking.

   Special Tool
   (A): 09912-58441
   (B): 09912-58431
   (C): 09912-58490

5) Install air cleaner assembly to throttle body and cylinder head cover.

6) Start engine and warm it up to normal operating temperature.

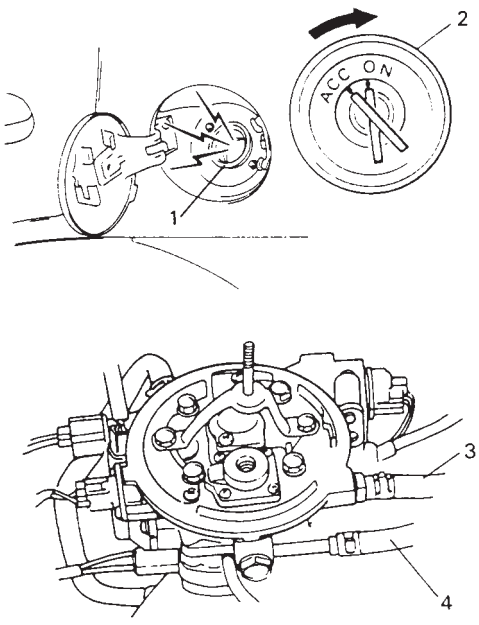
   If engine doesn't start, turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

   NOTE:
   Check that battery voltage is 11 V or more before operating fuel pump.

7) Measure fuel pressure under each of the following conditions.

CONDITION	FUEL PRESSURE
At specified idle speed	0.9 – 1.4 kg/cm^2 90 – 140 kPa 12.8 – 20.0 psi
With fuel pump operating and engine at stop	1.6 – 2.1 kg/cm^2 160 – 210 kPa 22.7 – 29.9 psi
Within 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	Over 0.9 kg/cm^2 90 kPa 12.8 psi

   If measured pressure doesn't satisfy specification, refer to "DIAGNOSTIC FLOW TABLE B-3" and check each possibly defective part. Replace if found defective.
8) Relieve fuel pressure, referring to Section 6.
9) Remove fuel pressure gauge, hose & 3-way joint after removing air cleaner assembly.
10) Connect fuel feed hose to throttle body and clamp it securely.
11) Install air cleaner assembly.
12) With engine "OFF" and ignition switch "ON", check for fuel leaks.



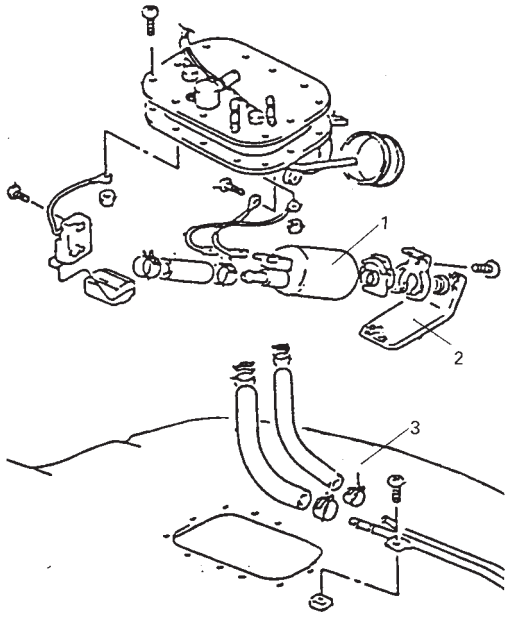
1. Fuel filler
2. Ignition switch
3. Fuel return hose
4. Fuel feed hose

FUEL PUMP

ON-VEHICLE INSPECTION

WARNING:
When fuel filler cap is removed in any procedure, work must be done with no smoking, in a well-ventilated area and away from any open flames.

1) 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 TABLE B-2”.
2) 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 TABLE B-3”.



1. Fuel pump
2. Filter
3. Fuel tank

REMOVAL

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

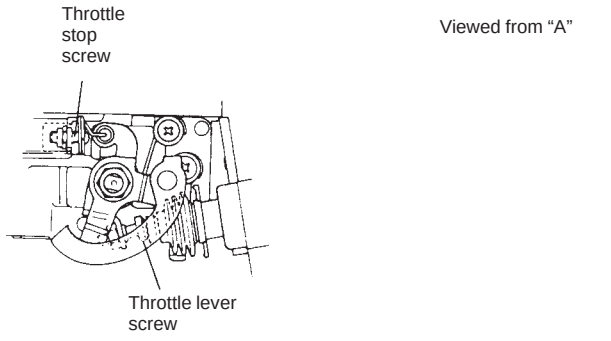
INSPECTION

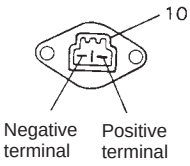
Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

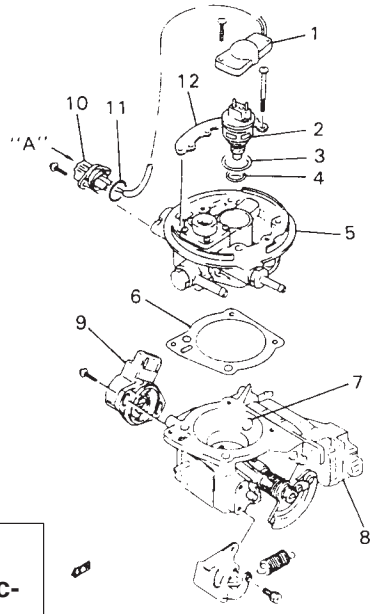
INSTALLATION

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.

THROTTLE BODY

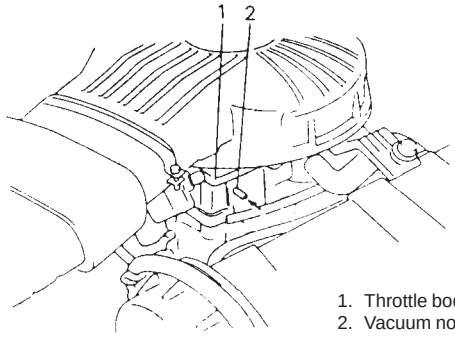






1. Fuel injector wire
2. Fuel injector
3. Upper O-ring
4. Lower O-ring
5. Throttle upper body
6. Gasket
7. Throttle lower body
8. ISC actuator
9. TP sensor
10. Injector sub wire coupler
11. O-ring
12. Injector wire cover

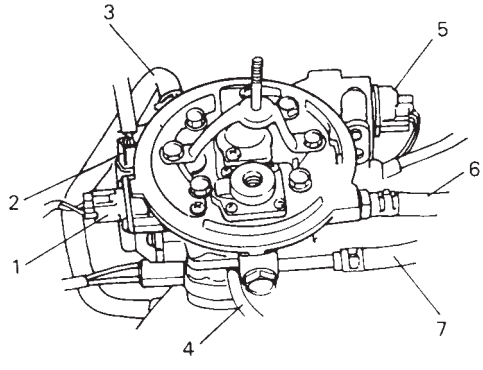
CAUTION:
As throttle stop screw and throttle lever screw are factory adjusted precisely, don't remove or adjust them.



1. Throttle body
2. Vacuum nozzle

ON-VEHICLE INSPECTION

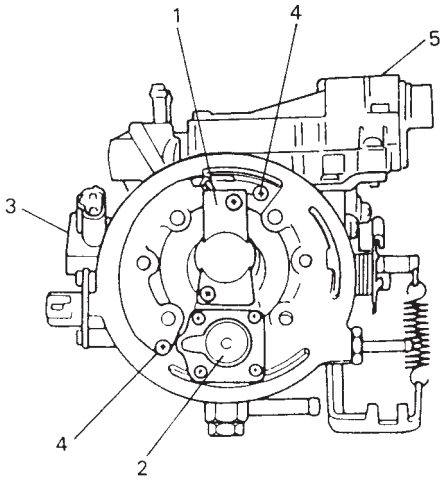
- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection.
  With fingers placed against vacuum nozzle, increase engine speed a little and check that vacuum is applied.



1. Injector coupler
2. TP sensor
3. Water hose
4. Vacuum hose
5. ISC actuator
6. Fuel return hose
7. Fuel feed hose

REMOVAL

1) Relieve fuel pressure, referring to Section 6.
2) Disconnect battery negative cable at battery.
3) Remove air cleaner assembly referring to Section 6A.
4) Drain cooling system.
5) Disconnect following wire harness couplers:
   - TP sensor
   - Fuel injector
   - ISC actuator
6) Disconnect following hoses from throttle body.
   - Fuel feed and return hoses
   - Engine cooling water hoses
   - Vacuum hoses
7) Disconnect accelerator cable from throttle valve lever and cable bracket.
8) Remove throttle body from intake manifold.



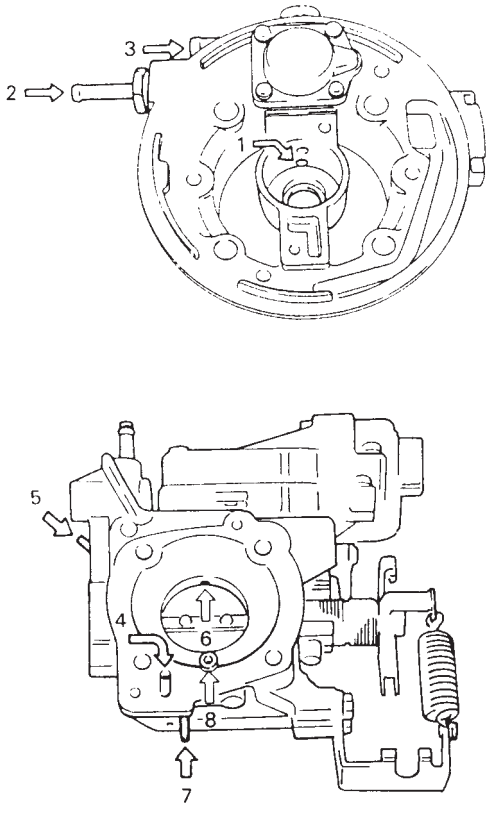
1. Fuel injector wire
2. Fuel pressure regulator
3. TP sensor
4. Screws
5. ISC actuator

DISASSEMBLY

NOTE:

- **Be sure not to remove either fuel pressure regulator or idle speed control actuator from throttle body. They are factory adjusted precisely.**
- **Be sure to replace gaskets and O-rings as well as worn or damaged parts.**
- **While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**

1) Remove fuel injector from throttle body according to procedure described in FUEL INJECTOR REMOVAL.
2) Remove TP sensor.
3) After removing screws, separate upper and lower bodies.



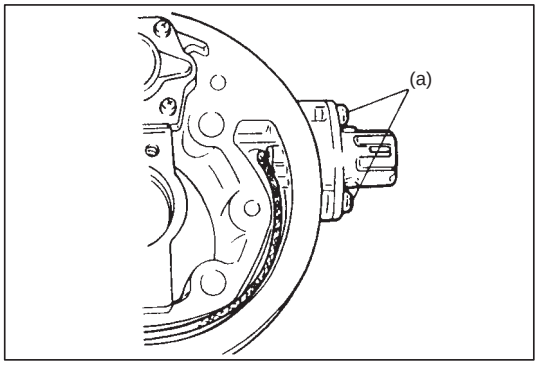
1. Injector chamber
2. Fuel return passage
3. Fuel feed passage
4. Vacuum passage for fuel pressure regulator
5. Vacuum passage for MAP sensor
6. Air induction passage
7. Vacuum passage
8. Fresh air passage

CLEANING

Clean passages and fuel injector chamber by blowing compressed air.

NOTE:

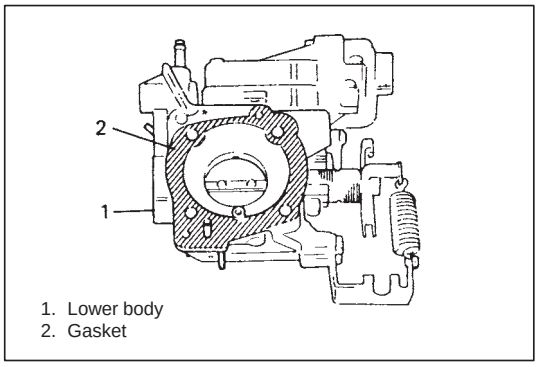
- **TP sensor, fuel pressure regulator, fuel injector, ISC actuator, other components containing rubber (resin) or throttle valve shaft seal must not be placed in a solvent or cleaner bath. Chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damage in passages.**



ASSEMBLY

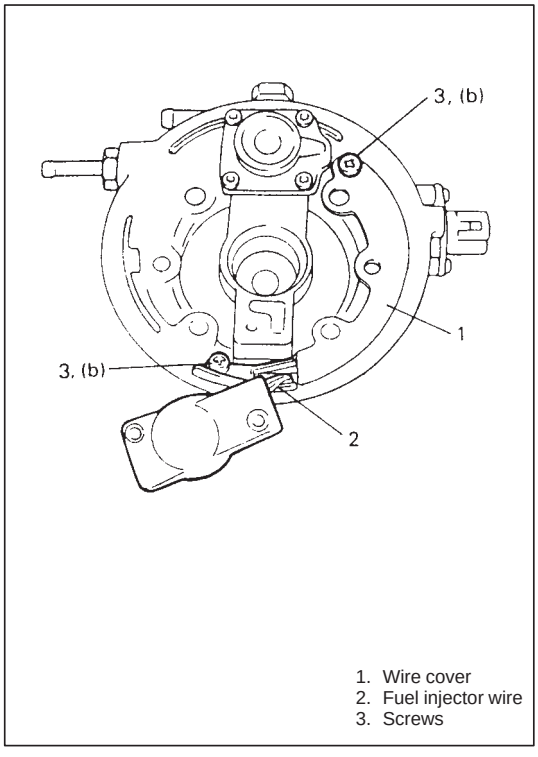
1) Install injector wire and coupler to throttle body.
   Use new O-ring.
   Tighten injector wire coupler screw to specified torque.

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



1. Lower body
2. Gasket

2) Install new gasket to lower body.
3) Install upper body on gasket, using care not to cause gasket to slip out of place.

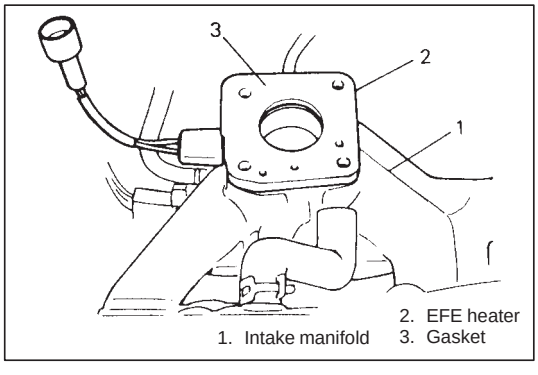


1. Wire cover
2. Fuel injector wire
3. Screws

4) Make sure to injector wire harness to fit in grooves of throttle body and install wire cover to throttle body.
   Tighten screws to specified torque.

   Tightening Torque
   (b): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)

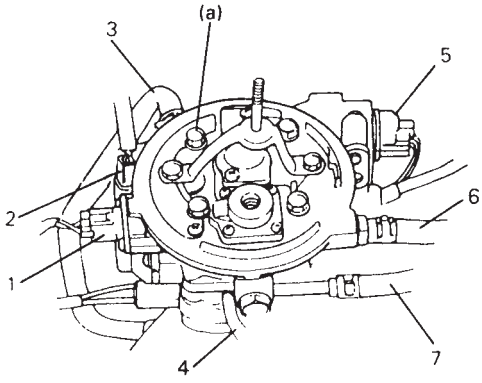
5) Install fuel injector according to procedure described in FUEL INJECTOR INSTALLATION.
6) Install TP sensor according to procedure described in THROTTLE POSITION SENSOR INSTALLATION.



1. Intake manifold
2. EFE heater
3. Gasket

INSTALLATION

1) Clean mating surfaces and install throttle body gasket to EFE heater. Use new gasket.

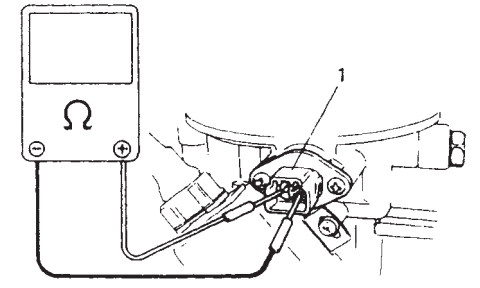


1. Injector coupler
2. TP sensor
3. Water hose
4. Vacuum hose
5. ISC actuator
6. Fuel return hose
7. Fuel feed hose

2) Install throttle body to EFE heater and tighten bolts to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install accelerator cable to throttle valve lever and cable bracket.
4) Connect fuel, cooling water and vacuum hoses to throttle body, and clamp securely.
5) Connect TP sensor and injector couplers securely.
6) Refill cooling system referring to Section 6B.
7) Connect negative cable at battery.
8) With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.
9) Install air cleaner assembly referring to Section 6A.
10) Upon completion of installation, start engine and check for fuel leaks and engine coolant leaks.
Adjust cable play to specification according to procedure described in ACCELERATOR CABLE ADJUSTMENT.



1. Injector coupler

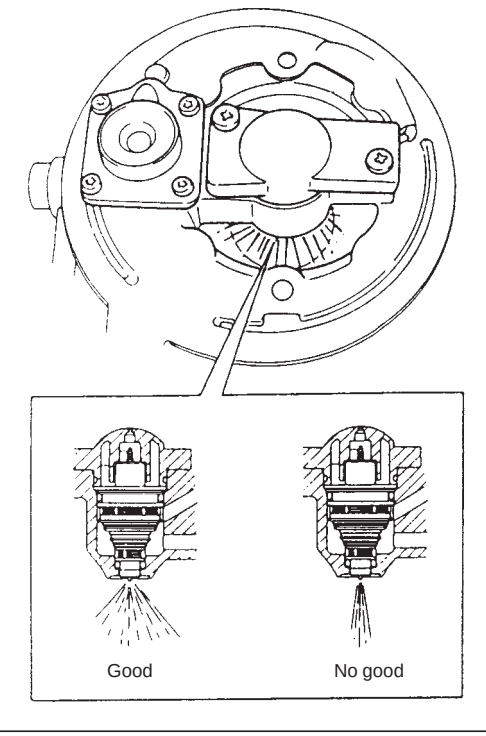
FUEL INJECTOR

ON-VEHICLE INSPECTION

1) With battery negative cable disconnected, disconnect injector coupler.
2) Connect ohmmeter to each injector terminal and measure resistance.

Resistance of injector: 0.5 – 1.5 Ω at 20°C (68°F)

If resistance is out of specification, replace fuel injector.



3) Connect injector coupler.
4) Remove air cleaner assembly without disconnecting IAT sensor coupler.
5) Check that fuel is injected out in conical shape from fuel injector when cranking or running engine.
If no fuel is injected, check wiring harness for continuity and couplers for proper connection referring to "DIAGNOSTIC FLOW TABLE B-1".
If fuel is not injected out in conical shape, replace injector.
6) Check injector for fuel leakage after injection is stopped (i.e., after cranking or engine stop).
Replace if leakage exists.

Fuel leakage: Less than 1 drop/min.

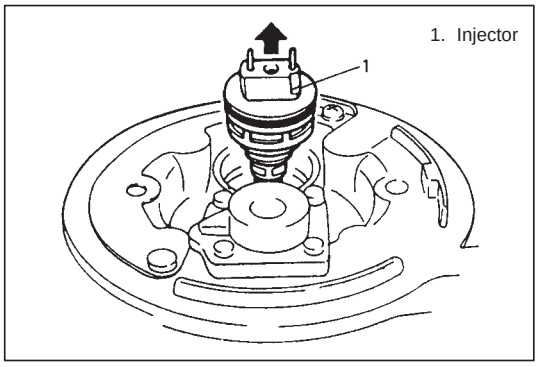
7) Install air cleaner assembly.

REMOVAL

NOTE:

Use care when handling fuel injector especially not to damage filter and its needle.

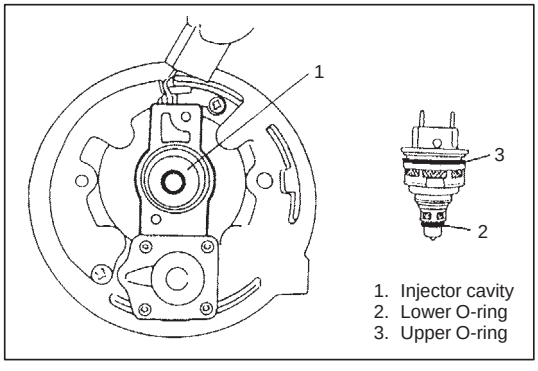
Also, because injector is an electrical component, it should not be immersed in any type of liquid solvent or cleaner, or it may get damaged.



1) Relieve fuel pressure, referring to Section 6.
2) Disconnect battery negative cable at battery.
3) Remove air cleaner assembly referring to Section 6A.
4) Remove air cleaner mounting stay from throttle body.
5) Remove injector wire and then remove fuel injector from throttle body.

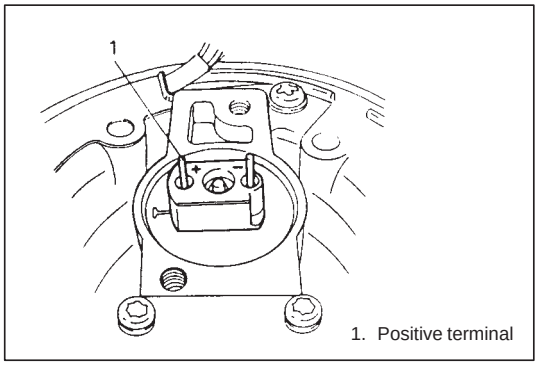
INSPECTION

Check fuel injector filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel lines and fuel tank.

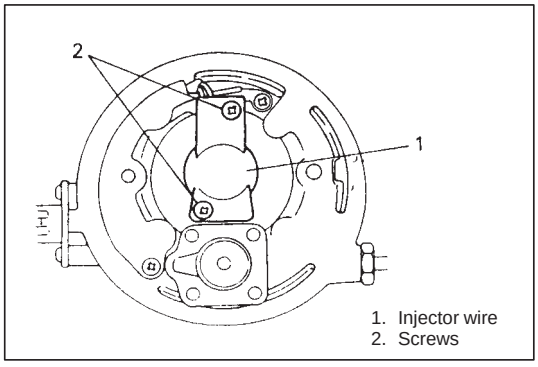


INSTALLATION

1) Apply thin coat of spindle oil or gasoline to new upper and lower O-rings, install lower O-ring and upper O-ring to injector.



2) Install injector by pushing it straight into fuel injector cavity. Never turn injector while pushing it.

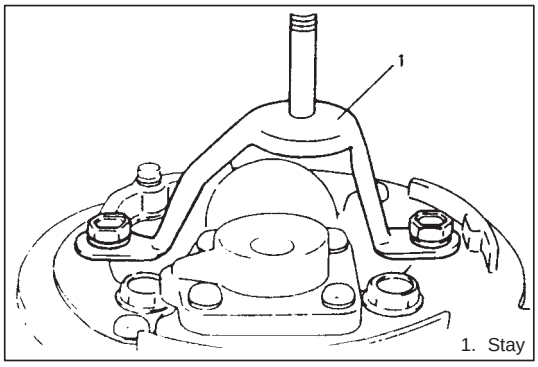


1. Injector wire
2. Screws

3) Make sure that injector wire O-ring is free from any damage and deterioration, and apply thin coat of spindle oil or gasoline to O-ring.
   Install injector wire and tighten new wire screw to specified torque.

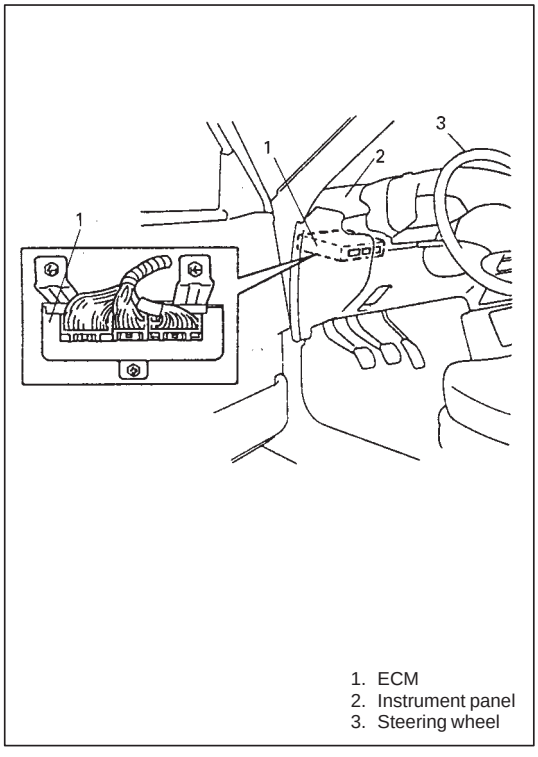
   Tightening Torque
   (a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)

4) Connect battery negative cable at battery.
5) With engine "OFF" and ignition switch "ON", check for fuel leaks.



1. Stay

6) Install air cleaner mounting stay as shown left.
7) Install air cleaner assembly referring to Section 6A.



1. ECM
2. Instrument panel
3. Steering wheel

ELECTRONIC CONTROL SYSTEM

ENGINE CONTROL MODULE (ECM)

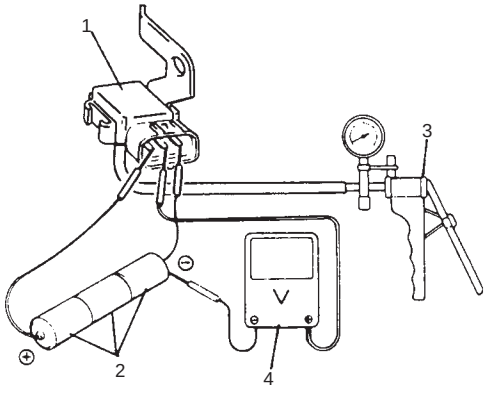
CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

REMOVAL

1) Disconnect battery negative cable at battery.
2) Lower fuse box after removing bolt.
3) Disconnect couplers from ECM while releasing coupler lock.
4) Remove ECM from body.

INSTALLATION

1) Install ECM to body.
2) Connect couplers to ECM securely.
3) Install fuse box and tighten its bolt.
4) Connect battery negative cable at battery.



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

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

MAP SENSOR INDIVIDUAL CHECK

1) Disconnect MAP sensor vacuum hose from filter.
2) Disconnect coupler from MAP sensor.
3) Remove MAP sensor.
4) Arrange 3 new 1.5 V batteries in series (check that total voltage is 4.5 – 5.0 V) 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 – 5.0 V, ambient temp. 20 – 30°C, 68 – 86°F)

ALTITUDE (Reference)		BAROMETRIC PRESSURE		OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	KPa	(V)
0 | 2 000	0 | 610	760 | 707	100 | 94	3.1 – 3.6
2 001 | 5 000	611 | 1 524	Under 707 over 634	94 | 85	2.8 – 3.4
5 001 | 8 000	1 525 | 2 438	Under 634 over 567	85 | 76	2.6 – 3.1
8 001 | 10 000	2 439 | 3 048	Under 567 over 526	76 | 70	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.

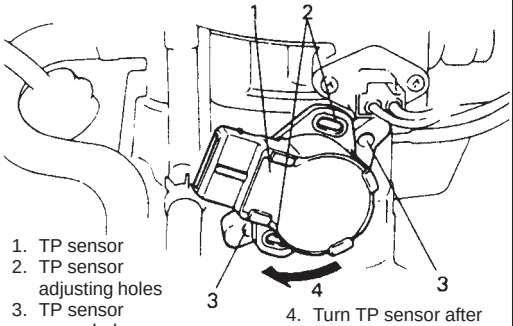
THROTTLE POSITION SENSOR (TP SENSOR)

INSPECTION

Check TP sensor referring to step 2 of DTC P0121 Flow Table. If malfunction is found, replace.

REMOVAL

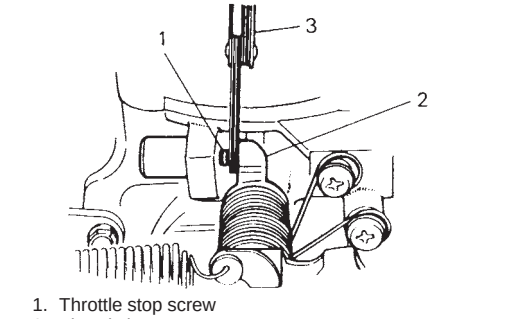
1) Disconnect battery negative cable at battery.
2) Remove air cleaner assembly referring to Section 6A.
3) Disconnect coupler from TP sensor.
4) Remove TP sensor from throttle body.



1. TP sensor
2. TP sensor adjusting holes
3. TP sensor screw holes
4. Turn TP sensor after fitting and align holes.

INSTALLATION

1) Install TP sensor to throttle body.
   Fit TP sensor to throttle body in such way that its adjusting holes are a little away from TP sensor screw holes as shown in left figure and turn TP sensor clockwise so that those holes align. Then hand-tighten TP sensor screws.
2) Connect coupler to TP sensor securely.
3) Install air cleaner assembly referring to Section 6A.
4) Connect battery negative cable battery.
5) Adjust installation angle of TP sensor according to procedure described in item “ADJUSTMENT”.

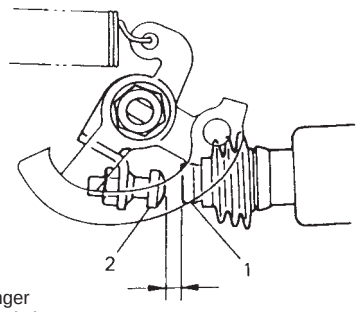


1. Throttle stop screw
2. Throttle lever
3. Thickness gauge

ADJUSTMENT

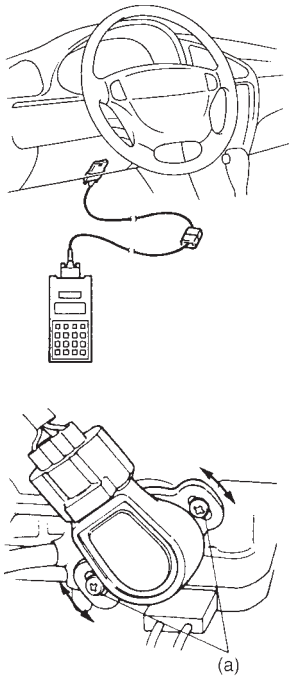
1) Insert 3.5 mm (0.14 in.) thickness gauge between throttle stop screw and throttle lever.

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



1. Plunger
2. Throttle lever screw

2) Check to make sure that plunger of ISC actuator and throttle lever screw are not in contact with each other. If they are, warm up engine.



3) Loosen TP sensor screws.
   a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
   b) Select “Data List” mode on SUZUKI scan tool.
   c) Observe TP sensor voltage.
4) Turn TP sensor clockwise or counterclockwise and tighten TP sensor screw at a position where voltage as specified below is obtained.

   TP sensor voltage when lever-to-stop screw clearance is 3.5 mm (0.14 in.) : 0.98 – 1.02 V

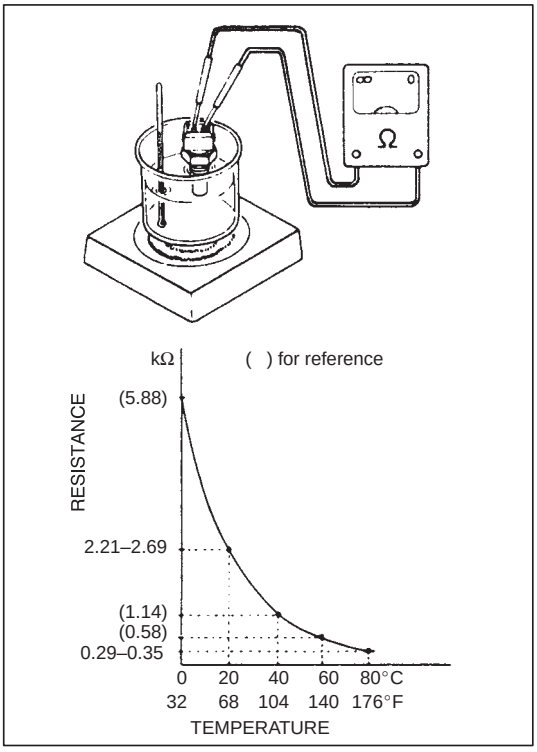
   Tightening Torque
   (a): 2.0 N·m (0.20 kg-m, 1.5 lb-ft)

5) Install ECM and connect couplers securely.

INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

REMOVAL

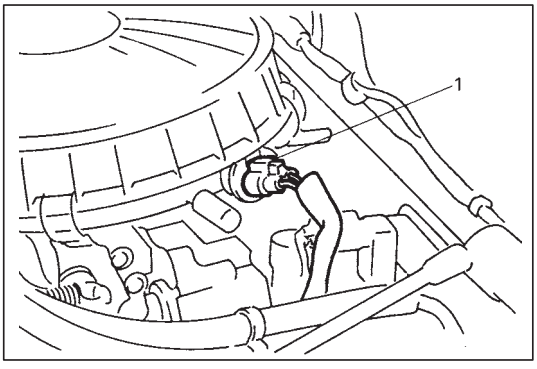
1) Disconnect battery negative cable at battery.
2) Disconnect coupler from IAT sensor.
3) Remove IAT sensor and gasket from air cleaner case.



INSPECTION

Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.

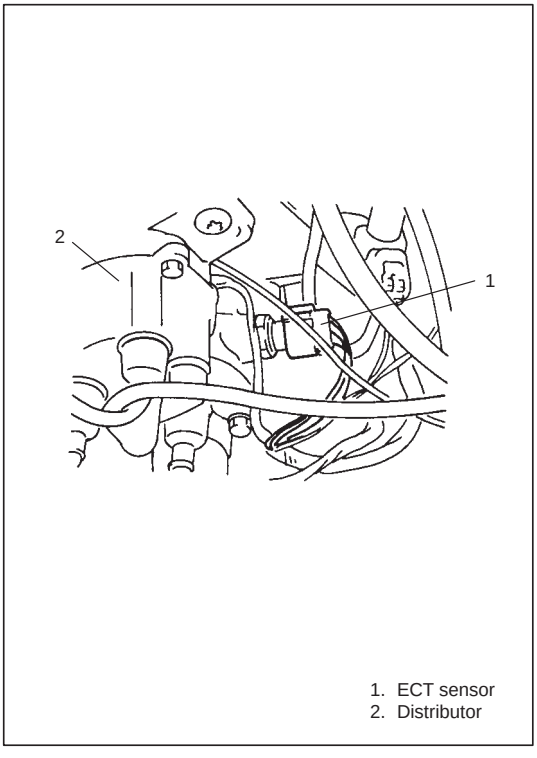
If measured resistance doesn't show such characteristic as shown in left figure, replace IAT sensor.



INSTALLATION

Reverse removal procedure noting the following.

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



1. ECT sensor
2. Distributor

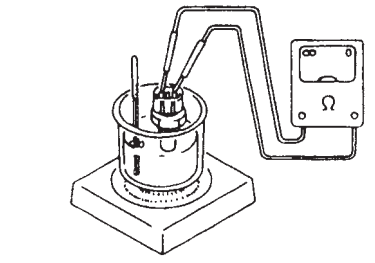
ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

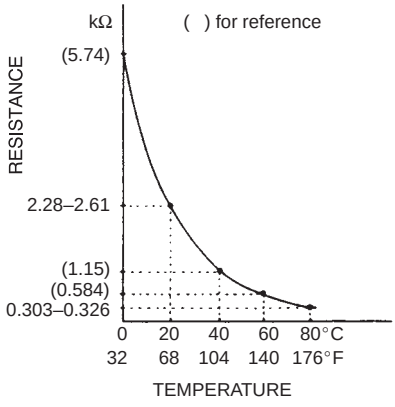
REMOVAL

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.

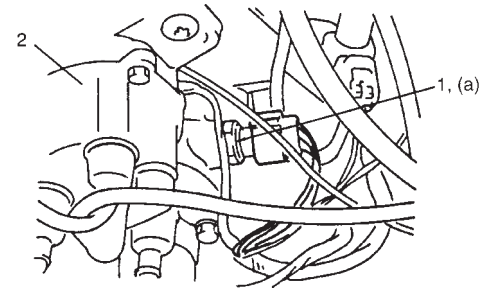




INSPECTION

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.



1. ECT sensor
2. Distributor

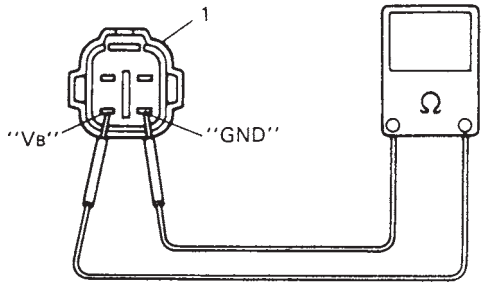
INSTALLATION

Reverse removal procedure noting the following.

- Clean mating surfaces of ECT sensor and thermostat case.
- Check O-ring for damage and replace 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.



1. Viewed from terminal side

HEATED OXYGEN SENSOR (SENSOR-1 AND SENSOR-2)

OXYGEN SENSOR HEATER INSPECTION

1) Disconnect sensor coupler.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor coupler.

NOTE:
Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater:
11.7 – 14.3 Ω at 20°C, 68°F

If found faulty, replace oxygen sensor.

3) Connect sensor coupler securely.

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.

1) Disconnect negative cable from battery.
2) Hoist vehicle when removing sensor-2.
3) Disconnect coupler of heated oxygen sensor and release its wire harness from clamps.
4) Remove heated oxygen sensor from exhaust manifold.

INSTALLATION

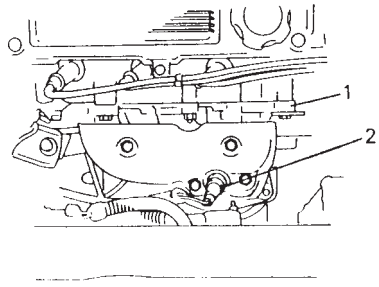
Reverse removal procedure noting the following.

- Tighten heated oxygen sensor to specified torque.

Tightening Torque for heated oxygen sensor
45 N·m (4.5 kg-m, 32.5 lb-ft)

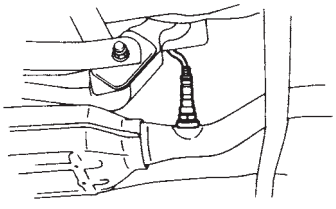
- Connect coupler of heated oxygen sensor and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.

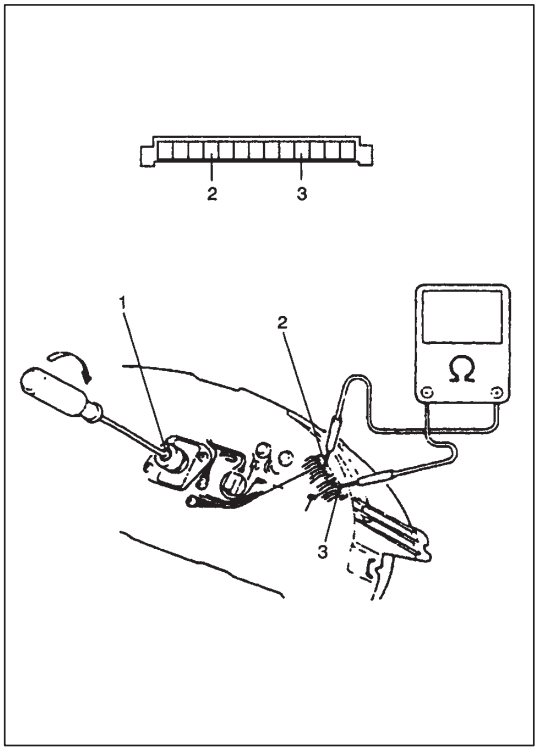
Sensor-1



1. Exhaust manifold
2. Heated oxygen sensor

Sensor-2

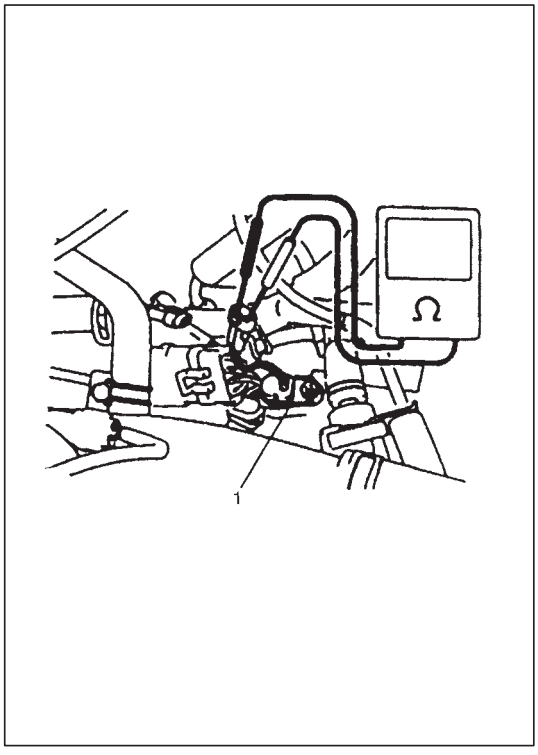




VEHICLE SPEED SENSOR (VSS) For M/T

INSPECTION

1) Disconnect negative cable at battery.
2) Remove combination meter from instrument panel.
3) Connect ohmmeter between “VSS” terminal (2) and “GND” terminal (3) of combination meter and turn cable joint (1) of speedometer with a screwdriver. Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.
   Replace speedometer if check result is not satisfactory.
4) Install combination meter to instrument panel.
5) Connect negative cable at battery.



VEHICLE SPEED SENSOR (VSS) For A/T

INSPECTION

Vehicle speed sensor (1) itself can be checked on its resistance by disconnecting connector.

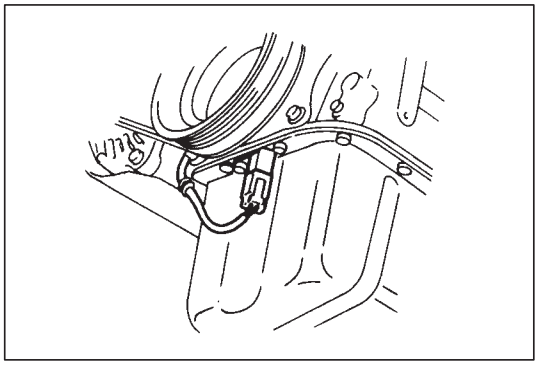
NOTE:

- **Function of vehicle speed sensor can be checked by measuring generated pulse as voltage.**
- **For its measurement, use an analog type voltmeter while spinning wheels on lift and with selector lever in D position.**

Vehicle speed sensor specifications	
Coil resistance	100 – 300 Ω
Output voltage at 40 km/h (25 mile/h)	approximately 1 V

FUEL LEVEL SENSOR (GAUGE)

Refer to Section 8.



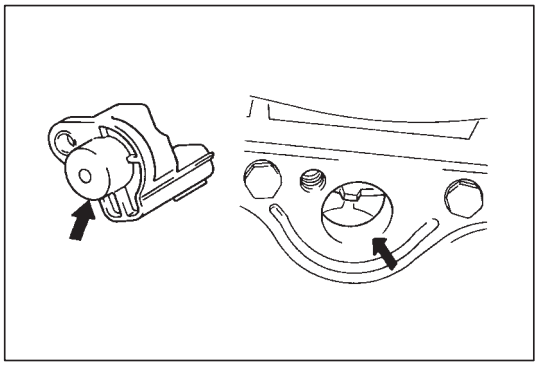
CRANKSHAFT POSITION SENSOR

INSPECTION

Check crankshaft position sensor referring to step 1 and 2 of DTC P0335 Flow Chart. If malfunction is found, replace.

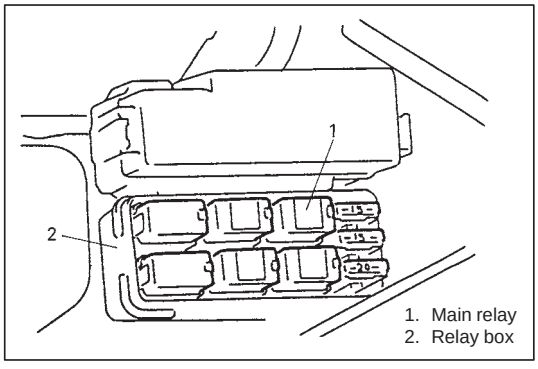
REMOVAL

1) Hoist vehicle.
2) Remove fender apron extension on right side.
3) Disconnect connector from crankshaft position sensor.
4) Remove crankshaft position sensor from oil pan.



INSTALLATION

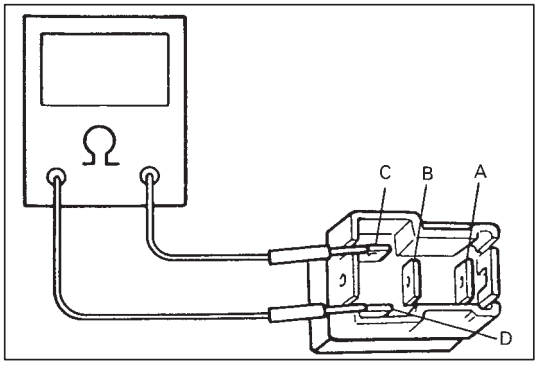
1) Check to make sure that crankshaft position sensor and pulley tooth is free from any metal particles and damage.
2) Install crankshaft position sensor to oil pan.
3) Connect connector to it securely.
4) Install fender apron extension.



MAIN RELAY

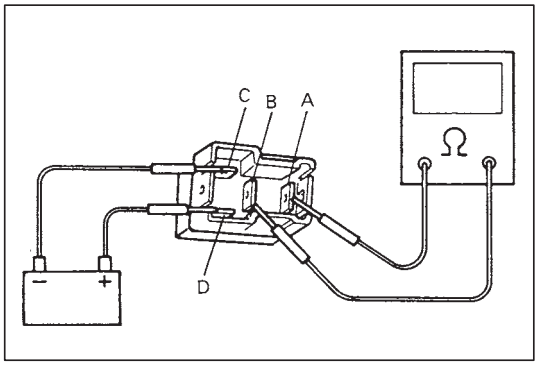
INSPECTION

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

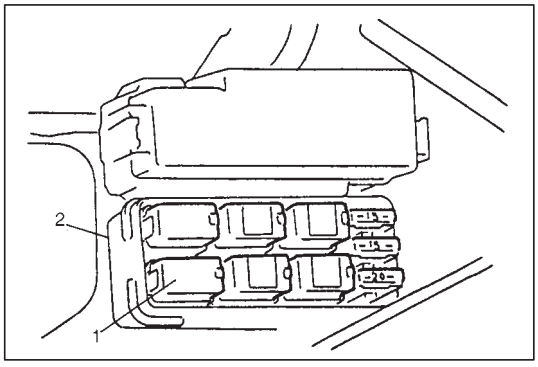


3) Check resistance between each two terminals as in table below. If check results are as specified, proceed to next operation check. If not, replace.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	100 – 120 Ω



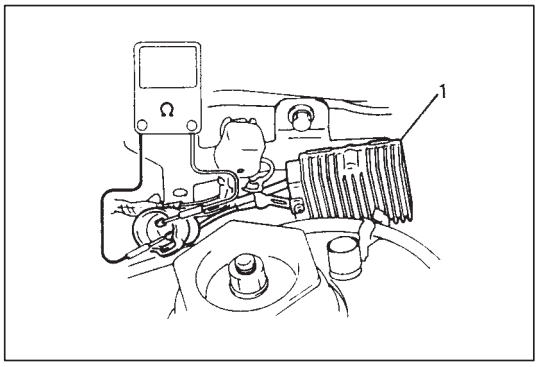
4) Check that there is continuity between terminals “A” and “B” when battery is connected to terminals “C” and “D”.
If found defective, replace.



FUEL PUMP RELAY

INSPECTION

1) Disconnect negative cable at battery.
2) Remove fuel pump relay (1) from relay box (2).
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.



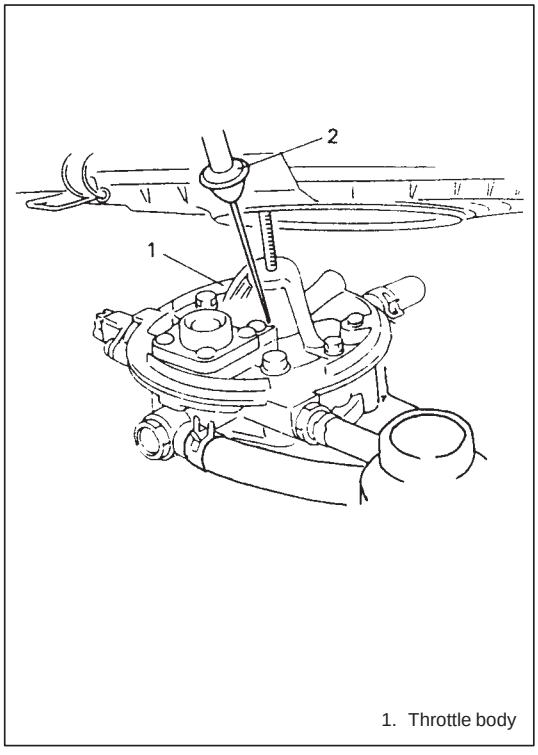
FUEL INJECTOR RESISTOR

INSPECTION

1) With ignition switch OFF, disconnect resistor coupler.
2) Check resistor (1) for resistance.

   Resistance: 1.9 – 2.1 Ω at 20°C, 68°F

   If check result is not satisfied, replace.



1. Throttle body

FUEL CUT OPERATION

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), A/C is OFF 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 (2) 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 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.

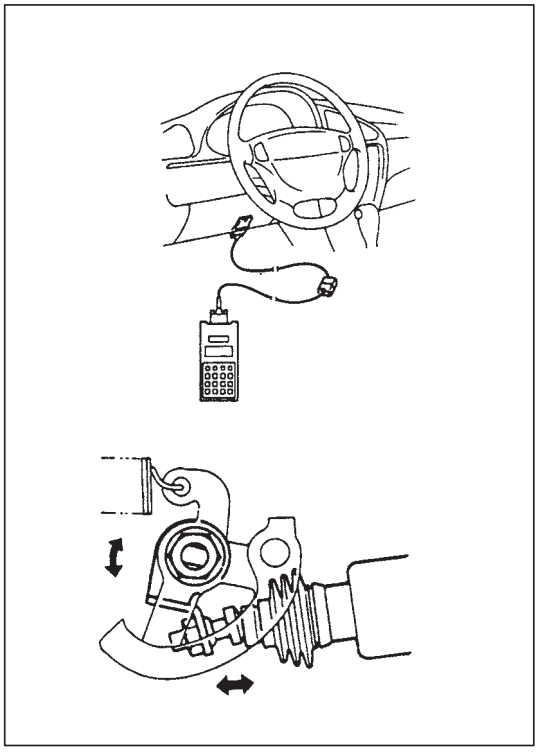
IDLE SPEED CONTROL SYSTEM

SYSTEM INSPECTION

NOTE:

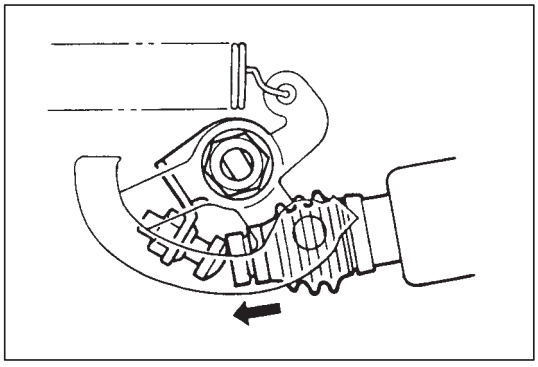
Before inspection, check to make sure that:

– Gear shift lever is in neutral position (with A/T vehicle, selector lever in "P" range) and that parking brake lever is pulled all the way up.
– Battery voltage is higher than 11 V.
– Throttle valve moves smoothly.
– Ambient temperature is higher than 0°C (32°F)



1) Connect scan tool to DLC with ignition switch OFF, if it is available.
2) Warm up engine to normal operating temperature.
3) Select “Data List” mode on scan tool to check “IAC duty”.
4) Apply load to engine as described below and check that idle speed is kept at specified level and “IAC duty” increases as specified below. At the same time, check that plunger of ISC actuator moves.

Increase of ISC duty
when headlight turns ON : About 3.5%
when A/C is operating : About 10%



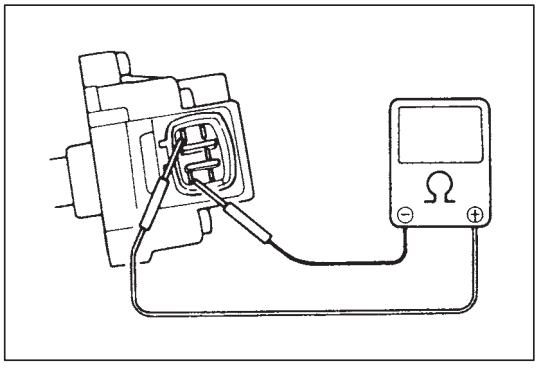
5) Stop engine and leave it as it is till it cools off. Then check that plunger of ISC actuator moves when ignition switch is turned from OFF to ON once.
If abnormality is found in Steps 4) and 5), check ISC relay, ISC actuator, ISC electric circuit and closed throttle position switch signal.
If abnormality is found in Step 4) only, check A/C signal circuit or power steering pressure switch signal circuit first.

ISC ACTUATOR

NOTE:
As ISC actuator has been preadjusted precisely at factory, it must not be taken out of throttle body or disassembled.

INSPECTION

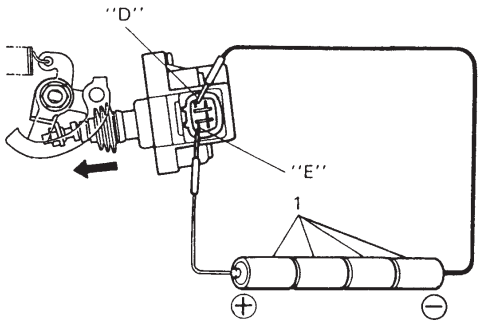
1) Disconnect connector from ISC actuator.



2) Check whether ISC actuator coil is open or short.

ISC actuator resistance at 20°C (68°F): 3 – 50 Ω

NOTE:
Above data should be used as reference value for determining whether coil is open or short only. ISC actuator resistance may be out of above specified range even when ISC actuator is normal.

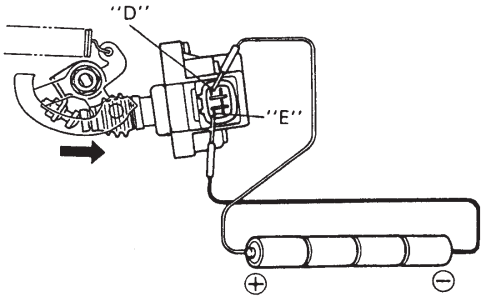


1. 1.5 V battery (6.0 V in total)

3) Arrange 4 new 1.5 V batteries in series (6.0 V in total).
With throttle lever in contact with plunger of ISC actuator, connect these batteries to ISC actuator terminals and check ISC actuator for operation.

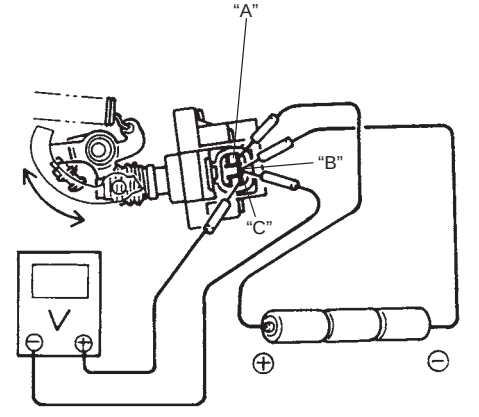
CAUTION:
- **Make sure that connection is made correctly between batteries and terminals. Also, voltage must not be applied for longer than 1 second, or a faulty condition will occur.**
- **Make sure that connection is correct. Connecting to other terminals may cause damage to closed throttle position switch (idle switch).**
- **After inspection, be sure to check that CTP switch is ON. If it is OFF, move ISC actuator again and turn CTP switch ON.**

When positive terminal is connected to "E" terminal while plunger is contracted: Plunger expands



When positive terminal is connected to "D" terminal while plunger is expanded : Plunger contracts

When an abnormality has been found in above checks 2) and 3), replace.



CLOSED THROTTLE POSITION (CTP) SWITCH, IDLE SWITCH (IN ISC ACTUATOR)

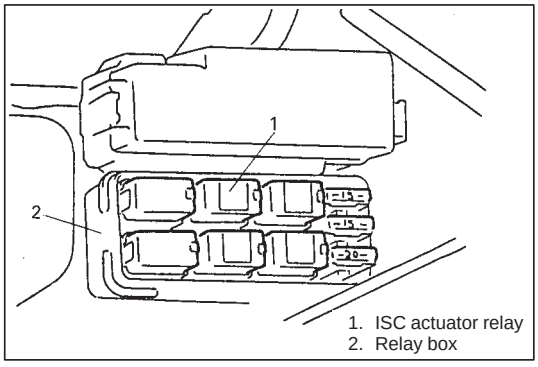
INSPECTION

1) Disconnect connector from ISC actuator.
2) Arrange 3 new 1.5 V batteries in series (4.5 V in total) and connect these batteries to CTP switch terminals "A" and "B".
Check voltage between terminals "B" and "C" under following each condition.

Throttle lever is in contact with ISC actuator plunger : 0 – 1 V

Throttle lever is apart from plunger : 3.5 – 5.5 V

If check result is not satisfactory, replace throttle lower body.

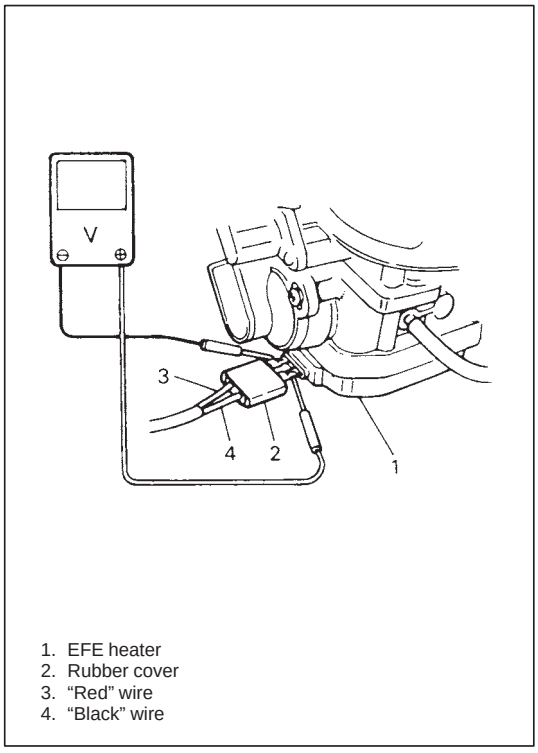


1. ISC actuator relay
2. Relay box

ISC ACTUATOR RELAY

INSPECTION

1) Disconnect negative cable at battery.
2) Remove ISC actuator relay from relay box.
3) Structure of ISC actuator relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.



1. EFE heater
2. Rubber cover
3. "Red" wire
4. "Black" wire

EFE HEATER CONTROL SYSTEM

SYSTEM CIRCUIT INSPECTION

NOTE:

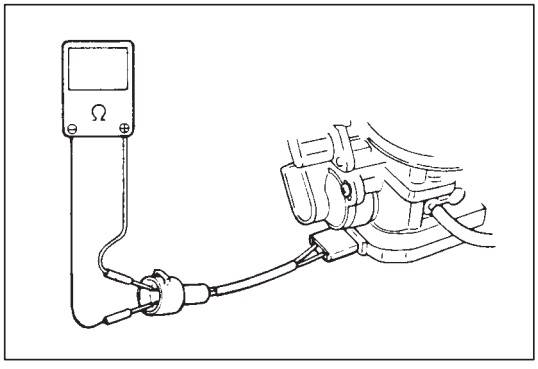
Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.

1) Turn up rubber cover of EFE heater to expose terminal-to-wire connections.
2) Connect voltmeter to EFE terminals and check for voltage under each condition given below.

CONDITION	VOLTAGE
Fast idle condition Coolant temp.: below 80°C (176°F) Engine speed: over 750 r/min.	Battery voltage
After warming up (other than above)	No voltage

If check results are not as specified in above table, check EFE heater, relay and wire harness.

3) Cover EFE heater connections with rubber cover.



EFE HEATER

CAUTION:
Do not bend wire harness of EFE heater excessively.

ON-VEHICLE INSPECTION

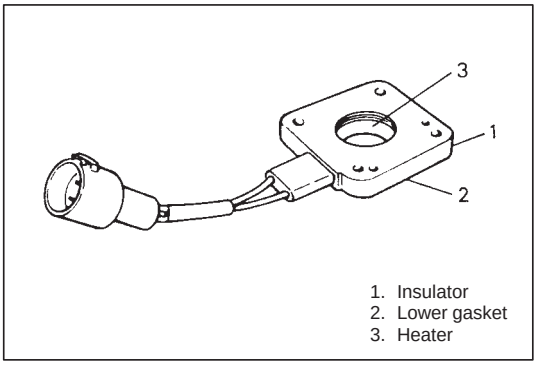
1) Disconnect EFE heater coupler.
2) Check resistance of EFE heater.
   If it is not as specified below, replace.

   EFE heater resistance: 0.5 – 3.0 Ω at 20°C (68°F)

3) Connect EFE heater coupler securely.

REMOVAL

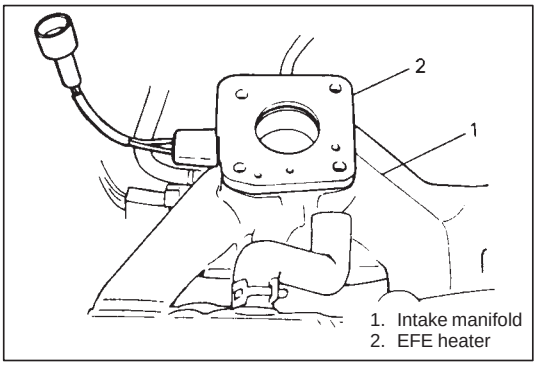
1) Remove throttle body according to procedure described previously.
   In this case, however, it is not necessary to disconnect fuel hoses and engine cooling water hoses from throttle body.
2) Disconnect EFE heater coupler.
3) Remove EFE heater from intake manifold.



1. Insulator
2. Lower gasket
3. Heater

INSPECTION

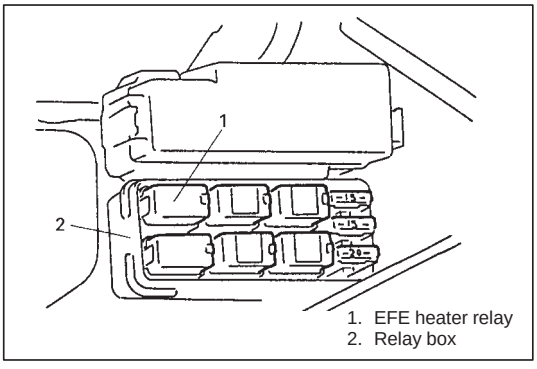
- Check lower gasket for damage and deterioration. Replace as necessary.
- Check heater and insulator for crack, corrosion or any other damage. Replace as necessary.



1. Intake manifold
2. EFE heater

INSTALLATION

1) Clean mating surfaces of throttle body and intake manifold that mate with EFE heater.
2) Install EFE heater to intake manifold.
   Use new upper gasket.
3) Install throttle body according to procedure described previously.
4) Connect EFE heater coupler.

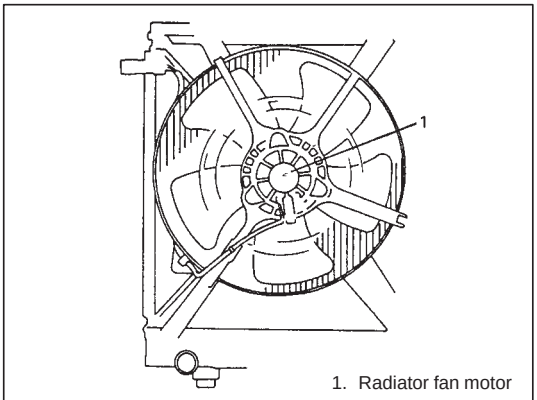


1. EFE heater relay
2. Relay box

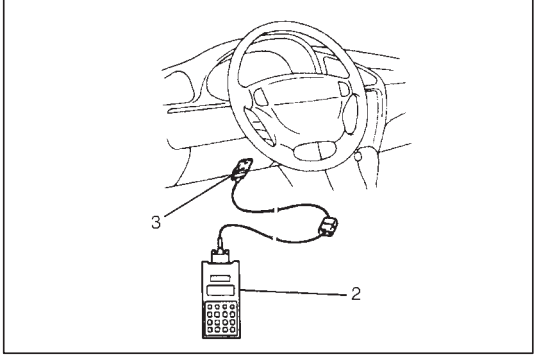
EFE HEATER RELAY

INSPECTION

1) Disconnect negative cable at battery.
2) Remove EFE heater relay from relay box.
3) Structure of EFE heater 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.



1. Radiator fan motor

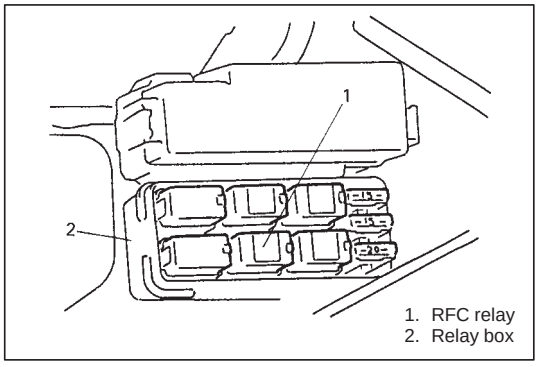


RADIATOR FAN CONTROL SYSTEM

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.

Connect SUZUKI scan tool (2) to DLC (3).
Start engine and keep it running to warm it up.
Now check to ensure that radiator fan is started when the coolant temperature displayed on SUZUKI scan tool reaches 96°C (205°F).
If check result is not satisfactory, check RFC relay, wire harness, ECT sensor, ECM, coolant temp. meter and sender gauge unit.
Refer to "DTC P0480 FLOW TABLE" of Section 6 and "COOLANT TEMP. METER AND GAUGE UNIT" of Section 8.

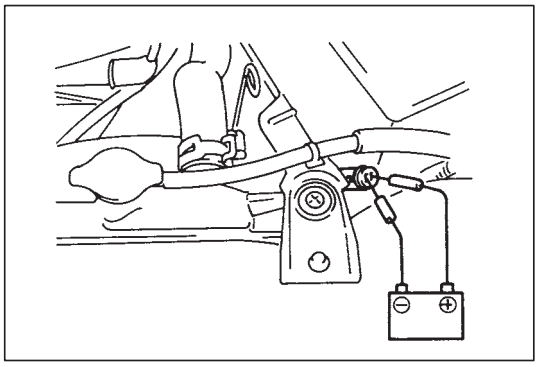


1. RFC relay
2. Relay box

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.



RADIATOR FAN

INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect radiator fan motor connector.
3) Connect battery to the motor and check for operation. If fan fails to operate, replace.

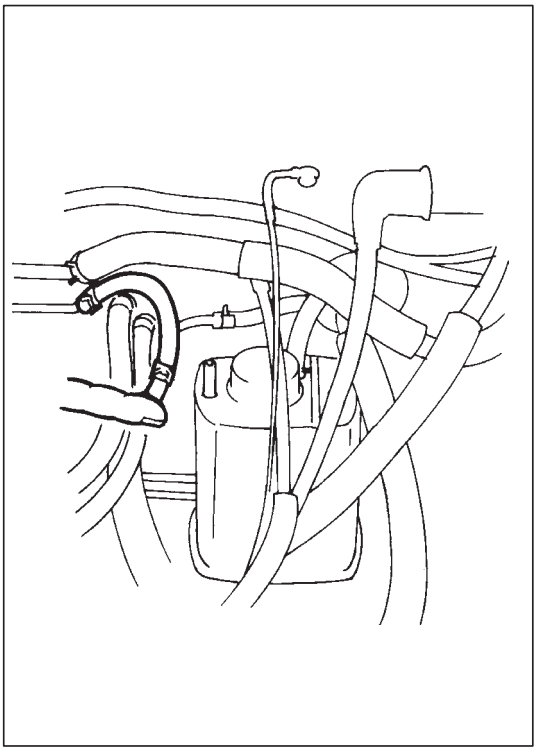
EMISSION CONTROL SYSTEM

EVAPORATIVE EMISSION CONTROL SYSTEM

EVAP CANISTER PURGE 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.

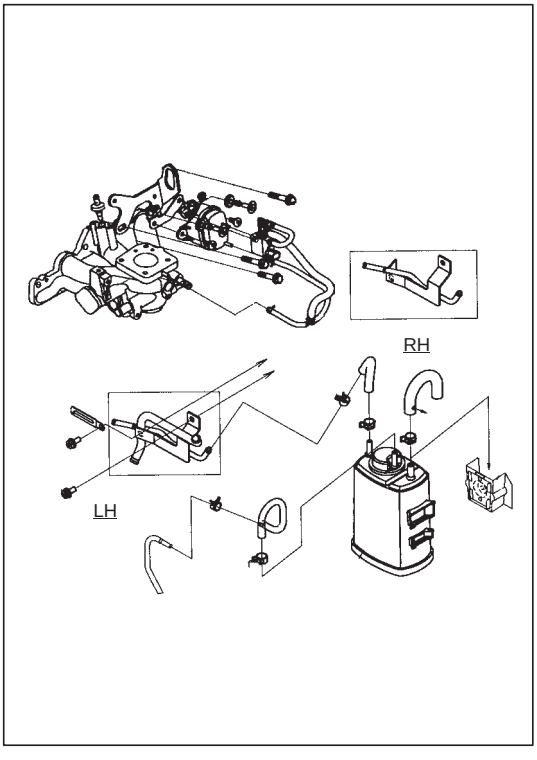


1) Disconnect purge hose from EVAP canister.
2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed.
3) Connect purge hose to EVAP canister and warm up engine to normal operating temperature.
4) Disconnect purge hose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

   NOTE:

   The EVAP canister purge system does not perform purging (vacuum is not detected at the purge hose) unless the engine is sufficiently warmed up and the heated oxygen sensor is activated fully. Also, when the purge hose is disconnected in Step 4), the air is drawn into the purge line. As a result, ECM detects a change in the purge gas concentration and sometimes stops purging but this indicates nothing abnormal.

If check result is not satisfactory, check vacuum passage, hoses, EVAP canister purge valve, wire harness and ECM.



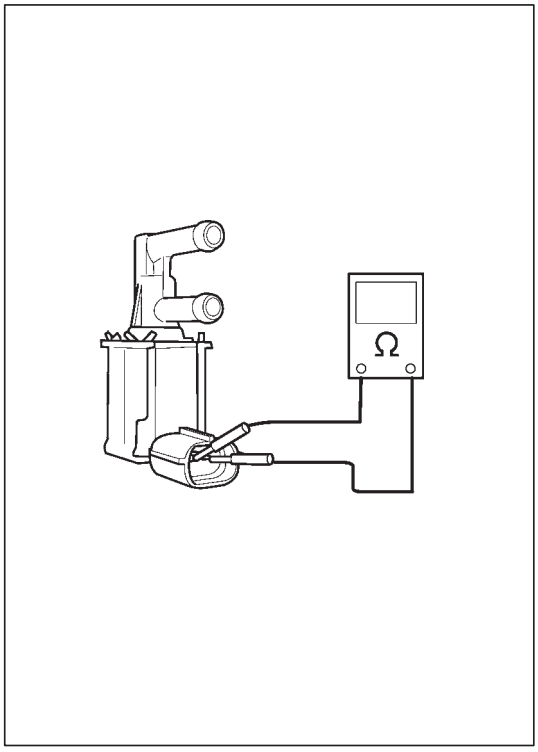
VACUUM PASSAGE INSPECTION

Start engine end 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.

VACUUM HOSE INSPECTION

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



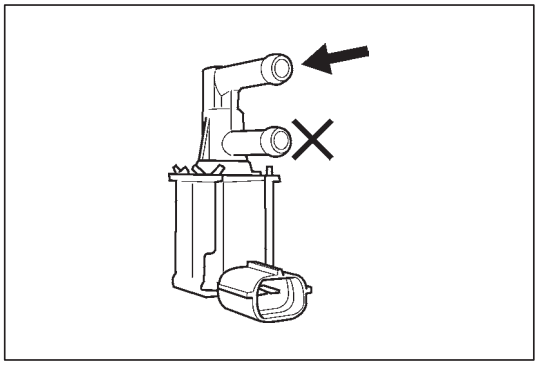
EVAP CANISTER PURGE VALVE INSPECTION

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

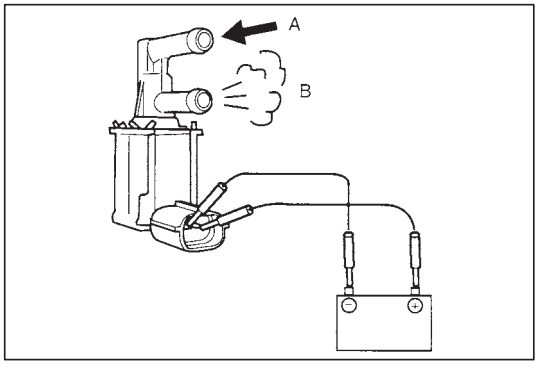
1) With the ignition switch OFF position, disconnect coupler from EVAP canister purge valve.
2) Check resistance between two terminals of EVAP canister purge valve.

   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.

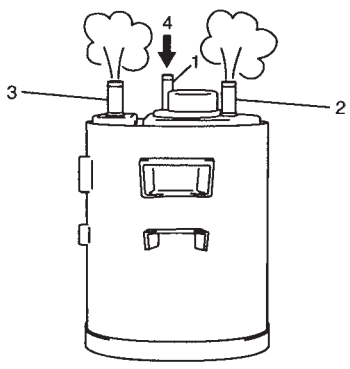


3) Disconnect vacuum hoses from intake manifold and its pipe.
4) With coupler disconnected, blow into pipe “A”. Air should not come out of pipe “B”.



5) Connect 12 V-battery to EVAP canister purge valve terminals. In this state, blow pipe “A”.
   Air should come out of pipe “B”.
   If check result is not as described, replace canister purge valve.

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

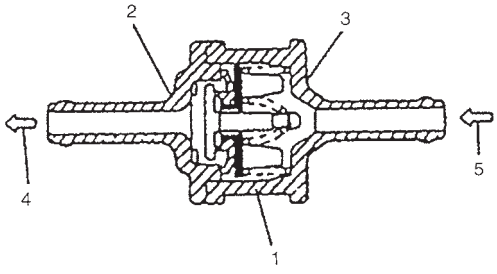


1. Tank pipe
2. Purge pipe
3. Air pipe
4. Blow air

EVAP CANISTER INSPECTION

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

1) Disconnect vacuum hoses from EVAP canister and remove EVAP canister.
2) When air is blown into tank pipe, there should be no restriction of flow through purge pipe and air pipe.
   If operation differs from above description, EVAP canister must be replaced.
3) Install EVAP canister and connect hoses to canister.



1. Tank pressure control valve
2. Orange side
3. Black side
4. To canister
5. From fuel tank

TANK PRESSURE CONTROL VALVE INSPECTION

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

1) Remove tank pressure control valve.
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 though valve in step 2) or hard blow is required in step 3), replace tank pressure control valve.
5) Install tank pressure control valve.

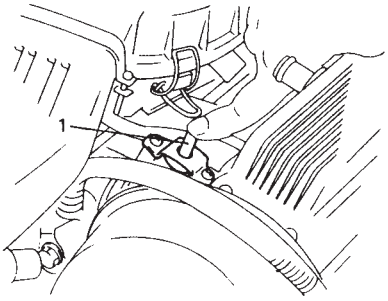
NOTE:
When connecting tank pressure control valve between hoses, refer to figure at the left for installing direction.

PCV SYSTEM

NOTE:
Be sure to check that there is no obstruction in PCV valve or its hoses before adjusting engine idle speed, for obstructed PCV valve or hose hampers its accurate adjustment.

PCV HOSE INSPECTION

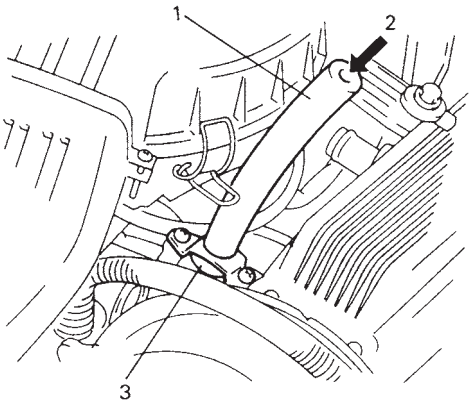
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.



1. PCV valve

PCV VALVE INSPECTION

1) Disconnect PCV hose from PCV valve.
2) Run engine at idle.
3) Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.



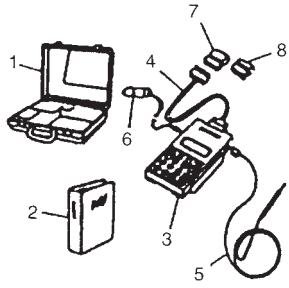
1. Proper size hose
2. Blow air
3. PCV valve

4) After checking vacuum, stop engine and check PCV valve for sticking.
   With engine stopped, connect a new hose to PCV valve for inspection.
   Blow air into the hose and check that air flows with difficulty from cylinder head side to intake manifold side.
   If air flows without difficulty, valve is stuck in “Open” position. Replace PCV valve.

> **WARNING:**
> **Do not suck air through PCV valve. Petroleum substances inside the valve and fuel vapor inside the intake manifold are harmful.**

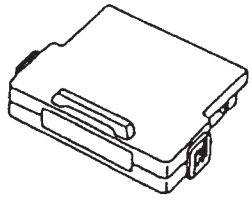
5) After removing the hose, connect PCV hose and clamp securely.

SPECIAL TOOLS

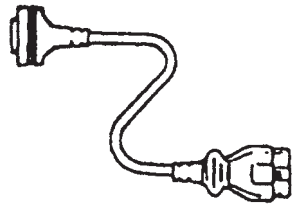


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable (14/26 pin, 09931-76040)
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

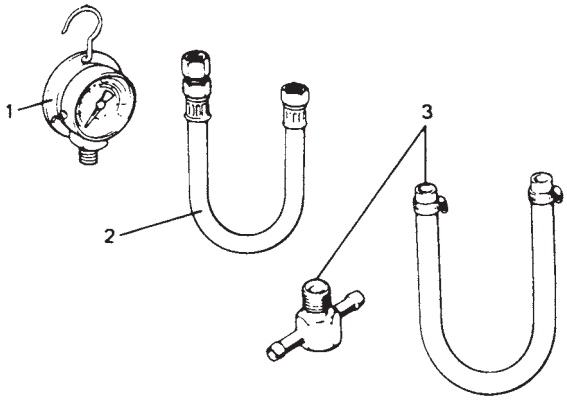
09913-76011
SUZUKI scan tool (Tech 1A) kit



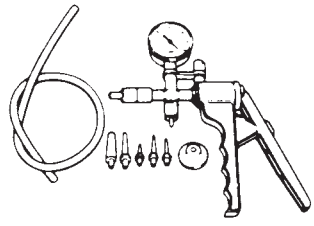
Mass storage cartridge



09931-76030
16/14 pin DLC cable



1. Fuel pressure gauge 09912-58441
2. Pressure hose 09912-58431
3. 3-way joint & hose 09912-58490



09917-47010
Vacuum pump gauge

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Throttle body mounting bolt	23	2.3	17.0
Throttle upper and lower body screw	3.5	0.35	2.5
Fuel injector wire connector screw	2.0	0.20	1.5
Fuel injector cover screw	3.5	0.35	2.5
TP sensor mounting screw	2.0	0.20	1.5
ECT sensor	15	1.5	11.0
Heated oxygen sensor -1 and -2	45	4.5	32.5

SECTION 6E1

ENGINE AND EMISSION CONTROL SYSTEM (TBI FOR G13)

NOTE:
For the details of this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

SECTION 6E2

ENGINE AND EMISSION CONTROL SYSTEM (SFI FOR G13)

WARNING:
For vehicles equipped with Supplemental Restraint (Air Bag) System:
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

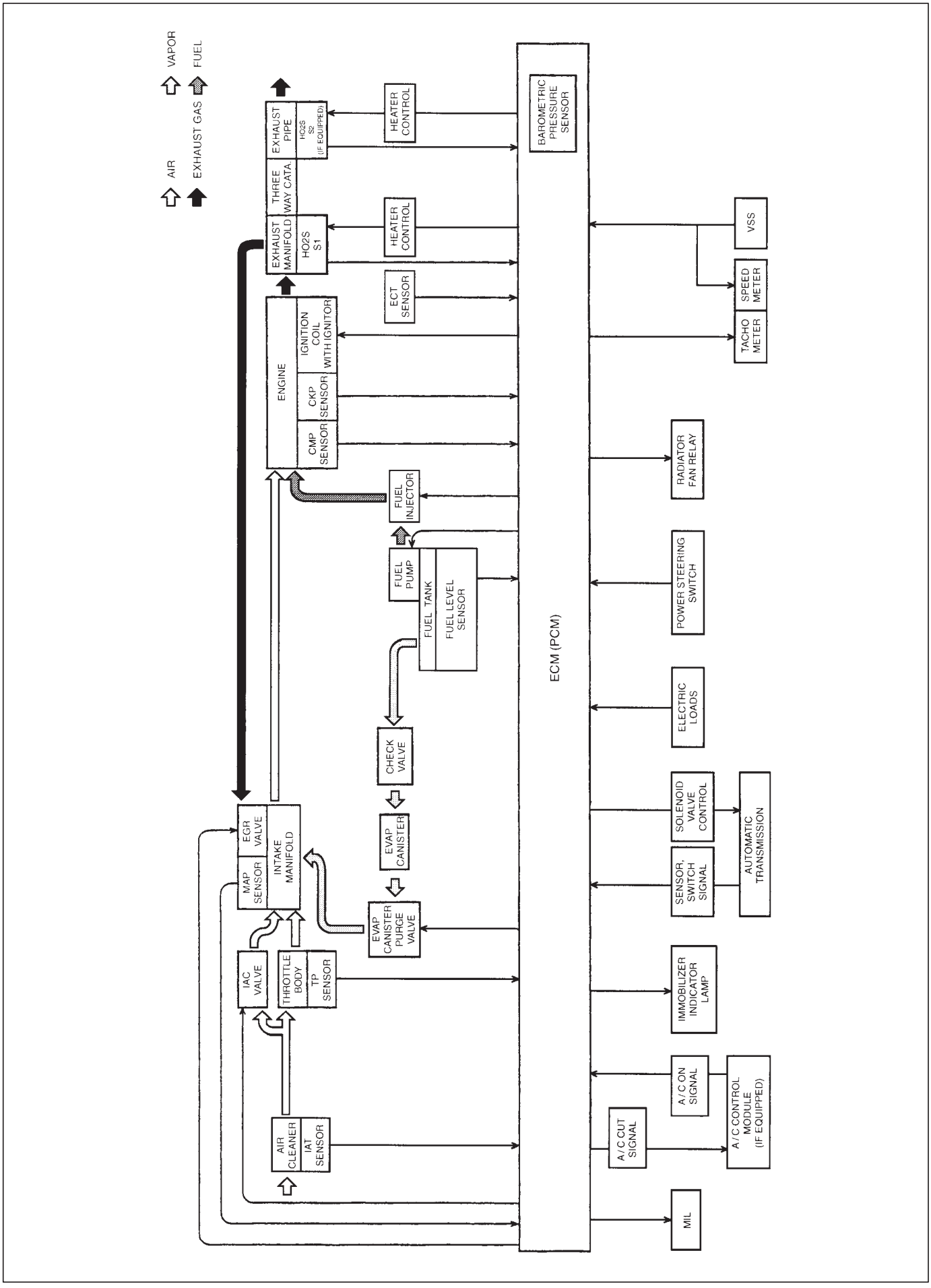
GENERAL DESCRIPTION

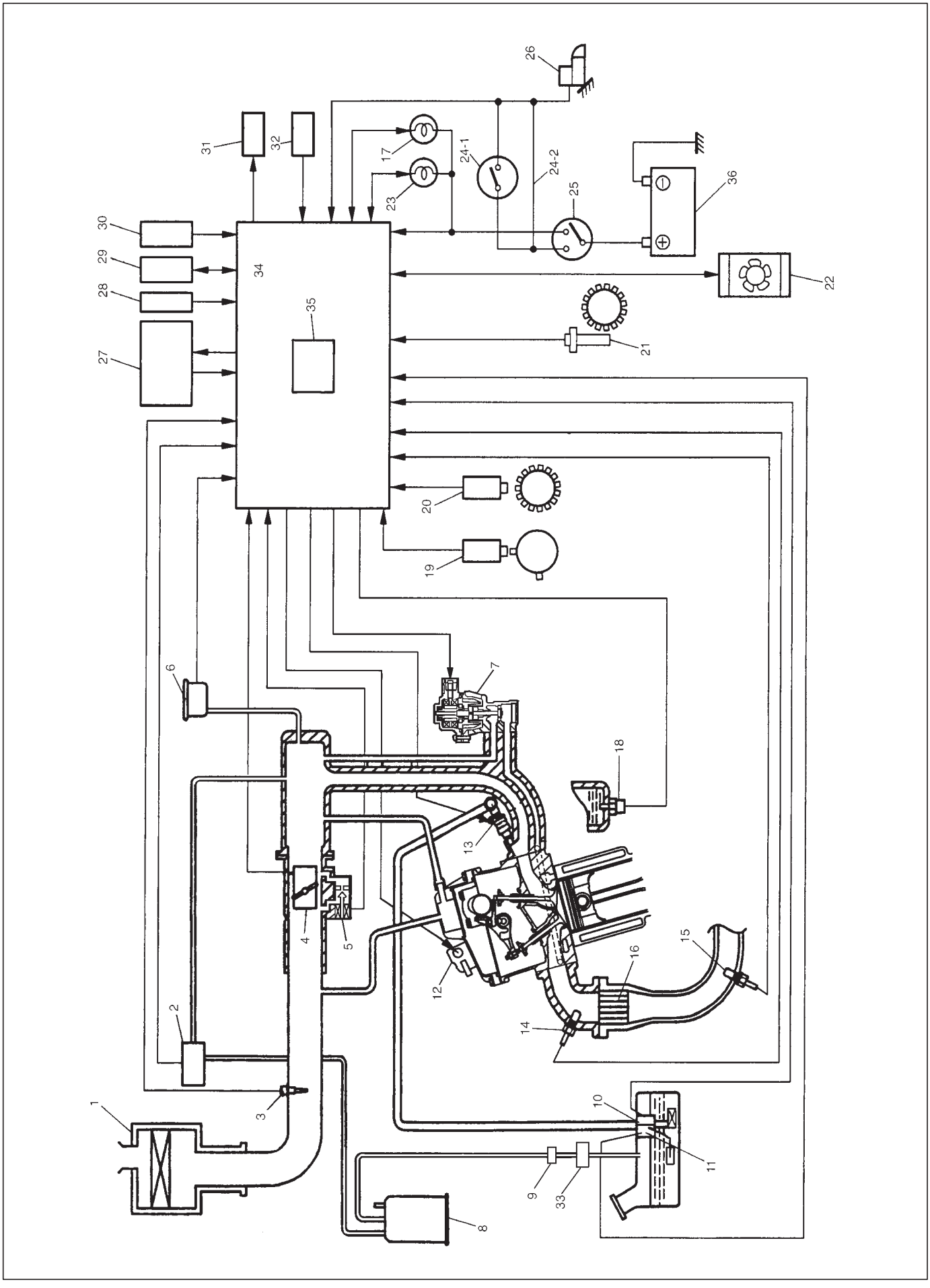
The engine and emission control system is divided into 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.

Air intake system includes air cleaner, throttle body, IAC valve and intake manifold.

Fuel delivery system includes fuel pump, delivery pipe, fuel pressure regulator, etc. Electronic control system includes ECM (PCM), various sensors and controlled devices.

Emission control system includes EGR, EVAP and PCV system.





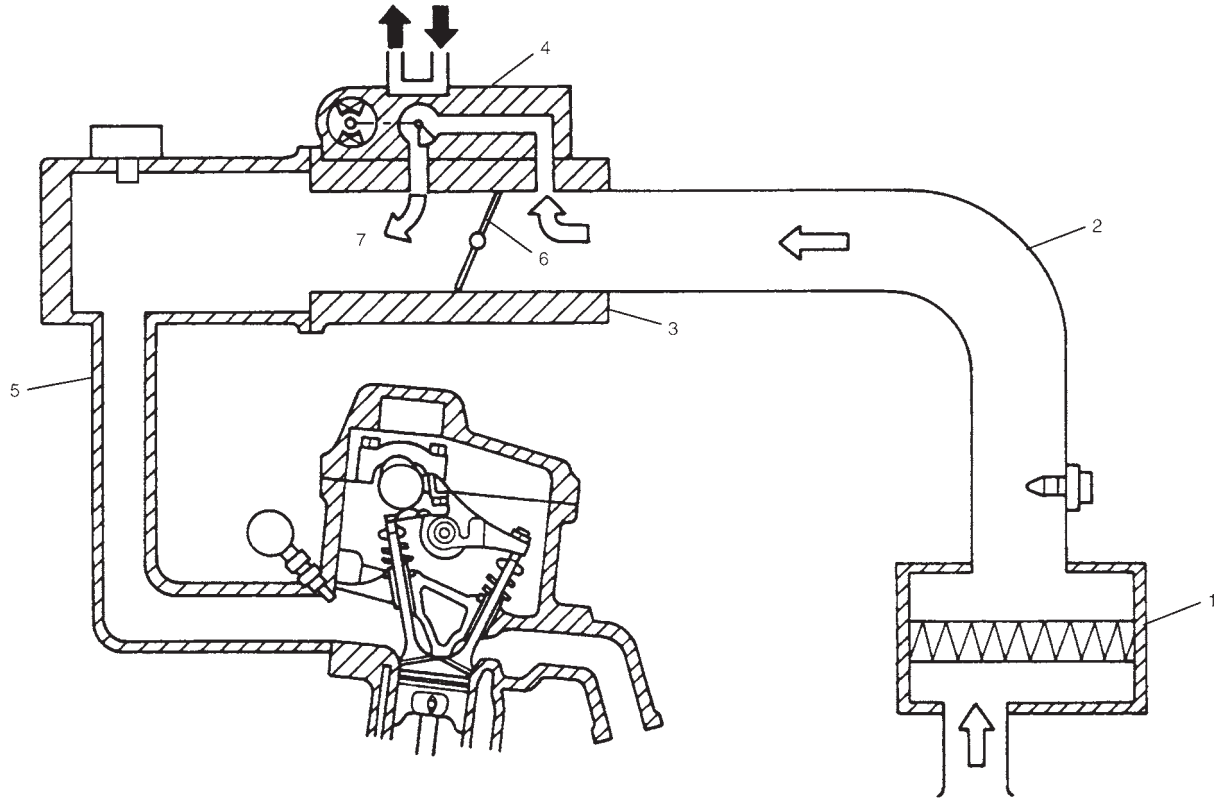
1. Air Cleaner
2. EVAP canister purge valve
3. IAT sensor
4. TP sensor
5. IAC valve
6. MAP sensor
7. EGR valve
8. EVAP canister
9. Tank pressure control valve
10. Fuel pump
11. Fuel level sensor
12. Ignition coil assembly
13. Fuel injector
14. Heated Oxygen Sensor (HO2S)-1
15. Heated Oxygen Sensor (HO2S)-2
16. Three way catalytic convertor
17. Immobilizer indicator lamp in combination meter
18. ECT sensor
19. CMP sensor
20. CKP sensor
21. VSS (A/T)
22. Radiator fan
23. Malfunction indicator lamp in combination meter

24-1. Park/Neutral position switch
24-2. Wiring harness (M/T)

25. Ignition switch
26. Starter magnetic switch
27. A/C control module (if equipped)
28. Transmission range switch (A/T)
29. DLC
30. Electric load
31. Tachometer
32. VSS (speedometer) (M/T)
33. Fuel and vapor separator
34. ECM/PCM
35. Barometric pressure sensor
36. Battery

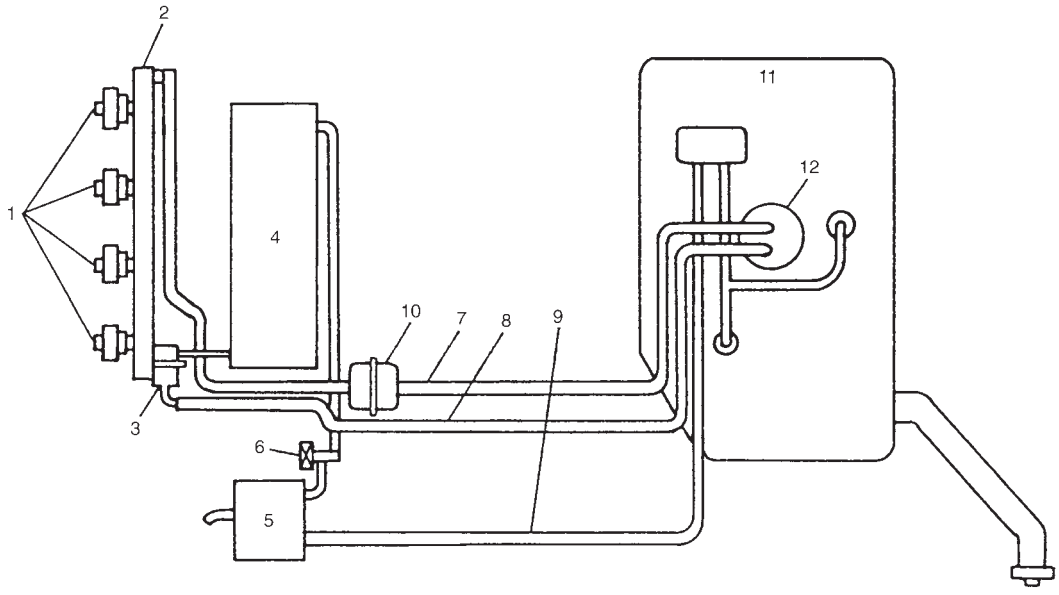
AIR INTAKE SYSTEM

The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), throttle body (3), idle air control valve (4) and intake manifold (5).
The air (by the amount corresponding to the throttle valve (6) opening and engine speed) is filtered by the air cleaner (1), passes through the throttle body (3), is distributed by the intake manifold (5) and finally drawn into each combustion chamber.
When the idle air control valve (4) is opened according to the signal from ECM (PCM), the air (7) bypasses the throttle valve (6) through bypass passage and is finally drawn into the intake manifold (5).



FUEL DELIVERY SYSTEM

The fuel delivery system consists of the fuel tank (11), fuel pump (12), fuel filter (10), fuel pressure regulator (3), delivery pipe (2) and fuel injectors (1).
The fuel in the fuel tank (11) is pumped up by the fuel pump (12), filtered by the fuel filter (10) and fed under pressure to each injector through the delivery pipe (2). As the fuel pressure applied to the injector (the fuel pressure in the fuel feed line (7)) is always kept a certain amount higher than the pressure in the intake manifold (4) by the fuel pressure regulator (3), the fuel is injected into the intake port of the cylinder head when the injector opens according to the injection signal from ECM (PCM).
The fuel relieved by the fuel pressure regulator returns through the fuel return line (8) to the fuel tank (11).
Also, fuel vapor generated in fuel tank is led through the fuel vapor line (9) into the EVAP canister (5).



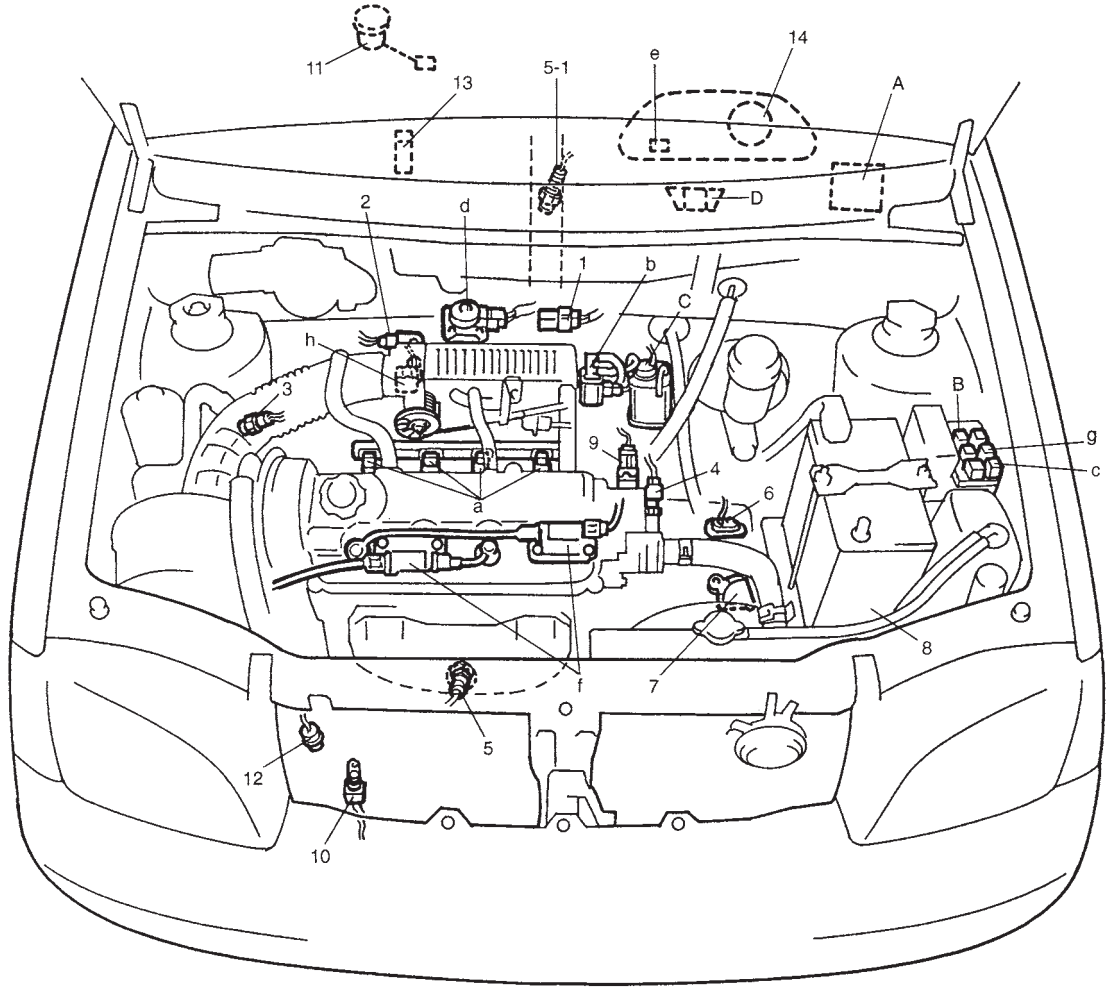
6. EVAP canister purge valve

ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM (PCM) 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, PCM controls A/T.



INFORMATION SENSORS
1. MAP sensor
2. TP sensor
3. IAT sensor
4. ECT sensor
5. Heated oxygen sensor-1

5-1. Heated oxygen sensor-2

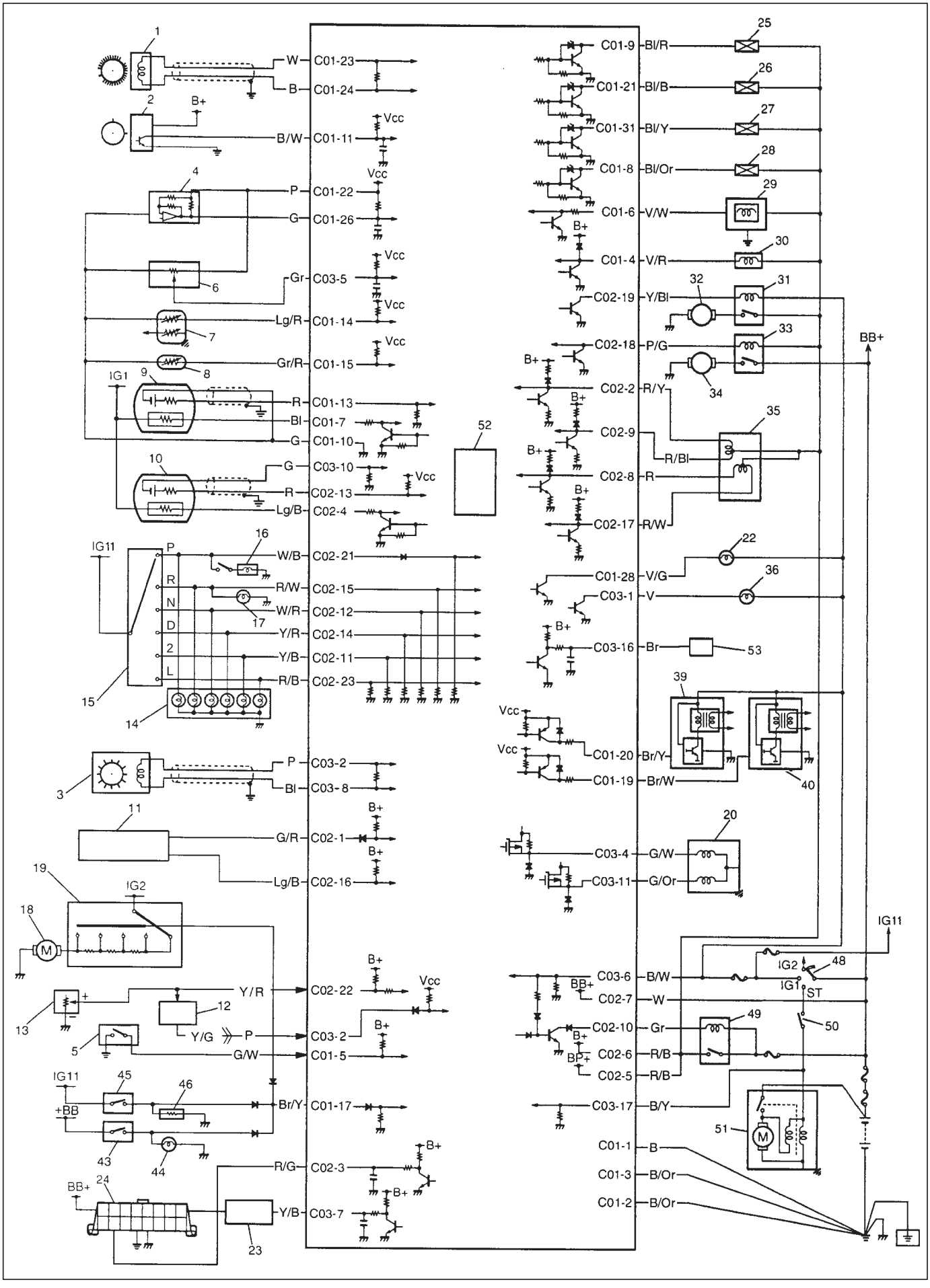
6. VSS (A/T)
7. Transmission range switch (A/T)
8. Battery
9. CMP sensor
10. CKP sensor
11. Fuel level sensor (gauge) (in fuel tank)
12. PSP switch
13. A/C control module (if equipped)
14. VSS (speedometer) (M/T)

CONTROL DEVICES
- a: Fuel injector
- b: EVAP canister purge valve
- c: Fuel pump relay
- d: EGR valve (step motor)
- e: Malfunction indicator lamp
- f: Ignition coil assembly
- g: Radiator fan control relay
- h: IAC valve

OTHERS
- A: ECM (PCM)
- B: Main relay
- C: EVAP canister
- D: Data link connector

ENGINE & EMISSION CONTROL INPUT/OUTPUT TABLE

INPUT \ OUTPUT		ELECTRIC CONTROL DEVICE										
		FUEL PUMP RELAY	FUEL INJECTOR	HO2S HEATER	IAC VALVE	IGNITION COIL WITH IGNITER	EGR VALVE	EVAP CANISTER PURGE VALVE	A/C CONTROL MODULE	RADIATOR FAN RELAY	MIL	MAIN RELAY
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	FUEL LEVEL SENSOR	For detecting fuel level										
	BAROMETRIC PRESSURE SENSOR		○		○						○	
	START SWITCH	○	○		○				○		○	
	IGNITION SWITCH	○	○	○	○	○	○	○	○	○		○
	LIGHTING SWITCH				○							
	REAR DEFOGGER SWITCH (IF EQUIPPED)				○							
	BLOWER SWITCH				○						○	
	A/C SWITCH				○				○	○		
	VSS				○				○	○	○	
	HEATED OXYGEN SENSOR-1		○					○			○	
	HEATED OXYGEN SENSOR-2	For detecting deterioration of three way catalytic convertor									○	
	IAT SENSOR		○		○	○	○	○	○		○	
	ECT SENSOR		○	○	○	○	○	○	○	○	○	
	TP SENSOR		○		○	○			○		○	
	MAP SENSOR		○	○	○	○	○	○	○		○	
	CMP SENSOR	○	○	○	○	○	○	○	○		○	
	CKP SENSOR	○	○	○	○	○	○	○	○		○	



1. CKP sensor
2. CMP sensor
3. Output shaft speed sensor (A/T VSS)
4. MAP sensor
5. Power steering pressure switch
6. TP sensor
7. ECT sensor
8. IAT sensor
9. Heated oxygen sensor-1
10. Heated oxygen sensor-2
11. A/C control module (if equipped)
12. M/T VSS (in speedometer)
13. Fuel level sensor
14. Transmission range indicator lamp (A/T)
15. Transmission range switch (A/T)
16. Shift lock solenoid (A/T)
17. Backup lamp (A/T)
18. Heater fan motor
19. Heater fan switch
20. Shift solenoid valve (A/T)
21. Blank
22. Immobilizer indicator lamp
23. Immobilizer control module
24. Data link connector
25. Injector No.1
26. Injector No.2
27. Injector No.3
28. Injector No.4
29. IAC
30. EVAP canister purge valve
31. Fuel pump relay
32. Fuel pump
33. Radiator fan relay
34. Radiator fan motor
35. EGR valve
36. Malfunction indicator lamp
37. Blank
38. Blank
39. Ignition coil assembly (for No.1 and No.4 spark plugs)
40. Ignition coil assembly (for No.2 and No.3 spark plugs)
41. Blank
42. Blank
43. Lighting switch
44. Position lamp
45. Rear defogger switch
46. Rear defogger
47. Blank
48. Ignition switch
49. Main relay
50. Transmission range switch (Park/Neutral position switch)
51. Starting motor
52. Barometric pressure sensor
53. Tachometer

CON-NECTOR	TERMINAL	WIRE COLOR	CIRCUIT
C01	1	B	Ground for ECM/PCM
	2	B/Or	Ground for drive circuit
	3	B/Or	Ground for drive circuit
	4	V/R	Canister purge valve
	5	G/W	Power steering pressure switch
	6	V/W	IAC valve
	7	Bl	Heater of HO2S-1
	8	Bl/Or	No.4 fuel injector
	9	Bl/R	No.1 fuel injector
	10	G	Ground for sensor circuit
	11	B/W	CMP sensor
	12	——	———
	13	R	Heated oxygen sensor-1
	14	Lg/R	Coolant temp. sensor
	15	Gr/R	Intake air temp. sensor
	16	——	———
	17	Br/Y	Electric load (+)
	18	——	———
	19	Br/W	IG coil assembly for No.2 and 3 spark plugs
	20	Br/Y	IG coil assembly for No.1 and 4 spark plugs
	21	Bl/B	No.2 fuel injector
	22	P	Power supply for sensor
	23	W	CKP sensor (+)
	24	B	CKP sensor (–)
	25	——	———
	26	G	MAP sensor
	27	——	———
	28	V/G	Immobilizer indicator lamp
	29	——	———
	30	——	———
	31	Bl/Y	No.3 fuel injector

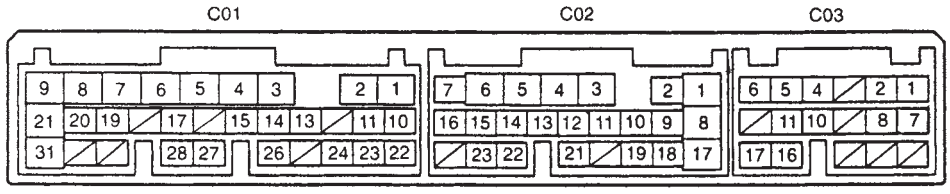
CON-NECTOR	TERMINAL	WIRE COLOR	CIRCUIT
C02	1	G/R	A/C compressor clutch
	2	R/Y	EGR valve (stepper motor coil 1)
	3	R/G	Data link connector
	4	Lg/B	Heater of HO2S-2
	5	R/B	Power source
	6	R/B	Power source
	7	W	Backup power source
	8	R	EGR valve (stepper motor coil 3)
	9	R/Bl	EGR valve (stepper motor coil 2)
	10	Gr	Ground for main relay
	11	Y/B	"2"-range signal (A/T)

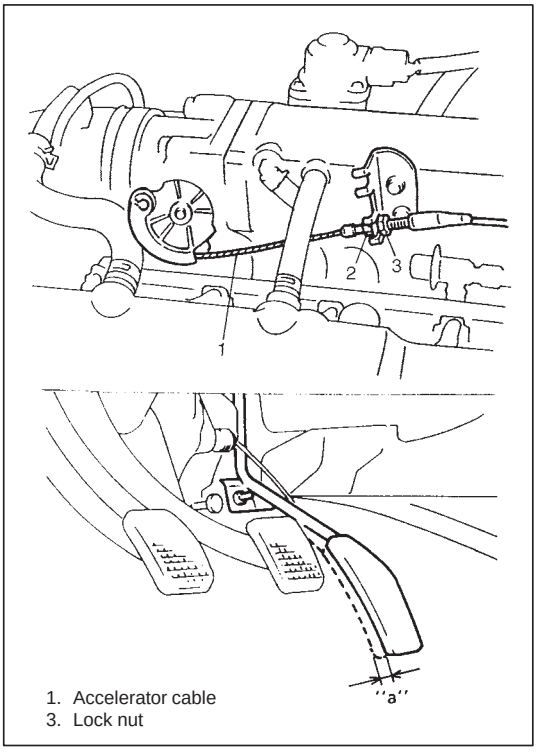
CON-NECTOR	TERMINAL	WIRE COLOR	CIRCUIT
C02	12	W/R	"N"-range signal (A/T)
	13	R	Heated oxygen sensor-2
	14	Y/R	"D"-range signal (A/T)
	15	R/W	"R"-range signal (A/T)
	16	Lg/B	A/C SW signal
	17	R/W	EGR valve (stepper motor coil 4)
	18	P/G	Radiator fan relay
	19	Y/Bl	Fuel pump relay
	20	——	———
	21	W/B	"P"-range signal (A/T)
	22	P/Bl	Fuel level gauge
	23	R/B	"L"-range signal (A/T)
	24	——	———

CON-NECTOR	TERMINAL	WIRE COLOR	CIRCUIT
C03	1	V	Malfunction indicator lamp
	2	P	Vehicle speed sensor (M/T) Output shaft speed sensor (+) (A/T)
	3	——	———
	4	G/W	Shift solenoid – A (A/T)
	5	Gr	Throttle position (TP) sensor
	6	B/W	Ignition switch signal
	7	Y/B	Data link connector
	8	Bl	Output shaft speed sensor (–) (A/T)
	9	——	———
	10	G	GND for HO2S-2
	11	G/Or	Shift solenoid – B (A/T)
	12	——	———
	13	——	———
	14	——	———
	15	——	———
	16	Br	Tachometer signal
	17	B/Y	Engine start signal

Wire color

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





1. Accelerator cable
3. Lock nut

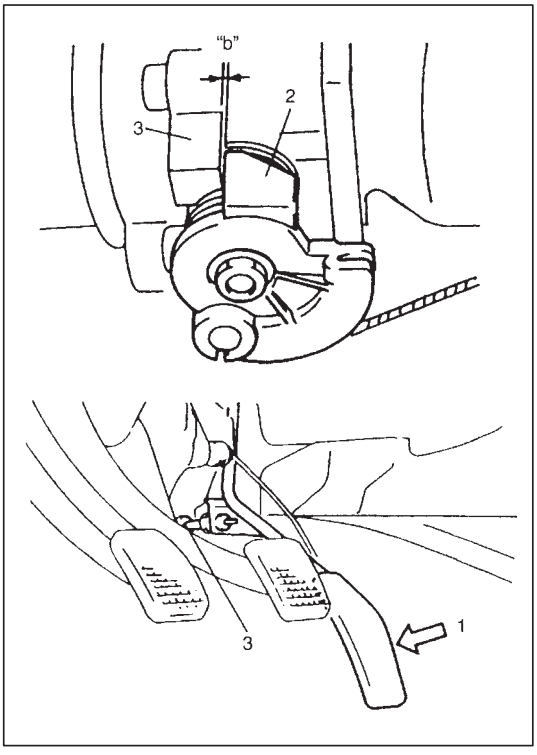
ON-VEHICLE SERVICE

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 (2).



2) With accelerator pedal depressed fully (1), check clearance between throttle lever (2) and lever stopper (3) (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 with cable adjusting nut.

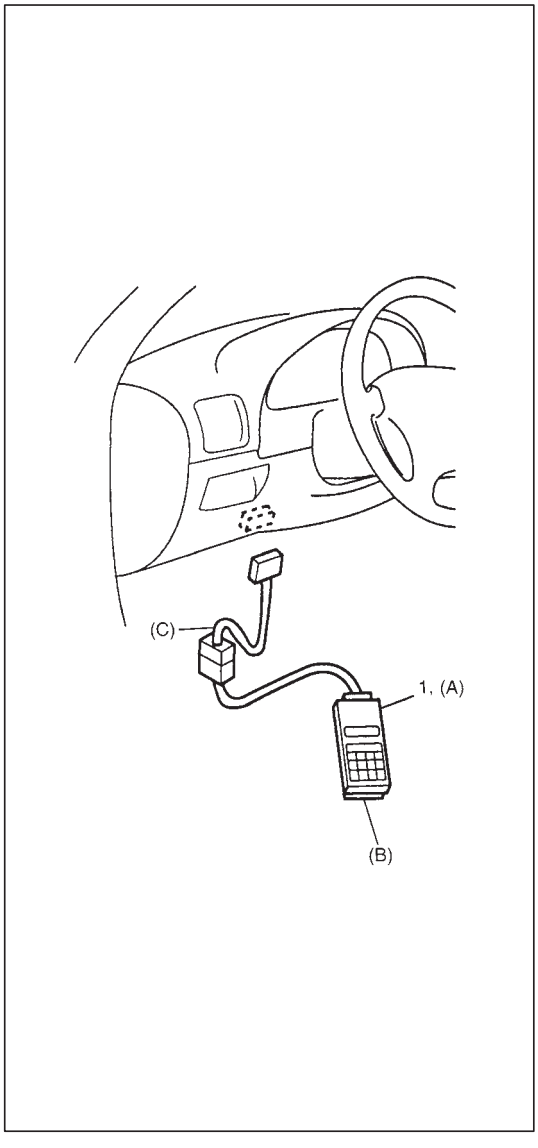
IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION

Before idle speed/IAC duty check, 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 inhaling from air intake system.

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.



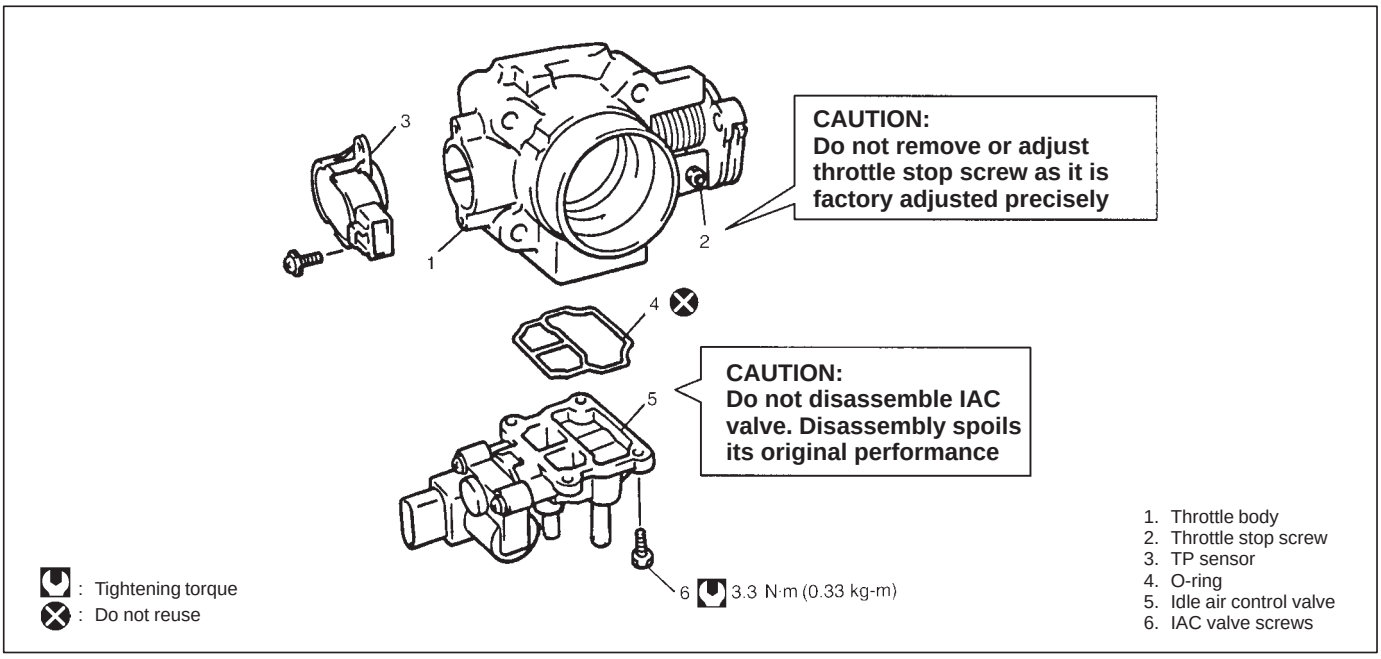
1) Connect SUZUKI scan tool (1) to DLC with ignition switch OFF, if it is available.
2) Warm up engine to normal operating temperature.
3) Check engine idle speed and "IAC duty" as follow:
   Select "Data List" mode on scan tool to check "IAC duty" and engine speed.
   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)
   If duty and/or idle speed is out of specifications, inspect idle air control system referring to Diagnostic Flow Table B-4 IDLE AIR CONTROL SYSTEM CHECK in Section 6.

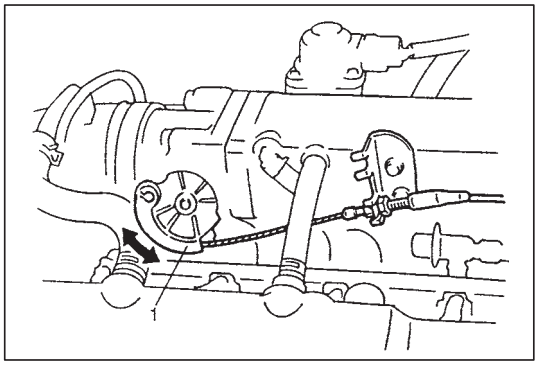
ENGINE IDLE SPEED AND IAC DUTY		
	A/C OFF	A/C ON
M/T vehicle	750 ± 50 r/min (rpm) 8 – 25 or *8 – 35%	875 ± 50 r/min (rpm)
A/T vehicle at P/N range		

   NOTE:
   Duty values with (*) are applicable to vehicle used at high altitude (higher than 2,000 m or 6,560 ft).
4) Check that 875 ± 50 r/min. idle speed is obtained with lighting switch ON and heater blower switch in 2 – 4 position.
   If not, check "Electric load (+)" circuit and "Heater blower switch signal" circuit referring to "ELECTRONIC CONTROL SYSTEM" in this section and idle air control system.
5) 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.

AIR INTAKE SYSTEM

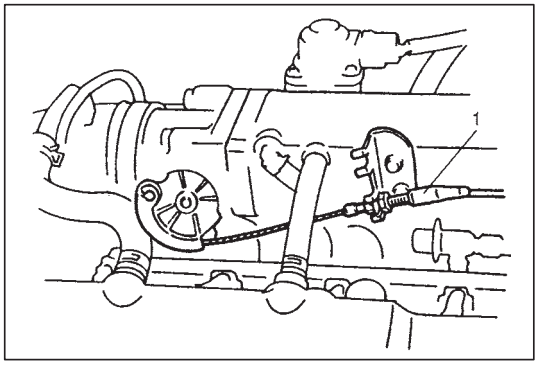
THROTTLE BODY





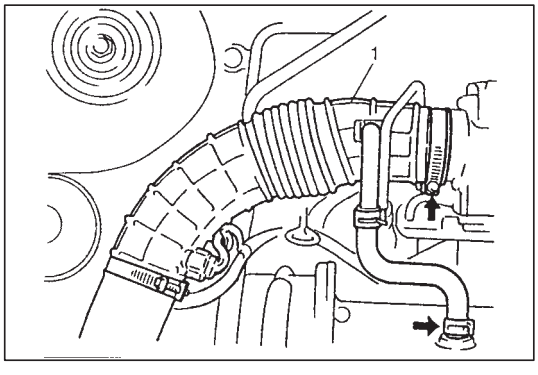
On-Vehicle Inspection

- Check that throttle valve lever (1) moves smoothly.

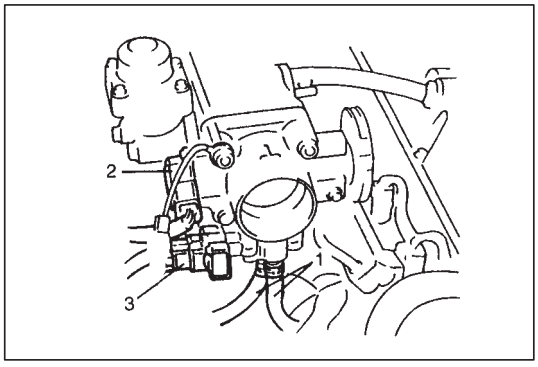


Removal

1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Disconnect accelerator cable (1) from throttle body.



4) Disconnect air cleaner outlet hose (1) from throttle body.

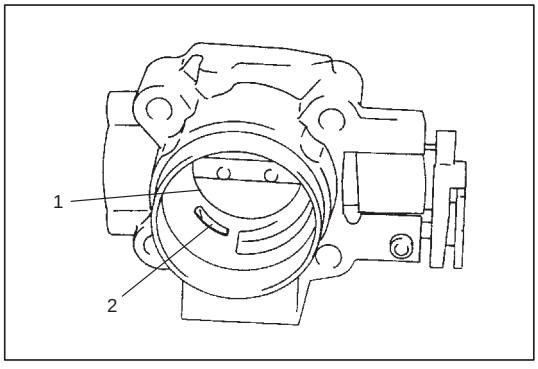


5) Disconnect electric coupler from TP sensor (2) and IAC valve (3).
6) Remove throttle body from intake manifold.
7) Disconnect engine coolant hoses (1) from throttle body.

Disassembly

NOTE:
While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.

1) Remove TP sensor and IAC valve from throttle body.



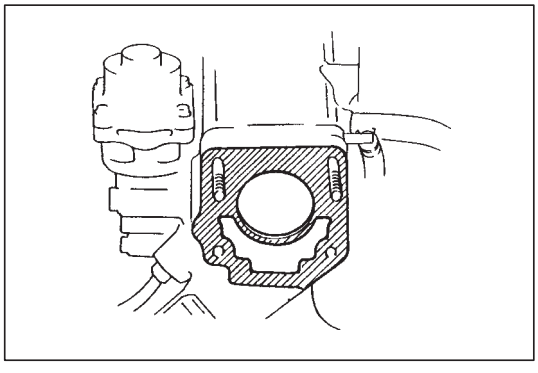
Cleaning

Clean throttle body bore (1) and idle air passage (2) 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.

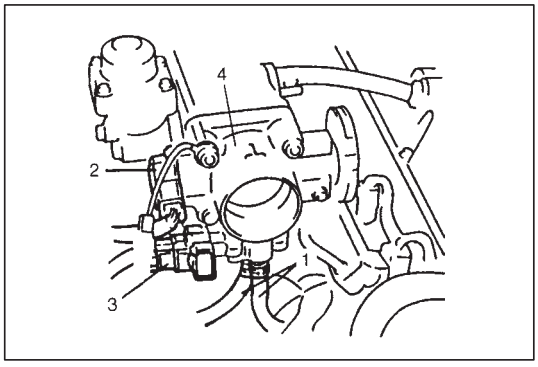
Reassembly

1) Install IAC valve to throttle body referring to “IAC valve Installation” section.
2) Install TP sensor to throttle body referring to “TP sensor Installation” section.

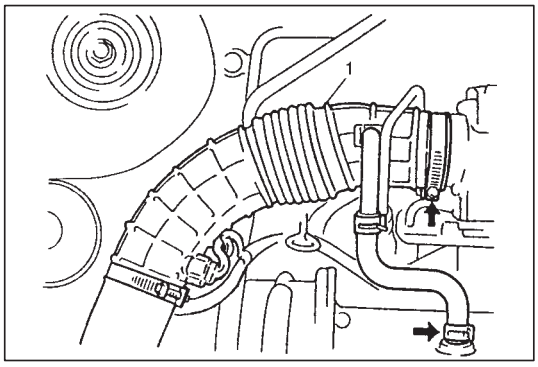


Installation

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



2) Connect engine coolant hoses (1).
3) Install throttle body (4) to intake manifold.
4) Connect coupler to TP sensor (2) and IAC valve (3) securely.

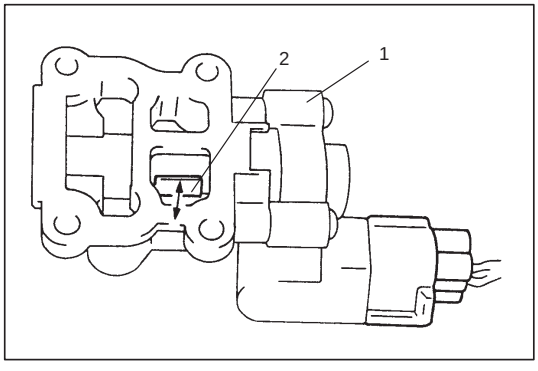


5) Install air cleaner outlet hose (1) and pipe.
6) Connect accelerator cable and adjust cable play to specification.
7) Refill cooling system.
8) Connect negative cable at battery.

IDLE AIR CONTROL VALVE (IAC VALVE)

Removal

1) Remove throttle body from intake manifold referring to “Throttle Body Removal” section.
2) Remove IAC valve from throttle body.

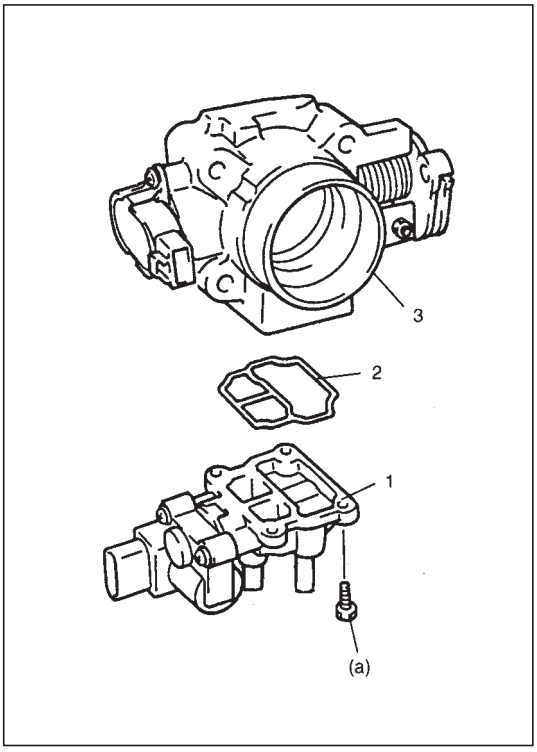


Inspection

1) Connect each connector to IAC valve (1), TP sensor and IAT sensor.
2) Check that rotary valve (2) of IAC valve opens and closes once and then stops in about 60 ms as soon as ignition switch is turned ON.

NOTE:

- **This check should be performed by two people, one person turns on ignition switch while the other checks valve operation.**
- **As valve operation is momentary, it may be overlooked. To prevent this, perform this operation check 3 times or more continuously.**
  If rotary valve of IAC valve does not operate at all, check wire harness for open and short. If wire harness is in good condition, replace IAC valve and recheck.



Installation

1) Install new O-ring (2) to IAC valve (1).
2) Install IAC valve (1) to throttle body (3).
   Tighten IAC valve screws to specified torque.

   Tightening Torque
   (a): 3.3 N·m (0.33 kg-m, 2.5 lb-ft)

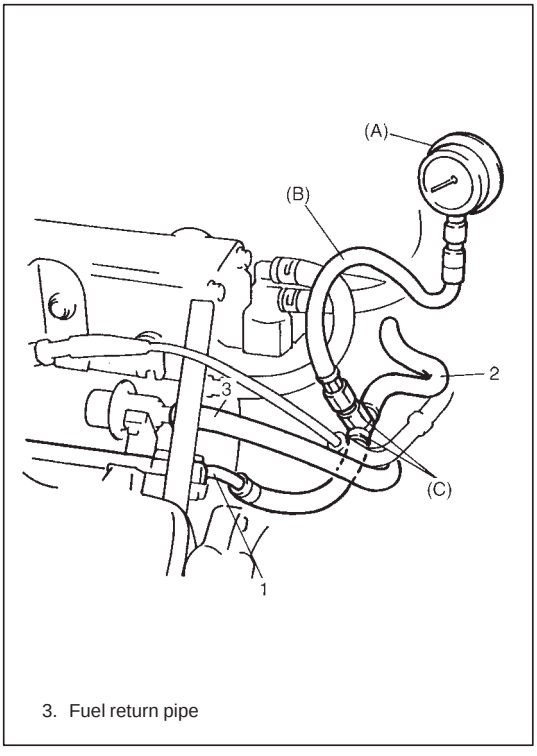
3) Install throttle body to intake manifold referring to "Throttle Body Installation" section.

FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

WARNING:
Be sure to perform work in a well-ventilated area and away from any open flames, or there is a risk of a fire breaking out.

1) Relieve fuel pressure in fuel feed line referring to "Fuel Pressure Relief Procedure" in Section 6.



3. Fuel return pipe

2) Disconnect fuel feed hose from fuel delivery pipe.

CAUTION:
A small amount of fuel may be released when fuel hose is disconnected. Place container under the joint with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place that cloth in an approved container.

3) Connect special tools and hose between fuel delivery pipe (1) and fuel feed hose (2) as shown in figure, and clamp hoses securely to ensure no leaks occur during checking.

   Special Tool
   (A): 09912-58441
   (B): 09912-58431
   (C): 09912-58490

4) Check that battery voltage is above 11 V.

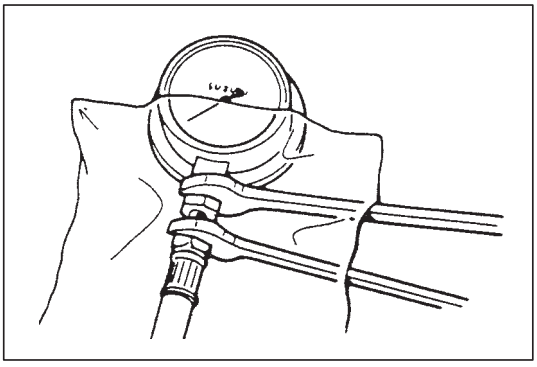
CONDITION	FUEL PRESSURE
With fuel pump operating and engine stopped	270 – 310 kPa 2.7 – 3.1 kg/cm^2 38.4 – 44.0 psi
At specified idle speed	200 – 240 kPa 2.0 – 2.4 kPa 28.4 – 34.1 psi
With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	over 200 kPa 2.0 kg/cm^2 28.4 psi

5) Check fuel pressure as follows.

[Not using SUZUKI scan tool]

a) Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
b) Start engine and warm it up to normal operating temperature.
c) Measure fuel pressure at idling.

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



d) 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.**

e) Remove special tools from fuel delivery pipe.
f) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
g) With engine OFF and ignition switch ON, check for fuel leaks.

[Using SUZUKI scan tool]

a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
b) Turn ignition switch ON and then select “DATA LIST” mode on scan tool.
c) Make sure that vehicle condition is as following.
   - Vehicle speed = 0 KPH
   - Engine speed = 0 RPM
   - Fuel tank level ≧ 15%
d) Clear DTC by using “CLEAR INFO” mode.
e) Check fuel pressure by using “FUEL PUMP CONT” mode in “MISC TEST” menu.

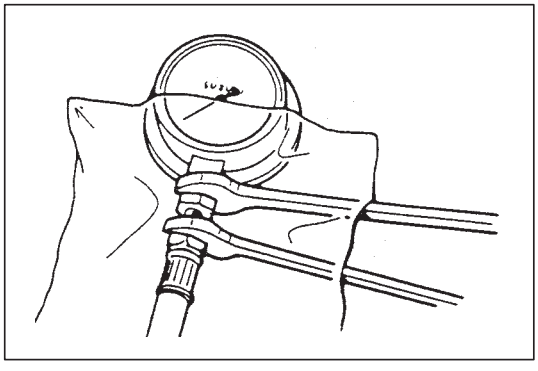
CONDITION	FUEL PRESSURE
With fuel pump operating	2.7 – 3.1 kg/cm^2 270 – 310 kPa 38.4 – 44.0 psi
Within 1 min. after fuel pump stop (Pressure reduces as time passes)	Over 2.0 kg/cm^2 200 kPa 28.4 psi

If measured pressure doesn’t satisfy specification, refer to “Diagnostic Flow Table B-3” and check each possibly defective part. Replace if found defective.

f) Start engine and warm it up to normal operating temperature. And then check fuel pressure.

CONDITION	FUEL PRESSURE
At specified idle speed	2.0 – 2.4 kg/cm^2 200 – 240 kPa 28.4 – 34.1 psi

If measured pressure doesn’t satisfy specification, refer to “Diagnostic Flow Table B-3” and check each possibly defective part. Replace if found defective.



g) 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.**

h) Remove special tools from fuel delivery pipe.
i) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
j) With engine OFF and ignition switch ON, check for fuel leaks.

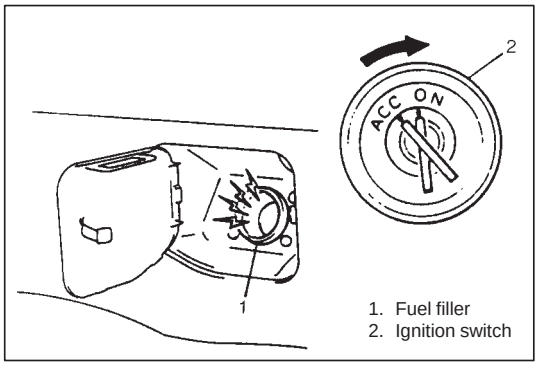
Tightening Torque
Fuel pressure regulator bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)

FUEL PUMP

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.

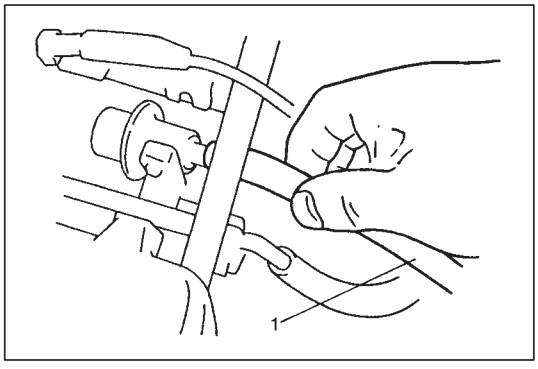
NOTE:
The fuel pressure regulator is the one body with the fuel pump assembly so individual inspection of it is impossible.



1. Fuel filler
2. Ignition switch

1) 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 Table B-2”.



2) Turn OFF ignition switch and leave over 10 minutes as it is.
3) Fuel pressure should be felt at fuel return hose (1) for 2 seconds after ignition switch ON.

   If fuel pressure is not felt, advance to “Diagnostic Flow Table B-3”.

Removal

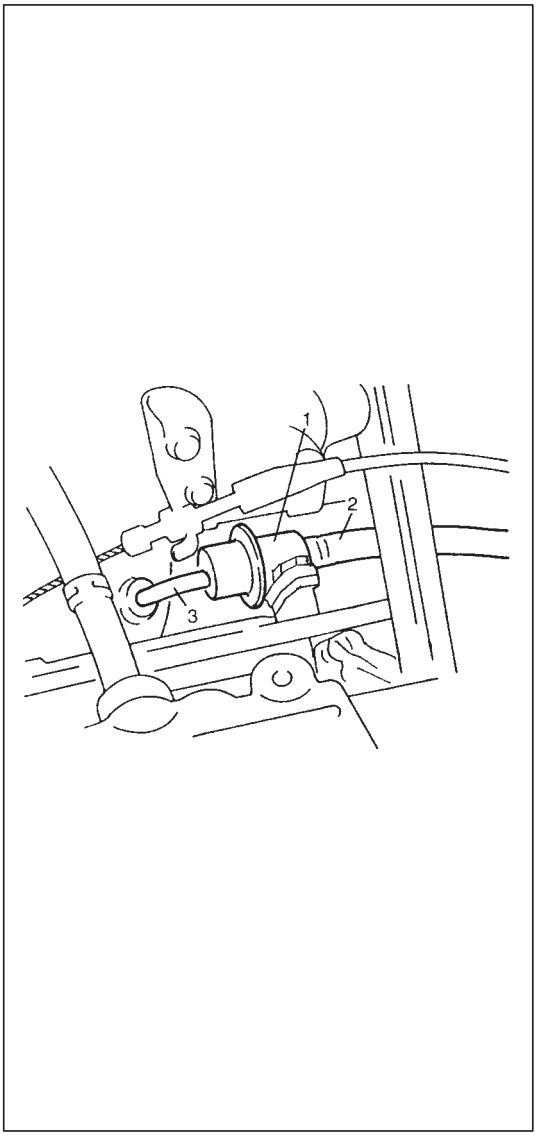
Remove fuel tank from body according to procedure described in Section 6C and remove fuel pump from fuel tank.

Inspection

Check fuel pump filter for evidence 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.



FUEL PRESSURE REGULATOR

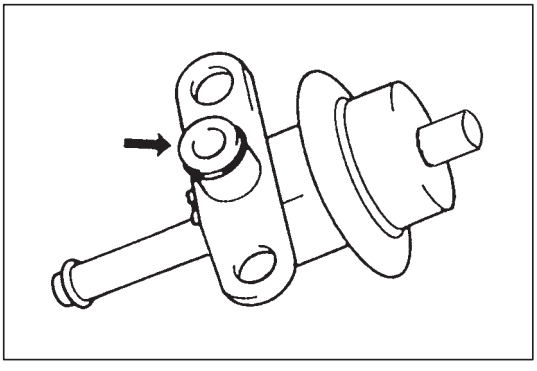
Removal

1) Relieve fuel pressure according to procedure described in section 6.
2) Disconnect battery negative cable at battery.
3) Disconnect vacuum hose (3) from fuel pressure regulator (1).
4) Disconnect fuel return hose (2) from fuel pressure regulator (1).

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

5) 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.

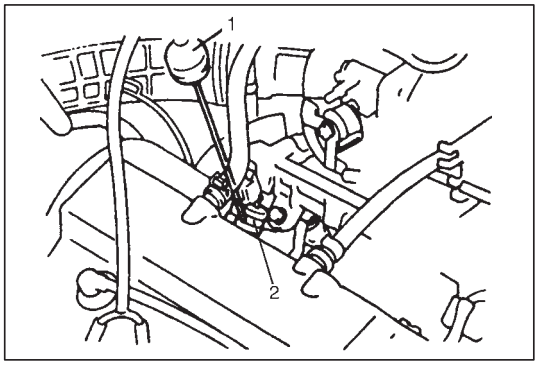


Installation

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.

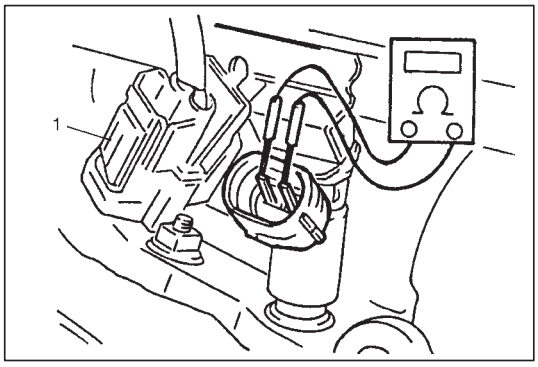
Tightening Torque
Fuel pressure regulator bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)



FUEL INJECTOR

On-Vehicle Inspection

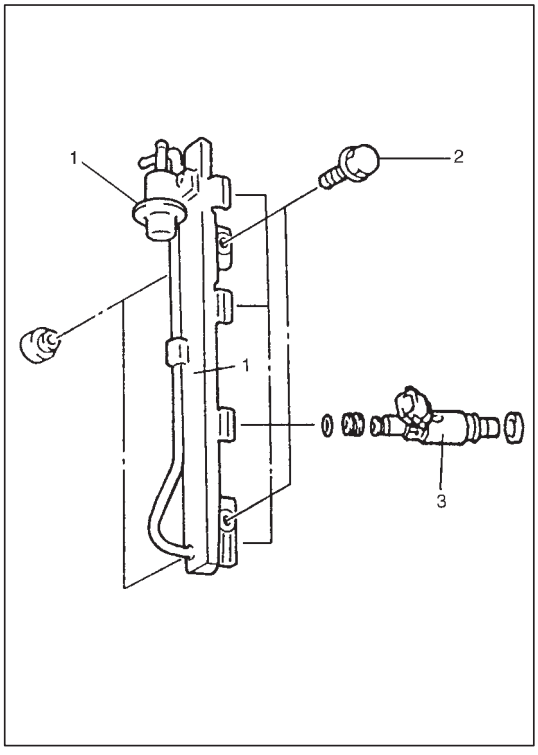
1) Using sound scope (1) or such, check operating sound of injector (2) when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector (2).



2) Disconnect coupler (1) from injector, connect ohmmeter between terminals of injector and check resistance.

   Resistance of injector: 12.0 – 13.0 Ω at 20°C, 68°F

   If resistance is out of specification, replace.
3) Connect coupler (1) to injector securely.



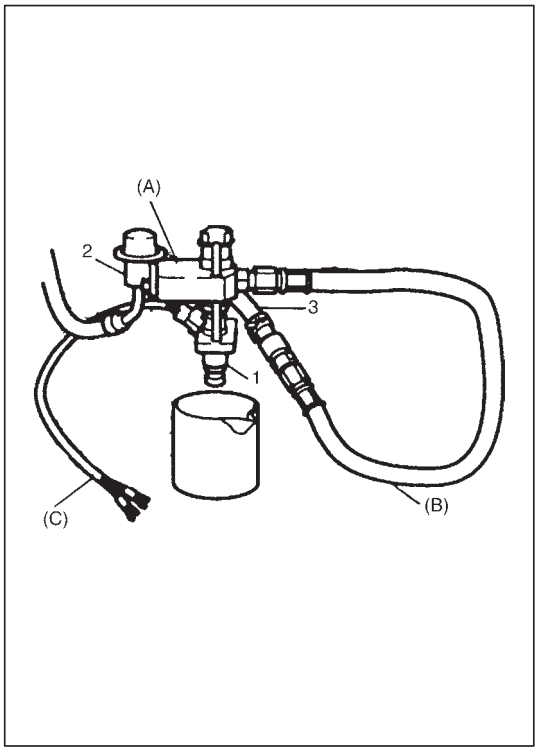
Removal

1) Relieve fuel pressure according to procedure described in Section 6.
2) Disconnect battery negative cable at battery.
3) Disconnect fuel injector couplers.
4) Disconnect vacuum hose from fuel pressure regulator (1).
5) Remove fuel delivery pipe bolts (2).
6) Remove fuel injector(s) (3).

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.



1) Install injector (1) and fuel pressure regulator (2) to special tool (injector checking tool).

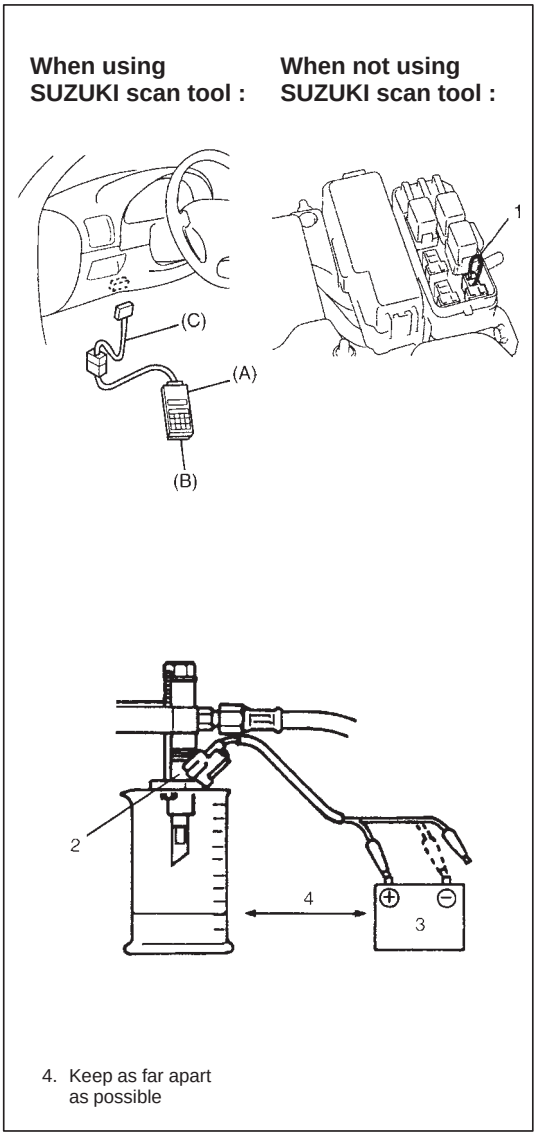
   Special Tool
   (A): 09912-58421

2) Connect special tools (hose and attachment) to fuel feed hose (3) of vehicle.

   Special Tool
   (B): 09912-58431

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

   Special Tool
   (C): 09930-88530



4. Keep as far apart as possible

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) Operate fuel pump and apply fuel pressure to injector as follows:
   When using SUZUKI scan tool :
   a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
   b) Turn ignition switch ON, clear DTC and select “MISC TEST” mode on SUZUKI scan tool.
   c) Turn fuel pump ON by using SUZUKI scan tool.

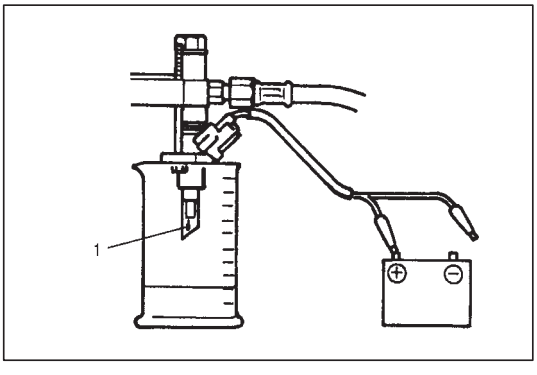
   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

   When not using SUZUKI scan tool :
   a) Remove fuel pump relay from connector.
   b) Connect two terminals of relay connector using service wire (1) 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.

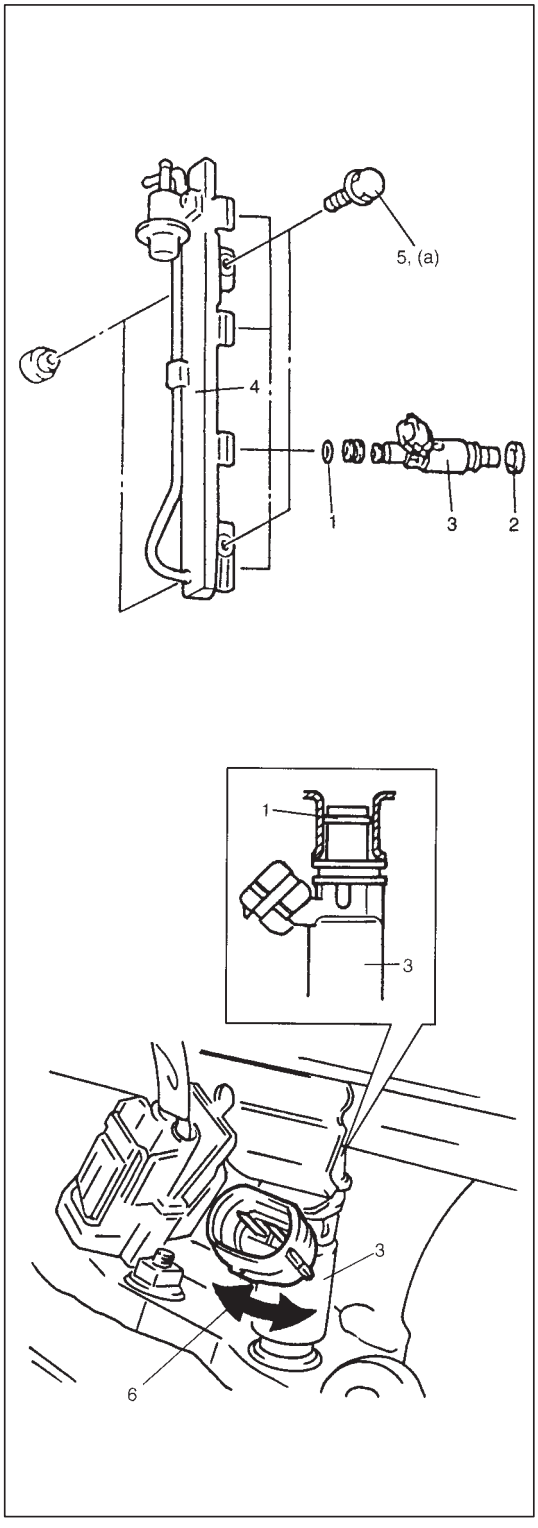
   c) Turn ignition switch ON.
7) Apply battery voltage (3) to injector (2) for 15 seconds and measure injected fuel volume with graduated cylinder.
   Test each injector two or three times.
   If not within specification, replace injector.

   Injected fuel volume:
   38 – 48 cc/15 sec. (1.28/1.34 – 1.62/1.69 US/Imp. oz/15 sec.)



8) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work).
   If fuel leaks (1) more than following specifications, replace.

   Fuel leakage (1): Less than 1 drop/min.



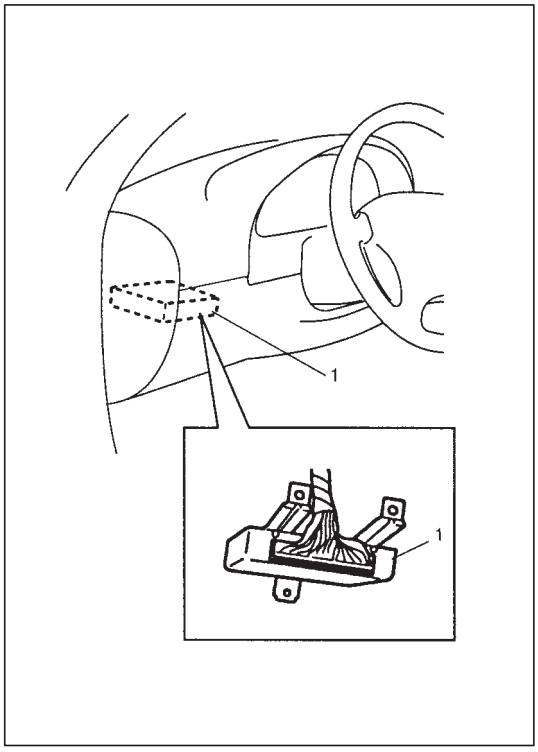
Installation

For installation, reverse removal procedure and note following precautions.

- Replace injector O-ring (1) with new one using care not to damage it.
- Check if cushion (2) is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings (1) and then install injectors (3) into delivery pipe (4) and intake manifold.
  Make sure that injectors (3) rotate smoothly (6). If not, probable cause is incorrect installation of O-ring (1). Replace O-ring (1) with new one.
- Tighten delivery pipe bolts (5) and make sure that injectors (3) rotate smoothly (6).

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

- After installation, with engine OFF and ignition switch ON, check for fuel leaks around fuel line connection.



ELECTRONIC CONTROL SYSTEM

ENGINE CONTROL MODULE (POWERTRAIN CONTROL MODULE) [ECM (PCM)]

CAUTION:
As ECM (PCM) 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 if equipped.
3) Lower fuse box after removing screws and remove fuse box bracket.
4) Remove ECM (PCM) (1) from body.
5) Disconnect couplers from ECM (PCM).

Installation

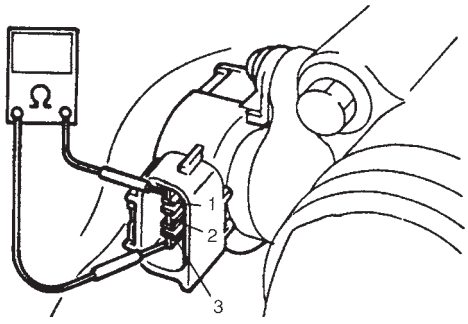
Reverse removal procedure noting the following:

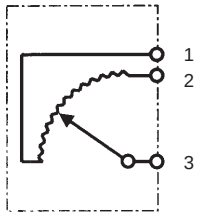
- Connect couplers to ECM (PCM) securely.

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

Inspection

Check MAP sensor referring to “MAP Sensor Individual Check” in DTC P0105 Flow Table. If malfunction is found, replace.





1. Ground terminal
2. Reference voltage terminal
3. Output voltage terminal

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.

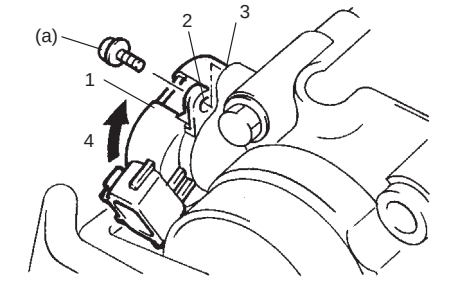
TERMINALS	RESISTANCE	
Between 1 and 2 terminals	2.5 – 6.0 kΩ	
Between 1 and 3 terminals	Throttle valve is at idle position	0.17 – 11.4 kΩ
	Throttle valve is fully opened	1.72 – 15.50 kΩ
NOTE: **There should be more than 1.5 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.**		

If check result is not satisfactory, replace TP sensor.

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

Removal

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

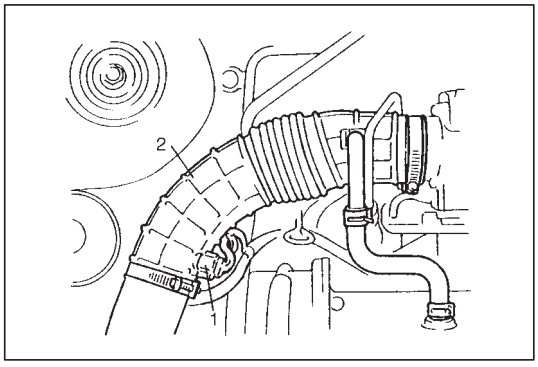


Installation

1) Install TP sensor (1) to throttle body.
   Fit TP sensor to throttle body in such way that its holes (3) are a little away from TP sensor screw holes (2) as shown in left figure and turn TP sensor clockwise so that those holes align (4).

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

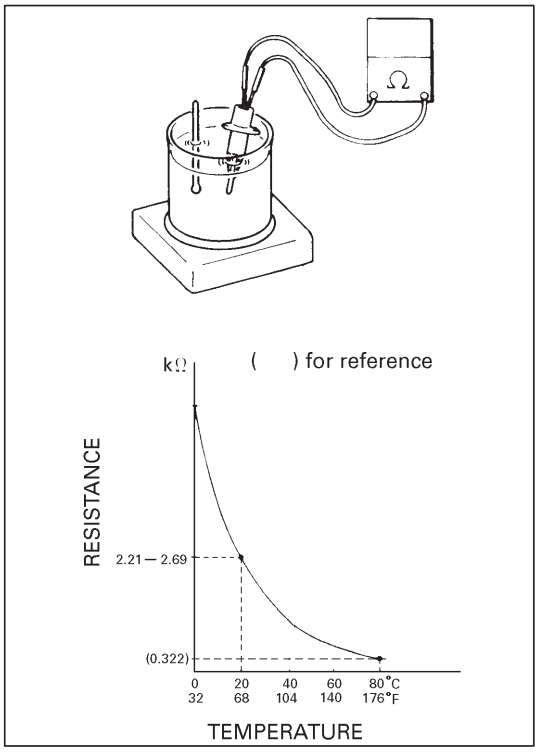
2) Connect coupler to TP sensor securely.
3) Connect battery negative cable to battery.



INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

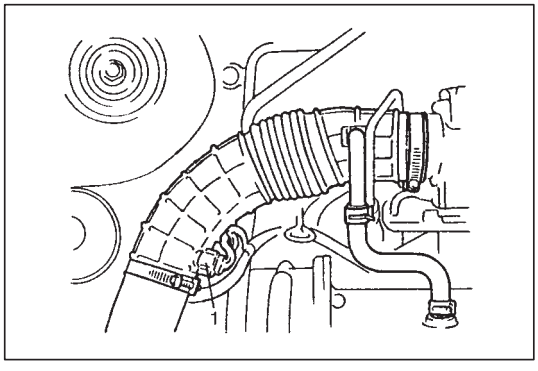
Removal

1) Disconnect battery negative cable at battery.
2) Disconnect coupler from IAT sensor (1).
3) Remove IAT sensor (1) from air cleaner outlet hose (2).



Inspection

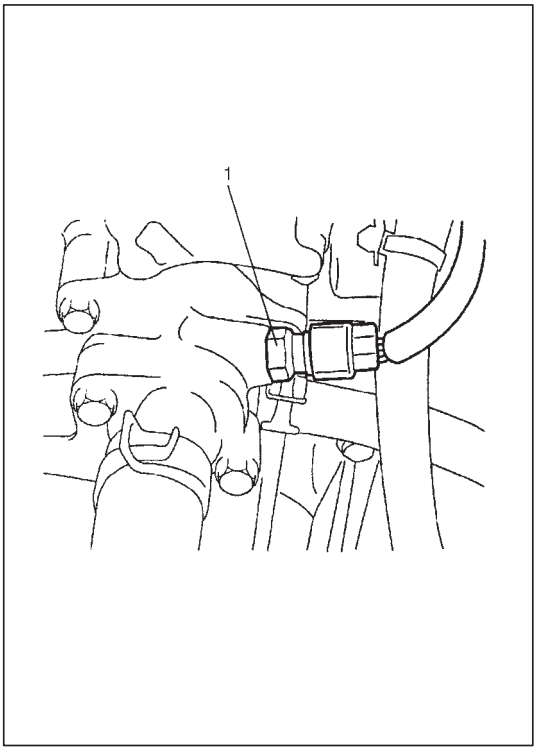
Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in left figure, replace IAT sensor.



Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of IAT sensor and air cleaner outlet hose.
- Connect IAT sensor coupler (1) securely.



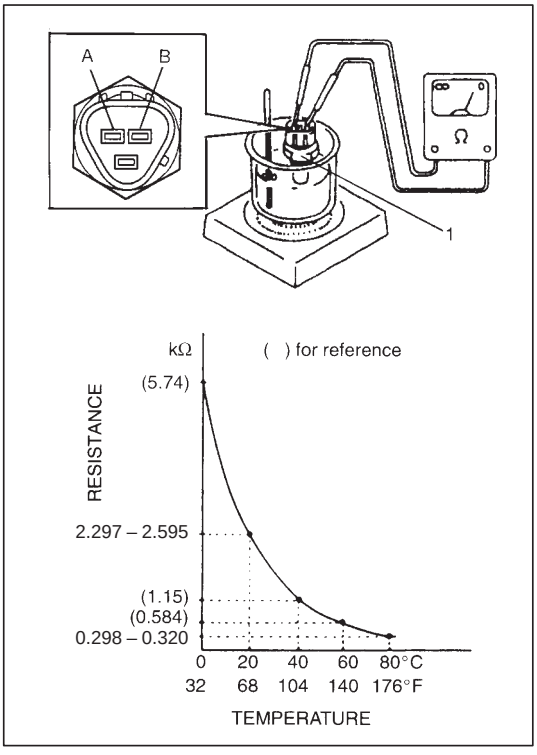
ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

Removal

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

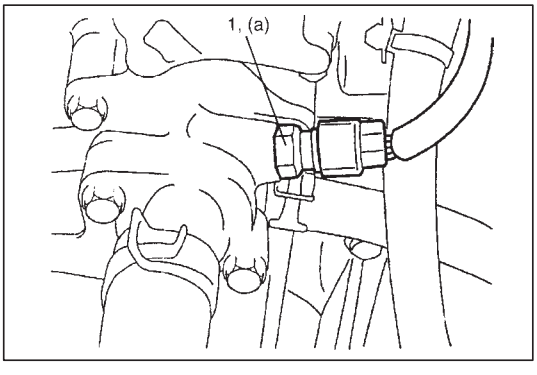
> **WARNING:**
> **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

3) Disconnect coupler from ECT sensor.
4) Remove ECT sensor (1) from thermostat case.



Inspection

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between terminal “A” and “B” while heating water gradually.
If measured resistance doesn’t show such characteristic as shown in left figure, replace ECT sensor (1).



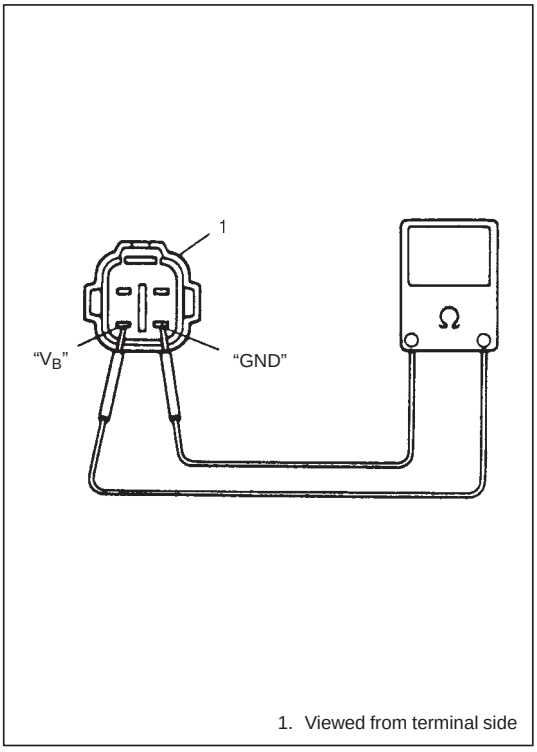
Installation

Reverse removal procedure noting the following:

- Clean mating surfaces of ECT sensor (1) and thermostat case.
- Check O-ring for damage and replace if necessary.
- Tighten ECT sensor (1) to specified torque.

Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

- Connect coupler to ECT sensor (1) securely.
- Refill coolant referring to Section 6B.



1. Viewed from terminal side

HEATED OXYGEN SENSOR (Sensor-1 and Sensor-2)

Oxygen Sensor Heater Inspection

1) Disconnect sensor coupler.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor coupler.

NOTE :
Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

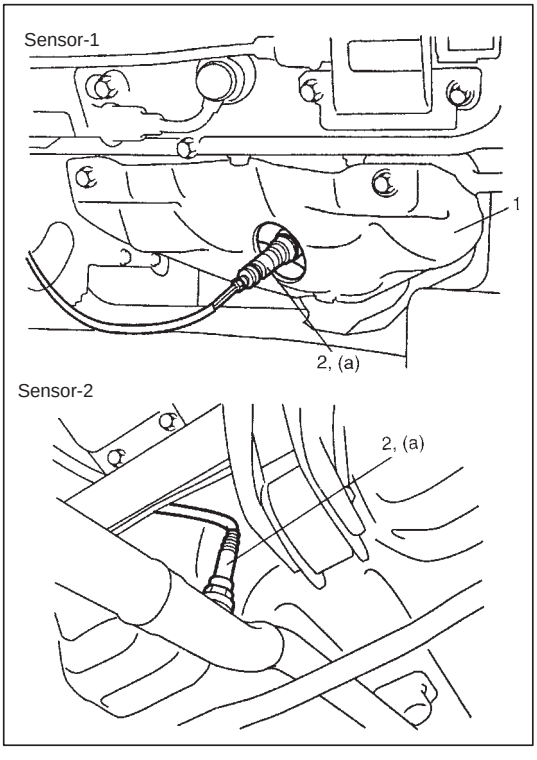
Resistance of oxygen sensor heater :
11.7 – 14.3 Ω at 20°C, 68°F

If found faulty, replace oxygen sensor.

3) Connect sensor coupler securely.

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.



1) Disconnect negative cable at battery.
2) For sensor-1, disconnect coupler of heated oxygen sensor and release its wire harness from clamps and remove exhaust manifold cover (1).
3) For sensor-2, disconnect coupler of heated oxygen sensor and release its wire harness from clamp and hoist vehicle.
4) Remove heated oxygen sensor (2) from exhaust manifold or exhaust pipe.

Installation

Reverse removal procedure noting the following.

- Tighten heated oxygen sensor (2) to specified torque.

Tightening Torque for heated oxygen sensor
(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

- Connect coupler of heated oxygen sensor (2) and clamp wire harness securely.
- After installing heated oxygen sensor (2), start engine and check that no exhaust gas leakage exists.

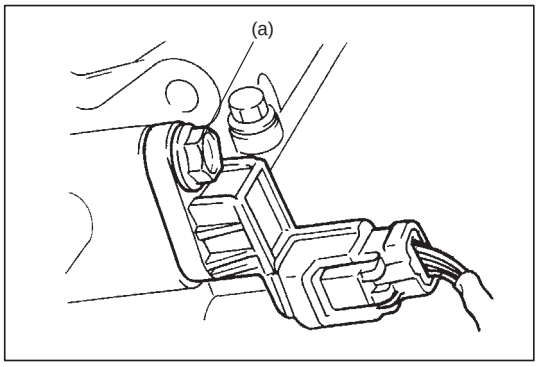
CAMSHAFT POSITION SENSOR

Inspection

Check camshaft position sensor referring to DTC P0340 Diag. Flow Table in Section 6. If malfunction is found, replace.

Removal

1) Disconnect negative cable at battery.
2) Disconnect connector from camshaft position sensor.
3) Remove camshaft position sensor from sensor case (distributorless ignition case).

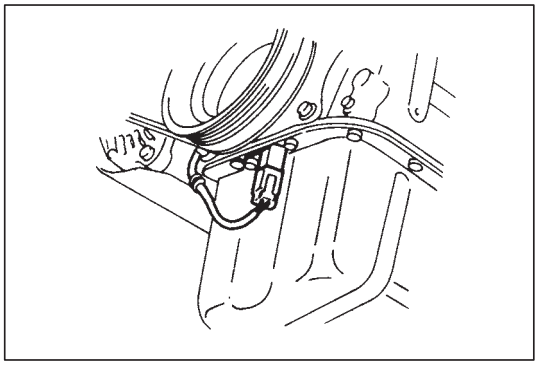


Installation

1) Check that O-ring is free from damage.
2) Check that camshaft position sensor and signal rotor tooth are free from any metal particles and damage.
3) Install camshaft position sensor to sensor case.

Tightening Torque
(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

4) Connect connector to it securely.
5) Connect negative cable to battery.



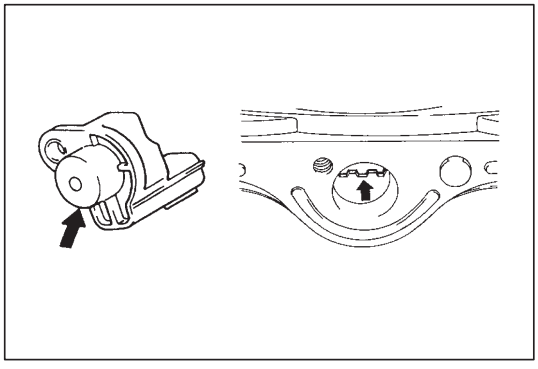
CRANKSHAFT POSITION SENSOR

Inspection

Check crankshaft position sensor referring to step 1 and 2 of DTC P0335 Flow Table. If malfunction is found, replace.

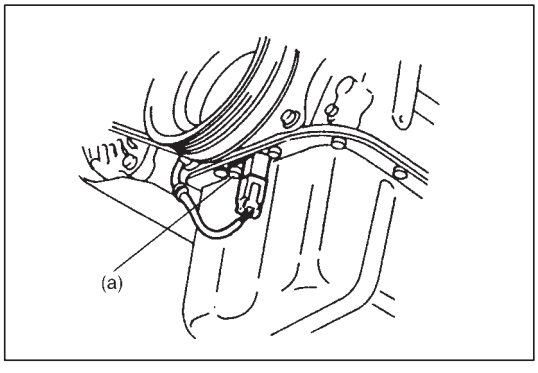
Removal

1) Hoist vehicle.
2) Disconnect connector from crankshaft position sensor.
3) Remove crankshaft position sensor from oil pan.



Installation

1) Check to make sure that crankshaft position sensor and pulley tooth is free from any metal particles and damage.



2) Install crankshaft position sensor to oil pan.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

CAUTION:
Be sure to tighten to specified torque. CKP sensor will be deformed if overtightened and correct CKP sensor signal will not be fed if loosened.

3) Connect connector to it securely.

VEHICLE SPEED SENSOR (VSS)

Inspection

Check vehicle speed sensor referring to step 3 of DTC P0500 Flow Table. If malfunction is found, replace.

Removal/Installation

Refer to Section 7A.

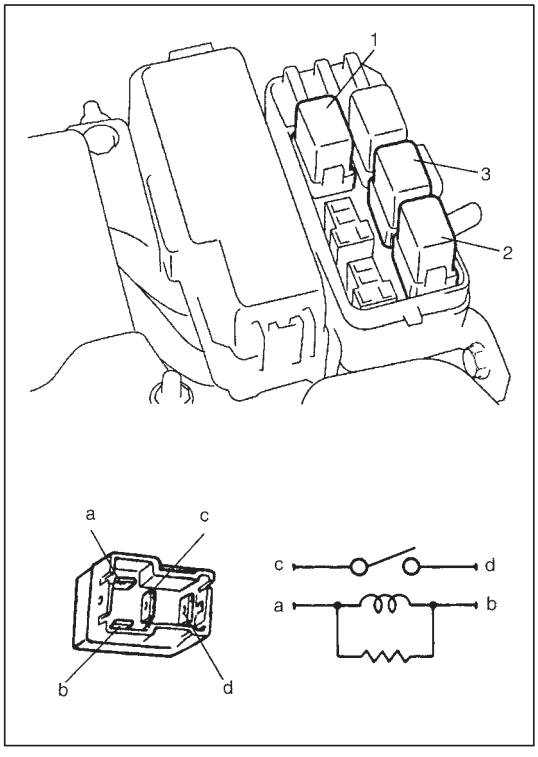
FUEL LEVEL SENSOR (GAUGE)

Inspection

Refer to Section 8.

Removal/Installation

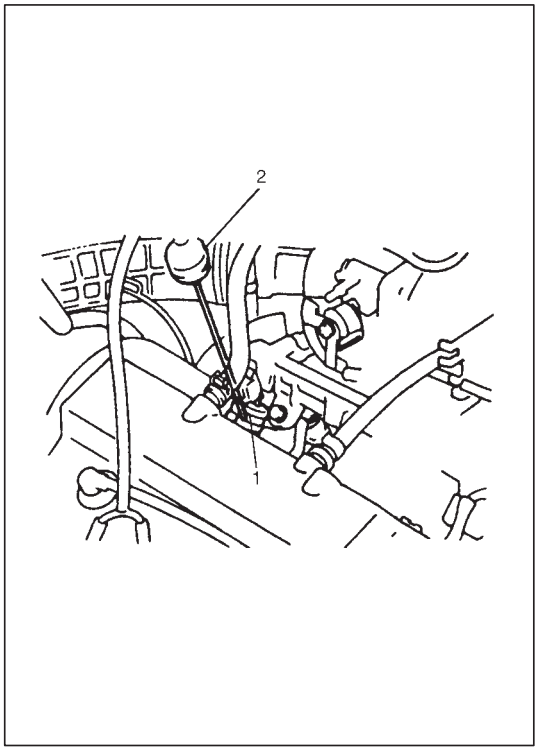
Refer to Section 6C.



MAIN RELAY, FUEL PUMP RELAY AND RADIATOR FAN CONTROL RELAY

Inspection

1) Disconnect negative cable at battery.
2) Remove main relay (1), fuel pump relay (2) and radiator fan control relay (3) from relay box.
3) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “b” of relay. Connect battery negative (–) terminal “a” of relay. Check continuity between terminal “c” and “d”. If there is no continuity when relay is connected to the battery, replace relay.



FUEL CUT OPERATION

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), A/C is OFF 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 (1) by using sound scope (2) 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.

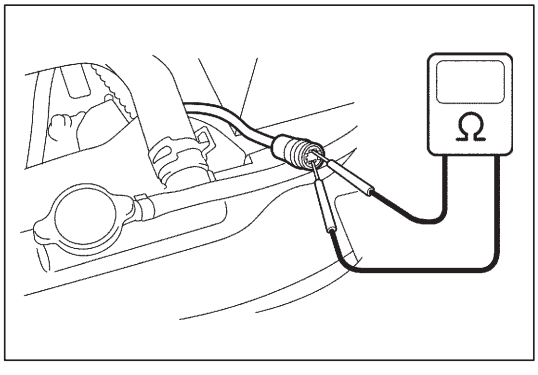
RADIATOR FAN CONTROL SYSTEM

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.

Check system for operation referring to Flow Table B-8 in Section 6.

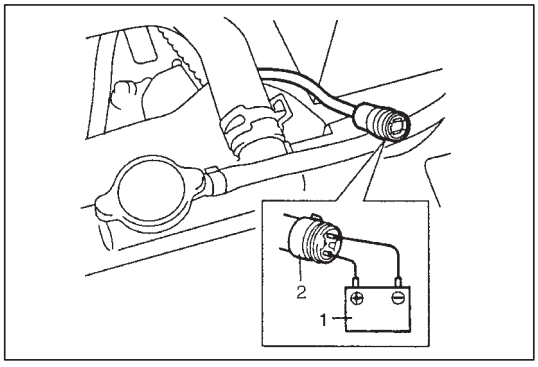
If radiator fan fails to operate properly, check relay, radiator fan and electrical circuit.



Radiator Fan

Inspection

1) Check continuity between each two terminals.
   If there is no continuity, replace radiator fan motor.



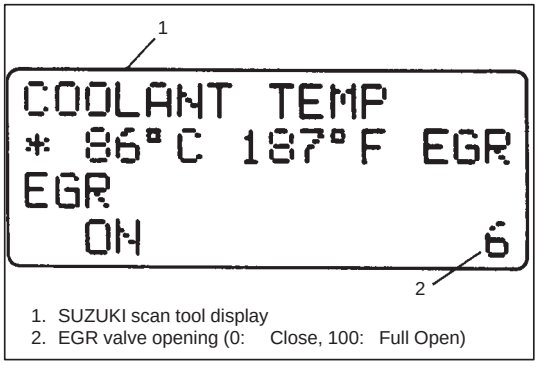
2) Connect battery (1) to radiator fan motor coupler (2) as shown in figure, then check that the radiator fan motor operates smoothly.
   If radiator fan motor does not operate smoothly, replace motor.

EMISSION CONTROL SYSTEM

EGR SYSTEM

System Inspection (using SUZUKI scan tool)

1) Connect SUZUKI scan tool to DLC with ignition switch OFF.
2) Turn ignition switch ON and then select “DATA LIST” mode on scan tool.
3) Make sure that vehicle condition is as following.
   - Vehicle speed = 0 KPH
   - Engine coolant temp. ≧ 80°C
   - Engine speed ≦ 3000 rpm
4) Clear DTC by using “CLEAR INFO” mode.

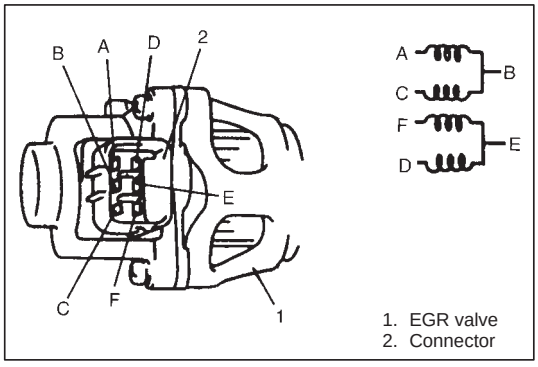


1. SUZUKI scan tool display
2. EGR valve opening (0: Close, 100: Full Open)

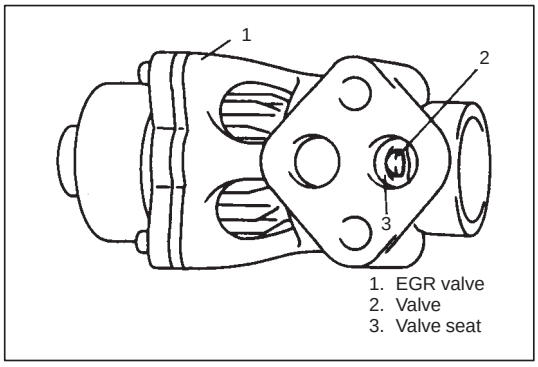
5) With engine idling (without depressing accelerator pedal), open EGR valve by using “STEP EGR” mode in “MISC TEST” menu. In this state, according as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve, poor performance of ECT sensor or TP sensor or DTC and/or pending DTC is (are) stored in ECM memory.

Removal

1) Disconnect negative cable at battery.
2) Disconnect EGR valve coupler.
3) Remove EGR valve and gasket from intake manifold.



1. EGR valve
2. Connector



1. EGR valve
2. Valve
3. Valve seat

Inspection

1) Check resistance between following terminals of EGR valve in each pair.

Terminal	Standard resistance
A – B C – B F – E D – E	20 – 24 Ω

If found faulty, replace EGR valve assy.

2) Remove carbon from EGR valve gas passage.

NOTE:
Do not use any sharp–edged tool to remove carbon.
Be careful not to damage or bend EGR valve, valve seat and rod.

3) Inspect valve, valve seat and rod for fault, cracks, bend or other damage.
If found faulty, replace EGR valve assembly.

Installation

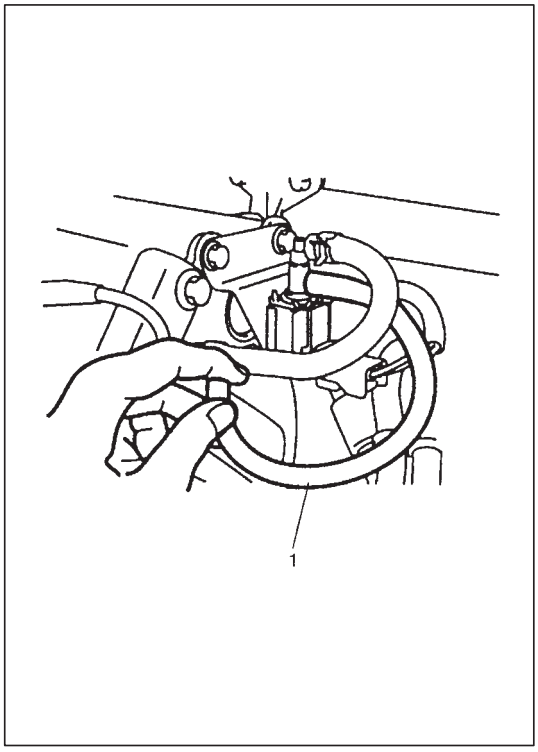
Reverse removal procedure noting following.

- Clean mating surface of valve and intake manifold.
- Use new gasket.

EVAPORATIVE EMISSION CONTROL SYSTEM

EVAP Canister Purge 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.

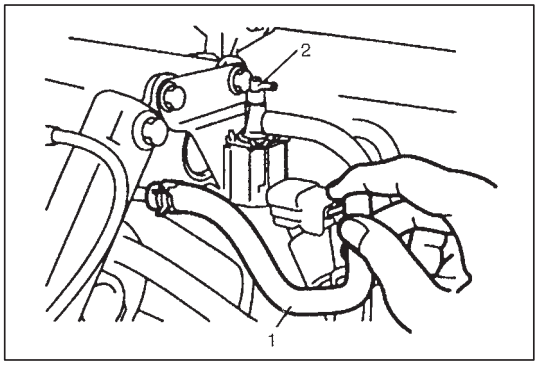


1) Disconnect purge hose (1) from EVAP canister.
2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed.
3) Connect purge hose to EVAP canister and warm up engine to normal operating temperature.
4) Disconnect purge hose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

NOTE:

The EVAP canister purge system does not perform purging (vacuum is not detected at the purge hose) unless the engine is sufficiently warmed up and the heated oxygen sensor is activated fully. Also, when the purge hose is disconnected in Step 4), the air is drawn into the purge line. As a result, ECM (PCM) detects a change in the purge gas concentration and sometimes stops purging but this indicates nothing abnormal.

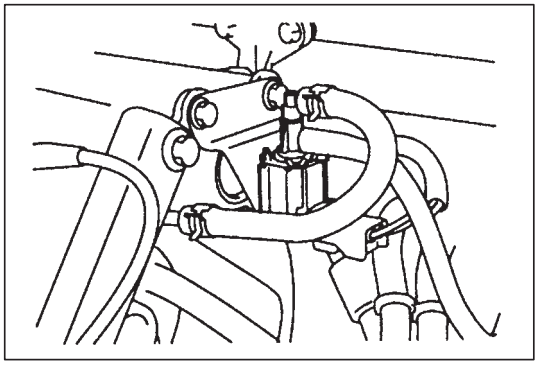
If check result is not satisfactory, check vacuum passage, hoses, EVAP canister purge valve, wire harness and ECM (PCM).



Vacuum Passage Inspection

Start engine and run it at idle speed. Disconnect vacuum hose (1) from EVAP canister purge valve (2). With finger placed against hose disconnected, check that vacuum is applied.

If it is not applied, clean vacuum passage by blowing compressed air.



Vacuum Hose Inspection

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

EVAP Canister Purge Valve Inspection

Check EVAP canister purge valve referring to step 1 of DTC P0443 Flow Table.

If found malfunction, replace.

EVAP Canister Inspection

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

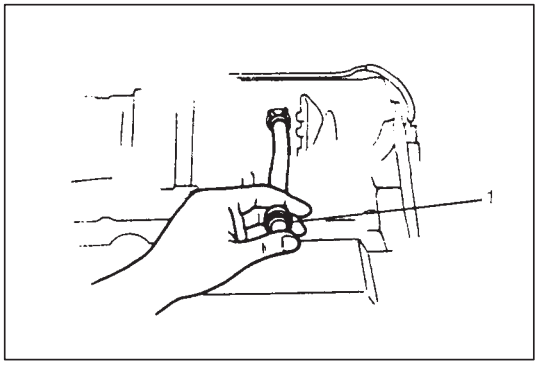
1) Check outside of EVAP canister visually.
2) Disconnect vacuum hoses from EVAP canister.
3) Check that there should be no restriction of flow through purge pipe (2) and air pipe (3) when air is blown (4) into tank pipe (1). If any faulty condition is found in above inspection replace.

PCV SYSTEM

NOTE:
Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC duty, for obstructed PCV valve or hose hampers its accurate adjustment.

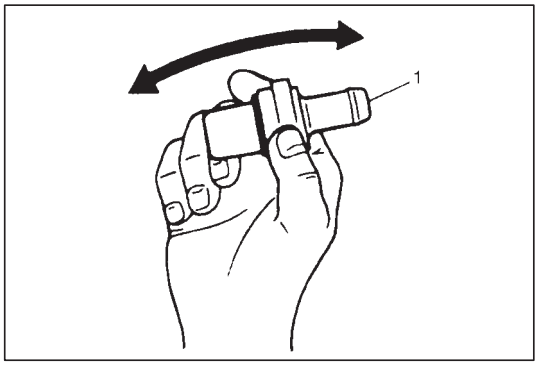
PCV Hose Inspection

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



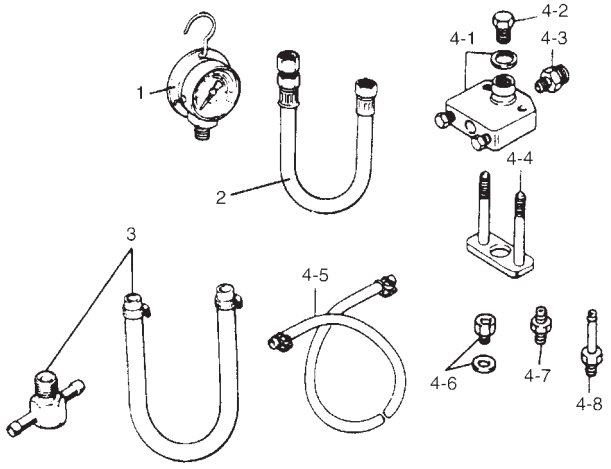
PCV Valve Inspection

1) Disconnect PCV valve (1) from cylinder head cover and install plug to head cover hole.
2) Run engine at idle.
3) Place your finger over end of PCV valve (1) to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.



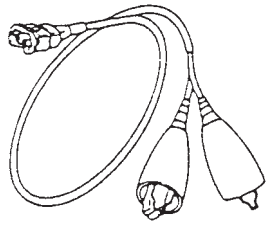
4) After checking vacuum, stop engine and remove PCV valve (1). Shake valve and listen for the rattle of check needle inside the valve. If valve does not the rattle, replace valve.
5) After checking, remove plug and install PCV valve (1).

SPECIAL TOOLS

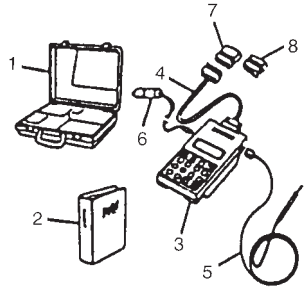


1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. 3-way joint & hose
   09912-58490
4. Checking tool set
   09912-58421

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

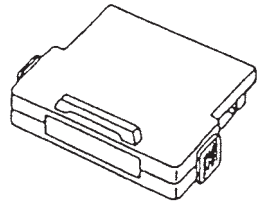


09930-88530
Injector test lead

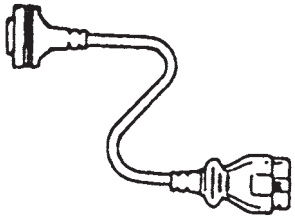


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable (14/26 pin, 09931-76040)
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

09931-76011
SUZUKI scan tool (Tech 1A) kit



Mass storage cartridge



09931-76030
16/14 pin DLC cable

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
TP sensor mounting screw	2	0.2	1.5
IAC valve	3.3	0.33	2.5
ECT sensor	12	1.2	9.0
Heated oxygen sensor-1 and -2	45	4.5	32.5
Camshaft position sensor	9	0.9	6.5

SECTION 6F

IGNITION 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 15 seconds from the time.**

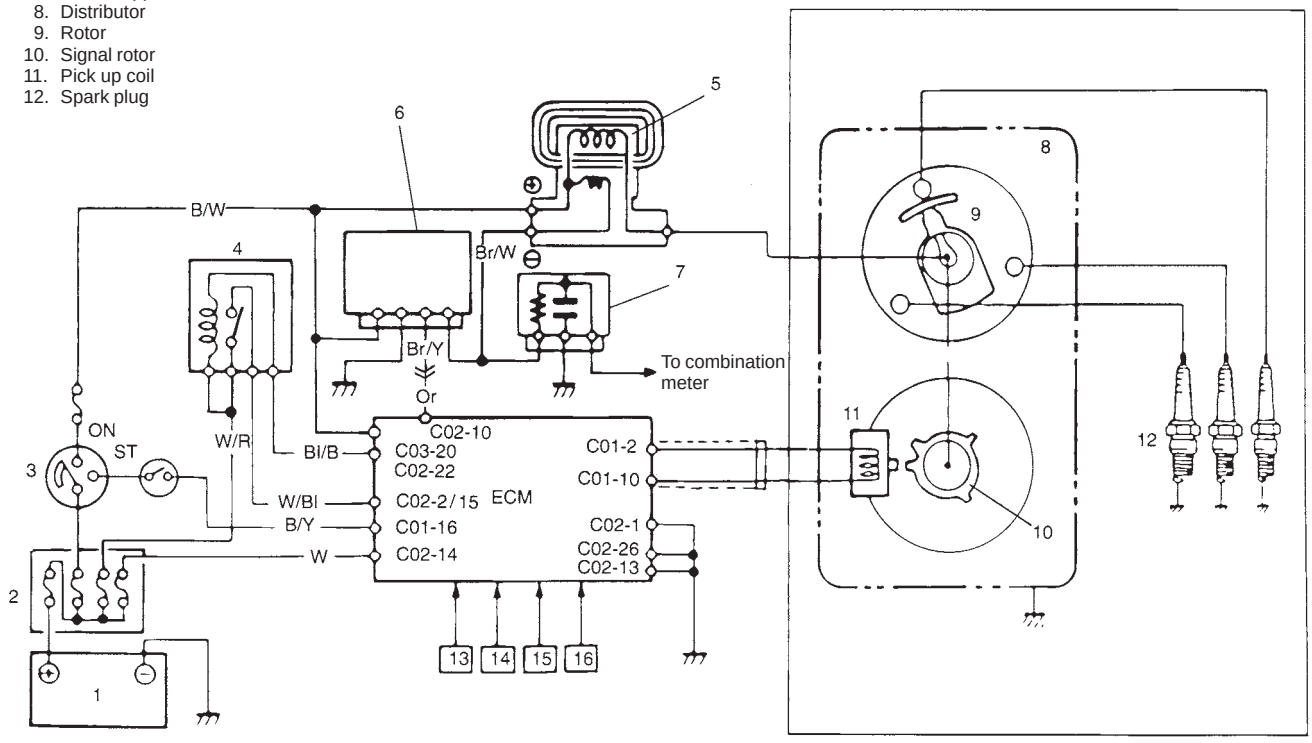
CONTENTS

GENERAL DESCRIPTION

The ignition system used for this vehicle has an electronic ignition control system and consists of the following parts.
- ECM
  It detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the power unit.
- Power unit (Igniter)
  It turns ON and OFF the primary current of the ignition coil according to the signal from ECM.
- Ignition coil
  When the ignition coil primary current is turned OFF, a high voltage is induced in the secondary winding.
- Distributor
  It distributes a high voltage current to each plug.
- High-tension cords and spark plugs.
- CMP sensor (Camshaft position Sensor)
  Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM. For its details, refer to Section 6E1.
- TP sensor, ECT sensor and MAP sensor
  For their details, refer to Section 6E.

In electronic ignition control system, the ECM is programmed for the best ignition timing under every engine condition. Receiving signals which indicate the engine condition from the sensors, e.g., engine revolution, intake air pressure, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the power unit.
Thus ignition timing is controlled to yield the best engine performance.
For more information, refer to Section 6E1.

1. Battery
2. Main fuse
3. Ignition switch
4. Main relay
5. Ignition coil
6. Igniter
7. Noise suppressor
8. Distributor
9. Rotor
10. Signal rotor
11. Pick up coil
12. Spark plug



DIAGNOSIS

Condition	Possible Cause	Correction
Engine cranks, but will not start or hard to start	● Blown fuse for ignition coil	Replace
	● Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely
	● Faulty high-tension cord(s)	Replace
	● Faulty spark plug(s)	Adjust, clean or replace
	● Cracked rotor or cap	Replace
	● Maladjusted signal rotor air gap	Adjust
	● Faulty ignition coil	Replace
	● Faulty noise suppressor	Replace
	● Faulty CMP sensor	Replace
	● Faulty igniter	Replace
	● Faulty ECM (or PCM)	Replace
	● Maladjusted ignition timing	Adjust
Poor fuel economy or engine performance	● Incorrect ignition timing	Adjust
	● Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace
	● Faulty ECM (or PCM)	Replace

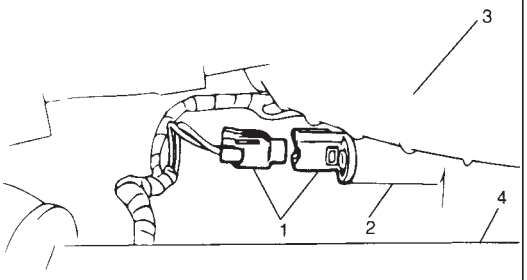
DIAGNOSTIC FLOW TABLE

STEP	ACTION	YES	NO
1	Was “Engine Diagnostic Flow Table” in SECTION 6 performed?	Go to Step 2.	Go to “Engine Diagnostic Flow Table” in SECTION 6.
2	Ignition Spark Test 1) Check all spark plug for condition and type, referring to “Spark Plugs” in this section. 2) If OK, perform ignition spark test, referring to “Ignition Spark Check” in this section. Is spark emitted from all spark plugs?	Go to Step 11 on the next page.	Go to Step 3.
3	Diagnostic Trouble Code (DTC) Check 1) Check DTC stored in ECM (or PCM), referring to “Diagnostic Trouble Code (DTC) Check” in SECTION 6. Is DTC stored?	Go to applicable flow table corresponding to that code No. in SECTION 6.	Go to Step 4.
4	Electrical Connection and Noise Suppressor Check 1) Check ignition coil for electrical connection and noise suppressor for conductivity. Are they good condition?	Go to Step 5.	Repair or replace.
5	High-tension Cord Check 1) Check high-tension cord for resistance, referring to “High-tension Cords” in this section. Is check result satisfactory?	Go to Step 6.	Replace high-tension cord(s).

STEP	ACTION	YES	NO
6	Ignition Coil Power Supply and Ground Circuit Check 1) Check ignition coil power supply (“B/W” wire) circuit for open and short. Are circuits in good condition?	Go to Step 7.	Repair or replace.
7	Ignition Coil Check 1) Check ignition coil for resistance, referring to “Ignition Coil” in this section. Is check result satisfactory?	Go to Step 8.	Replace ignition coil assembly.
8	CMP Sensor Check 1) Check CMP sensor and signal rotor, referring to “Distributor Unit” in this section. Is check result satisfactory?	Go to Step 9 on the next page.	Adjust or replace.
9	Ignition Trigger Signal Circuit Check 1) Check ignition trigger signal (“Br/Y” or “Or” wire) circuit for open, short and poor connection. Are circuits in good condition?	Go to Step 10.	Repair or replace.
10	Igniter Check 1) Check igniter, referring to “Igniter” in this section. Is check result satisfactory?	Go to Step 11.	Replace igniter.
11	Ignition Timing Check 1) Check initial ignition timing and ignition timing advance, referring to “Ignition Timing” in this section. Is check result satisfactory?	Substitute a known-good ECM (or PCM) and then repeat Step 2.	Go to Step 12.
12	Ignition Timing Adjustment and Recheck 1) Adjust initial ignition timing, referring to “Ignition Timing” in this section. 2) Recheck initial ignition timing and ignition timing advance, referring to “Ignition Timing” in this section. Is check result satisfactory?	System is in good condition.	Substitute a known-good ECM (or PCM) and then repeat Step 2.

ON-VEHICLE SERVICE

IGNITION SPARK TEST



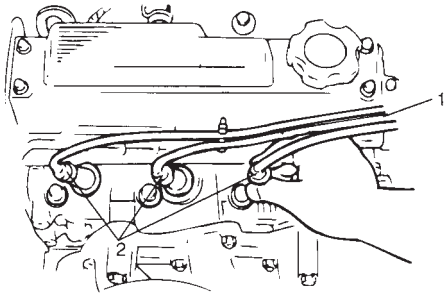
1. Injector coupler
2. Throttle body
3. Air cleaner case
4. Cylinder head cover

1) Disconnect injector coupler at throttle body side.

WARNING:
Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

2) Remove spark plugs and connect them to high-tension cords, and then ground spark plugs.
3) Crank engine and check if each spark plug sparks.
4) If no spark is emitted, inspect high-tension cords, spark plugs, ignition coil, distributor, etc.

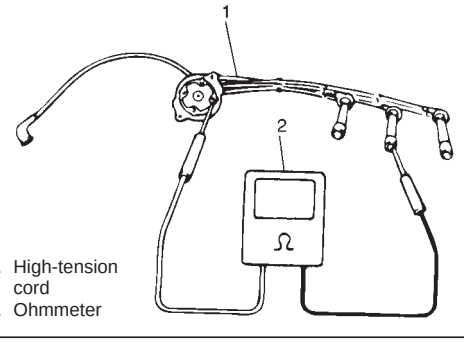
HIGH-TENSION CORDS



1. High-tension code
2. Cap

1) Remove high-tension cord at ignition coil while gripping its cap.
2) Remove distributor cap installed with high-tension cords.
3) Remove high-tension cord clamp from cylinder head cover.
4) Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:
- **Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**



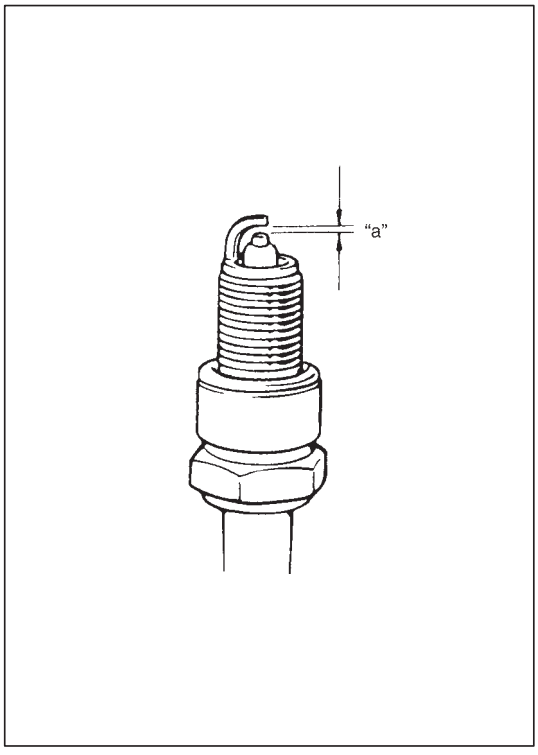
1. High-tension cord
2. Ohmmeter

5) Measure resistance of high-tension cord by using ohmmeter.

High-tension cord resistance: 10 – 22 kΩ/m (3.0 – 6.7 kΩ/ft)

6) If resistance exceeds specification, inspect distributor terminal and replace high-tension cord(s) and/or distributor cap as required.

CAUTION:
- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**



SPARK PLUGS

1) Pull out high-tension cords by gripping their caps and then remove spark plugs.
2) Inspect them for:
   - Electrode wear
   - Carbon deposits
   - Insulator damage
3) If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

   Spark plug air gap "a": 1.0 – 1.1 mm (0.039 – 0.043 in.)
   Spark plug type : NGK BPR6ES-11
   : DENSO W20EPR-U11

4) Install spark plugs and torque them to specification.

   Tightening Torque for spark plug
   25 N·m (2.5 kg-m, 18.0 lb-ft)

5) Install high-tension cords securely by gripping their caps.

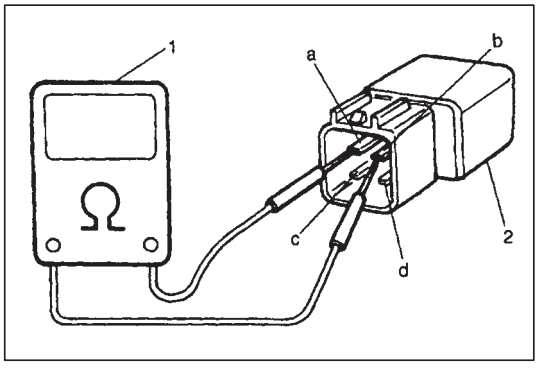
NOISE SUPPRESSOR

REMOVAL

1) Unwrap tape from noise suppressor.
2) Disconnect coupler of noise suppressor.
3) Remove noise suppressor.

INSTALLATION

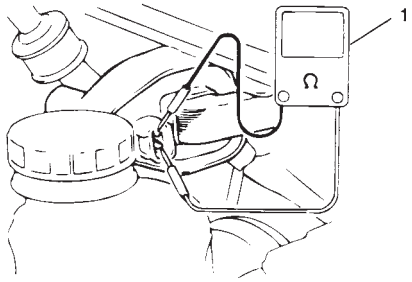
Reverse removal procedure for installation.



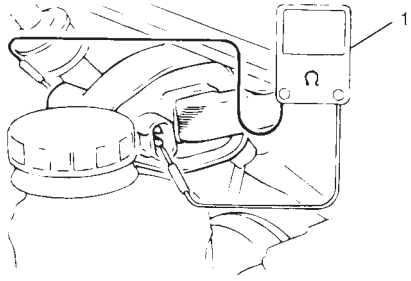
INSPECTION

Using an ohmmeter (1) to check continuity as the following.
"a" – "b": No continuity
"a" – "c": No continuity
"c" – "d": Continuity (Approx. 2.2 kΩ)
If check result is not satisfactory, replace noise suppressor (2).

PRIMARY



SECONDARY



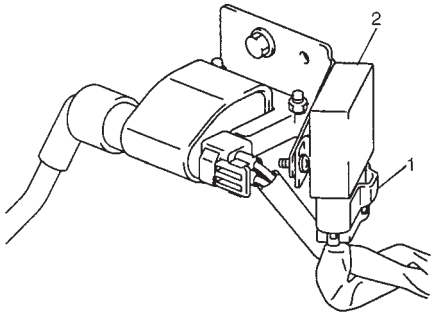
1. Ohmmeter

IGNITION COIL

1) Pull out high-tension cord by gripping its cap.
2) Disconnect ignition coil coupler.
3) Measure primary and secondary coil resistances.

Ignition coil resistance (at 20°C, 68°F)
Primary : 0.87 – 1.05 Ω
Secondary : 11.2 – 15.2 kΩ

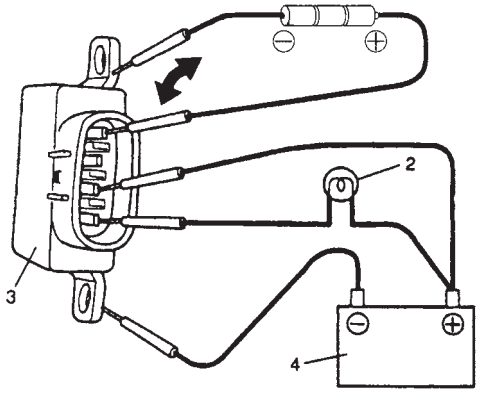
4) If resistance is out of specification, replace coil with new one.



IGNITER

Before this inspection, prepare 5 V power supply (3 new 1.5 V batteries), one 12 V 3.4 W light bulb and one 12 V battery (fully charged).

1) Disconnect igniter coupler (1).
2) Remove igniter (2) from its bracket.



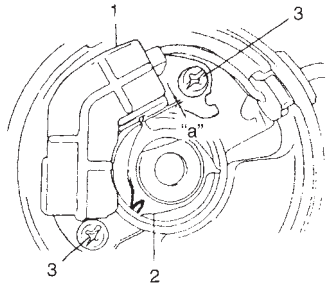
3) Arrange 3 new batteries in series (1) (check total voltage is about 4.7 V).
4) Connect light bulb (2) between “c” terminal of igniter (3) and battery (4) positive (+) terminal, then connect battery negative (–) terminal to igniter body.
   Also connect battery positive (+) terminal and “b” terminal of igniter.
   Check that the light bulb does not illuminate.
5) Connect negative (–) terminal of batteries (1) and igniter body.
   Check that the light bulb illuminate when positive (+) terminal of batteries (1) is connected to “a” terminal of igniter.
   If inspection result is not satisfactory, replace igniter.
6) Install igniter and connect igniter coupler.

DISTRIBUTOR

DISTRIBUTOR CAP AND ROTOR

INSPECTION

Check cap and rotor for crack and their terminals for corrosion and wear. Replace as necessary.



1. Pickup coil
2. Signal rotor
3. Screws

SIGNAL ROTOR AIR GAP

INSPECTION

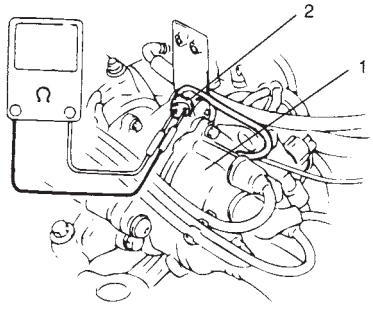
1) Remove distributor cap and rotor.
2) Using thickness gauge, measure air gap, between signal rotor tooth and CMP sensor (generator).

   Signal rotor air gap "a": About 0.2 mm (about 0.008 in.)

3) If gap is out of specification, loose CMP sensor (signal generator) securing screws. Using blade (–) screw driver, move CMP sensor (generator) and adjust gap to specification. After adjustment, tighten securing screws and recheck gap.

   NOTE:
   Check to make sure that CMP sensor (signal generator) tooth is free from any metal particles.

4) Install distributor cap and rotor.



1. Distributor
2. Coupler
3. Ohmmeter

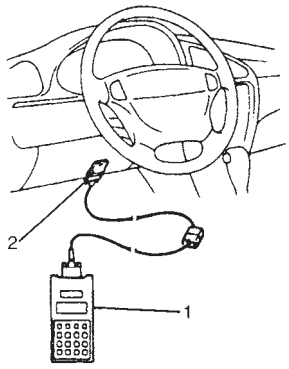
CMP SENSOR (PICKUP COIL) RESISTANCE

INSPECTION

1) Disconnect distributor lead coupler.
2) Measure resistance of pickup coil by using ohmmeter.
3) If resistance is out of specification, replace CMP sensor (signal generator) as follows.

   Pickup coil resistance:
   185 – 275 Ω at – 10°C (14°F) – 50°C (122°F)
   240 – 325 Ω at 50°C (122°F) – 100°C (212°F)

4) Remove distributor cap and rotor.
5) Remove CMP sensor (signal generator) securing screws and lead wire clamp screws.
6) Replace CMP sensor (signal generator).
7) Adjust signal rotor air gap to specifications as previously outlined.
8) Install rotor, distributor cap seal and cap.

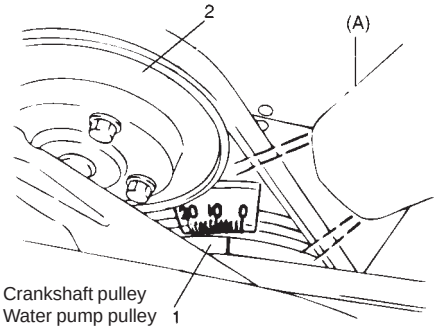


IGNITION TIMING

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

INSPECTION AND ADJUSTMENT

1) Connect SUZUKI scan tool (1) to DLC (2) with ignition switch OFF.
2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification.
   (Refer to SECTION 6E1)
5) Set timing light to No.1 high-tension cord.
6) Fix ignition timing to initial one as follows:
   Select "MISC" made on SUZUKI scan tool and fix ignition timing to initial one.

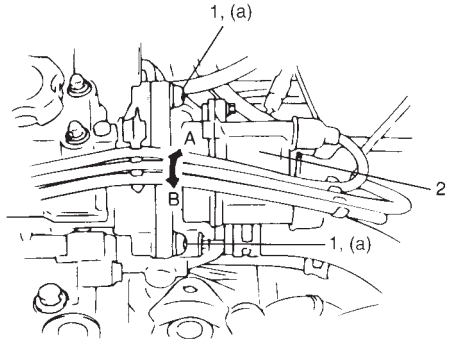


1. Crankshaft pulley
2. Water pump pulley

7) Using timing light, check that timing is within specification.

   Initial ignition timing (Ignition timing fixed):
   5 ± 3° BTDC (at idle speed)
   Ignition order: 1-3-2

   Special Tool
   (A): 09900-27301 or 09930-76420



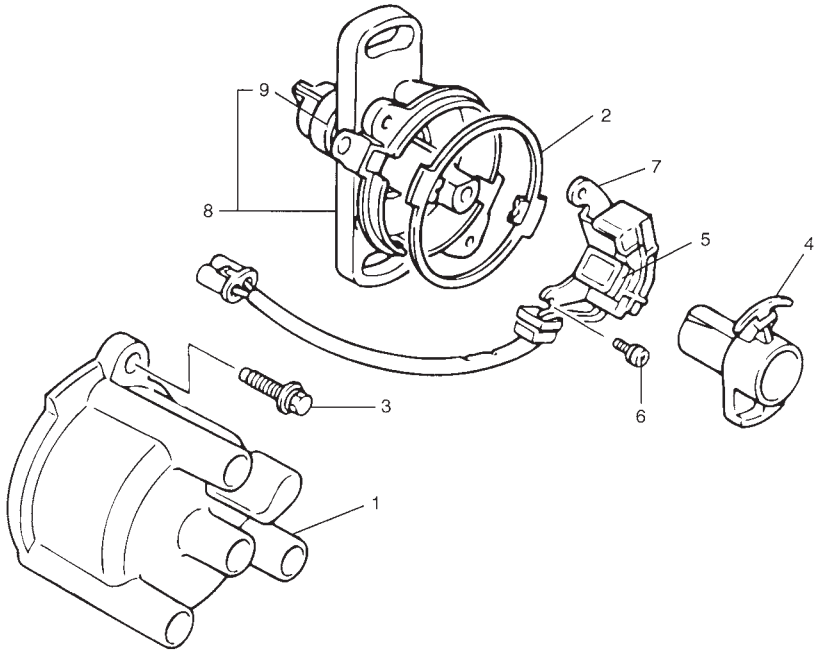
A: To be advanced
B: To be retarded
1. Distributor flange bolt
2. Distributor

8) If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.

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

9) After tightening distributor flange bolts, recheck that ignition timing is within specification.
10) After checking and/or adjusting Initial Ignition Timing, release ignition timing fixation by SUZUKI scan tool.
11) With engine idling (ignition timing not fixed, idle switch ON and car stopped), check that ignition timing is about 10° BTDC. (Constant variation within a few degrees from 10° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
    If above check results are not satisfactory, check CTP switch, test switch terminal circuit and ECM.

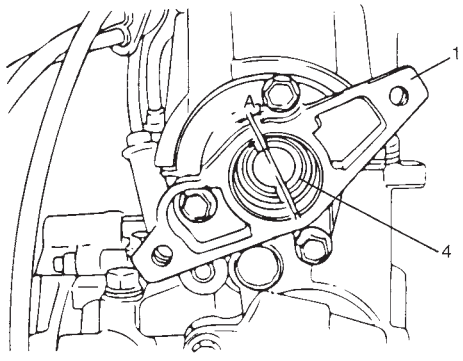
DISTRIBUTOR UNIT



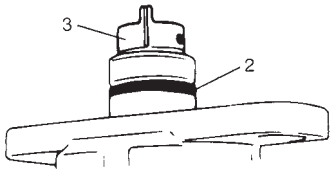
1. Cap
2. Cap seal
3. Cap screw
4. Rotor
5. CMP sensor (Signal generator)
6. Screw
7. Cover
8. Housing
9. O-ring

DISMOUNTING

1) Disconnect distributor lead coupler.
2) Remove distributor cap screws and cap.
3) Remove distributor flange bolts.
4) Pull out distributor housing assembly.



A: Slot offset



1. Distributor case
2. O-ring
3. Distributor coupling
4. Camshaft

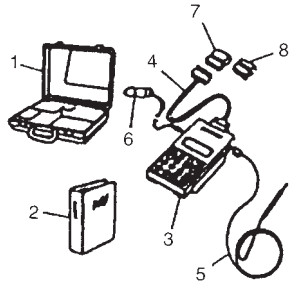
REMOUNTING

NOTE:

- **Before installing distributor, check to make sure that its O-ring is in good condition.**
- **If new O-ring is installed, apply oil.**

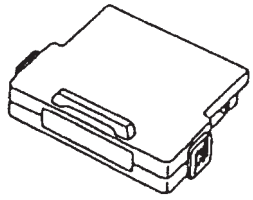
1) Install distributor without cap to camshaft.
   Fit the dogs of distributor coupling into the slots of camshaft, when installing. The dogs of distributor coupling are offset. Therefore, if the dogs can not shaft by 180 degree and try again.
2) Lightly install flange bolts and prepare for ignition timing adjustment.
3) Check to make sure that rotor is in good condition.
4) Inspect distributor cap and clean or replace as required.
5) Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
6) Connect distributor lead coupler.
7) Check and adjust ignition timing as previously outlined.

SPECIAL TOOLS

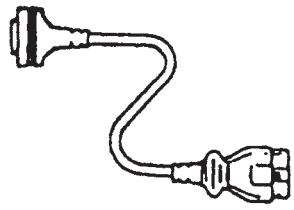


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable (14/26 pin, 09931-76040)
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

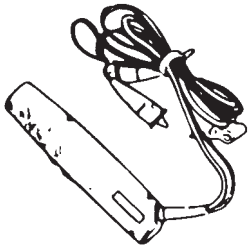
09913-76011
SUZUKI scan tool (Tech 1A) kit



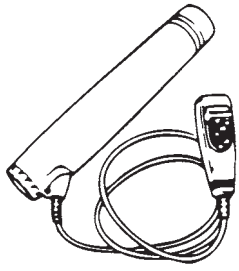
Mass storage cartridge



09931-76030
16/14 pin DLC cable



09900-27301
Timing light (DC 12 V)



09930-76420
Timing light (Dry cell type)

SECTION 6F

IGNITION SYSTEM (TBI FOR G13)

NOTE:
For the details of this section, refer to the same section of the Service manual mentioned in the FOREWORD of this manual.

SECTION 6F1

IGNITION SYSTEM (SFI FOR G13)

WARNING:
For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

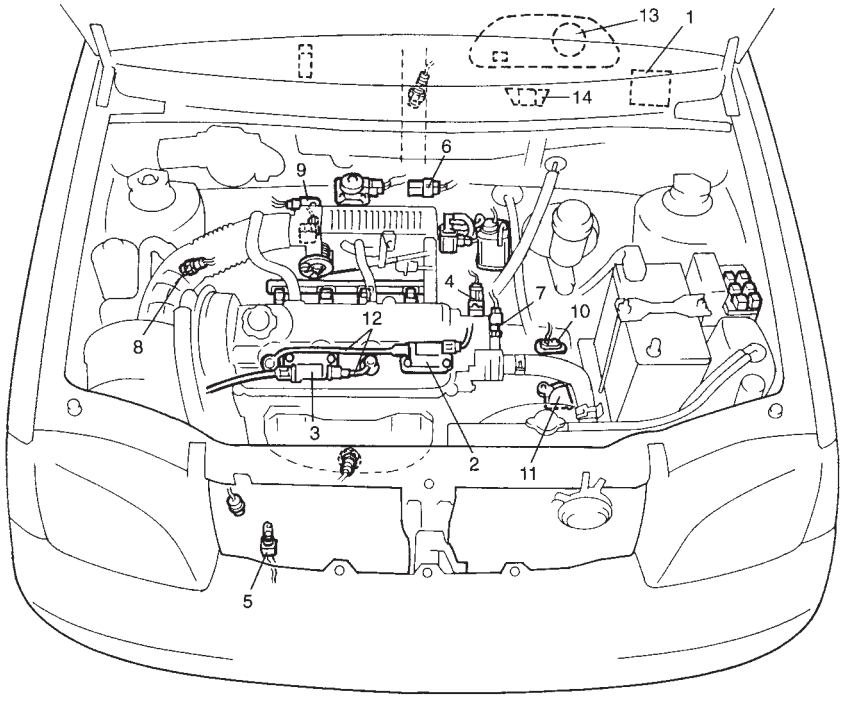
GENERAL DESCRIPTION

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below and has an electronic ignition control system.

- ECM (PCM)
  It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.
- Ignition coil assembly (including an ignitor)
  The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM (PCM). When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.
- High tension cords and spark plugs.
- CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)
  Using signals from these sensors, ECM (PCM) identifies the specific cylinder whose piston is in the compression stroke and detects the crank angle.
- TP sensor, ECT sensor, MAP sensor and other sensors/switches
  Refer to section 6E2 for details.

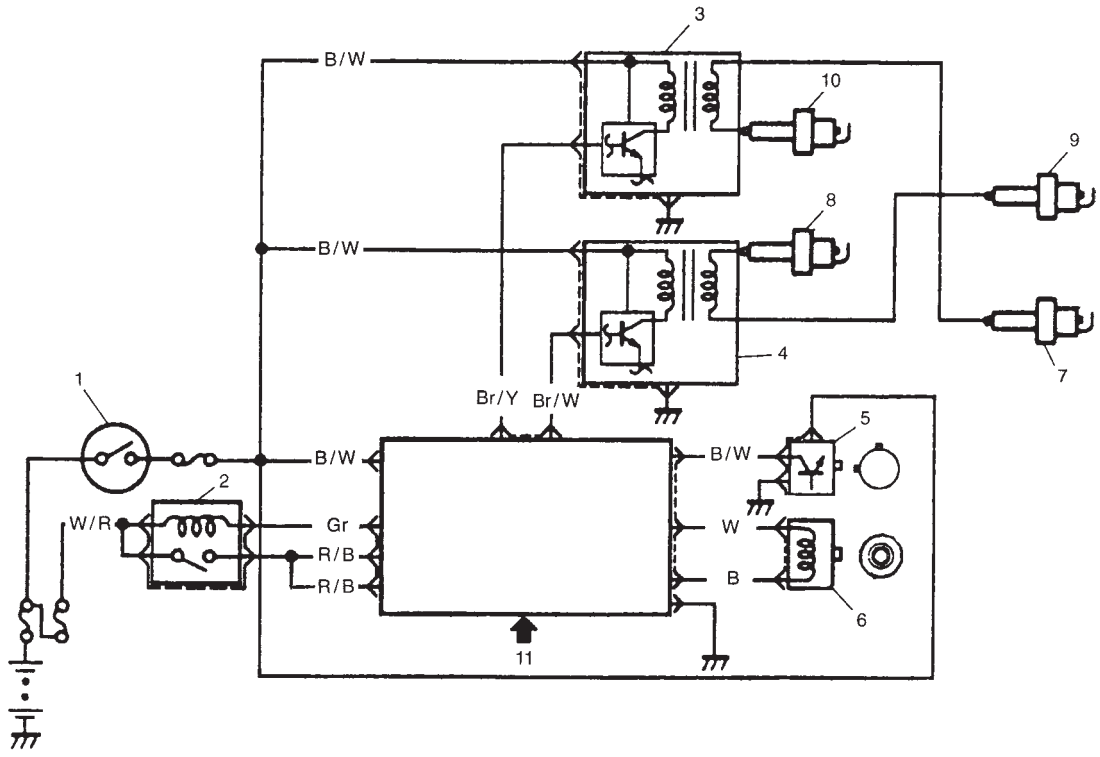
Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM (PCM) to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

SYSTEM COMPONENTS



1. ECM (PCM)
2. Ignition coil assembly for No.1 and No.4 spark plugs
3. Ignition coil assembly for No.2 and No.3 spark plugs
4. CMP sensor
5. CKP sensor
6. MAP sensor
7. ECT sensor
8. IAT sensor
9. TP sensor
10. VSS (A/T)
11. Transmission range switch (A/T)
12. High-tension cords
13. VSS (speedometer) (M/T)
14. Data link connector

SYSTEM WIRING DIAGRAM



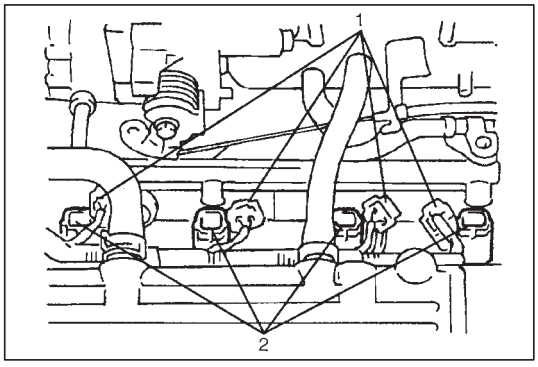
1. Ignition switch
2. Main relay
3. Ignition coil assembly for No.1 and No.4 spark plugs
4. Ignition coil assembly for No.2 and No.3 spark plugs
5. CMP sensor
6. CKP sensor
7. No.1 spark plug
8. No.2 spark plug
9. No.3 spark plug
10. No.4 spark plug
11. Sensed information
    - MAP sensor
    - ECT sensor
    - IAT sensor
    - TP sensor
    - VSS
    - Park / Neutral position signal (A / T)
    - Electric load signal
    - Engine start signal

DIAGNOSIS

Condition	Possible Cause	Correction
Engine cranks, but will not start or hard to start	**No spark**	
	● Blown fuse for ignition coil	Replace.
	● Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely.
	● Faulty high-tension cord(s)	Replace.
	● Faulty spark plug(s)	Adjust, clean or replace.
	● Faulty ignition coil	Replace ignition coil assembly.
	● Faulty CKP sensor or crankshaft timing belt pulley	Clean, tighten or replace.
	● Faulty ECM (PCM)	Replace.
Poor fuel economy or engine performance	● Incorrect ignition timing	Check related sensors and crankshaft timing belt pulley.
	● Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace.
	● Faulty ignition coil assembly	Replace.
	● Faulty CKP sensor or crankshaft timing belt pulley	Clean, tighten or replace.
	● Faulty ECM (PCM)	Replace.

IGNITION SYSTEM DIAGNOSTIC FLOW TABLE

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE” in section 6.
2	Ignition Spark Test 1) Check all spark plugs for condition and type referring to “Spark Plugs” section. 2) If OK, perform ignition spark test, referring to “Ignition Spark Test” section. Is spark emitted from all spark plugs?	Go to Step 11.	Go to Step 3.
3	Diagnostic Trouble Code (DTC) Check Is DTC stored in ECM (PCM)?	Go to applicable DTC Diag. Flow Table in section 6.	Go to Step 4.
4	Electrical Connection Check 1) Check ignition coil assemblies and high-tension cords for electrical connection. Are they connected securely?	Go to Step 5.	Connect securely.
5	High-Tension Cords Check 1) Check high-tension cord for resistance referring to “High-Tension Cords” section. Is check result satisfactory?	Go to Step 6.	Replace high-tension cord(s).
6	Ignition Coil Assembly Power Supply and Ground Circuit Check 1) Check ignition coil assembly power supply and ground circuits for open and short. Are circuits in good condition?	Go to Step 7.	Repair or replace.
7	Ignition Coil Assembly Check 1) Check ignition coil for resistance referring to “Ignition Coil Assembly” section. Is check result satisfactory?	Go to Step 8.	Replace ignition coil assembly.
8	Crankshaft Position (CKP) Sensor Check 1) Check crankshaft position sensor referring to Step 3 and 4 of DTC P0335 Diag. Flow Table in section 6. Is check result satisfactory?	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or crankshaft timing belt pulley.
9	Ignition Trigger Signal Circuit Check 1) Check ignition trigger signal wire for open, short and poor connection. Is circuit in good condition?	Go to Step 10.	Repair or replace.
10	A Known-good Ignition Coil Assembly Substitution 1) Substitute a known-good ignition coil assembly and then repeat Step 2. Is check result of Step 2 satisfactory?	Go to Step 11.	Substitute a known-good ECM (PCM) and then repeat Step 2.
11	Ignition Timing Check 1) Check initial ignition timing and ignition timing advance referring to “Ignition Timing” section. Is check result satisfactory?	System is in good condition.	Check CKP sensor, crankshaft timing belt pulley (signal rotor) and input signals related to this system.



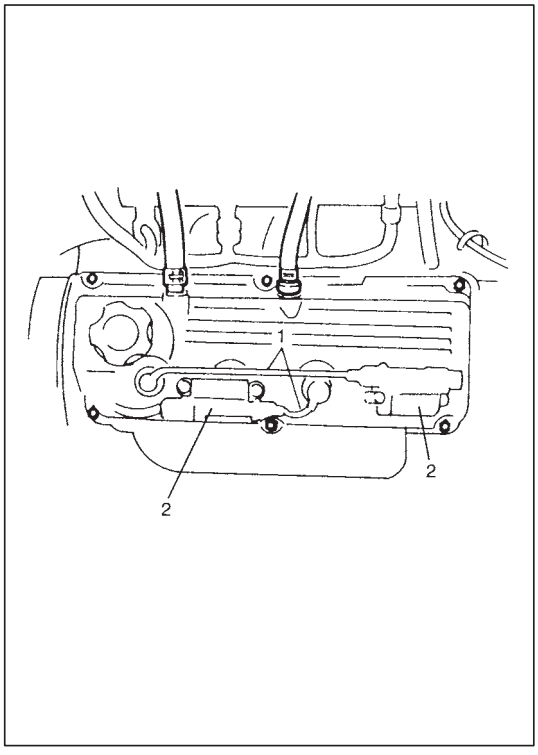
ON-VEHICLE SERVICE

IGNITION SPARK TEST

1) Disconnect all injector couplers (1) from injectors (2).

WARNING:
Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

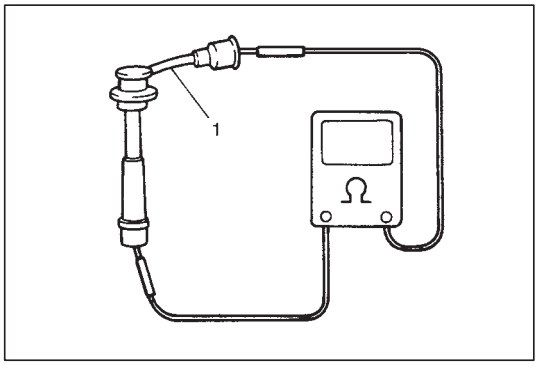
2) Remove spark plug and check it for condition and type referring to “Spark Plugs” in this section.
3) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.
4) Crank engine and check if each spark plug sparks.
5) If no spark is emitted, inspect the related parts as described under “Diagnosis” earlier in this section.



HIGH-TENSION CORDS

1) Disconnect high-tension cords (1) from ignition coil assemblies (2) while gripping each cap.
2) Pull out high-tension cords from spark plugs while gripping each cap.

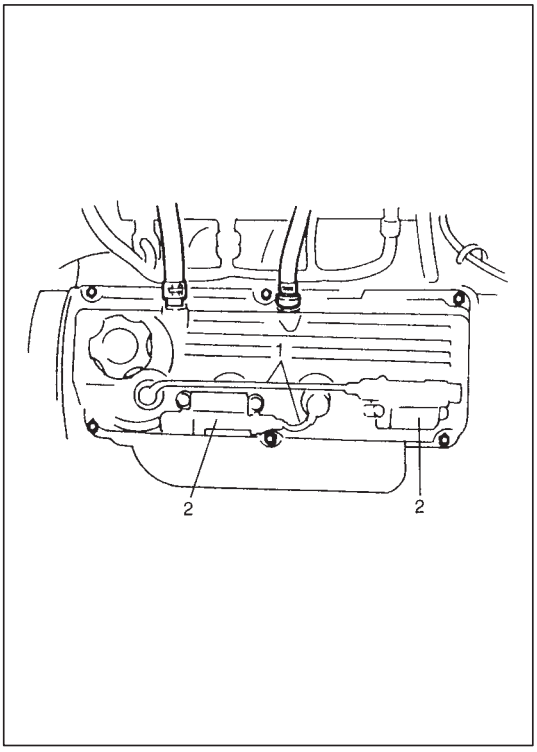
CAUTION:
Pull out each connection by gripping cap portion so as not to damage their inside wire (resistive conductor).



3) Measure resistance of high-tension cord (1) by using ohmmeter.

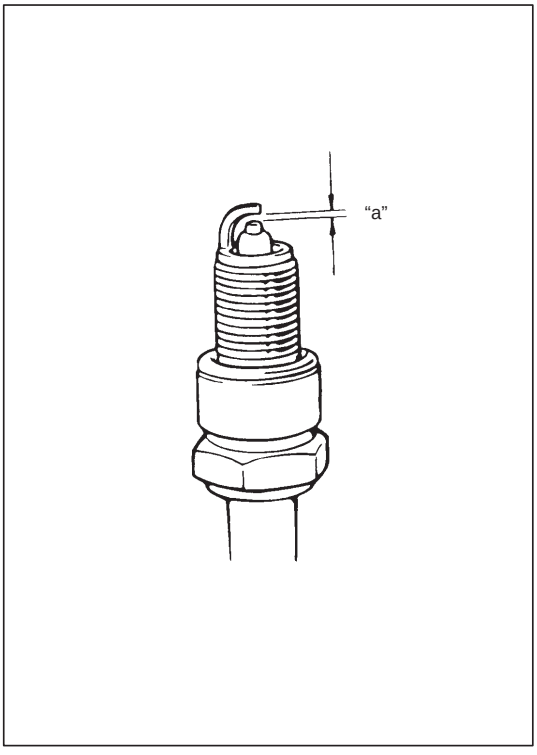
High-tension cord resistance: 4 – 10 kΩ/m (1.2 – 3.0 kΩ/ft)

4) If resistance exceeds specification, replace high-tension cord(s).



5) Install high-tension cords (1) to spark plugs and ignition coil assemblies (2) while gripping each cap.

CAUTION:
- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**



SPARK PLUGS

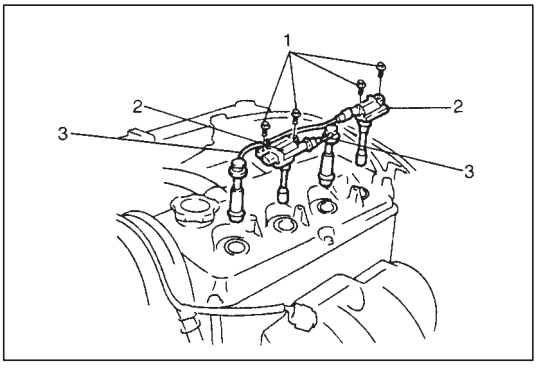
1) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to IGNITION COIL ASSEMBLY in this section.
2) Remove spark plugs.
3) Inspect them for:
   - Electrode wear
   - Carbon deposits
   - Insulator damage
4) If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

Spark plug air gap "a" : 1.0 – 1.1 mm (0.040 – 0.043 in.)
Spark plug type : NGK BKR6E-11
: DENSO K20PR-U11

5) Install spark plugs and torque them to specification.

Tightening Torque for spark plug
28 N·m (2.8 kg-m, 20.0 lb-ft)

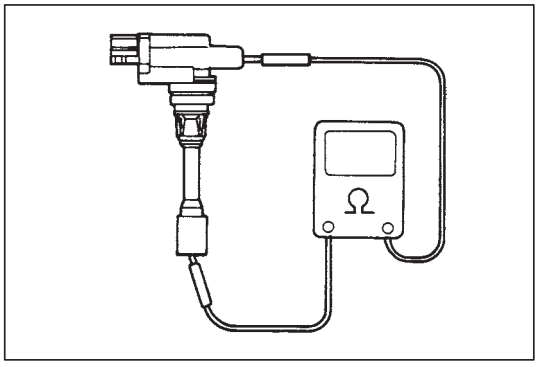
6) Install ignition coil assemblies referring to IGNITION COIL ASSEMBLY in this section.
7) Install high-tension cords securely by gripping their caps.



IGNITION COIL ASSEMBLY (INCLUDING IGNITOR)

Inspection

1) Disconnect negative cable at battery.
2) Disconnect ignition coil coupler.
3) Disconnect high-tension cord (3) from ignition coil assembly (2).
4) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



5) Measure secondary coil for resistance.

   Secondary coil resistance : 7.6 – 10.2 kΩ at 20°C, 68°F

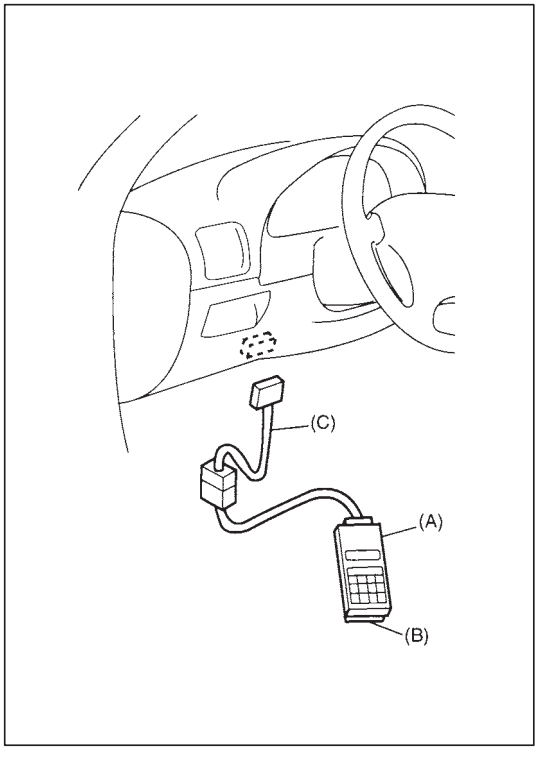
   If resistance is out of specification, replace ignition coil assembly.
6) Install ignition coil assembly.
7) Tighten ignition coil bolts, and then connect ignition coil coupler.
8) Install high-tension cord to ignition coil assembly while gripping its cap.

CRANKSHAFT POSITION SENSOR (CKP SENSOR)

Refer to section 6E2 for removal, inspection and installation.

IGNITION TIMING

NOTE:
- **Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.**
- **Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.**



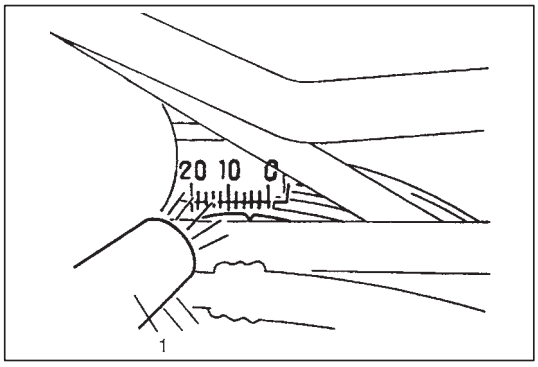
INSPECTION

1) Connect SUZUKI scan tool to DLC with ignition switch OFF.

   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification. (Refer to SECTION 6E2)

5) Fix ignition timing to initial one as follow.
   Select “MISC” mode on SUZUKI scan tool and fix ignition timing to initial one.

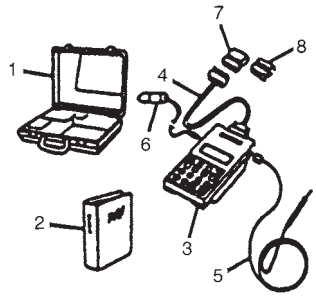
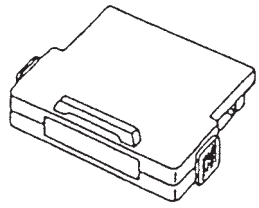
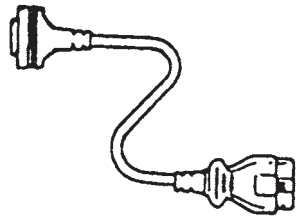


6) Detach air cleaner case and shift air cleaner case and hose position to observe ignition timing.
7) Using timing light (1), check that ignition timing is within specification.

Initial ignition timing (fixed with SUZUKI scan tool)	**: 5 ± 3° BTDC at idle speed**
Ignition order	**: 1-3-4-2**

8) If ignition timing is out of specification, check the followings:
   - CKP sensor
   - Crankshaft timing belt pulley (signal rotor)
   - TP sensor
   - VSS
   - Timing belt cover installation
9) After checking Initial Ignition Timing, release ignition timing fixation by using SUZUKI scan tool.
10) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 9°–15° BTDC. (Constant variation within a few degrees from 9°–15° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
    If above check results are not satisfactory, check CKP sensor and ECM (PCM).
11) Install air cleaner case.

SPECIAL TOOLS

 1. Storage case 2. Operator's manual 3. Tech 1A 4. DLC cable (14/26 pin, 09931-76040) 5. Test lead/probe 6. Power source cable 7. DLC cable adaptor 8. Self-test adaptor 09931-76011 SUZUKI scan tool (Tech 1A) kit	 Mass storage cartridge	 09931-76030 16/14 pin DLC cable

SECTION 6K

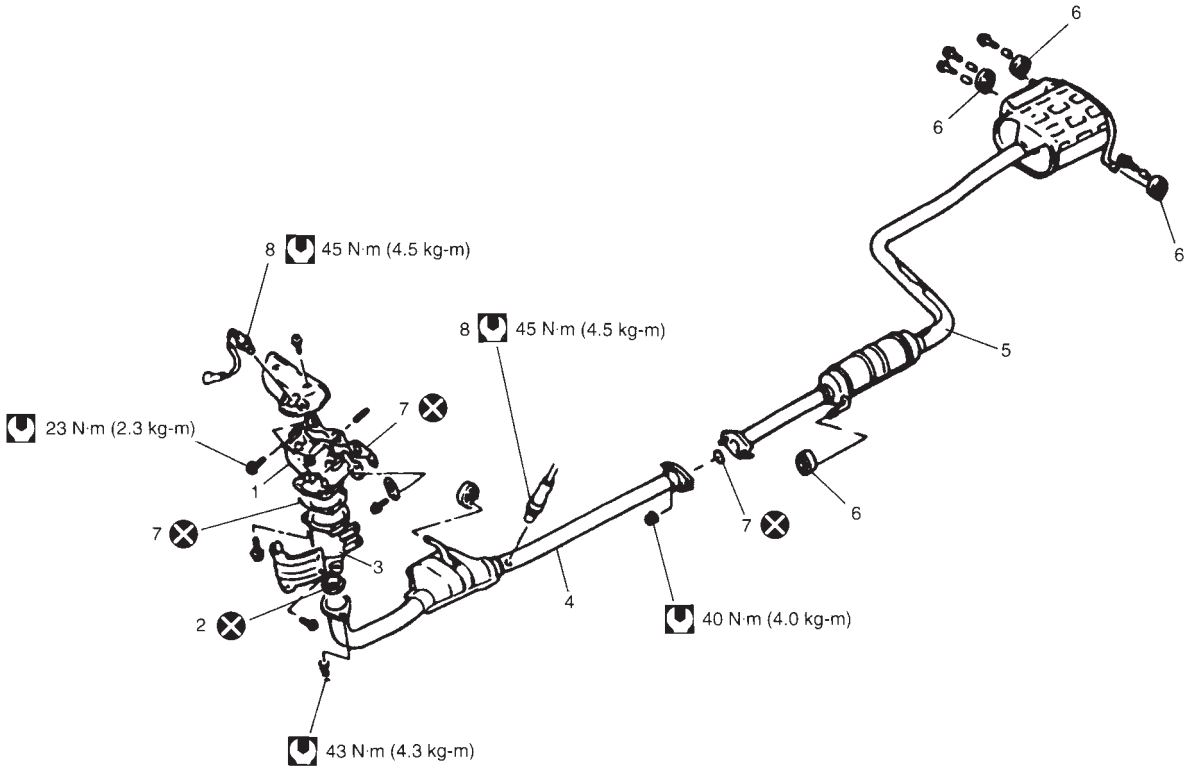
EXHAUST SYSTEM

NOTE:
For the descriptions (items) not found in this section, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

ON-VEHICLE SERVICE

[For 1.0 ℓ 2WD H/B model]

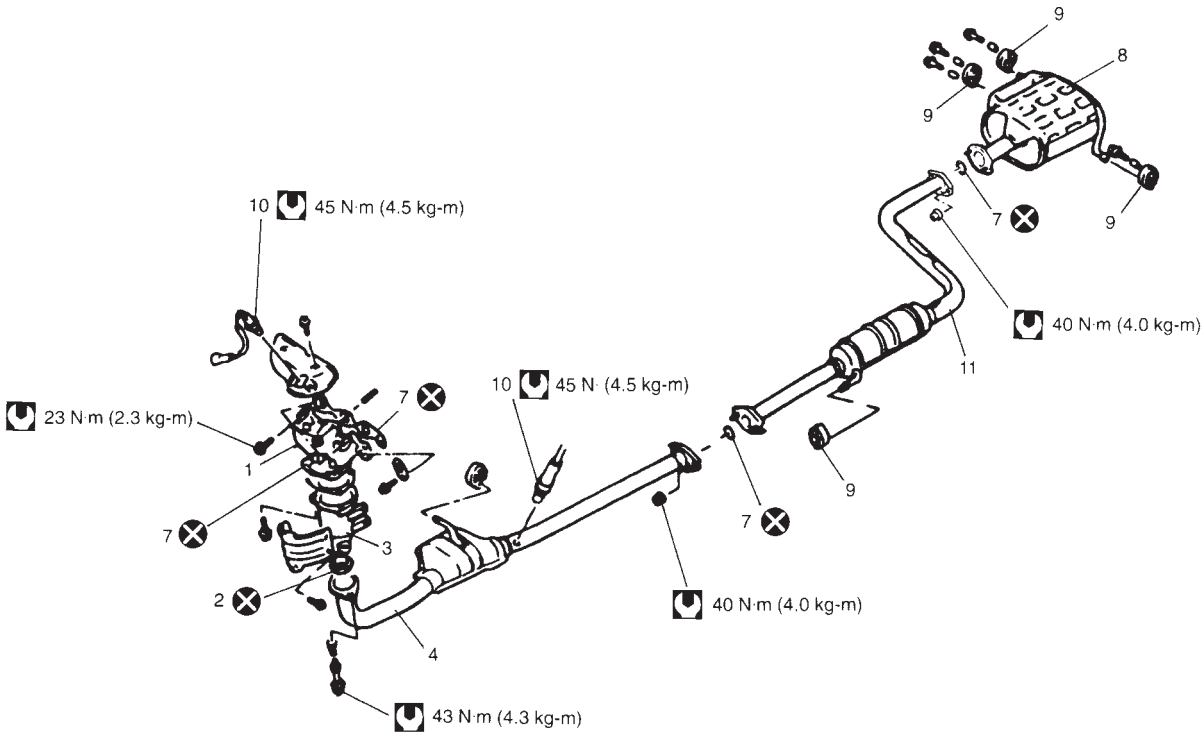


1. Exhaust manifold
2. Seal
3. WU-TWC
4. Exhaust pipe
5. Muffler
6. Muffler mounting
7. Gasket
8. Heated oxygen sensor

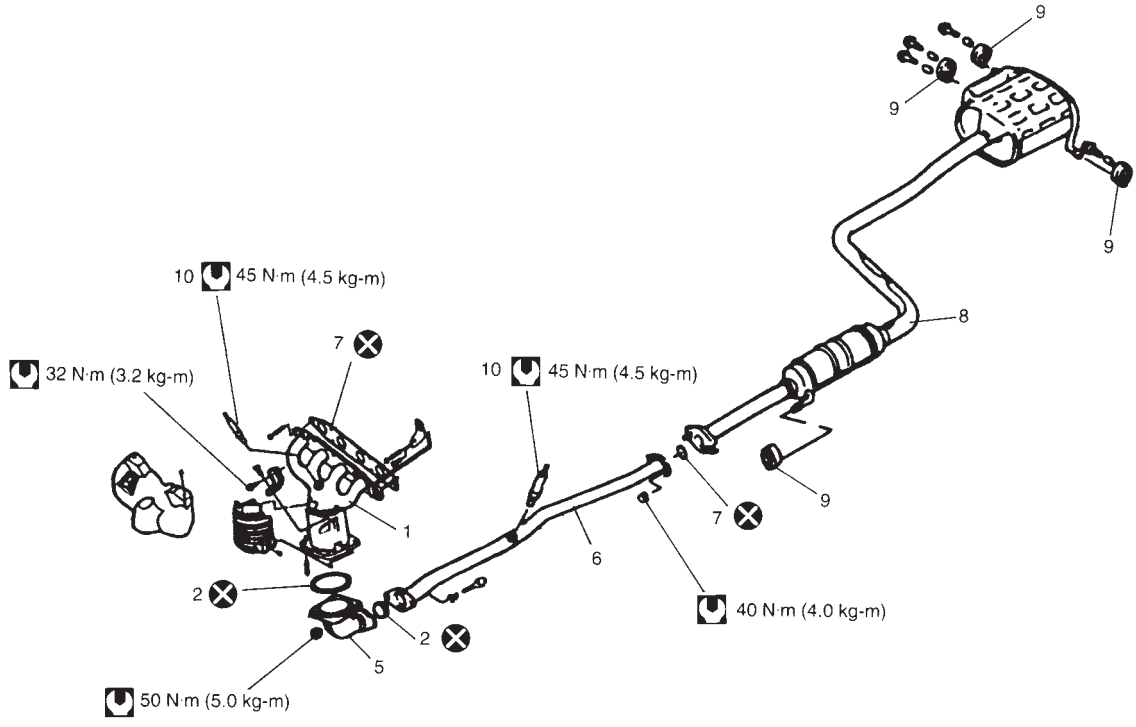
: Tightening Torque : Do not reuse

6K

[For 1.0 ℓ 2WD N/B model]



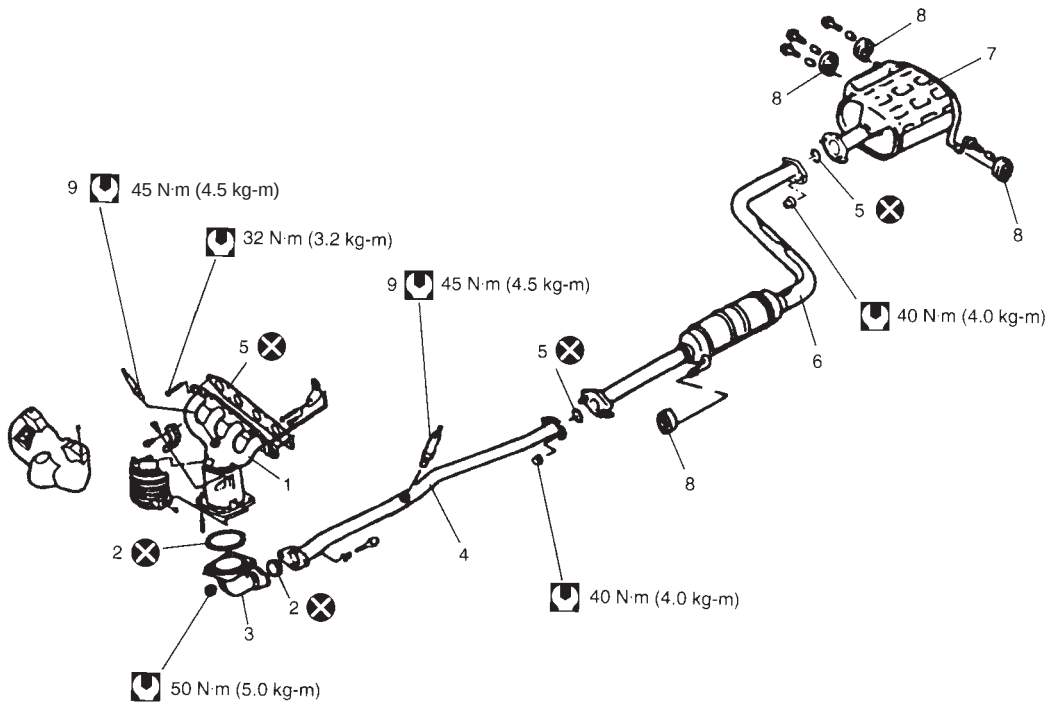
[For 1.3 ℓ 2WD H/B model]



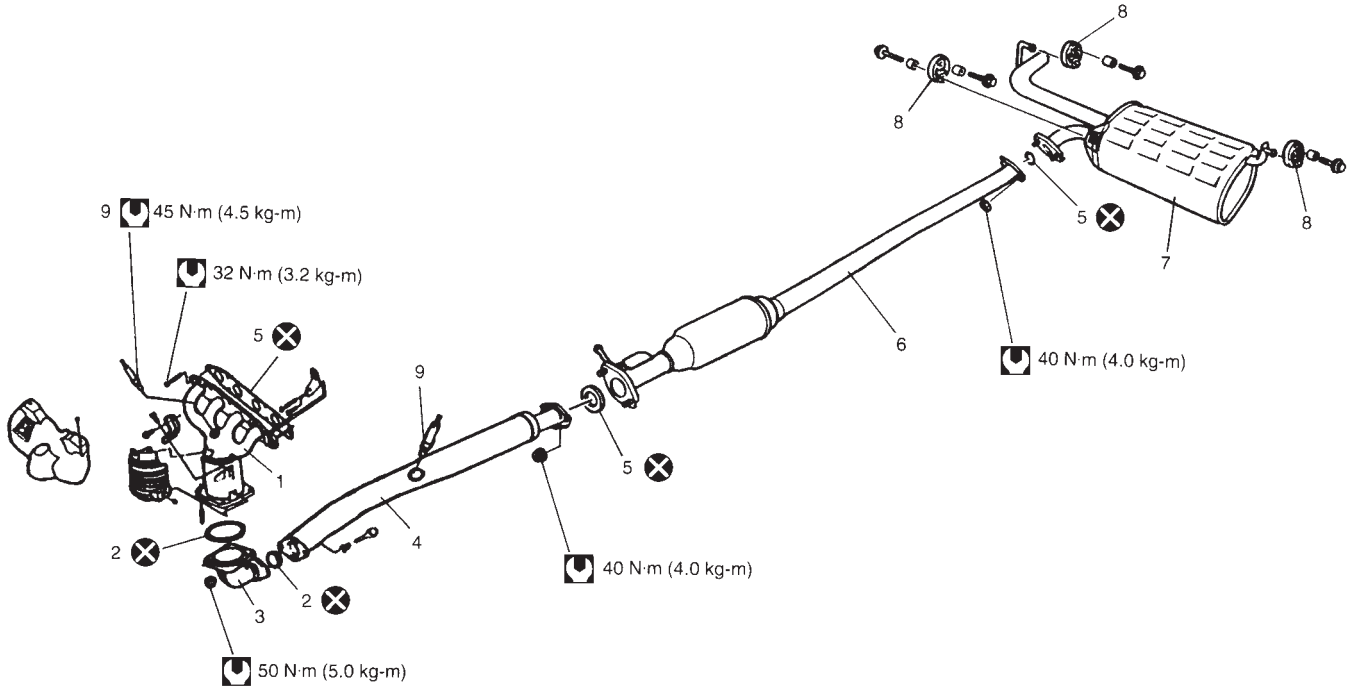
1. Exhaust manifold
2. Seal
3. WU-TWC
4. Exhaust pipe
5. Exhaust No.1 pipe
6. Exhaust No.2 pipe
7. Gasket
8. Muffler
9. Muffler mounting
10. Heated oxygen sensor
11. Exhaust center pipe

: Do not reuse
: Tightening Torque

[For 1.3 ℓ 2WD N/B model]



[For 1.3 ℓ 4WD model]



1. Exhaust manifold
2. Seal
3. Exhaust No.1 pipe
4. Exhaust No.2 pipe
5. Gasket
6. Exhaust center pipe
7. Muffler
8. Muffler mounting
9. Heated oxygen sensor

: Do not reuse
: Tightening Torque