SECTION 6-1

ENGINE GENERAL INFORMATION AND DIAGNOSIS (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).**

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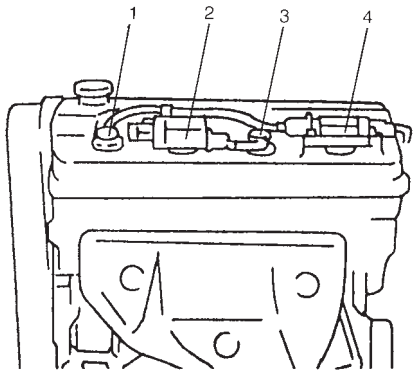


GENERAL INFORMATION

STATEMENT ON CLEANLINESS AND CARE

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of an inch).
Accordingly, when any internal engine parts are serviced, care and cleanliness are important.
Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
  Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) counted from crankshaft pulley side to flywheel side.

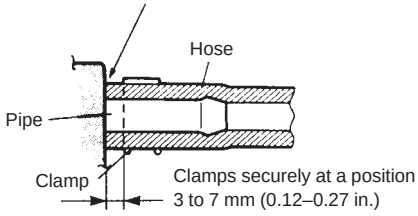
GENERAL INFORMATION ON ENGINE SERVICE

THE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

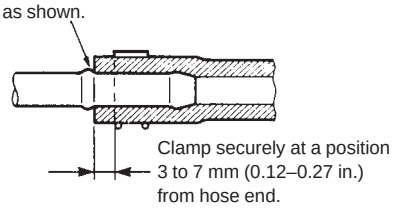
- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
  When performing any work where electrical terminals can be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.

HOSE CONNECTION

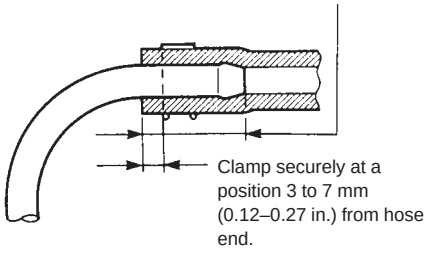
With short pipe, fit hose as far as it reaches pipe joint as shown.



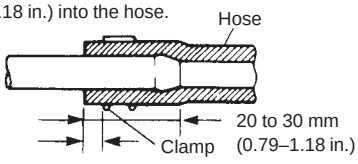
With following type pipe, fit hose as far as its peripheral projection as shown.



With bent pipe, fit hose as its bent part as shown or till pipe is about 20 to 30 mm (0.79–1.18 in.) into the hose.



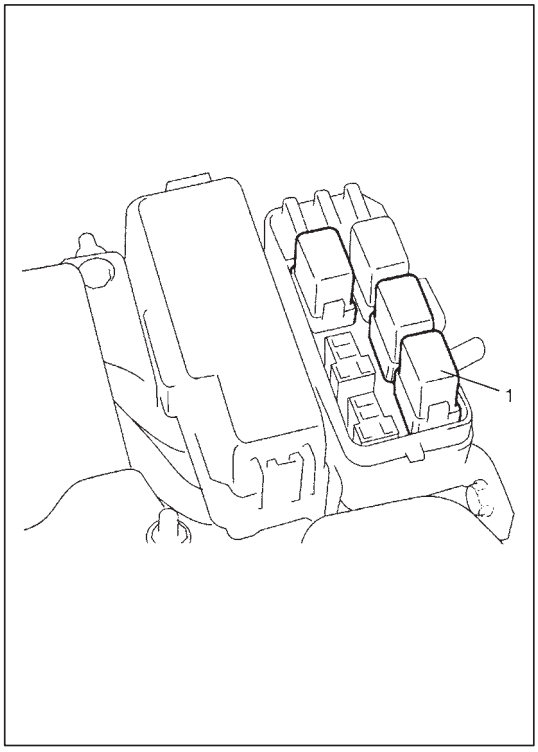
With straight pipe, fit hose till pipe is, about 20 to 30 mm (0.79–1.18 in.) into the hose.



Clamp securely at a position 3 to 7mm (0.12–0.27 in.) from hose end.

PRECAUTION ON FUEL SYSTEM SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel delivery pipe) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.
  Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to “FUEL PRESSURE RELIEF PROCEDURE”. A small amount of fuel may be released after the fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to left figure Hose Connection.
  After connecting, make sure that it has no twist or kink.
- When installing injector or fuel delivery pipe, lubricate its O-ring with spindle oil or gasoline.
- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque.



FUEL PRESSURE RELIEF PROCEDURE

CAUTION:
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

After making sure that engine is cold, release fuel pressure as follows.

1) Place transmission gear shift lever in “Neutral” (Shift selector lever to “P” range for A/T model), set parking brake, and block drive wheels.
2) Remove relay box cover.
3) Disconnect fuel pump relay (1) from relay box.
4) Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
5) Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2-3 times for about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
6) Upon completion of servicing, connect fuel pump relay (1) to relay box and install relay box cover.

FUEL LEAKAGE CHECK PROCEDURE

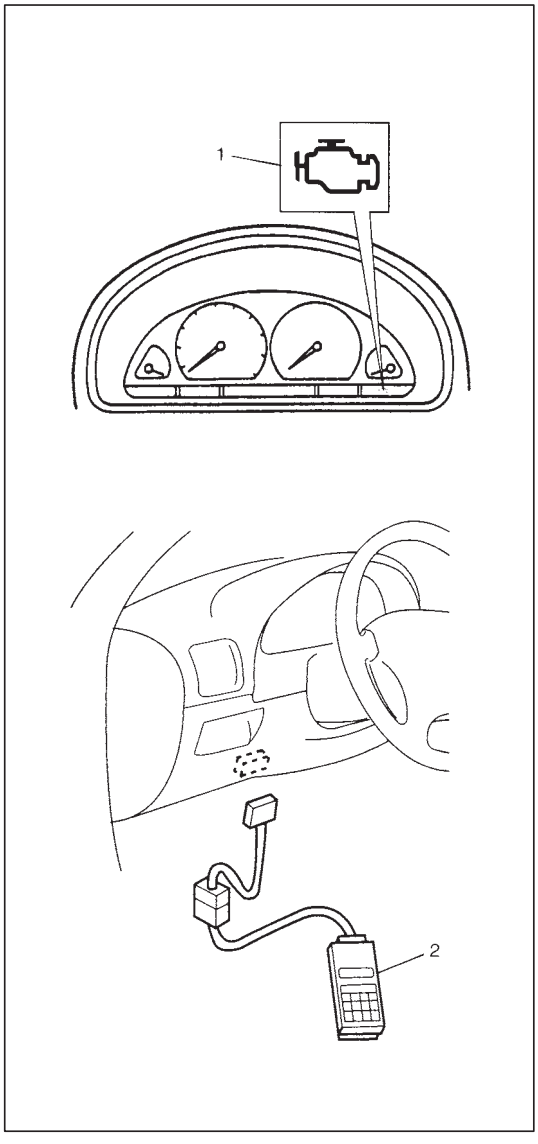
After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1) Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF.
   Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line. (till fuel pressure is felt by hand placed on fuel feed hose.)
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

ENGINE DIAGNOSIS

GENERAL DESCRIPTION

This vehicle is equipped with an engine and emission control system which are under control of ECM (PCM). The engine and emission control system in this vehicle are controlled by ECM (PCM). ECM (PCM) has an On-Board Diagnostic system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of “On-Board Diagnostic System” and each item in “Precaution in Diagnosing Trouble” and execute diagnosis according to “ENGINE DIAGNOSTIC FLOW TABLE”.
There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the malfunction indicator lamp (MIL) doesn’t turn ON, it should be diagnosed according to this flow table.



ON-BOARD DIAGNOSTIC SYSTEM

ECM (PCM) in this vehicle has following functions.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (1) turns ON to check the bulb of the malfunction indicator lamp (1).
- When ECM (PCM) detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the malfunction indicator lamp (1) in the meter cluster of the instrument panel turn ON or flash (flashing only when detecting a misfire which can cause damage to the catalyst) and stores the malfunction area in its memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL (1) turn OFF although DTC stored in its memory will remain.)
- As a condition for detecting a malfunction in some areas in the system being monitored by ECM (PCM) and turning ON the malfunction indicator lamp (1) due to that malfunction, 2 driving cycle detection logic is adopted to prevent erroneous detection.
- When a malfunction is detected, engine and driving conditions then are stored in ECM (PCM) memory as freeze frame data. (For the details, refer to description on Freeze frame data.)
- It is possible to communicate by using not only SUZUKI scan tool (Tech-1) (2) but also generic scan tool. (Diagnostic information can be accessed by using a scan tool.)

Warm-up Cycle
A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22°C (40°F) from engine starting and reaches a minimum temperature of 70°C (160°F).

Driving Cycle
A “Driving Cycle” consists of engine startup and engine shutoff.

2 Driving Cycle Detection Logic
The malfunction detected in the first driving cycle is stored in ECM (PCM) memory (in the form of pending DTC and freeze frame data) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC
Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

An Example of Freeze Frame Data

1.	Trouble Code	P0102 (1st)
2.	Engine Speed	782 RPM
3.	Eng Cool Tmp.	80°C
4.	Vehicle Spd.	0 km/h
5.	MAP Sensor	39 kPa
6.	St. Term FT1	– 0.8% Lean
7.	Lg. Term FT1	– 1.6% Lean
8.	Fuel 1 Stat.	Closed Loop
9.	Fuel 2 Stat.	Not used
10.	Load value	25.5%

1st, 2nd or 3rd in parentheses here represents which position in the order the malfunction is detected.

Freeze Frame Data
ECM (PCM) stores the engine and driving conditions (in the from of data as shown at the left) at the moment of the detection of a malfunction in its memory. This data is called “Freeze frame data”. Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped, where air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM (PCM) has a function to store each freeze frame data for three different malfunctions in the order as the malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.

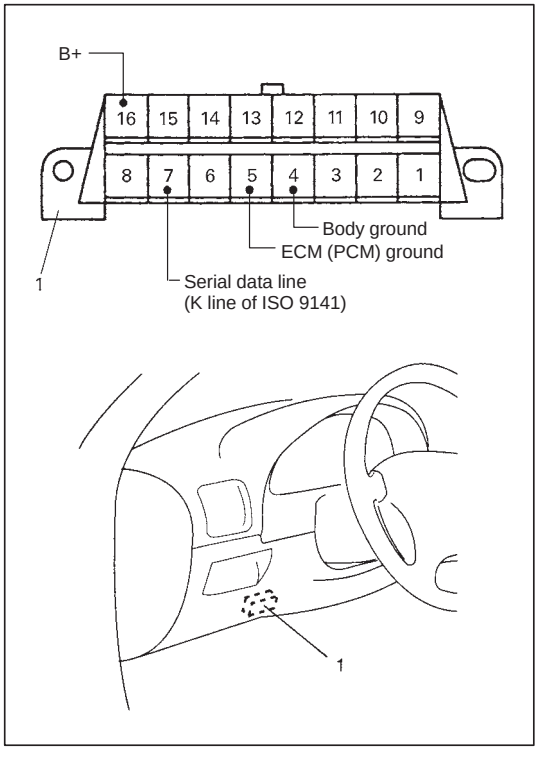
Priority of freeze frame data:
ECM (PCM) has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described below. (If malfunction as described in the upper square “1” below is detected while the freeze frame data in the lower square “2” has been stored, the freeze frame data “2” will be updated by the freeze frame data “1”.)

PRIORITY	FREEZE FRAME DATA IN FRAME 1
1	Freeze frame data at initial detection of malfunction among misfire detected (P0300-P0304), fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in “1” above is detected

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as the malfunction is detected. These data are not updated.
Shown in the table below are examples of how freeze frame data are stored when two or more malfunctions are detected.

FRAME / MALFUNCTION DETECTED ORDER		FRAME 1	FRAME 2	FRAME 3	FRAME 4
		FREEZE FRAME DATA to be updated	1st FREEZE FRAME DATA	2nd FREEZE FRAME DATA	3rd FREEZE FRAME DATA
	No malfunction	No freeze frame data			
1	P0400 (EGR) detected	Data at P0400 detection	Data at P0400 detection	–	–
2	P0171 (Fuel system) detected	Data at P0171 detection	Data at P0400 detection	Data at P0171 detection	–
3	P0300 (Misfire) detected	Data at P0171 detection	Data at P0400 detection	Data at P0171 detection	Data at P0300 detection
4	P0301 (Misfire) detected	Data at P0171 detection	Data at P0400 detection	Data at P0171 detection	Data at P0300 detection

Freeze frame data clearance:
The freeze frame data is cleared at the same time as clearance of diagnostic trouble code (DTC).



Data Link Connector (DLC)
DLC (1) is in compliance with ISO 15031-3 (SAEJ1962) in its installation position, the shape of connector and pin assignment.

Serial data line (K line of ISO 9141) is used for SUZUKI scan tool (Tech-1) to communicate with ECM (PCM).

PRECAUTION IN DIAGNOSING TROUBLE

- Don't disconnect couplers from ECM (PCM), battery cable from battery, ECM (PCM) ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM (PCM) memory. Such disconnection will erase memorized information in ECM (PCM) memory.
- Diagnostic information stored in ECM (PCM) memory can be cleared as well as checked by using SUZUKI scan tool (Tech-1) or generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Priorities for diagnosing troubles
  If two or more DTCs are stored, proceed to the flow table of the DTC which was detected earliest in the order and follow the instruction in that table.
  If no instructions are given, troubleshoot DTCs according to the following priorities.
  1. Diagnostic trouble codes (DTCs) other than DTC P0171/P0172 (Fuel system too lean/too rich), DTC P0300/P0301/P0302/P0303/P0304 (Misfire detected) and DTC P0400 (EGR flow malfunction)
  2. DTC P0171/P0172 (Fuel system too lean/too rich) and DTC P0400 (EGR flow malfunction)
  3. DTC P0300/P0301/P0302/P0303/P0304 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service" in Section 0A before inspection and observe what is written there.
- ECM (PCM) Replacement
  When substituting a known-good ECM (PCM), check for following conditions. Neglecting this check may cause damage to a known-good ECM (PCM).
  – Resistance value of all relays, actuators is as specified respectively.
  – MAP sensor and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.

ENGINE DIAGNOSTIC FLOW TABLE

Refer to the following pages for the details of each step.

STEP	ACTION	YES	NO
1	Customer Complaint Analysis 1) Perform customer complaint analysis referring to the next page. Was customer complaint analysis performed?	Go to Step 2.	Perform customer complaint analysis.
2	Diagnostic Trouble Code (DTC) and Freeze Frame Data Check, Record and Clearance 1) Check for DTC (including pending DTC) referring to the next page. Is there any DTC(s)?	1) Print DTC and freeze frame data or write them down and clear them by referring to "DTC Clearance" section. 2) Go to Step 3.	Go to Step 4.
3	Visual Inspection 1) Perform visual inspection referring to the next page. Is there any faulty condition?	1) Repair or replace malfunction part. 2) Go to Step 11.	Go to Step 5.
4	Visual Inspection 1) Perform visual inspection referring to the next page. Is there any faulty condition?		Go to Step 8.
5	Trouble Symptom Confirmation 1) Confirm trouble symptom referring to the next page. Is trouble symptom identified?	Go to Step 6.	Go to Step 7.
6	Rechecking and Record of DTC/Freeze Frame Data 1) Recheck for DTC and freeze frame data referring to "DTC Check" section. Is there any DTC(s)?	Go to Step 9.	Go to Step 8.
7	Rechecking and Record of DTC/Freeze Frame Data 1) Recheck for DTC and freeze frame data referring to "DTC Check" section. Is there any DTC(s)?		Go to Step 10.
8	Engine Basic Inspection and Symptoms-To-Diagnosis Matrix Table 1) Check and repair according to "Engine Basic Check" and "Symptom-To-Diagnosis Matrix Table" section. Are check and repair complete?	Go to Step 11.	1) Check and repair malfunction part(s). 2) Go to Step 11.
9	Trouble shooting for DTC 1) Check and repair according to applicable DTC diag. flow table. Are check and repair complete?		
10	Check for Intermittent Problems 1) Check for intermittent problems referring to the next page. Is there any faulty condition?	1) Repair or replace malfunction part(s). 2) Go to Step 11.	Go to Step 11.
11	Final Confirmation Test 1) Clear DTC if any. 2) Perform final confirmation test referring to the next page. Is there any problem symptom, DTC or abnormal condition?	Go to Step 6.	End.

1. CUSTOMER COMPLAINT ANALYSIS

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

2. DIAGNOSTIC TROUBLE CODE (DTC)/FREEZE FRAME DATA CHECK, RECORD AND CLEARANCE

First, check DTC (including pending DTC), referring to "DTC check" section. If DTC is indicated, print it and freeze frame data or write them down and then clear them by referring to "DTC clearance" section. DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 4 and recheck DTC according to Step 5.

Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

NOTE:

If only Automatic transmission DTCs (P0705-P0758) or Immobilizer DTCs (P1610-P1614) are indicated in this step, perform trouble diagnosis according to "Diagnosis" in Section 7B or Section 8G.

3. and 4. VISUAL INSPECTION

As a preliminary step, be sure to perform visual check of the items that support proper function of the engine referring to "Visual Inspection" section.

5. TROUBLE SYMPTOM CONFIRMATION

Based on information obtained in Step 1 Customer complaint analysis and Step 2 DTC/freeze frame data check, confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each DTC Diagnosis section.

6. and 7. RECHECKING AND RECORD OF DTC/FREEZE FRAME DATA

Refer to "DTC check" section for checking procedure.

8. ENGINE BASIC INSPECTION AND ENGINE DIAGNOSIS TABLE

Perform basic engine check according to the "Engine Basic Inspection Flow Table" first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause referring to SYMPTOMS-TO-DIAGNOSIS MATRIX TABLE and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

9. TROUBLESHOOTING FOR DTC (See each DTC Diag. Flow Table)

Based on the DTC indicated in Step 5 and referring to the applicable DTC diag. flow table in this section, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM (PCM) or other part and repair or replace faulty parts.

10. CHECK FOR INTERMITTENT PROBLEM

Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "INTERMITTENT AND POOR CONNECTION" in Section 0A and related circuit of DTC recorded in Step 2.

11. FINAL CONFIRMATION TEST

Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

CUSTOMER PROBLEM INSPECTION FORM (EXAMPLE)

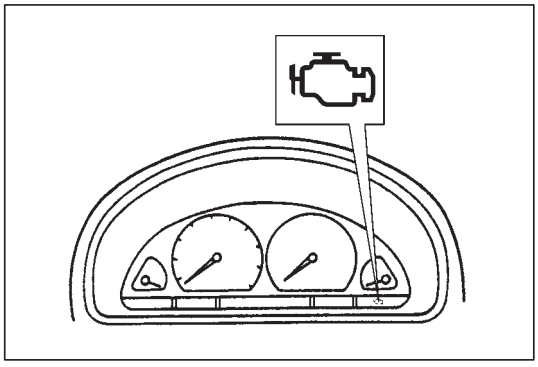
User name:	Model:	VIN:	
Date of issue:	Date of Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ Load is applied ☐ A/C ☐Electric load ☐P/S ☐ Other_____ ☐ Other_____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐Fair ☐Cloudy ☐Rain ☐Snow ☐Always ☐Other_____ ☐Hot ☐Warm ☐Cool ☐Cold (°F/ °C) ☐Always ☐Always ☐Sometimes (times/ day, month) ☐Only once ☐Under certain condition ☐Urban ☐Suburb ☐Highway ☐Mountainous (☐Uphill ☐Downhill) ☐Tarmacadam ☐Gravel ☐Other_____
Vehicle Condition	
Engine condition	☐Cold ☐Warming up phase ☐Warmed up ☐Always ☐Other at starting ☐Immediately after start ☐Racing without load ☐Engine speed (r/min)
Vehicle condition	During driving: ☐Constant speed ☐Accelerating ☐Decelerating ☐Right hand corner ☐Left hand corner ☐When shifting (Lever position) ☐At stop ☐Vehicle speed when problem occurs (km/h, Mile/h) ☐Other_____

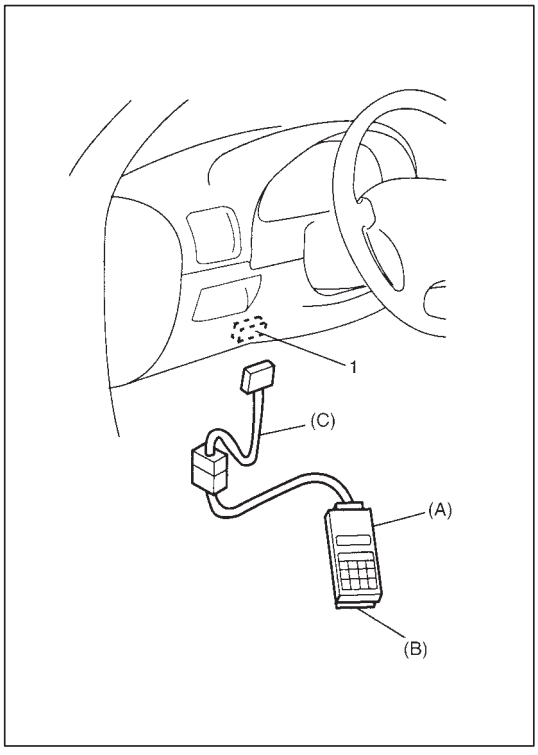
Malfunction indicator lamp condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition
Diagnostic trouble code	First check: ☐No code ☐Malfunction code ( )
	Second check: ☐No code ☐Malfunction code ( )

NOTE:
The above form is a standard sample. It should be modified according to conditions characteristic of each market.



MALFUNCTION INDICATOR LAMP (MIL) CHECK

1) Turn ON ignition switch (but the engine at stop) and check that MIL lights.
   If MIL does not light up (or MIL dims), go to “Diagnostic Flow Table A-1” for troubleshooting.
2) Start engine and check that MIL turns OFF.
   If MIL remains ON and no DTC is stored in ECM (PCM), go to “Diagnostic Flow Table A-2” for troubleshooting.



DIAGNOSTIC TROUBLE CODE (DTC) CHECK

1) Prepare SUZUKI scan tool (Tech-1).
2) With ignition switch OFF, connect it to data link connector (DLC) (1) located on underside of instrument panel at driver’s seat side.

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

3) Turn ignition switch ON and confirm that MIL lights.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it or write it down. Refer to scan tool operator’s manual for further details.
   If communication between scan tool and ECM (PCM) is not possible, check if scan tool is communicable by connecting it to ECM (PCM) in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DIAGNOSTIC TROUBLE CODE (DTC) CLEARANCE

[Using SUZUKI scan tool]

1) Connect SUZUKI scan tool (Tech-1) to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch off and disconnect scan tool from data link connector.

NOTE:
DTC and freeze frame data stored in ECM (PCM) memory are also cleared in following cases. Be careful not to clear them before keeping their record.

- **When power to ECM (PCM) is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM (PCM) connectors)**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

[Not using SUZUKI scan tool]

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

Time required to erase DTC:

Ambient temperature	Time to cut power to ECM (PCM)
Over 0°C (32°F)	30 sec. or longer
Under 0°C (32°F)	Not specifiable. Select a place with higher than 0°C (32°F) temperature.

DIAGNOSTIC TROUBLE CODE (DTC) TABLE

NOTE:
1 driving cycle: MIL lights up when DTC is detected in the first driving cycle.
2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.

DTC NO.	DETECTING ITEM	DETECTING CONDITION (DTC will set when detecting:)	MIL
P0105	Manifold absolute pressure circuit malfunction	Low pressure-high vacuum-low voltage (or MAP sensor circuit shorted to ground) High pressure-low vacuum-high voltage (or MAP sensor circuit open)	1 driving cycle
P0110	Intake air temp. circuit malfunction	Intake air temp. circuit low input Intake air temp. circuit high input	1 driving cycle
P0115	Engine coolant temp. circuit malfunction	Engine coolant temp. circuit low input Engine coolant temp. circuit high input	1 driving cycle
P0120	Throttle position circuit malfunction	Throttle position circuit low input Throttle position circuit high input	1 driving cycle
P0121	Throttle position circuit performance problem	Poor performance of TP sensor	2 driving cycles
P0130	HO2S circuit malfunction (Sensor-1)	Min. output voltage of HO2S-higher than specification Max. output voltage of HO2S-lower than specification	2 driving cycles
P0133	HO2S circuit slow response (Sensor-1)	Response time of HO2S-1 output voltage between rich and lean is longer than specification.	2 driving cycles
P0134	HO2S circuit no activity detected (Sensor-1)	Output voltage of HO2S-1 fails to go specification. (or HO2S-1 circuit open or short)	2 driving cycles
P0135	HO2S heater circuit malfunction (Sensor-1)	Terminal voltage is lower than specification at heater OFF or it is higher at heater ON.	2 driving cycles
P0136	HO2S circuit malfunction (Sensor-2)	Max. voltage of HO2S-2 is lower than specification or its min. voltage is higher than specification	2 driving cycles
P0141	HO2S heater circuit malfunction (Sensor-2)	Terminal voltage is lower than specification at heater OFF or it is higher at heater ON. (or heater circuit or short)	2 driving cycles
P0171	Fuel system too lean	Short term fuel trim or total fuel trim (short and long terms added) is larger than specification for specified time or longer. (fuel trim toward rich side is large.)	2 driving cycles
P0172	Fuel system too rich	Short term fuel trim or total fuel trim (short and long term added) is smaller than specification for specified time or longer. (fuel trim toward lean side is large.)	2 driving cycles
P0300 P0301 P0302 P0303 P0304	Random misfire detected Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected	Misfire of such level as to cause damage to three way catalyst	MIL flashing during misfire detection
		Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst	2 driving cycles

DTC NO.	DETECTING ITEM	DETECTING CONDITION (DTC will set when detecting:)	MIL
P0335	Crankshaft position sensor circuit malfunction	No signal for 2 sec. During engine cranking	1 driving cycle
P0340	Camshaft position sensor circuit malfunction	No signal during engine running	1 driving cycle
P0400	Exhaust gas recirculation flow malfunction detected	Excessive or insufficient EGR flow	2 driving cycles
P0420	Catalyst system efficiency below threshold	Output waveforms of HO2S-1 and HO2S-2 are similar. (Time from output voltage change of HO2S-1 to that of HO2S-2 is shorter than specification.)	2 driving cycles
P0443	Purge control valve circuit malfunction	Purge control valve circuit is open or shorted to ground	2 driving cycles
P0480	Radiator fan control circuit malfunction	Radiator cooling fan relay terminal voltage is low when cooling temp. is lower than specification	2 driving cycles
P0500	Vehicle speed sensor malfunction	No signal while running in “D” range or during fuel cut at decelerating	2 driving cycles
P0505	Idle control system malfunction	No closed signal to IAC valve is detected	2 driving cycles
P0601	Internal control module memory check sum error	Data write error (or check sum error) when written into ECM (PCM)	1 driving cycle
P1450	Barometric pressure sensor circuit malfunction	Barometric pressure is lower or higher than specification. (or sensor malfunction)	1 driving cycle
P1451	Barometric pressure sensor performance problem	Difference between manifold absolute pressure (MAP sensor value) and barometric pressure (barometric pressure sensor value) is larger than specification during cranking.	2 driving cycles
P1500	Starter signal circuit malfunction	Starter signal is not inputted from engine cranking till its start and after or it is always inputted	2 driving cycles
P1510	ECM (PCM) backup power source malfunction	No backup power after starting engine	1 driving cycle

DTC NO.	DETECTING ITEM	DETECTING CONDITION (DTC will set when detecting:)	MIL
P0705	Transmission Range Sensor Circuit Malfunction	Refer to Section 7B	
P0720	Output Speed Sensor Circuit Malfunction		
P0751	Shift Solenoid A Performance or Stuck Off		
P0753	Shift Solenoid A Circuit		
P0756	Shift Solenoid B Performance or Stuck Off		
P0758	Shift Solenoid B Circuit		
☆P1620 (No.84)	ECU code not registered	Refer to Section 8G	
☆P1621 (No.83)	NO ECU code transmitted from Immobilizer Control Module		
☆P1622 (No.82)	Fault in ECM		
☆P1623 (No.81)	ECU code not matched		

Note:
With the generic scan tool, only star (☆) marked data in the above table can not be read.

FAIL-SAFE TABLE

When any of the following DTCs is detected, ECM (PCM) enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM (PCM) detects normal condition after that.

DTC NO.	DETECTED ITEM	FAIL-SAFE OPERATION
P0105	Manifold absolute pressure circuit malfunction	● ECM (PCM) uses value determined by throttle opening and engine speed. ● ECM (PCM) stops EGR, EVAP purge and idle air control.
P0110	Intake air temp. circuit malfunction	ECM (PCM) controls actuators assuming that intake air temperature is 20°C (68°F).
P0115	Engine coolant temp. circuit malfunction	ECM (PCM) controls actuators assuming that engine coolant temperature is 80°C (176°F).
P0120	Throttle position circuit malfunction	ECM (PCM) controls actuators assuming that throttle opening is 20°.
P0340	Camshaft position sensor circuit malfunction	ECM (PCM) controls injection system sequential injection to synchronous injection.
P0500	Vehicle speed sensor malfunction	ECM (PCM) stops idle air control.
P1450	Barometric pressure sensor low/ high input	ECM (PCM) controls actuators assuming that barometric pressure is 100 kPa (760 mmHg).

VISUAL INSPECTION

Visually check following parts and systems.

INSPECTION ITEM	REFERRING SECTION
● Engine oil – – – – – level, leakage	Section 0B
● Engine coolant – – – – – level, leakage	Section 0B
● Fuel – – – – – level, leakage	Section 0B
● A/T fluid – – – – – level, leakage	Section 0B
● Air cleaner element – – – – – dirt, clogging	Section 0B
● Battery – – – – – fluid level, corrosion of terminal	
● Water pump belt – – – – – tension, damage	Section 0B
● Throttle cable – – – – – play, installation	Section 6E2
● Vacuum hoses of air intake system – – – – – disconnection, looseness, deterioration, bend	
● Connectors of electric wire harness – – – – – disconnection, friction	
● Fuses – – – – – burning	Section 8
● Parts – – – – – installation, bolt – – – – – looseness	
● Parts – – – – – deformation	
● Other parts that can be checked visually	
Also check following items at engine start, if possible	
● Malfunction indicator lamp	Section 6
● Charge warning lamp	Section 6H
● Engine oil pressure warning lamp (Operation)	Section 8 (Section 6 for pressure check)
● Engine coolant temp. meter	Section 8
● Fuel level meter	Section 8
● Tachometer, if equipped	
● Abnormal air being inhaled from air intake system	
● Exhaust system – – – – – leakage of exhaust gas, noise	
● Other parts that can be checked visually	

ENGINE BASIC INSPECTION

This check is very important for troubleshooting when ECM (PCM) has detected no DTC and no abnormality has been found in visual inspection.
Follow the flow table carefully.

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check battery voltage. Is it 11 V or more?	Go to Step 3.	Charge or replace battery.
3	Is engine cranked?	Go to Step 4.	Go to “DIAGNOSIS” in Section 6G.
4	Does engine start?	Go to Step 5.	Go to Step 7.
5	Check idle speed as follows: 1) Warm up engine to normal operating temp. 2) Shift transmission to neutral position for M/T (“P” position for A/T). 3) All of electrical loads are switched off. 4) Check engine idle speed with scan tool. See Fig. 1. Is it 700 – 800 r/min?	Go to Step 6.	“ENGINE DIAGNOSIS TABLE” in this section.
6	Check ignition timing as follows: 1) Using SUZUKI scan tool, select “MISC” mode on SUZUKI scan tool and fix ignition timing to initial one. See Fig. 2. 2) Remove air cleaner bolt and shift air cleaner position to observe ignition timing. 3) Using timing light (1), check initial ignition timing. See Fig. 3. Is it 5° ± 3° BTDC at specified idle speed?	“ENGINE DIAGNOSIS TABLE” in this section.	Check ignition control related parts referring to Section 6F1.
7	Check fuel supply as follows: 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 2 seconds and then OFF. See Fig. 4. Is fuel return pressure (returning sounds) felt from fuel feed hose (1) when ignition switch is turned ON?	Go to Step 9.	Go to Step 8.
8	Check fuel pump for operating. 1) Was fuel pump operating sound heard from fuel filler for about 2 seconds after ignition switch ON and stop?	Go to “DIAG. FLOW TABLE B-3”.	Go to “DIAG. FLOW TABLE B-2”.
9	Check ignition spark as follows: 1) Disconnect injector couplers. 2) Remove spark plugs and connect them to high tension cords. 3) Ground spark plugs. 4) Crank engine and check if each spark plug sparks. Is it in good condition?	Go to Step 10.	Go to “DIAGNOSIS” in Section 6F1.
10	Check fuel injector for operation as follows: 1) Install spark plugs and connect injector connectors. 2) Using sound scope (1), check operating sound of each injector (2) when cranking engine. See Fig. 5. Was injector operating sound heard from all injectors?	“ENGINE DIAGNOSIS TABLE” in this section.	Go to “DIAG. FLOW TABLE B-1”.

Fig. 1 for Step 5

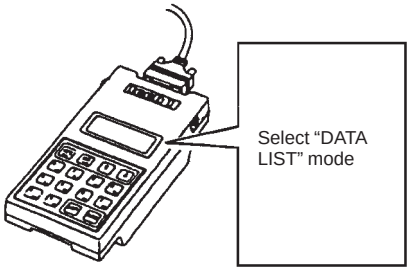


Fig. 2 for Step 6

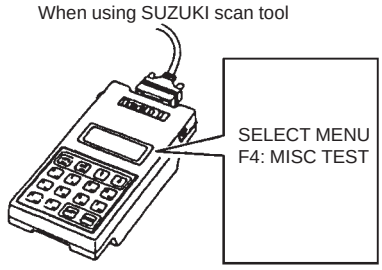


Fig. 3 for Step 6

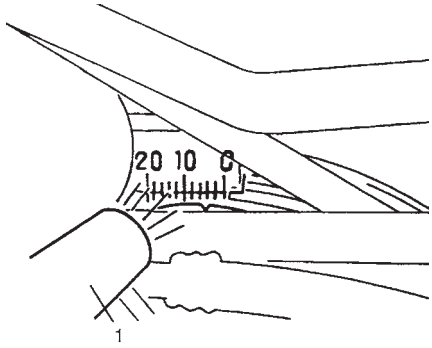


Fig. 4 for Step 7

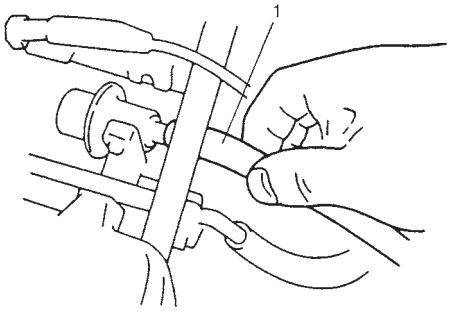
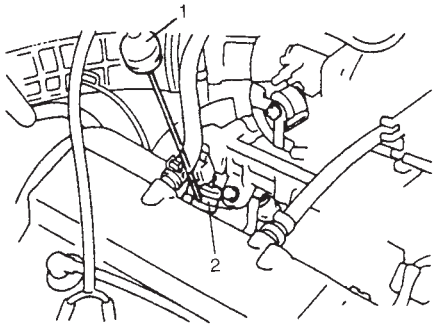


Fig. 5 for Step 10



ENGINE DIAGNOSIS TABLE

Perform troubleshooting referring to following table when ECM (PCM) has detected no DTC and no abnormality has been found in visual inspection and engine basic inspection previously.

Condition	Possible Cause	Referring Item
Hard Starting (Engine cranks OK)	**Ignition system out of order**	
	● Faulty spark plug	Spark plugs in Section 6F1
	● Leaky high-tension cord	High-tension cords in Section 6F1
	● Loose connection or disconnection of high-tension cords or lead wires	High-tension cords in Section 6F1
	● Faulty ignition coil	Ignition coil in Section 6F1
	Fuel system out of order	
	● Dirty or clogged fuel hose or pipe	Diagnostic Flow Table B-3
	● Malfunctioning fuel pump	Diagnostic Flow Table B-3
	● Air inhaling from intake manifold gasket or throttle body gasket	
	Engine and emission control system out of order	
	● Faulty idle air control system	Diagnostic Flow Table B-4
	● Faulty ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E2
	● Faulty ECM (PCM)	
	Low compression	Compression check in Section 6A1
	● Poor spark plug tightening or faulty gasket	Spark plugs in Section 6F1
	● Compression leak from valve seat	Valves inspection in Section 6A1
	● Sticky valve stem	Valves inspection in Section 6A1
	● Weak or damaged valve springs	Valve springs inspection in Section 6A1
	● Compression leak at cylinder head gasket	Cylinder head inspection in Section 6A1
	● Sticking or damaged piston ring	Cylinders, pistons and piston rings inspection in Section 6A1
	● Worn piston, ring or cylinder	Cylinders, pistons and piston rings inspection in Section 6A1
	Others	
	● Malfunctioning PCV valve	PCV system in Section 6E2

Condition	Possible Cause]	Referring Item
Low oil pressure	● Improper oil viscosity	Engine oil and oil filter change in Section 0B
	● Malfunctioning oil pressure switch	Oil pressure switch inspection in Section 8
	● Clogged oil strainer	Oil pan and oil pump strainer cleaning in Section 6A1
	● Functional deterioration of oil pump	Oil pump in Section 6A1
	● Worn oil pump relief valve	Oil pump in Section 6A1
	● Excessive clearance in various sliding parts	
Engine noise Note: Before checking mechanical noise, make sure that: ● Specified spark plug in used. ● Specified fuel is used.	**Valve noise**	
	● Improper valve lash	Valve lash in Section 6A1
	● Worn valve stem and guide	Valves inspection in Section 6A1
	● Weak or broken valve spring	Valve springs inspection in Section 6A1
	● Warped or bent valve	Valves inspection in Section 6A1
	Piston, ring and cylinder noise	
	● Worn piston, ring and cylinder bore	Pistons and cylinders inspection in Section 6A1
	Connecting rod noise	
	● Worn rod bearing	Crank pin and connecting rod bearing inspection in Section 6A1
	● Worn crank pin	Crank pin and connecting rod bearing inspection in Section 6A1
	● Loose connecting rod nuts	Connecting rod installation in Section 6A1
	● Low oil pressure	Previously outlined
	Crankshaft noise	
	● Low oil pressure	Previously outlined
	● Worn bearing	Crankshaft and bearing inspection in Section 6A1
	● Worn crankshaft journal	Crankshaft and bearing inspection in Section 6A1
	● Loose bearing cap bolts	Crankshaft inspection in Section 6A1
	● Excessive crankshaft thrust play	Crankshaft thrust play inspection in Section 6A1

Condition	Possible Cause	Referring Item
Overheating	● Inoperative thermostat	Thermostat in Section 6B
	● Poor water pump performance	Water pump in Section 6B
	● Clogged or leaky radiator	Radiator in Section 6B
	● Improper engine oil grade	Engine oil and oil filter change in Section 0B
	● Clogged oil filter or oil strainer	Oil pressure check in Section 6A1
	● Poor oil pump performance	Oil pressure check in Section 6A1
	● Faulty radiator fan control system	Radiator fan control system in Section 6E2
	● Dragging brakes	Trouble diagnosis in Section 5
	● Slipping clutch	Trouble diagnosis in Section 7C
	● Blown cylinder head gasket	Cylinder head in Section 6A1
Poor gasoline mileage	**Ignition system out of order**	
	● Leaks or loose connection of high-tension cord	High-tension cords in Section 6F1
	● Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	Spark plugs in Section 6F1
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system in Section 6E2
	● High idle speed	Refer to item “Improper engine idle speed” previously outlined
	● Poor performance of TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E2
	● Faulty EGR valve	EGR system in Section 6E2
	● Faulty fuel injector(s)	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	Low compression	Previously outlined
	Others	
	● Poor valve seating	Valves inspection in Section 6A1
	● Dragging brakes	Trouble diagnosis in Section 5
	● Slipping clutch	Trouble diagnosis in Section 7C
	● Thermostat out of order	Thermostat in Section 6B
	● Improper tire pressure	Refer to Section 3F
Excessive engine oil consumption	**Oil leakage**	
	● Blown cylinder head gasket	Cylinder head in Section 6A1
	● Leaky camshaft oil seals	Camshaft in Section 6A1
	Oil entering combustion chamber	
	● Sticky piston ring	Piston cleaning in Section 6A1
	● Worn piston and cylinder	Pistons and cylinders inspection in Section 6A1
	● Worn piston ring groove and ring	Pistons inspection in Section 6A1
	● Improper location of piston ring gap	Pistons assembly in Section 6A1
	● Worn or damaged valve stem seal	Valves removal and installation in Section 6A1
	● Worn valve stem	Valves inspection in Section 6A1

Condition	Possible Cause	Referring Item
Engine hesitates (Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.)	**Ignition system out of order**	
	● Spark plug faulty or plug gap out of adjustment	Spark plugs in Section 6F1
	● Leaky high-tension cord	High-tension cords in Section 6F1
	Fuel system out of order	
	● Fuel pressure out of specification	Diagnostic Flow Table B-3
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system in section 6E2
	● Poor performance of TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E2
	● Faulty fuel injector	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	Engine overheating	Refer to “Overheating” section
	Low compression	Previously outlined
Surge (Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.)	**Ignition system out of order**	
	● Leaky or loosely connected high-tension cord	High-tension cords in Section 6F1
	● Faulty spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Spark plugs in Section 6F1
	Fuel system out of order	
	● Variable fuel pressure	Diagnostic Flow Table B-3
	– Kinky or damaged fuel hose and lines	
	– Faulty fuel pump (clogged fuel filter)	
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system in Section 6E2
	● Poor performance of MAP sensor	MAP sensor in Section 6E2
	● Faulty fuel injector	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
Excessive detonation (Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating**	Refer to “Overheating” section
	Ignition system out of order	
	● Faulty spark plug	Spark plugs in Section 6F1
	● Loose connection of high-tension cord	High-tension cords in Section 6F1
	Fuel system out of order	
	● Clogged fuel filter (faulty fuel pump) or fuel lines	Diagnostic Flow Table B-1 or B-2
	● Air inhaling from intake manifold or throttle body gasket	
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system in Section 6E2
	● Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E2
	● Faulty fuel injector(s).	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	● Excessive combustion chamber deposits	Piston and cylinder head cleaning in Section 6A1

Condition	Possible Cause	Referring Item
Engine has no power	**Ignition system out of order**	
	● Faulty spark plug	Spark plugs in Section 6F1
	● Faulty ignition coil with ignitor	Ignition coil in Section 6F1
	● Leaks, loose connection or disconnection of high-tension cord	High-tension cords in Section 6F1
	Engine overheating	Refer to “Overheating” section
	Fuel system out of order	
	● Clogged fuel hose or pipe	Diagnostic Flow Table B-3
	● Malfunctioning fuel pump	Diagnostic Flow Table B-2
	● Air inhaling from intake manifold gasket or throttle body gasket	
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system inspection in Section 6E2
	● Maladjusted accelerator cable play	Accelerator cable play in Section 6E2
	● Poor performance of TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E2
	● Faulty fuel injector(s)	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	Low compression	Previously outlined
	Others	
	● Dragging brakes	Trouble diagnosis in Section 5
	● Slipping clutch	Trouble diagnosis in Section 7C

Condition	Possible Cause	Referring Item
Improper engine idling or engine fails to idle	**Ignition system out of order**	
	● Faulty spark plug	Spark plugs in Section 6F
	● Leaky or disconnected high-tension cord	High-tension cords in Section 6F
	● Faulty ignition coil with ignitor	Ignition coil in Section 6F
	Fuel system out of order	
	● Fuel pressure out of specification	Diagnostic Flow Table B-3
	● Leaky manifold, throttle body, or cylinder head gasket	
	Engine and emission control system out of order	
	● Malfunctioning EGR valve	EGR system in Section 6E2
	● Faulty idle air control system	Diagnostic Flow Table B-4
	● Faulty evaporative emission control system	EVAP control system in Section 6E2
	● Faulty EGR system	EGR system in Section 6E2
	● Faulty fuel injector(s)	Diagnostic Flow Table B-1
	● Poor performance of ECT sensor, TP sensor or MAP sensor	ECT sensor, TP sensor or MAP sensor in Section 6E2
	● Faulty ECM (PCM)	
	Engine overheating	Refer to “Overheating” section
	Low compression	Previously outlined
	Others	
	● Loose connection or disconnection of vacuum hoses	
	● Malfunctioning PCV valve	PCV system in Section 6E2

Condition	Possible Cause	Referring Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	**Ignition system out of order**	
	● Faulty spark plug	Spark plugs in Section 6F1
	● Leaky or disconnected high-tension cord	High-tension cords in Section 6F1
	● Faulty ignition coil with ignitor	Ignition coil assembly in Section 6F1
	Low compression	Refer to “Low compression” section
	Engine and emission control system out of order	
	● Lead contamination of three way catalytic converter	Check for absence of filler neck restrictor
	● Faulty evaporative emission control system	EVAP control system in Section 6E2
	● Fuel pressure out of specification	Diagnostic Flow Table B-3
	● Closed loop system (A/F feed back compensation) fails	
	– Faulty TP sensor	TP sensor in Section 6E2
	– Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E2
	● Faulty injector(s)	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	Others	
	● Engine not at normal operating temperature	
	● Clogged air cleaner	
	● Vacuum leaks	
Excessive nitrogen oxides (NOx) emission	**Ignition system out of order**	
	● Improper ignition timing	See section 6F1
	Engine and emission control system out of order	
	● Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	● Faulty EGR system	EGR system in Section 6E2
	● Fuel pressure out of specification	Diagnostic Flow Table B-3
	● Closed loop system (A/F feed back compensation) fails	
	– Faulty TP sensor	TP sensor in Section 6E2
	– Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E2
	● Faulty injector(s)	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	

SCAN TOOL DATA

As the data values given below are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, conditions in the below table that can be checked by the scan tool are those detected by ECM (PCM) and output from ECM (PCM) as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing.

NOTE:
- **With the generic scan tool, only star (☆) marked data in the table below can be read.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral gear position and A/T gear to the "Park" position and pull the parking brake fully. Also, if nothing or "no load" is indicated, turn OFF A/C, all electric loads, P/S and all the other necessary switches.**

	SCAN TOOL DATA	VEHICLE CONDITION		NORMAL CONDITION/ REFERENCE VALUES
☆	FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLOSED (closed loop)
☆	CALC LOAD (CALCULATED LOAD VALUE)	At specified idle speed with no load after warming up		3 – 9%
		At 2500 r/min with no load after warming up		12 – 17%
☆	COOLANT TEMP. (ENGINE COOLANT TEMP.)	At specified idle speed after warming up		85 – 100°C, 185 – 212°F
☆	SHORT FT BI (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
☆	LONG FT BI (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–15 – +15%
☆	MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE)	At specified idle speed with no load after warming up		24 – 37 kPa, 180 – 280 mmHg
☆	ENGINE SPEED	At idling with no load after warming up		Desired idle speed ± 50 r/min
☆	VEHICLE SPEED	At stop		0 km/h, 0 MPH
☆	IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		9 – 15° BTDC
☆	INTAKE AIR TEMP.	At specified idle speed after warming up		Ambient temp. +35°C (95°F) –5°C (23°F)
☆	MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		0 – 4 gm/sec
		At 2500 r/min with no load after warming up		4 – 9 gm/sec
☆	THROTTLE POS (ABSOLUTE THROTTLE POSITION)	Ignition switch ON/engine stopped	Throttle valve fully closed	7 – 18%
			Throttle valve fully open	70 – 100%
☆	O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.05 – 0.95 V
☆	O2S B1 S2 (HEATED OXYGEN SENSOR-2)	When engine is running at 2000 r/min. for 3 min or longer after warming up.		0 – 0.95 V
☆	O2S FT B1 S1	At specified idle speed after warning up		–20 – +20%
☆	DIS. WITH MIL ON	——		——

	SCAN TOOL DATA	CONDITION		NORMAL CONDITION/ REFERENCE VALUES
	DESIRED IDLE (DESIRED IDLE SPEED)	At idling with no load after warming up, M/T at neutral, A/T at "P" range		750 r/min
	TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE)	Ignition switch ON/engine stopped	Throttle valve fully closed	More than 0.2 V
			Throttle valve fully open	Less than 4.8 V
	INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up		2.0 – 3.6 msec.
		At 2500 r/min with no load after warming up		2.0 – 3.6 msec.
	IAC FLOW DUTY (IDLE AIR CONTROL FLOW DUTY)	At idling with no load after warming up		5 – 25%
	TOTAL FUEL TRIM	At specified idle speed after warming up		–35 – +35%
	BATTERY VOLTAGE	Ignition switch ON/engine stop		10 – 14 V
	CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	———		0 – 100%
	CLOSED THROT POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
		Throttle valve opens larger than idle position		OFF
	FUEL CUT	When engine is at fuel cut condition		ON
		Other than fuel cut condition		OFF
	RADIATOR FAN (RADIATOR FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: Lower than 92.5°C (199°F)	OFF
			Engine coolant temp.: 97.5°C (208°F) or higher	ON
	ELECTRIC LOAD	Ignition switch ON/Headlight, small light, heater fan and rear window defogger all turned OFF		OFF
		Ignition switch ON/Headlight, small light, heater fan or rear window defogger turned ON		ON
	A/C SWITCH	Engine running after warming up, A/C not operating		OFF
		Engine running after warming up, A/C operating		ON
	PNP SIGNAL (PARK/ NEUTRAL POSITION SIGNAL) A/T only	Ignition switch ON	Selector lever in "P" or "N" position	P/N Range
			Selector lever in "R", "D", "2" or "L" position	D Range
	EGR VALVE	At specified idle speed after warming up		0%
	FUEL TANK LEVEL	———		0 – 100%
	BAROMETRIC PRESS	———		Display the barometric pressure
	FUEL PUMP	Within 3 seconds after ignition switch ON or engine running		ON
		Engine stop at ignition switch ON.		OFF
	BRAKE SW	Ignition switch ON	Brake pedal is depressing	ON
			Brake pedal is releasing	OFF
	BLOWER FAN	Ignition switch ON	Blower fan switch ON	ON
			Blower fan switch OFF	OFF
	A/C MAG CLUTCH	Ignition switch ON	A/C switch ON	ON
			A/C switch OFF	OFF

SCAN TOOL DATA DEFINITIONS

FUEL SYSTEM (FUEL SYSTEM STATUS)
Air/fuel ratio feedback loop status displayed as either open or closed loop. Open indicates that ECM (PCM) ignores feedback from the exhaust oxygen sensor. Closed indicates final injection duration is corrected for oxygen sensor feedback.

CALC LOAD (CALCULATED LOAD VALUE, %)
Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume x 100%.

COOLANT TEMP. (ENGINE COOLANT TEMPERATURE, °C, °F)
It is detected by engine coolant temp. sensor

SHORT FT B1 (SHORT TERM FUEL TRIM, %)
Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)
Long term fuel trim Value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE, kPa, inHg)
It is detected by manifold absolute pressure sensor and used (among other things) to compute engine load.

ENGINE SPEED (rpm)
It is computed by reference pulses from crankshaft position sensor.

VEHICLE SPEED (km/h, MPH)
It is computed based on pulse signals from vehicle speed sensor.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)
Ignition timing of NO.1 cylinder is commanded by ECM (PCM). The actual ignition timing should be checked by using the timing light.

INTAKE AIR TEMP. (°C, °F)
It is detected by intake air temp. sensor and used to determine the amount of air passing into the intake manifold as air density varies with temperature.

MAF (MASS AIR FLOW RATE, gm/s, lb/min)
It represents total mass of air entering intake manifold which is computed based on signals from MAP sensor, IAT sensor, TP sensor, etc.

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %)
When throttle position sensor is fully closed position, throttle opening is indicated as 0% and 100% full open position.

OXYGEN SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)
It indicates output voltage of HO2S-1 installed on exhaust manifold (pre-catalyst).

OXYGEN SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)
It indicates output voltage of HO2S-2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

DESIRED IDLE (DESIRED IDLE SPEED, rpm)
The Desired Idle Speed is an ECM (PCM) internal parameter which indicates the ECM (PCM) requested idle. If the engine is not running, this number is not valid.

TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE, V)
The Throttle Position Sensor reading provides throttle valve opening information in the form of voltage.

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (PCM) (but injector drive time of NO.1 cylinder for multiport fuel injection).

IAC FLOW DUTY (IDLE AIR (SPEED) CONTROL DUTY, %)
This parameter indicates current flow time rate within a certain set cycle of IAC valve (valve opening rate) which controls the amount of bypass air (idle speed).

TOTAL FUEL TRIM (%)
The value of Total Fuel Trim is obtained by putting values of short Term Fuel Trim and Long Term Fuel Trim together. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

BATTERY VOLTAGE (V)
This parameter indicates battery positive voltage inputted from main relay to ECM (PCM).

CANIST PURGE DUTY (EVAP CANISTER PURGE FLOW DUTY, %)

This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP purge solenoid valve which controls the amount of EVAP purge.
0% means that the purge valve is completely closed while 100% is a fully open valve.

CLOSED THROTTLE POSITION (ON/OFF)

This parameter will read ON when throttle valve is fully closed, or OFF when the throttle is not fully closed.

FUEL CUT (ON/OFF)

ON : Fuel being cut (output signal to injector is stopped)
OFF : Fuel not being cut

RADIATOR FAN (RADIATOR FAN CONTROL RELAY, ON/OFF)

ON : Command for radiator fan control relay operation being output.
OFF : Command for relay operation not being output.

ELECTRIC LOAD (ON/OFF)

ON : Headlight, small light, heater fan or rear window defogger ON signal inputted.
OFF : Above electric loads all turned OFF.

A/C SWITCH (ON/OFF)

ON : Command for A/C operation being output from ECM (PCM) to A/C amplifier.
OFF : Command for A/C operation not being output.

FUEL TANK LEVEL (%)

This parameter indicates approximate fuel level in the fuel tank. As the detectable range of the fuel level sensor is set as 0 to 100%, however, with some models whose fuel tank capacity is smaller, the indicated fuel level may be only 70% even when the fuel tank is full.

PNP SIGNAL (PARK/NEUTRAL POSITION SIGNAL, P/N RANGE or D RANGE)

It is detected by signal from TCM.
D range : A/T is in “R”, “D”, “2” or “L” range.
P/N range : A/T is in “P” or “N” range or the above signal is not inputted from TCM.

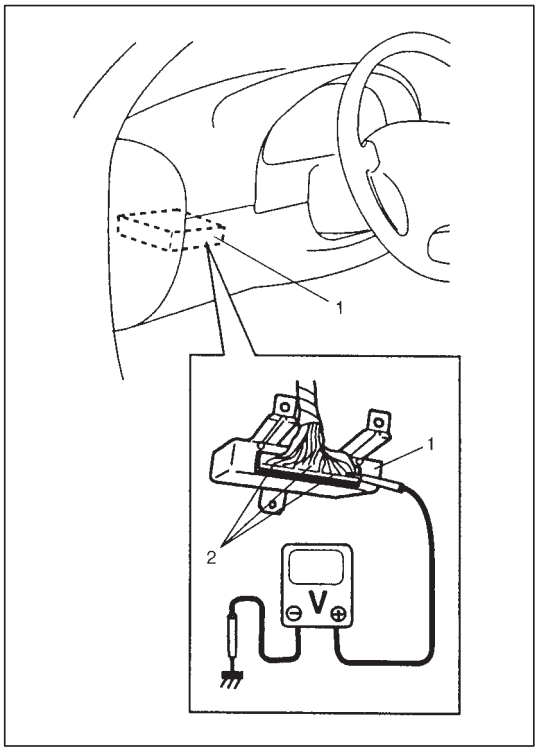
EGR VALVE (%)

This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

INSPECTION OF ECM (PCM) AND ITS CIRCUITS

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

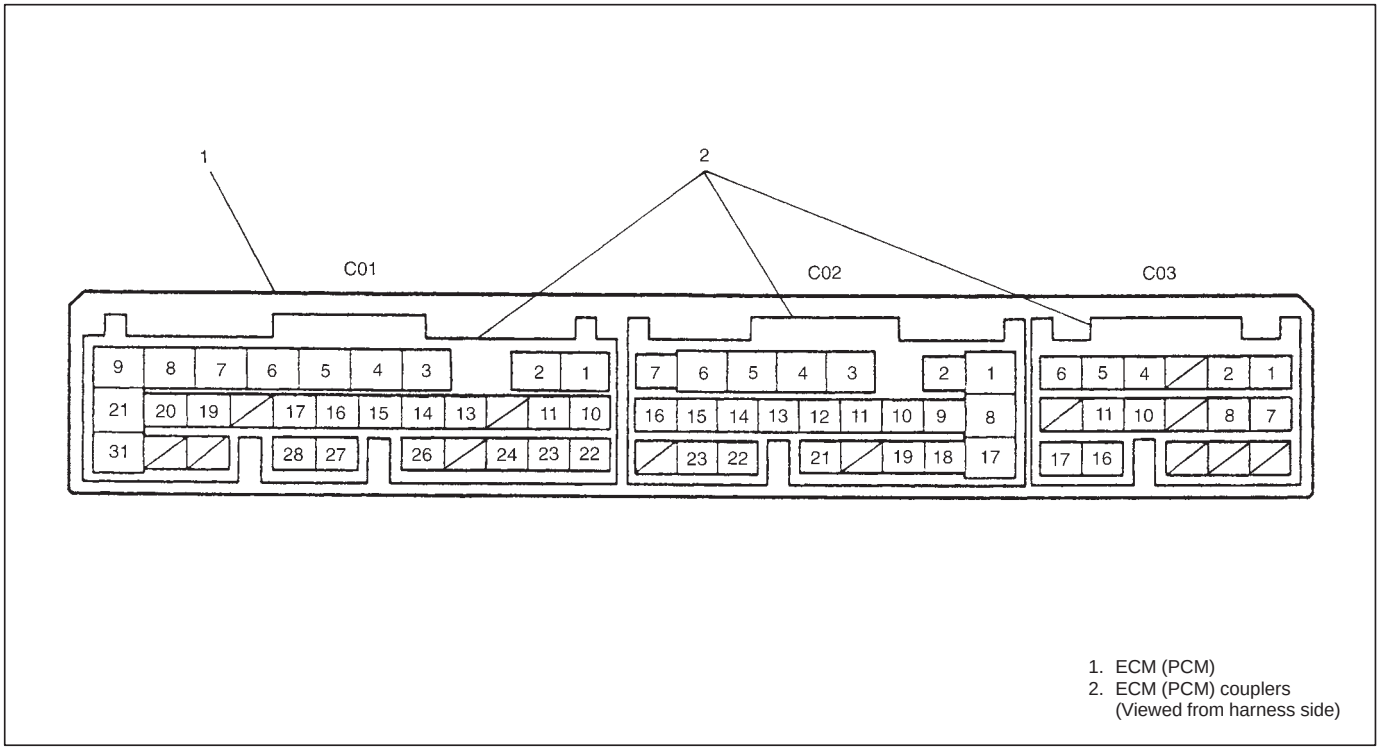
CAUTION:
ECM (PCM) cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM (PCM) with coupler disconnected from it.



Voltage Check

1) Remove ECM (PCM) (1) from body referring to Section 6E2.
2) Check voltage at each terminal of couplers (2) connected.

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

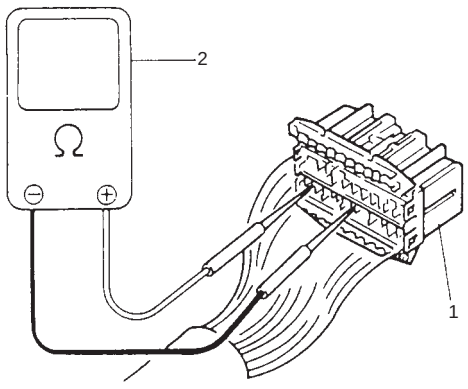


1. ECM (PCM)
2. ECM (PCM) couplers
   (Viewed from harness side)

TERMINAL NO.		CIRCUIT	NORMAL VOLTAGE	CONDITION
CONNECTOR "C01"	1	Ground	—	—
	2	Ground	—	—
	3	Ground	—	—
	4	EVAP canister purge valve	10 – 14 V	Ignition switch ON
	5	Power steering switch	Indication deflection repeated 0 V and 10 – 14 V	Ignition switch ON
	6	Idle air control valve	0 – 13 V	At specified idle speed after engine warmed up
	7	Heater of HO2S-1	10 – 14 V	Ignition switch ON
	8	Fuel injector NO.4	10 – 14 V	Ignition switch ON
	9	Fuel injector NO.1	10 – 14 V	Ignition switch ON
	10	Sensor ground	—	—
	11	Camshaft position sensor	0 – 0.8 V and 4 – 6 V	Ignition switch ON
	12	Blank	—	—
	13	Heater oxygen sensor-1	Refer to DTC P0130 diag. flow table	
	14	Engine coolant temp. sensor	0.55 – 0.95 V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
	15	Intake air temp. sensor	2.0 – 2.7 V	Ignition switch ON Intake air temp.: 20°C (68°F)
	16	Blank	—	—
	17	Electric load signal (+)	0 – 1 V	Ignition switch ON Small light and rear defogger OFF
			10 – 14 V	Ignition switch ON Small light and rear defogger ON
	18	Blank	—	—
	19	Ignition coil #2	—	—
	20	Ignition coil #1	—	—
	21	Fuel injector NO.2	10 – 14 V	Ignition switch ON
	22	Power source for sensor	4.75 – 5.25 V	Ignition switch ON
	23	Crankshaft position sensor (+)	—	—
	24	Crankshaft position sensor (–)	—	—
	25	Blank	—	—
	26	Manifold absolute pressure sensor	3.3 – 4.0 V	Ignition switch ON Barometric pressure: 100 kPa (760 mmHg)
	27	Blank	—	—
	28	Immobilizer indicator lamp	0 – 2 V	Ignition switch ON
			10 – 14 V	When engine running
	29	Blank	—	—
	30	Blank	—	—
	31	Fuel injector NO.3	10 – 14 V	Ignition switch ON

TERMINAL NO.		CIRCUIT	NORMAL VOLTAGE	CONDITION
CONNECTOR "C02"	1	A/C ON output signal	0 V	Ignition switch ON
	2	EGR valve (stepper motor coil 1)	10 – 14 V	Ignition switch ON
			0 – 1 V	Engine running at idle speed
	3	Data link connector	10 – 14 V	Ignition switch ON
	4	Heater of HO2S-2	10 – 14 V	Ignition switch ON
	5	Power source	10 – 14 V	Ignition switch ON
	6	Power source	10 – 14 V	Ignition switch ON
	7	Power source for buck-up	10 – 14 V	Ignition switch ON and OFF
	8	EGR valve (stepper motor coil 3)	10 – 14 V	Ignition switch ON
			10 – 14 V	Engine running at idle speed
	9	EGR valve (stepper motor coil 2)	10 – 14 V	Ignition switch ON
			10 – 14 V	Engine running at idle speed
	10	Main relay	10 – 14 V	Ignition switch OFF
			0.4 – 1.5 V	Ignition switch ON
	11	2-range signal (A/T)	10 – 14 V	Ignition switch ON, Select lever at 2-range
	12	N-range signal (A/T)	10 – 14 V	Ignition switch ON, Select lever at N-range
	13	Heated oxygen sensor-2	Refer to DTC P0130 diag. flow table	
	14	D-range signal (A/T)	10 – 14 V	Ignition switch ON, Select lever at D-range
	15	R-range signal (A/T)	10 – 14 V	Ignition switch ON, Select lever at R-range
	16	A/C input signal	10 – 14 V	Ignition switch ON A/C switch OFF
			0 – 2 V	Ignition switch ON A/C switch ON
	17	EGR valve (stepper motor coil 4)	10 – 14 V	Ignition switch ON
			0 – 1 V	Engine running at idle speed
	18	Radiator fan control relay	10 – 14 V	Ignition switch ON Engine coolant temp.: Below 92.5°C (199°F)
			0 – 1 V	Ignition switch ON Engine coolant temp.: Below 97.5°C (208°F) or higher
	19	Fuel pump relay	0 – 1 V	For 2 seconds after ignition switch ON
			10 – 14 V	After the above time
	20	Blank	—	—
	21	P-range signal (A/T)	Indication deflection repeated 0 V and 10 – 14 V	Ignition switch ON
	22	Fuel level sensor (gauge)	0 – 2 V	Ignition switch ON Fuel tank fully filled
			4.5 – 7.5 V	Ignition switch ON Fuel tank emptied
	23	L-range signal (A/T)	10 – 14 V	Ignition switch ON, Select lever at L-range
	24	Blank	—	—

TERMINAL NO.		CIRCUIT	NORMAL VOLTAGE	CONDITION
CONNECTOR "C03"	1	Malfunction indicator lamp	0 – 1 V	Ignition switch ON
			10 – 14 V	When engine running
	2	Vehicle speed sensor (M/T)	Indicator deflection repeated 0 V and 4 – 6 V	Ignition switch ON Front left tire turned slowly with front right tire locked
		Output shaft speed sensor (+) (A/T)	0.4 – 0.8 V	Ignition switch ON
	3	Blank	—	—
	4	Shift solenoid – A (A/T)	0 V	Ignition switch ON, Select lever at P-range
			10 – 14 V	Ignition switch ON, Select lever at D-range
	5	Throttle position sensor	0.2 – 1.0 V	Ignition switch ON Throttle valve at idle position
			2.8 – 4.8 V	Ignition switch ON Throttle valve at full open position
	6	Ignition switch	10 – 14 V	Ignition switch ON
	7	Data link connector	—	Ignition switch ON
	8	Output shaft speed sensor (–) (A/T)	0.4 – 0.8 V	Ignition switch ON
	9	Blank	—	—
	10	Sensor ground	—	—
	11	Shift solenoid – B (A/T)	0 V	Ignition switch ON, Select lever at P-range
			10 – 14 V	Ignition switch ON, Select lever at D-range
	12	Blank	—	—
	13	Blank	—	—
	14	Blank	—	—
	15	Blank	—	—
	16	Tachometer (if equipped)	0 – 1 V	Ignition switch ON
	17	Engine start switch (Engine start signal)	6 – 12 V	While engine cranking
			0 – 1 V	Other than above



1. ECM (PCM) coupler disconnected
2. Ohmmeter

Resistance Check

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

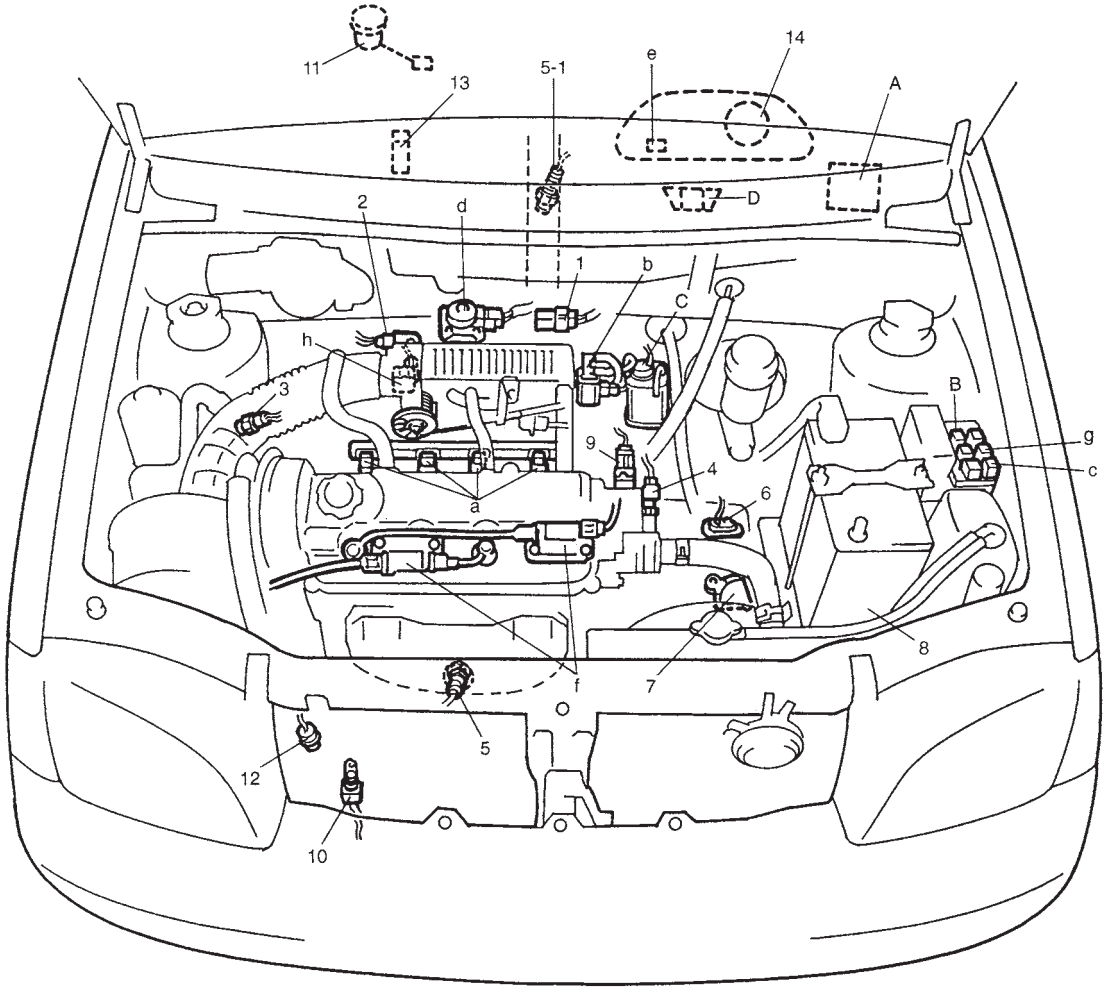
CAUTION:
Never touch terminals of ECM (PCM) itself or connect voltmeter or ohmmeter.

2) Check resistance between each terminal of couplers disconnected.

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

TERMINALS	CIRCUIT	STANDARD RESISTANCE
C01-7 to C03-6	HO2S-1 heater	11.7 – 15.6 Ω
C02-4 to C03-6	HO2S-2 heater	11.7 – 15.6 Ω
C01-9 to C02-5/6	No.1 injector	12.0 – 13.0 Ω
C01-21 to C02-5/6	No.2 injector	12.0 – 13.0 Ω
C01-31 to C02-5/6	No.3 injector	12.0 – 13.0 Ω
C01-8 to C02-5/6	No.4 injector	12.0 – 13.0 Ω
C02-2 to C02-5/6	EGR valve (stepper motor coil 4)	20 – 24 Ω
C02-9 to C02-5/6	EGR valve (stepper motor coil 3)	20 – 24 Ω
C02-8 to C02-5/6	EGR valve (stepper motor coil 2)	20 – 24 Ω
C02-17 to C02-5/6	EGR valve (stepper motor coil 1)	20 – 24 Ω
C01-4 to C02-5/6	EVAP canister purge valve	30 – 34 Ω
C02-19 to C03-6	Fuel pump relay	70 – 110 Ω
C02-1 to Body ground	A/C control module	No continuity
C02-18 to C02-5/6	Radiator fan control relay	70 – 110 Ω
C02-10 to C02-7	Main relay	70 – 110 Ω
C01-1 to Body ground	Ground	Continuity
C01-2 to Body ground	Ground	Continuity
C01-3 to Body ground	Ground	Continuity

COMPONENT LOCATION



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

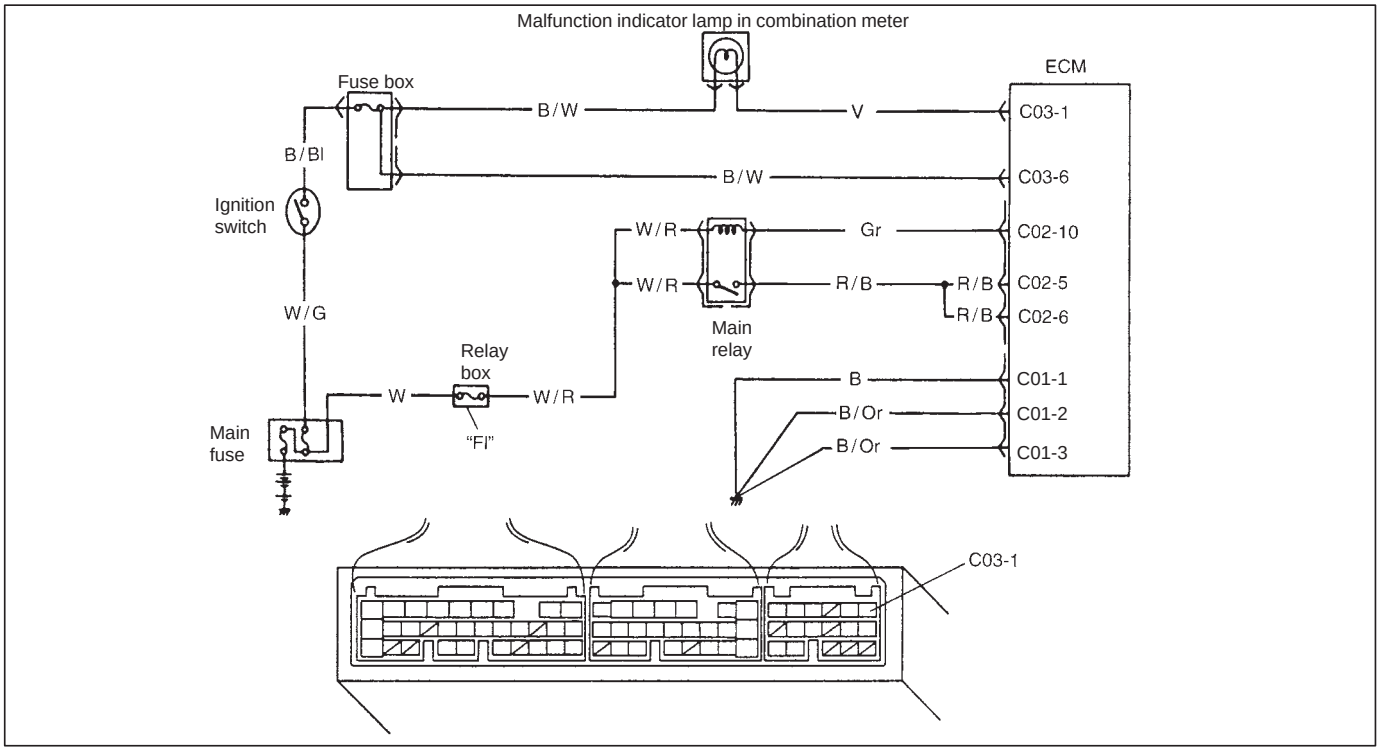
6. VSS (A/T)
7. Transmission range switch (A/T)
8. Battery
9. CMP sensor
10. CKP sensor
11. Fuel level sensor (gauge) (in fuel tank)
12. PSP switch
13. A/C control module (if equipped)
14. VSS (speedometer) (M/T)

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

TABLE A-1 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK – LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON (BUT ENGINE AT STOP)

CIRCUIT DESCRIPTION



When the ignition switch is turned ON, ECM (PCM) causes the main relay to turn ON (close the contact point). Then, ECM (PCM) being supplied with the main power, turns ON the malfunction indicator lamp (MIL). When the engine starts to run and no malfunction is detected in the system, MIL goes OFF but if a malfunction was or is detected, MIL remains ON even when the engine is running.

INSPECTION

STEP	ACTION	YES	NO
1	MIL Power Supply Check 1) Turn ignition switch ON. Do other indicator/warning lights in combination meter comes ON?	Go to Step 2.	"IG" fuse blown, main fuse blown, ignition switch malfunction, "B/W" circuit between "IG" fuse and combination meter or poor coupler connection at combination meter.
2	ECM (PCM) Power and Ground Circuit Check Does engine start?	Go to Step 3.	Go to TABLE A-3 ECM (PCM) POWER AND GROUND CIRCUIT CHECK. If engine is not cranked, go to DIAGNOSIS in SECTION 6G.
3	MIL Circuit Check 1) Turn ignition switch OFF and disconnect connectors from ECM (PCM). 2) Check for proper connection to ECM (PCM) at terminal C03-1. 3) If OK, then using service wire, ground terminal C03-1 in connector disconnected. Does MIL turn on at ignition switch ON?	Substitute a known-good ECM (PCM) and recheck.	Bulb burned out or "V" wire circuit open.

TABLE A-2 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK – LAMP REMAINS "ON" AFTER ENGINE STARTS

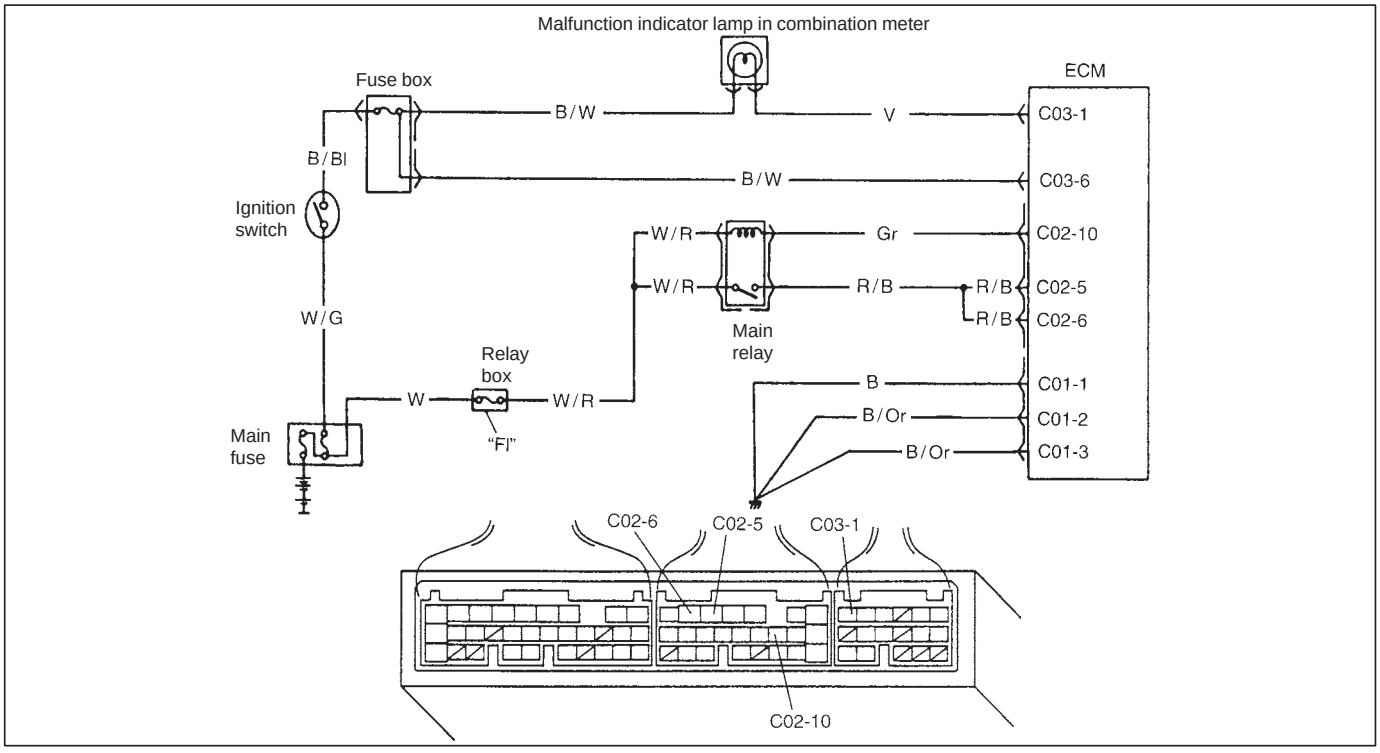
WIRING DIAGRAM/CIRCUIT DESCRIPTION – Refer to table A-1.

INSPECTION

STEP	ACTION	YES	NO
1	Diagnostic Trouble Code (DTC) check 1) Check DTC referring to DTC CHECK section. Is there any DTC(s)?	Go to Step 2 of ENGINE DIAG. FLOW TABLE.	Go to Step 2.
2	DTC check Start engine and recheck DTC while engine running. Is there any DTC(s)?		Go to Step 3.
3	MIL Circuit check 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM (PCM). Does MIL turn ON at ignition switch ON?	"V" wire circuit shorted to ground.	Substitute a known-good ECM (PCM) and recheck.

TABLE A-3 ECM (PCM) POWER AND GROUND CIRCUIT CHECK – MIL DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP

CIRCUIT DESCRIPTION



When the ignition switch tuned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM (PCM).

INSPECTION

STEP	ACTION	YES	NO
1	Main Relay Operating Sound Check Is operating sound of main relay heard at ignition switch ON?	Go to Step 5.	Go to Step 2.
2	Main Relay Check 1) Turn OFF ignition switch and remove main relay (1). 2) Check for proper connection to main relay (1) at terminal 3 and 4. 3) Check resistance between each two terminals. See Fig. 1 and 2. Between terminals 1 and 2: Infinity Between terminals 3 and 4: 100 – 150 Ω 4) Check that there is continuity between terminals 1 and 2 when battery is connected to terminals 3 and 4. See Fig. 3. Is main relay in good condition?	Go to Step 3.	Replace main relay.
3	Fuse Check Is main "FI" fuse in good condition?	Go to Step 4.	Check for short in circuits connected to this fuse.
4	ECM (PCM) Power Circuit Check 1) Turn OFF ignition switch, disconnect connectors from ECM (PCM) and install main relay. 2) Check for proper connection to ECM (PCM) at terminals C03-6, C02-10, C02-5 and C02-6. 3) If OK, then measure voltage between terminal C03-6 and ground, C02-10 and ground with ignition switch ON. Is each voltage 10 – 14 V?	Go to Step 5.	"B/W", "W/R" or "Gr" circuit open.

STEP	ACTION	YES	NO
5	ECM (PCM) Power Circuit Check 1) Using service wire, ground terminal C02-10 and measure voltage between terminal C02-5/6 and ground at ignition switch ON. Is it 10 – 14 V?	Check ground circuits "B/Y" and "B" for open. If OK, then substitute a known-good ECM (PCM) and recheck.	Go to Step 6.
6	Is operating sound of main relay heard in Step 1?	Go to Step 7.	"W/R" or "R/B" wire open.
7	Main Relay Check 1) Check main relay according to procedure in Step 2. Is main relay in good condition?	"W/R" or "R/B" wire open.	Replace main relay.

Fig. 1 for Step 2

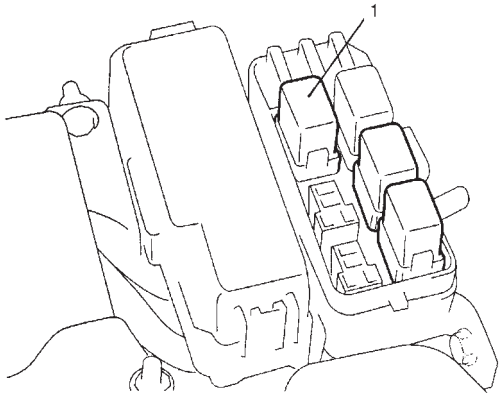


Fig. 2 for Step 2

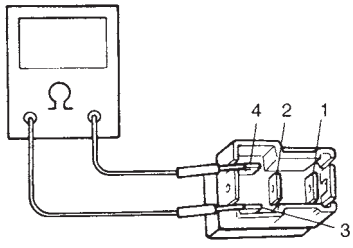
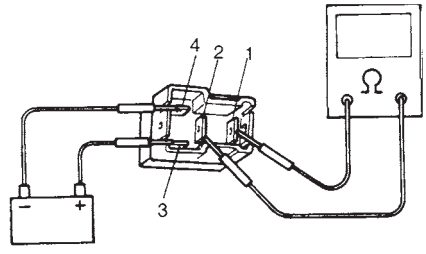
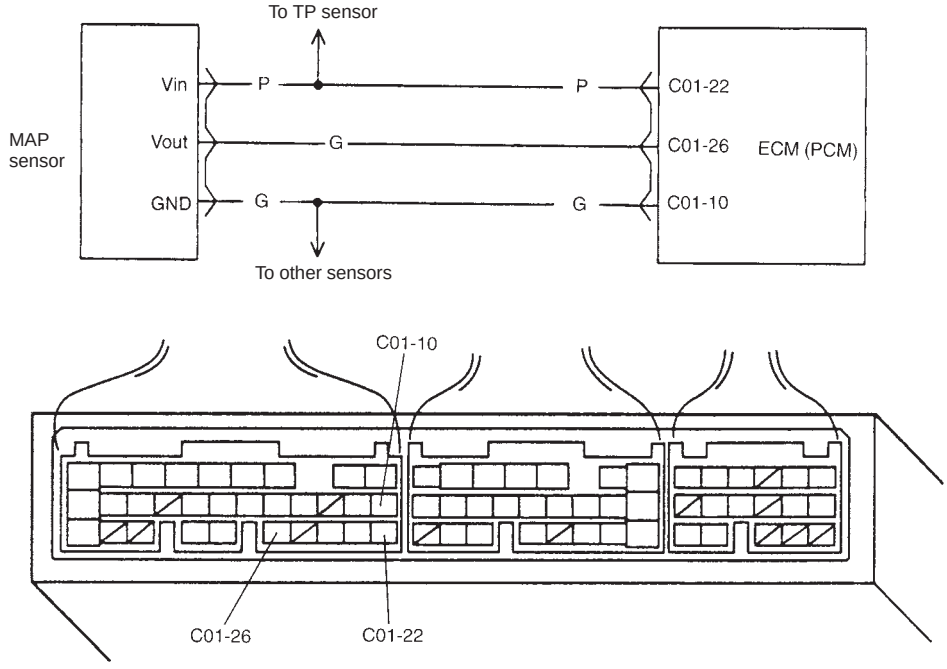


Fig. 3 for Step 2



DTC P0105 MANIFOLD ABSOLUTE PRESSURE (MAP) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

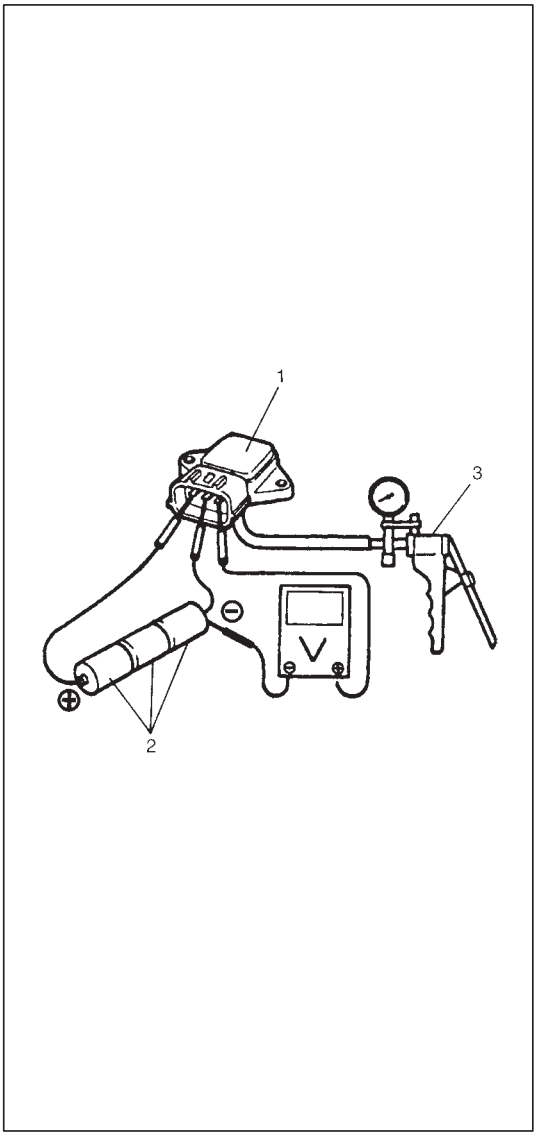


DTC DETECTING CONDITION	POSSIBLE CAUSE
● MAP: 4.9 kpa, 37 mmHg or less (Low pressure – High vacuums – Low voltage) ● MAP: 114.7 kpa, 860 mmHg or more (High pressure – Low vacuums – High voltage)	● "G" circuit open ● "P" circuit open or shorted to ground ● "G" circuit open or shorted to ground ● MAP sensor malfunction ● ECM (PCM) malfunction

NOTE:
When DTC P0120 is indicated together, it is possible that "P" circuit is open.

DTC CONFIRMATION PROCEDURE

1) Clear DTC, start engine and keep it at idle for 1 min.
2) Select "DTC" mode on scan tool and check DTC.



MAP Sensor Individual Check

1) Disconnect coupler from MAP sensor (1).
2) Remove MAP sensor (1).
3) Arrange 3 new 1.5 V batteries (2) 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 400 mmHg by using vacuum pump (3).

   Output voltage (Vin voltage 4.5 – 5.5 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	3.3 – 4.3
2 001 | 5 000	611 | 1 524	Under 707 over 634	94 | 85	3.0 – 4.1
5 001 | 8 000	1 525 | 2 438	Under 634 over 567	85 | 76	2.7 – 3.7
8 001 | 10 000	2 439 | 3 048	Under 567 over 526	76 | 70	2.5 – 3.3

   If check result is not satisfactory, replace MAP sensor (1).

4) Install MAP sensor (1) securely.
5) Connect MAP sensor (1) coupler securely.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check MAP Sensor and Its Circuit. 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake manifold pressure. See Fig. 1. Is it 114.7 kPa or more or 4.9 kPa or less?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “INTERMITTENT AND POOR CONNECTION” in Section 0A.
3	Check Wire Harness. 1) Disconnect MAP sensor connector with ignition switch OFF. 2) Check for proper connection of MAP sensor at “Gr” and “G” wire terminals. 3) If OK, then with ignition switch ON, check voltage at each of “P” and “Gr” wire terminals. See Fig. 2. Is voltage about 4 – 6 V at each terminal?	Go to Step 4.	“P” wire open or shorted to ground circuit or shorted to power circuit, “Gr” wire open or shorted to ground, poor C03-5 connection or C01-22 connection. If wire and connection are OK, confirm that MAP sensor is normal and then substitute a known-good ECM (PCM) and recheck. **NOTE: When battery voltage is applied to “P” wire, it is possible that MAP sensor is also faulty.**
4	Check MAP sensor according to “MAP Sensor Individual Check” below. Is it in good condition?	“P” wire shorted to “Gr” wire, “G” wire open, poor C01-10 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace MAP sensor.

Fig. 1 for Step 2

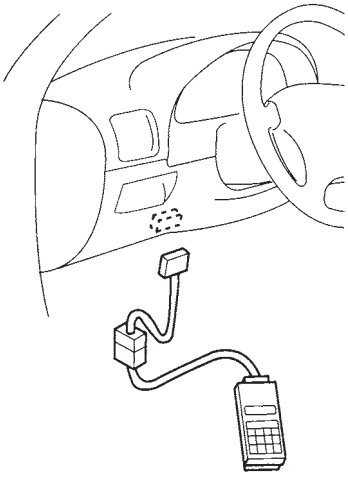
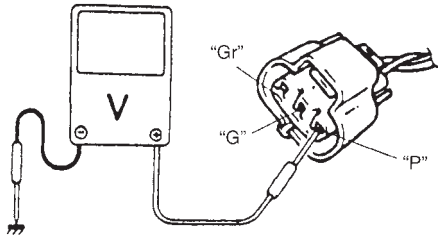
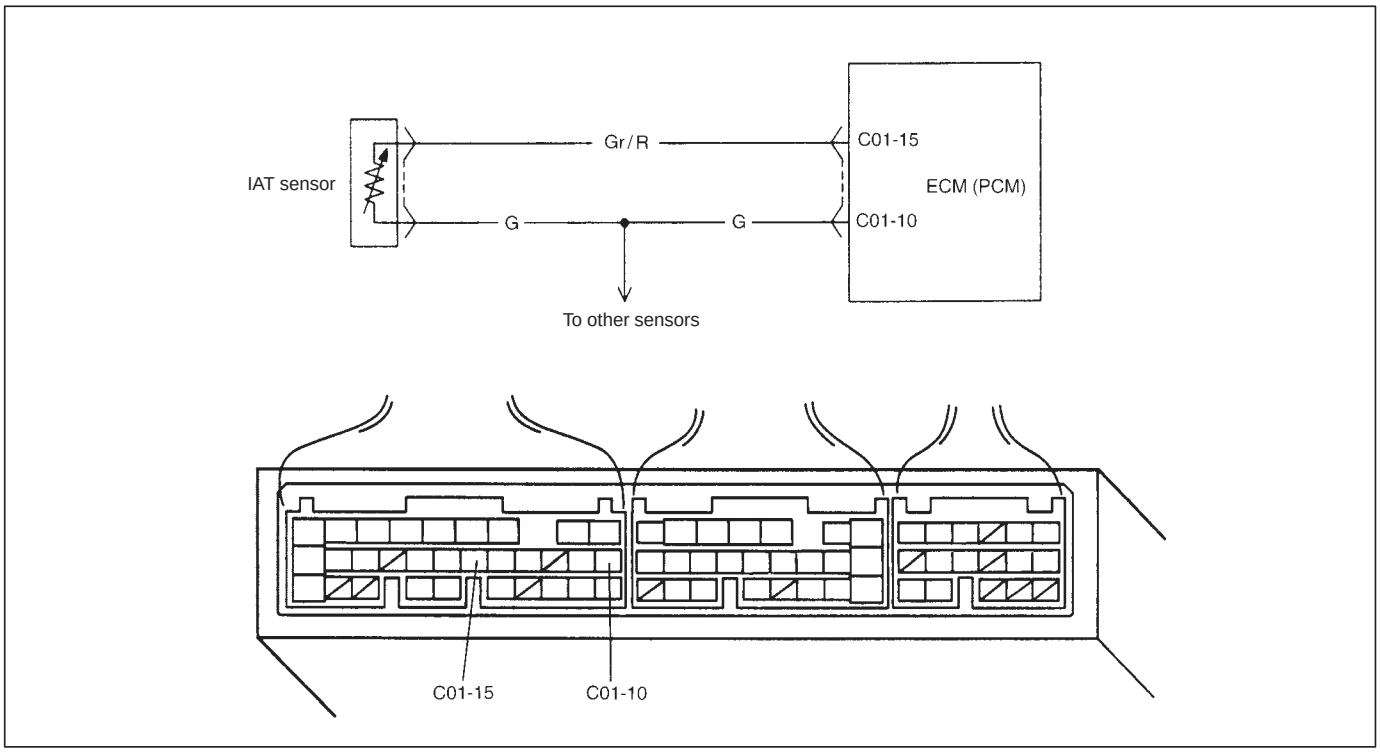


Fig. 2 for Step 3



DTC P0110 INTAKE AIR TEMP. (IAT) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low intake air temperature (High voltage-High resistance) ● High intake air temperature (Low voltage-Low resistance)	● "Gr/R" circuit open or shorted to power ● "G" circuit open ● IAT sensor malfunction ● ECM (PCM) malfunction

NOTE:

- **When DTC P0115 and P0120 are indicated together, it is possible that "G" circuit is open.**
- **Before inspecting, be sure to check that ambient temperature is higher than −40°C (−40°F).**

DTC CONFIRMATION PROCEDURE

1) Clear DTC, start engine and keep it at idle for 1 min.
2) Select "DTC" mode no scan tool and check DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check IAT Sensor and Its Circuit. 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake air temp. displayed on scan tool. See Fig. 1. Is –40°C (–40°F) or 119°C (246°F) indicated?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.
3	Check Wire Harness. 1) Disconnect IAT sensor connector with ignition switch OFF. 2) Check for proper connection to IAT sensor at “Gr/R” and “G” wire terminals. 3) If OK, then with ignition switch ON, is voltage applied to “Gr/R” wire terminal about 4 – 6 V? See Fig. 2.	Go to Step 5.	“Gr/R” wire open or shorted to power, or poor C01-15 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.
4	Does scan tool indicate –40°C (–40°F) at Step 2.	Go to Step 6.	Go to Step 5.
5	Check Wire Harness 1) Check intake air temp. displayed on scan tool with ignition switch ON. Is –40°C (–40°F) indicated?	Replace IAT sensor.	“Gr/R” wire shorted to ground. If wire is OK, substitute a known-good ECM (PCM) and recheck.
6	Check Wire Harness. 1) Using service wire, connect IAT sensor connector terminals. 2) Check intake air temp. displayed on scan tool with ignition switch ON. See Fig. 3. Is 119°C (246°F) indicated?	Replace IAT sensor.	“Gr/R” wire open or poor C01-10 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.

Fig. 1 for Step 2

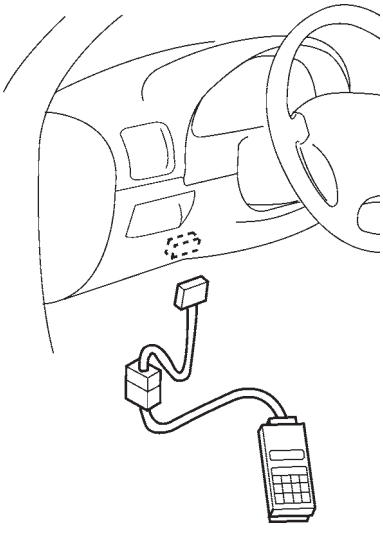


Fig. 2 for Step 3

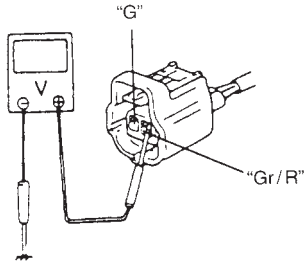
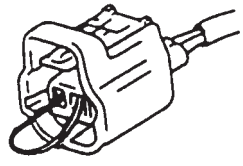
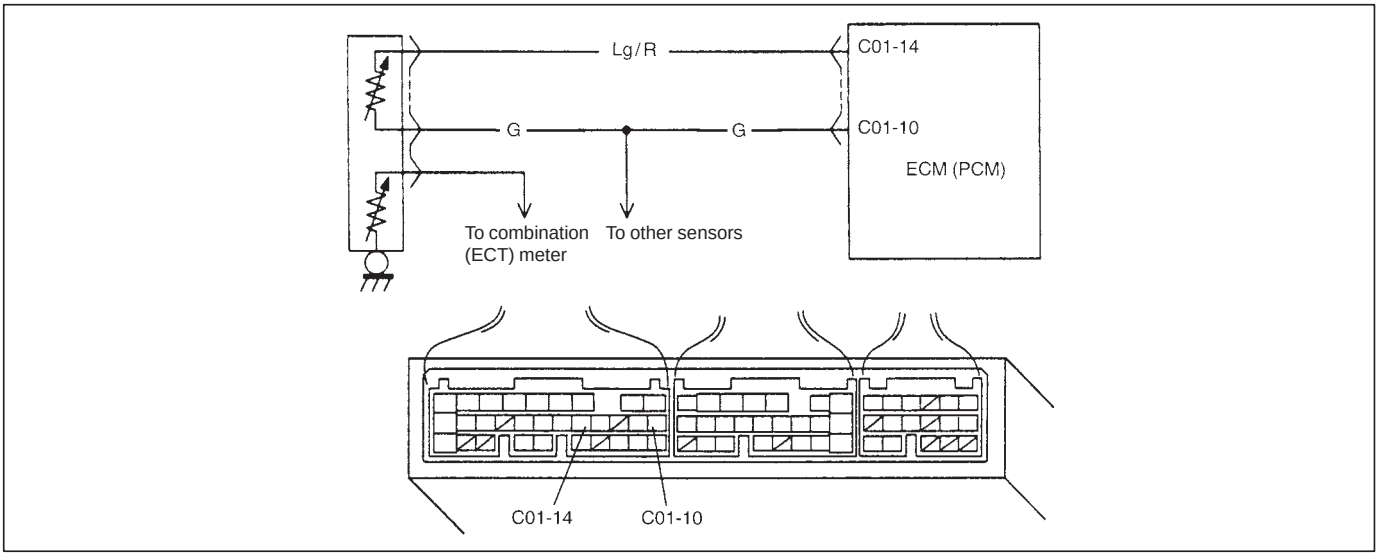


Fig. 3 for Step 4



DTC P0115 ENGINE COOLANT TEMPERATURE (ECT) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low engine coolant temperature (High voltage-High resistance) ● High engine coolant temperature (Low voltage-Low resistance)	● "Lg/R" circuit open or shorted to power ● "G" circuit open ● ECT sensor malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

1) Clear DTC, start engine and keep it at idle for 1 min.
2) Select "DTC" mode on scan tool and check DTC.

NOTE:
Before inspecting, be sure to check that coolant temp. meter in combination meter indicates normal operating temperature (Engine is not overheating).

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check ECT Sensor and Its Circuit. 1) Connect scan tool with ignition switch OFF. 2) Turn ignition switch ON. 3) Check engine coolant temp. displayed on scan tool. See Fig. 1. Is –40°C (–40°F) or 119°C (246°F) indicated?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0 A.
3	Check Wire Harness. 1) Disconnect ECT sensor connector. 2) Check engine coolant temp. displayed on scan tool. Is –40°C (–40°F) indicated?	Replace ECT sensor.	“Lg/R” wire shorted to ground. If wire is OK, substitute a known-good ECM (PCM) and recheck.
4	Does scan tool indicate –40°C (–40°F) at Step 2.	Go to Step 6.	Go to Step 5.
5	Check Wire Harness. 1) Disconnect ECT sensor connector with ignition switch OFF. 2) Check for proper connection to ECT sensor at “G” and “Lg/R” wire terminals. 3) If OK, then with ignition switch ON, is voltage applied to “G” wire terminal about 4 – 6 V? See Fig. 2.	Go to Step 4.	“Lg/R” wire open or shorted to power, or poor C01-14 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.
6	Check Wire Harness. 1) Using service wire, connect ECT sensor connector terminals. See Fig. 3. 2) Turn ignition switch ON and check engine coolant temp. displayed on scan tool. Is 119°C (246°F) indicated?	Replace ECT sensor.	“G” wire open or poor C01-10 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.

Fig. 1 for Step 2

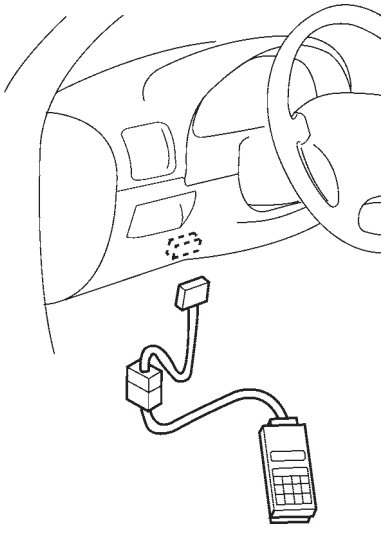


Fig. 2 for Step 5

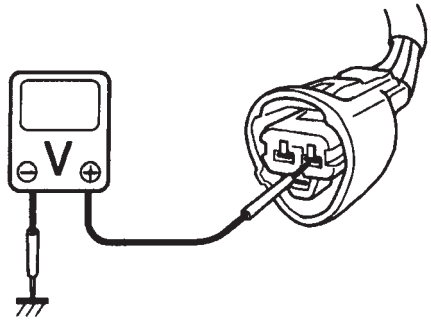
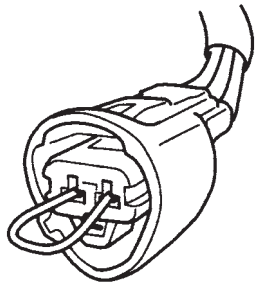
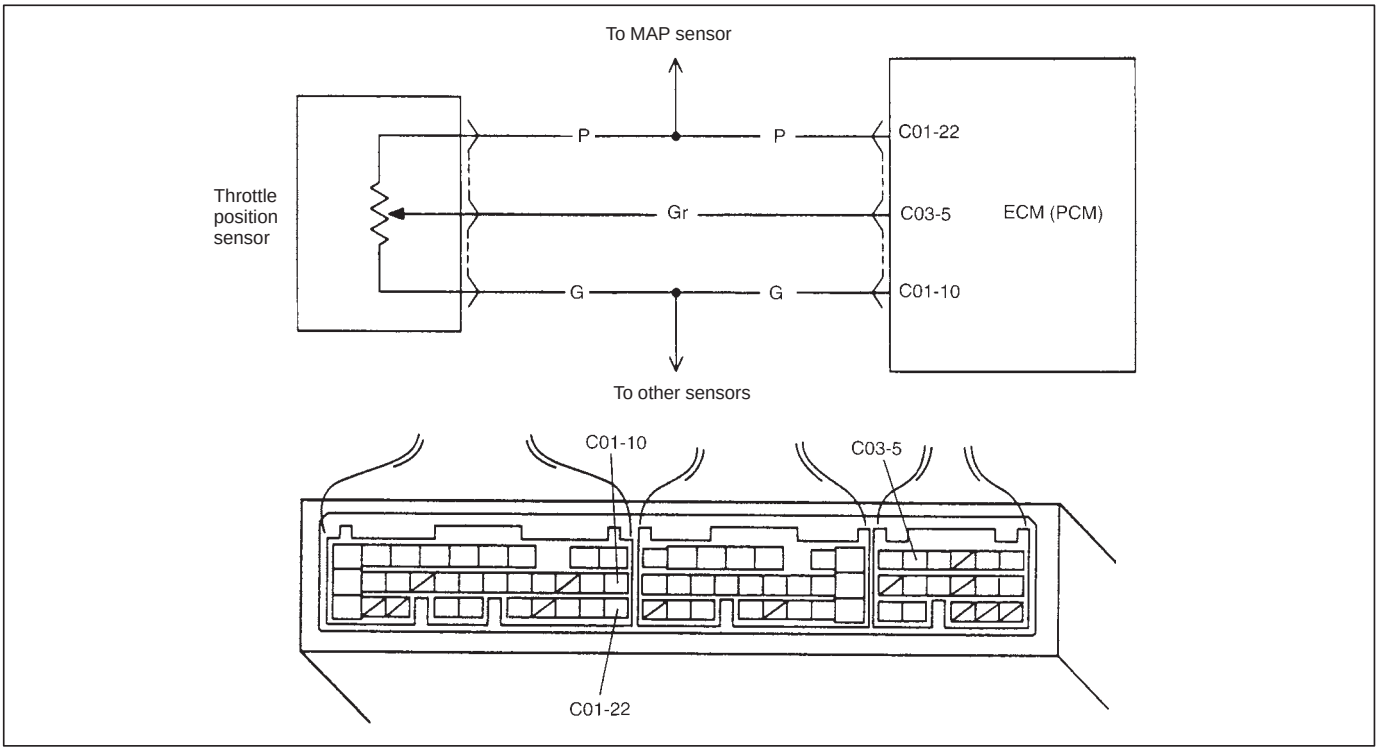


Fig. 3 for Step 6



DTC P0120 THROTTLE POSITION CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Signal voltage high ● Signal voltage low	● "G" circuit open ● "Gr" circuit open or shorted to ground ● "P" circuit open or shorted to power or ground ● TP sensor malfunction ● ECM (PCM) malfunction

NOTE:

- **When DTC P0105, P0110, P0115 and/or P0120 are/is indicated together, it is possible that "G" circuit is open.**
- **When DTC P0105 and/or P0120 are/is indicated together, it is possible that "P" circuit is open.**

DTC CONFIRMATION PROCEDURE

1) Clear DTC, start engine and keep it at idle for 1 min.
2) Select "DTC" mode on scan tool and check DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check TP Sensor and Its Circuit. 1) Connect scan tool to DLC with ignition switch OFF and then turn ignition switch ON. 2) Check throttle valve opening percentage displayed on scan tool. See Fig. 1. Is it displayed 2% or less? 3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position. See Fig. 1. Is it displayed 96% or higher?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.
3	Check Wire Harness. 1) Disconnect connector from TP sensor with ignition switch OFF. 2) Check for proper connection to TP sensor at “P”, “Gr” and “G” wire terminal. 3) If OK, then with ignition switch ON, check voltage at each of “P” and “Gr” wire terminals. See Fig. 2. Is voltage about 4 – 6 V at each terminal?	Go to Step 4.	“P” wire open, “P” wire shorted to ground circuit or power circuit or “G” wire, “Gr” wire open or shorted to ground circuit or poor C01-22 or C03-5 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.
4	Check TP Sensor. 1) Check resistance between terminals of TP sensor. See Fig. 3. Between 1 and 2: 2.5 – 6.0 kΩ Between 1 and 3: 170 Ω – 15.5 kΩ Are measured values within specifications?	“G” wire open or poor C01-10 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace TP sensor.

Fig. 1 for Step 2

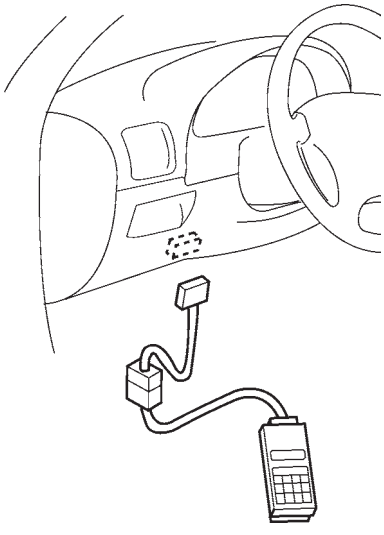


Fig. 2 for Step 3

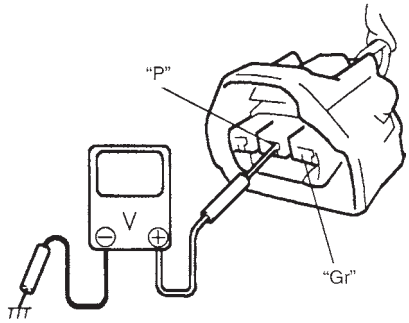
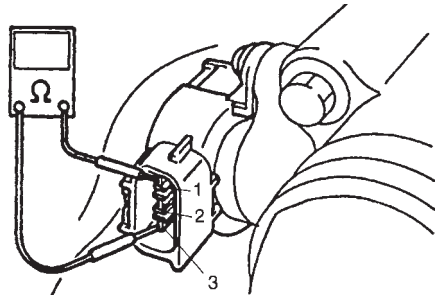
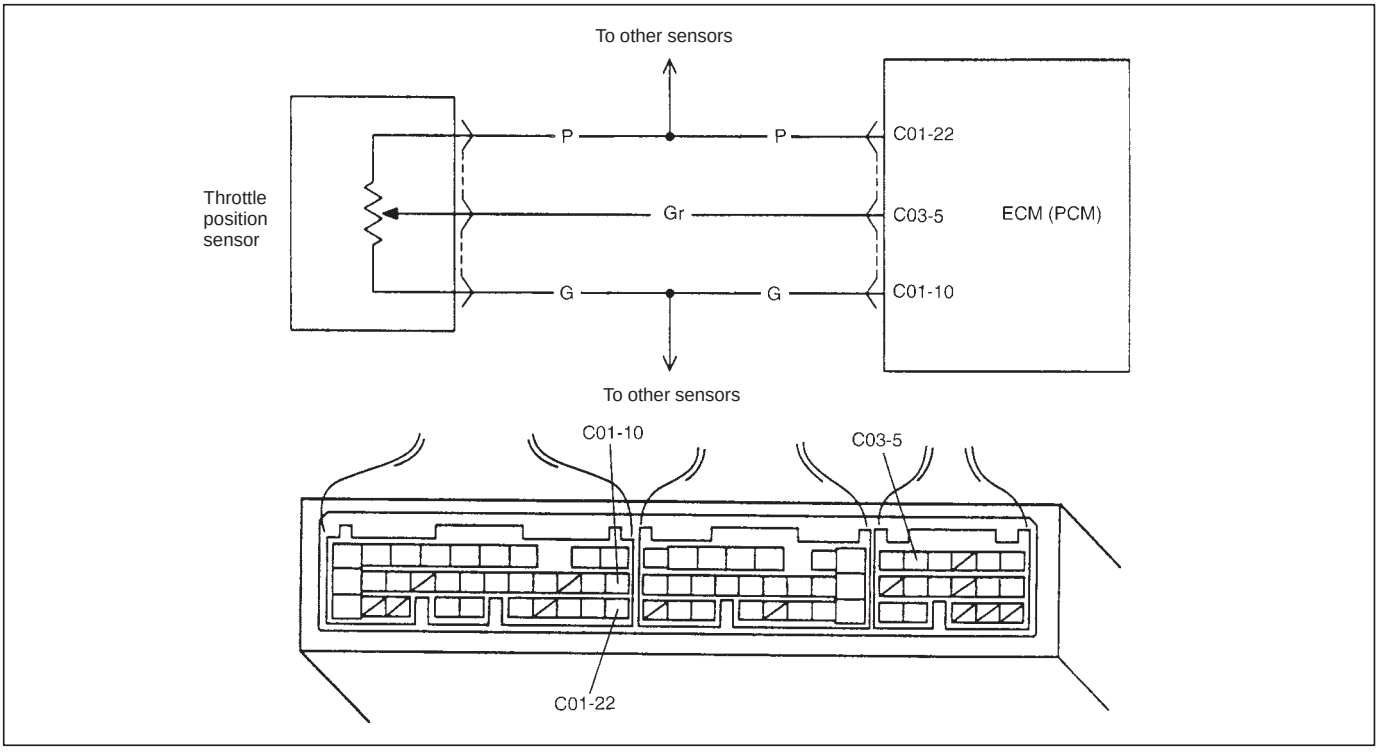


Fig. 3 for Step 4



DTC P0121 THROTTLE POSITION CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● After engine warmed up. ● While vehicle running at specified engine speed. ● No change in intake manifold pressure (constant throttle opening) ● Difference between actual throttle opening (detected from TP sensor) and opening calculated by ECM (PCM) (Obtained on the basis of engine speed and intake manifold pressure) in larger than specified value. ⁎ 2 driving cycle detection logic, continuous monitoring	● TP sensor malfunction ● High resistance in the circuit ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF. Clear DTC with ignition switch ON, check vehicle and environmental condition for:
   – Indication of fuel level meter in combination meter: 1/4 or more
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 176°F)
   – Engine coolant temp.: 70°C, 158°F or higher
2) Warm up engine to normal operating temperature.
3) Increase vehicle speed to 30 – 40 mph, 50 – 60 km/h in 3rd gear or “D” range and hold throttle valve at that opening position for 1 min.
4) Stop vehicle.
5) Check DTC in “DTC” mode and pending DTC in “ON BOARD TEST” or “PENDING DTC” mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check TP Sensor and Its Circuit. When using SUZUKI scan tool: 1) Turn ignition switch OFF and connect SUZUKI scan tool to DLC. 2) Turn ignition switch ON and check TP sensor output voltage when throttle valve is at idle position and fully opened. See Fig. 1 and 3. When not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminal C03-5 of ECM (PCM) connector connected, when throttle valve is at idle position and fully opened. See Fig. 2 and 3. Dose voltage vary within specified value linearly as shown in figure?	If voltmeter was used, check terminal C03-5 for poor connection. If OK, substitute a known-good ECM (PCM) and recheck.	Go to Step 3.
3	Check TP Sensor. 1) Turn ignition switch OFF. 2) Disconnect TP sensor connector. 3) Check for proper connection to TP sensor at each terminal. 4) If OK, then measure resistance between terminals and check if each measured value is as specified below. See Fig. 4. Between 1 and 2: 2.5 – 6.0 kΩ Between 1 and 3: 170 Ω – 15.5 kΩ, varying according to throttle valve opening. Are measured values as specified?	High resistance in “P”, “Gr” or “G” circuit. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace TP sensor.

Fig. 1 for Step 2

When using SUZUKI scan tool:

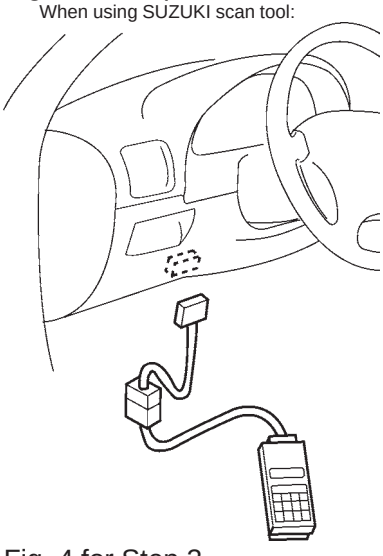


Fig. 2 for Step 2

When not using SUZUKI scan tool:

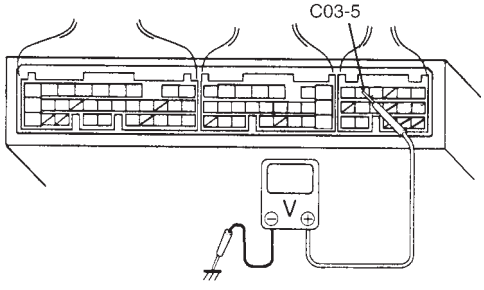


Fig. 3 for Step 2

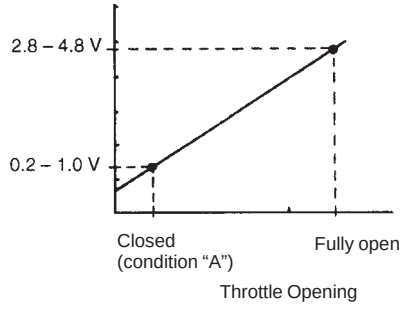
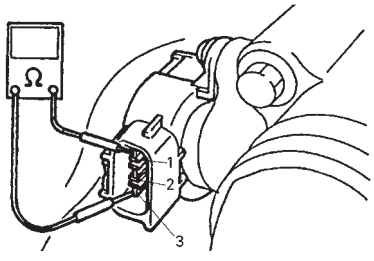
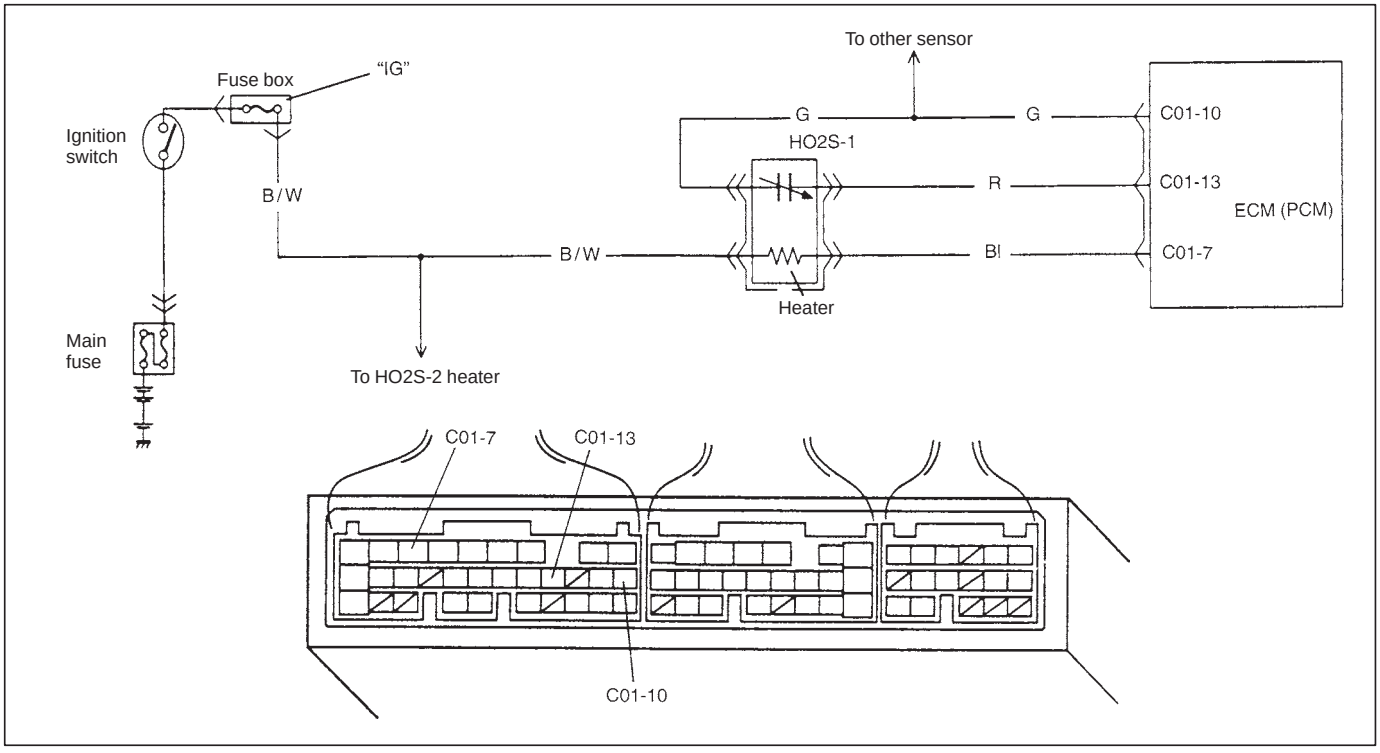


Fig. 4 for Step 3



DTC P0130 HEATED OXYGEN SENSOR (HO2S) CIRCUIT MALFUNCTION (SENSOR-1)

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● When running at idle speed after engine warmed up and running at specified vehicle speed, HO2S-1 output voltage does not go 0.3 V below or over 0.6 V. ✳ 2 driving cycle detection logic, Monitoring once/1 driving.	● Heated oxygen sensor-1 malfunction ● "G" or "R" circuit open (poor connection) or short

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF. Clear DTC with ignition switch ON, check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 176°F)
2) Warm up engine to normal operating temperature.
3) Drive vehicle at 38 – 50 mph, 60 – 80 km/h for 2 min.
4) Stop vehicle and run engine at idle for 2 min.
5) Check DTC in "DTC" mode and pending DTC in "ON BOARD TEST" or "PENDING DTC" mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Is there DTC(s) other than HO2S-1 (DTC P0130)?	Go to applicable DTC Diag. Flow Table.	Go to Step 3.
3	1) Connect scan tool to DLC with ignition switch OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously and take foot off from pedal to enrich and enlean A/F mixture). See Fig. 1 and 2. Does HO2S-1 output voltage deflect between 0.3 V and over 0.6 V repeatedly?	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Check “R” and “G” wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-1.

Fig. 1 for Step 3

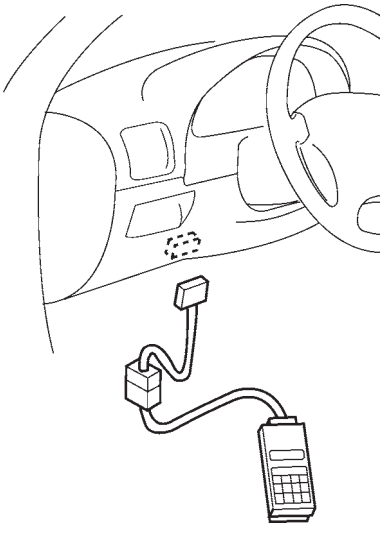
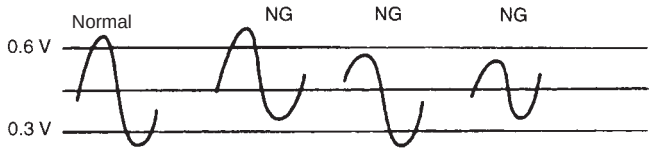


Fig. 2 for Step 3

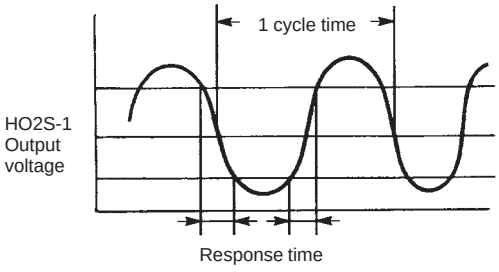


DTC P0133 HEATED OXYGEN SENSOR (HO2S) CIRCUIT SLOW RESPONSE (SENSOR-1)

WIRING DIAGRAM/CIRCUIT DESCRIPTION – Refer to DTC P0130 section.

DTC DETECTING CONDITION	POSSIBLE CAUSE
● When running at specified idle speed after engine warmed up and running at specified vehicle speed, response time (time to change from lean to rich or from rich to lean) of HO2S-1 output voltage is about 1 sec. at minimum or average time of 1 cycle is 5 sec. at minimum. See. Fig. 1 ⁎ 2 driving cycle detection logic, Monitoring once/1 driving.	● Heated oxygen sensor-1 malfunction

Fig. 1



DTC CONFIRMATION PROCEDURE – Refer to DTC P0130 section.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Is there DTC(s) other than HO2S-1 (DTC P0133)?	Go to applicable DTC Diag. Flow Table.	Replace HO2S-1.

DTC P0134 HEATED OXYGEN SENSOR (HO2S) CIRCUIT NO ACTIVITY DETECTED (SENSOR-1)

CIRCUIT DESCRIPTION – Refer to DTC P0130 section.

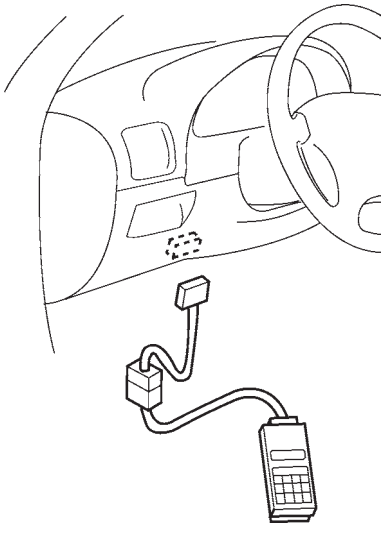
DTC DETECTING CONDITION	POSSIBLE CAUSE
● Engine warmed up. ● While running under other than high load and high engine speed conditions or at specified idle speed (engine is in closed loop condition), HO2S-1 output voltage is high or low continuously. ⁎ 2 driving cycle detection logic, Continuous monitoring.	● "G" or "R" circuit open or short ● Heated oxygen sensor malfunction ● Fuel system malfunction ● Exhaust gas leakage

DTC CONFIRMATION PROCEDURE – Refer to DTC P0130 section.

INSPECTION

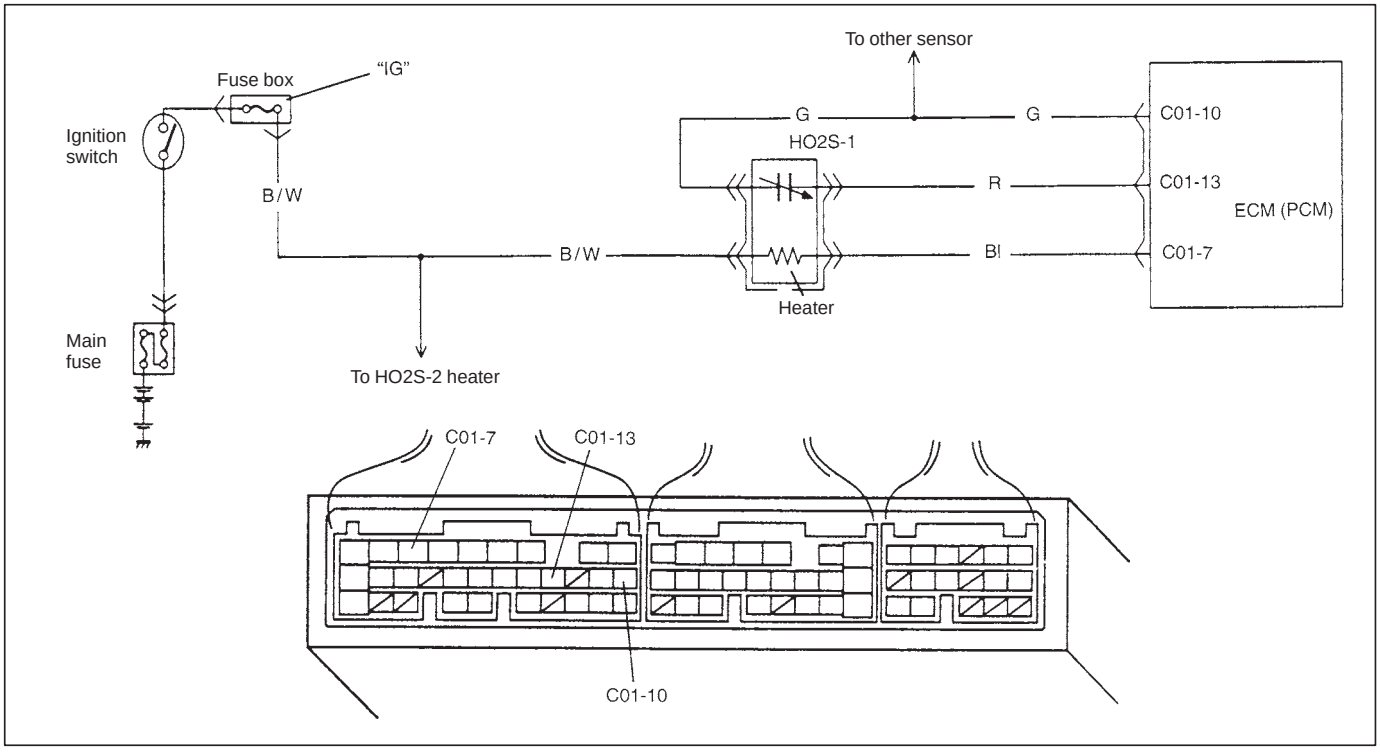
STEP	ACTION	YES	NO
1	Was "ENGINE DIAG. FLOW TABLE" performed?	Go to Step 2.	Go to "ENGINE DIAG. FLOW TABLE".
2	Is there DTC(s) other than Fuel system (DTC P0171/P0172) and HO2S-1 (DTC P0134)?	Go to applicable DTC Diag. Flow Table.	Go to Step 3.
3	Check HO2S-1 and Its Circuit. 1) Connect scan tool to DLC with ignition switch OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously and take foot off from pedal to enrich and enlean A/F mixture). See Fig. 1. Does HO2S-1 output voltage deflect between 0.3 V and over 0.6 V repeatedly?	Go to DTC P0171 and P0172 Diag. Flow Table (Fuel System Check).	Check "R" and "G" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-1.

Fig. 1 for Step 3



DTC P0135 HEATED OXYGEN SENSOR (HO2S) HEATER CIRCUIT MALFUNCTION (SENSOR-1)

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC will set when A or B condition is met. A: ● Low voltage at terminal C01-7 when engine is running at high load. B: ● High voltage at terminal C01-7 when engine is running under condition other than above. ※ 2 driving cycle detection logic, Continuous monitoring.	● HO2S-1 heater circuit open or shorted to ground ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON, start engine and keep it at idle for 1 min.
3) Start vehicle and depress accelerator pedal fully for 5 sec. or longer.
4) Stop vehicle.
5) Check DTC in "DTC" mode and pending DTC in "ON BOARD TEST" or "PENDING DTC" mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go t o“ENGINE DIAG. FLOW TABLE”.
2	Check Heater for Operation. 1) Check voltage at terminal C01-7. See Fig. 1. 2) Warm up engine to normal operating temperature. 3) Stop engine. 4) Turn ignition switch ON and Check voltage at terminal C01-7. See Fig. 1. Voltage should be over 10 V. 5) Start engine, run it at idle and check voltage at the same terminal. Voltage should be below 1.9 V. Are check results are specified?	Intermittent trouble Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check Heater of Sensor-1. 1) Disconnect HO2S-1 coupler with ignition switch OFF. 2) Check for proper connection to HO2S-1 at “B/W” and “Bl” wire terminals. 3) If OK, then check heater resistance. See Fig. 2. Is it 11.7 – 14.3 Ω at 20°C, 68°F?	“Bl” wire open or shorted to ground or poor connection at C01-7. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace HO2S-1.

Fig. 1 for Step 2

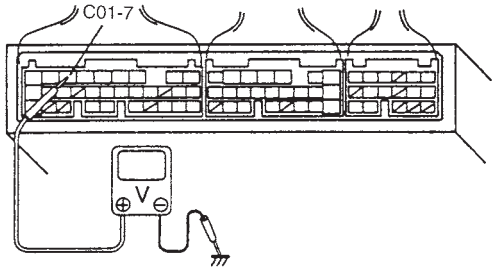
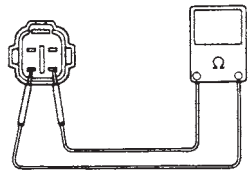
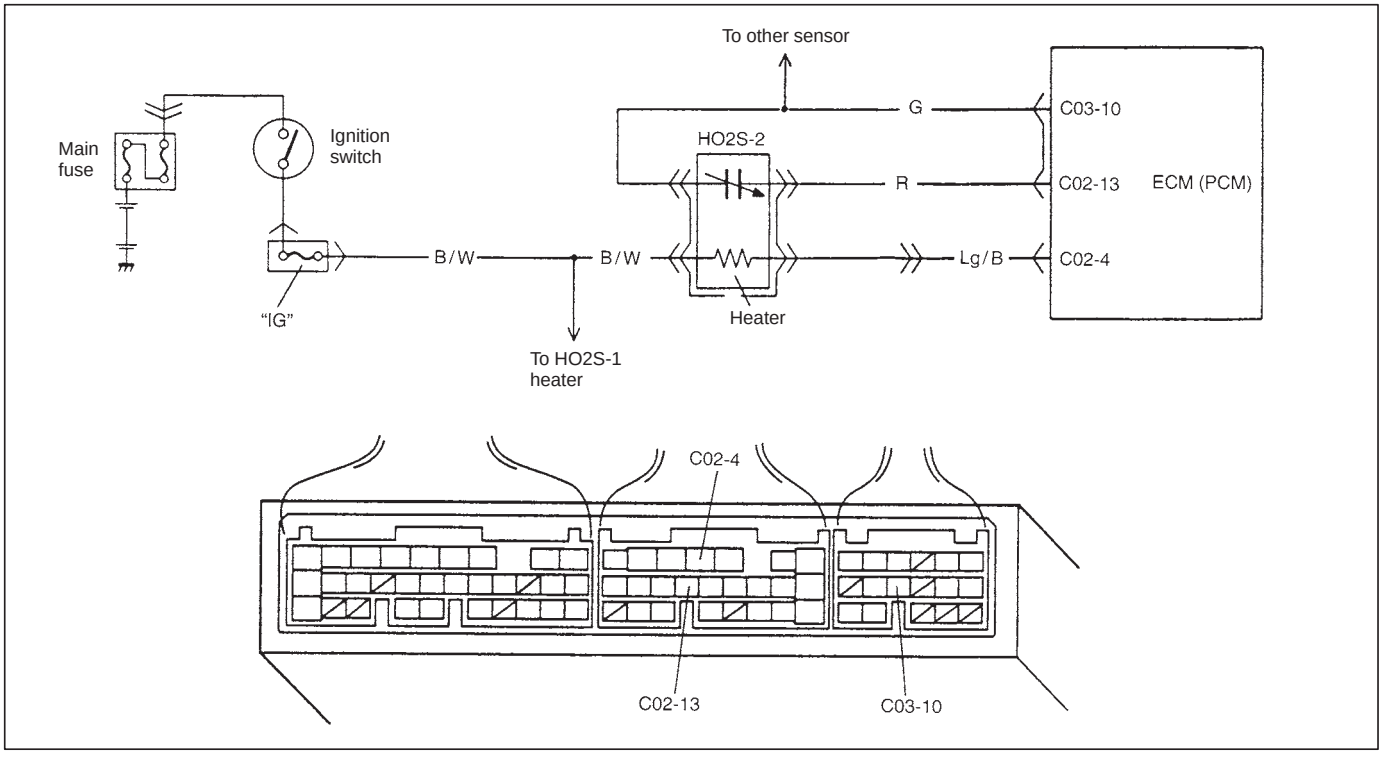


Fig. 2 for Step 3



DTC P0136 HEATED OXYGEN SENSOR (HO2S) CIRCUIT MALFUNCTION (SENSOR-2)

CIRCUIT DESCRIPTION

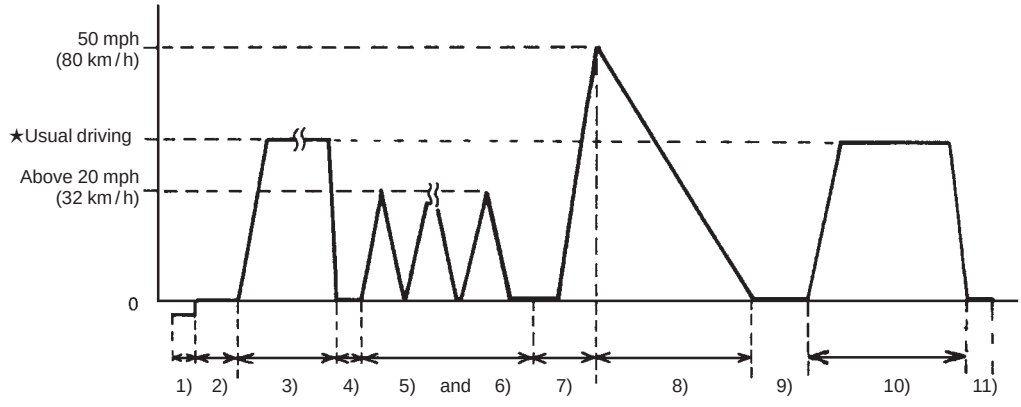


DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC will set when A or B condition is detected. A. Max. output voltage of HO2S-2 is lower than specified value or Min. output voltage is higher than specified value while vehicle driving. B. Engine is warmed up and HO2S-2 voltage is 4.5 V or more. (circuit open) ⁎ 2 driving cycle detection logic, monitoring once/1 driving.	● Exhaust gas leakage ● "G" or "R" circuit open or short ● Heated oxygen sensor-2 malfunction ● Fuel system malfunction

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF.
   Clear DTC with ignition switch ON, check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: –10°C, 14°F or higher
   – No exhaust gas leakage and loose connection
2) Warm up engine to normal operating temperature.
3) Drive vehicle under usual driving condition for 5 min. and check HO2S-2 output voltage and “short term fuel trim” with “Data List” mode on scan tool, and write it down.
4) Stop vehicle (don’t turn ignition switch OFF).
5) Increase vehicle speed to higher than 20 mph, 32 km/h and then stop vehicle.
6) Repeat above steps 5) 4 times.
7) Increase vehicle speed to about 50 mph (80 km/h) in 3rd gear or 2 range.
8) Release accelerator pedal and with engine brake applied, keep vehicle coasting (fuel cut condition) for 10sec. or more.
9) Stop vehicle (don’t turn ignition switch OFF) and run engine at idle for 2 min.
   After this step 9), if “Oxygen Sensor Monitoring TEST COMPLETED” is displayed in “READINESS TESTS” mode and DTC is not displayed in “DTC” mode, confirmation test is completed.
   If “TEST NOT COMPLTD” is still being displayed, proceed to next step 10).
10) Drive vehicle under usual driving condition for 10 min. (or vehicle is at a stop and run engine at idle for 10 min. or longer)
11) Stop vehicle (don’t turn ignition switch OFF). Confirm test results according to “Test Result Confirmation Flow Table” in “DTC CONFIRMATION PROCEDURE” of DTC P0420.



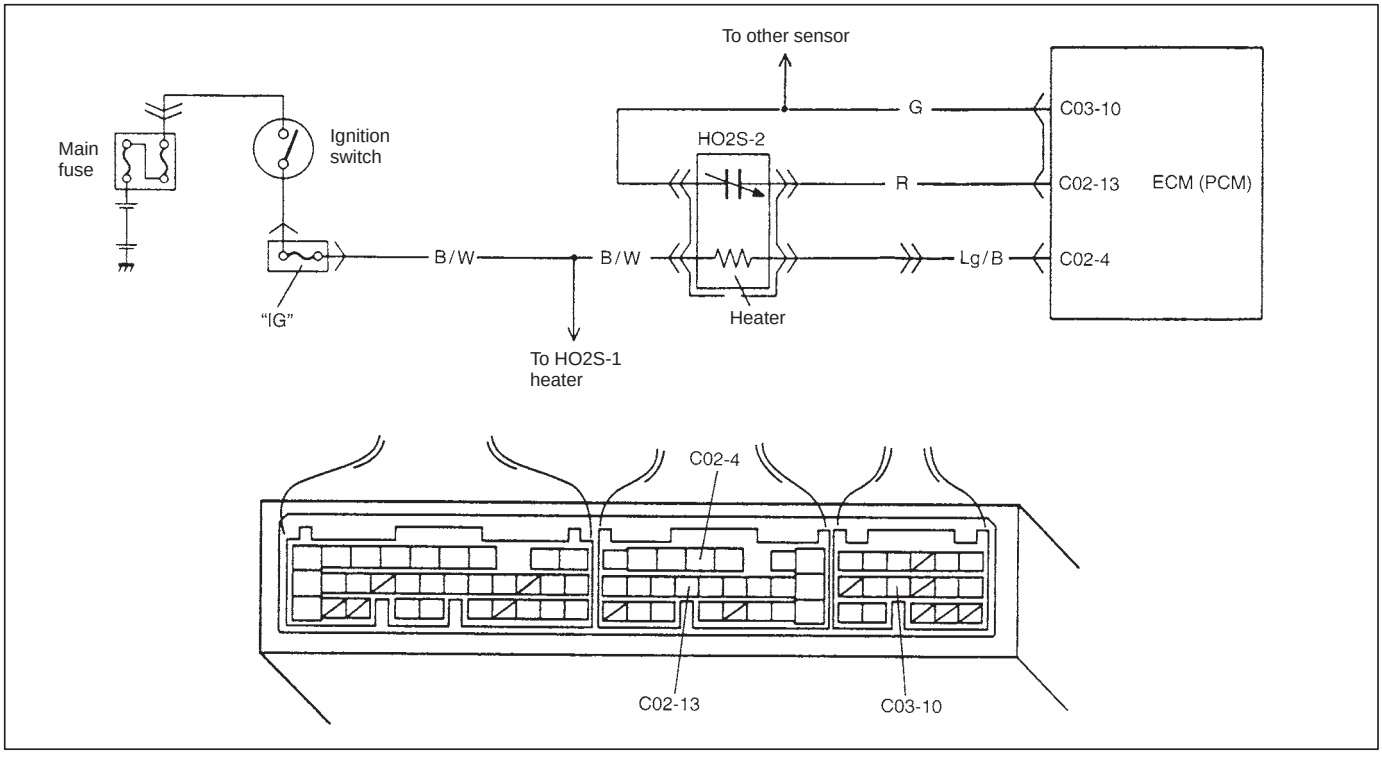
★Usual driving: Driving at 30 – 40 mph, 50 – 60 km/h including short stop according to traffic signal. (under driving condition other than high-load, high-engine speed, rapid accelerating and decelerating)

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check exhaust system for leakage, loose connection and damage. Is it good condition?	Go to Step 3.	Repair or replace.
3	Check HO2S-2 and Its Circuit. Was HO2S-2 output voltage indicated on scan tool in step 3) of DTC confirmation test less than 1.275 V?	Go to Step 4.	“G” or “R” circuit open or HO2S-2 malfunction.
4	Check Short Term Fuel Trim. Did short term fuel trim very within –20 – +20% range in step 3) of DTC confirmation test?	Check “R” and “G” wire for open and short, and connection for poor connection. If wire and connection are OK, replace HO2S-2.	Check fuel system. Go to DTC P0171/P0172 Diag. Flow Table.

DTC P0141 HEATED OXYGEN SENSOR (HO2S) HEATER CIRCUIT MALFUNCTION (SENSOR-2)

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC will set when A or B condition it met. A. Low voltage at terminal C02-4 for specified time after engine start or while engine running at high load. B. High voltage at terminal C02-4 while engine running under other than above condition. ※ 2 driving cycle detection logic, continuous monitoring.	● HO2S-2 heater circuit open or shorted to ground ● ECM (PCM) malfunction

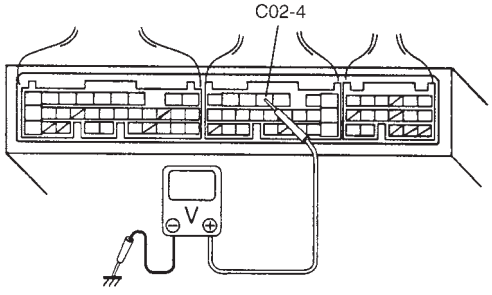
DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF once and then ON.
2) Clear DTC, start engine and warm up engine to normal operating temperature.
3) Keep it at 2000 r/min for 2 min.
4) Check pending DTC in "ON BOARD TEST" or "PENDING DTC" mode and DTC in "DTC" mode.

INSPECTION

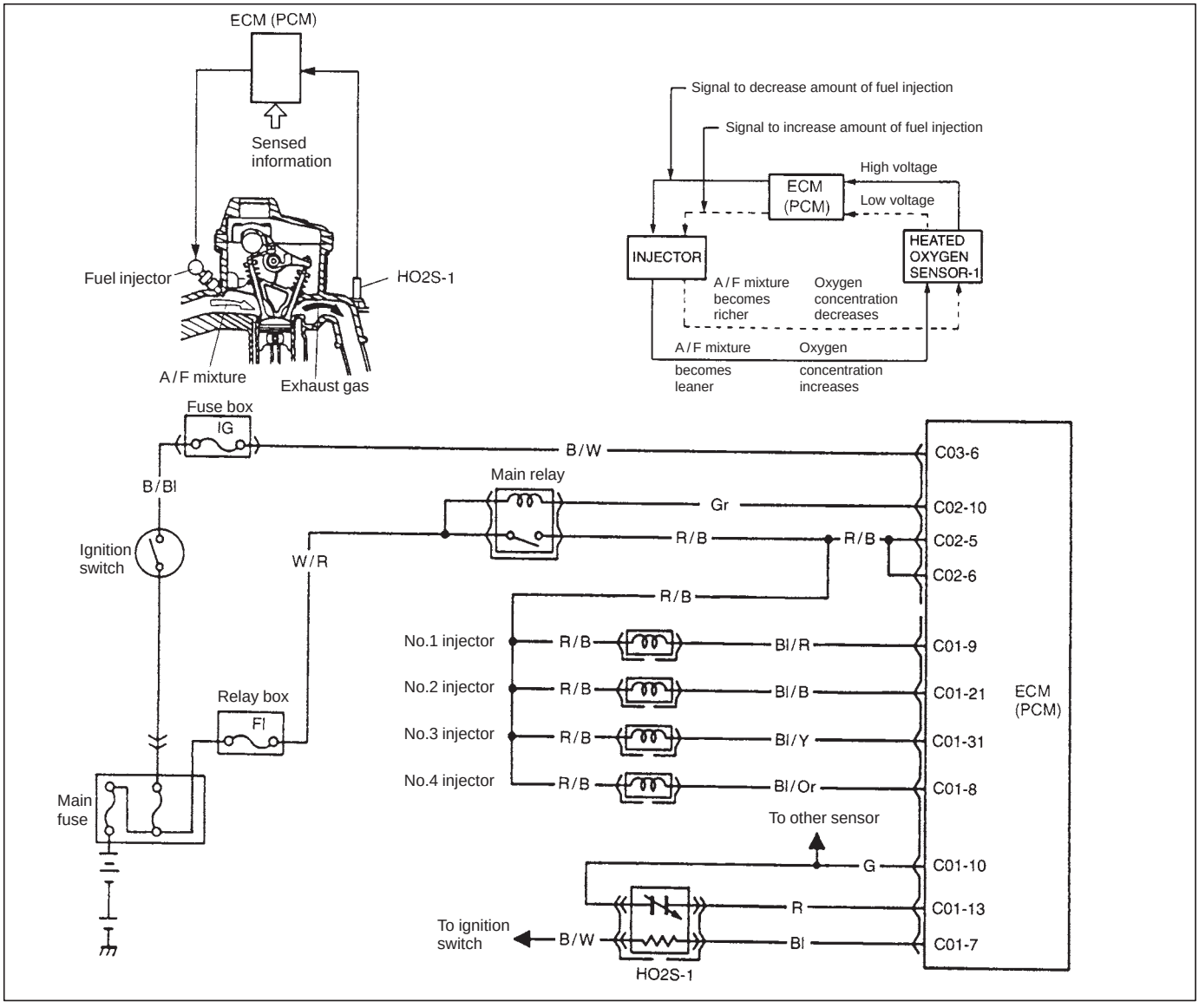
STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check HO2S-2 Heater and Its Circuit. 1) Warm up engine to normal operating temperature. 2) Stop engine. 3) Turn ignition switch ON and check voltage at terminal C02-4 See Fig. 1. Voltage should be over 10 V. 4) Start engine, run it at idle and check voltage at the same terminal after 1 min. from engine start. Voltage should be below 1.9 V. Are check result as specified?	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check Heater or Sensor-2. 1) Disconnect HO2S-2 coupler with ignition switch OFF. 2) Check for proper connection to HO2S-2 at “B/W” and “Lg/B” wire terminals. 3) If OK, then check heater resistance. Is it 11.7 – 14.3 Ω at 20°C, 68°F?	“Lg/B” wire open or shorted to ground or poor connection at C02-4. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace HO2S-2.

Fig. 1 for Step 2



DTC P0171 FUEL SYSTEM TOO LEAN
DTC P0172 FUEL SYSTEM TOO RICH

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● When following condition occurs while engine running under closed loop condition. – Air/fuel ratio too lean (Total fuel trim (short and long terms added) is more than 30%) or – Air/fuel ratio too rich (Total fuel trim is less than –30%) ✳ 2 driving cycle detection logic, continuous monitoring.	● Vacuum leaks (air drawn in). ● Exhaust gas leakage. ● Heated oxygen sensor-1 circuit malfunction. ● Fuel pressure out of specification. ● Fuel injector malfunction (clogged or leakage). ● MAP sensor poor performance. ● ECT sensor poor performance. ● IAT sensor poor performance. ● TP sensor poor performance. ● EVAP control system malfunction. ● PCV valve malfunction.

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 176°F)
4) Start engine and drive vehicle under usual driving condition (described in DTC confirmation procedure of DTC P0136) for 5 min. or longer and until engine is warmed up to normal operating temperature.
5) Keep vehicle speed at 30 – 40 mph, 50 – 60 km/h in 5th gear or “D” range for 5 min. or more.
6) Stop vehicle (do not turn ignition switch OFF).
7) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Is there DTC(s) other than fuel system (DTC P0171/P0172)?	Go to applicable DTC Diag. Flow Table.	Go to Step 3.
3	Check HO2S-1 Output Voltage. 1) Connect scan tool to DLC with ignition switch OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously and take foot off from pedal to enrich and enlean A/F mixture). See Fig. 1. Does HO2S-1 output voltage deflect between below 0.3 V and over 0.6 V repeatedly?	Go to Step 4.	Go to DTC P0130 Diag. Flow Table (HO2S-1 circuit check).
4	Check Fuel Pressure (Refer to section 6E2 for details). 1) Release fuel pressure from fuel feed line. 2) Install fuel pressure gauge. 3) Check fuel pressure. See Fig. 2. With fuel pump operating and engine at stop : 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 kg/cm^2, 28.4 – 34.1 psi. Is measured value as specified?	Go to Step 5.	Go to Diag. Flow Table B-3 Fuel Pressure Check.
5	Check Fuel Injectors and Circuit. 1) Using sound scope (1) or such, check operating sound of each injector (2) when engine is running. Cycle of operating sound should vary according to engine speed. See Fig. 3. If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector. 2) Turn ignition switch OFF and disconnect a fuel injector connector. 3) Check for proper connection to fuel injector at each terminal. See Fig. 4. 4) If OK, then check injector resistance. Injector Resistance: 12 – 13 ohm at 20°C (68°F) 5) Carry out steps 1) and 3) on each injector. 6) Check each injector for injected fuel volume referring to Section 6E2. See Fig. 5. Injected Fuel Volume: 38 – 48 cc/15 sec 1.28/1.34 – 1.62/1.69 US/Imp.oz/15 sec) 7) Check each injector for fuel leakage after injector closed. Fuel Leakage: Less than 1 drop/min. Is check result in step 1) and 3) to 7) satisfactory?	Go to Step 6.	Check injector circuit or replace fuel injector(s).
6	Check EVAP Canister Purge Valve. 1) Disconnect purge hose (1) from EVAP canister. 2) Place finger against the end of disconnected hose. 3) Check that vacuum is not felt there when engine is cool and running at idle. See Fig. 6. Is vacuum felt?	Check EVAP control system (See Section 6E2).	Go to Step 7.
7	Check intake manifold absolute pressure sensor for performance (See DTC P0105 Diag. Flow Table). Is it in good condition?	Go to Step 8.	Repair or replace.

STEP	ACTION	YES	NO
8	Check engine coolant temp. sensor for performance (See Section 6E2). Is it in good condition?	Go to Step 9.	Replace engine coolant temp. sensor.
9	Check intake air temp. sensor for performance (See Section 6E2). Is it in good condition?	Go to Step 10.	Replace intake air temp. sensor.
10	Check throttle position sensor for performance (See Step 3 of DTC P0121 Diag. Flow Table). Is it in good condition?	Go to Step 11.	Replace throttle position sensor.
11	Check PCV valve for valve clogging (See Section 6E2). Is it good condition?	Substitute a known-good ECM (PCM) and recheck.	Replace PCV valve.

Fig. 1 for Step 3

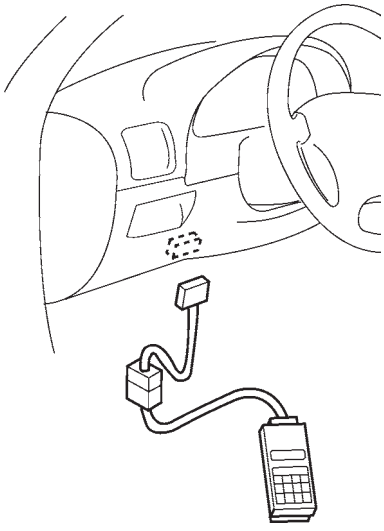
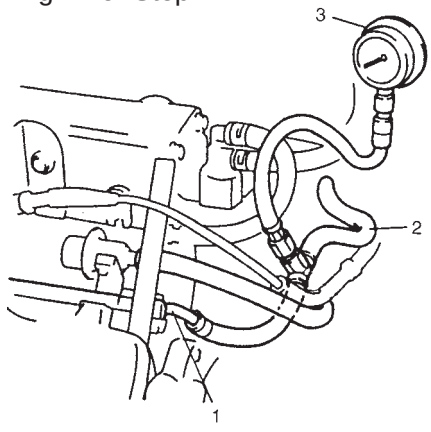


Fig. 2 for Step 4



1. Fuel delivery pipe
2. Fuel feed hose
3. Fuel pressure gauge & 3 way joint

Fig. 3 for Step 5

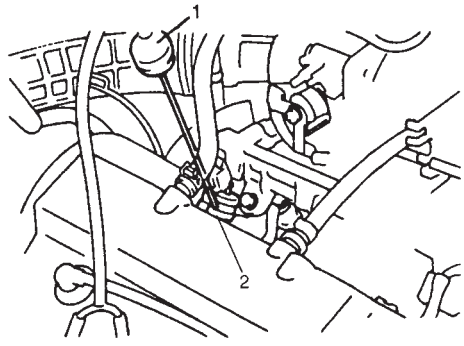


Fig. 4 for Step 5

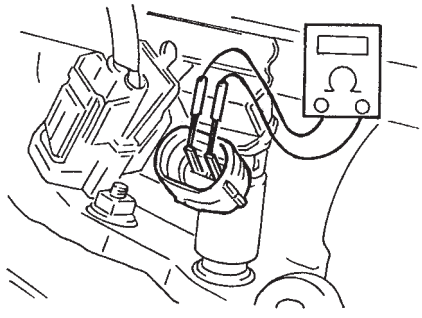


Fig. 5 for Step 5

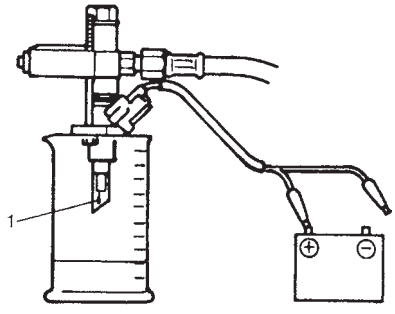
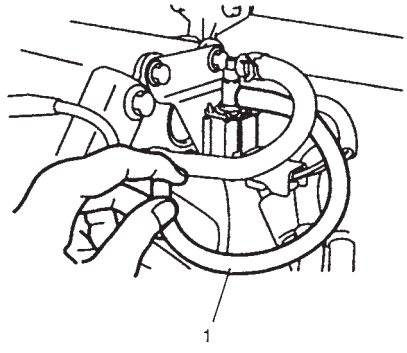
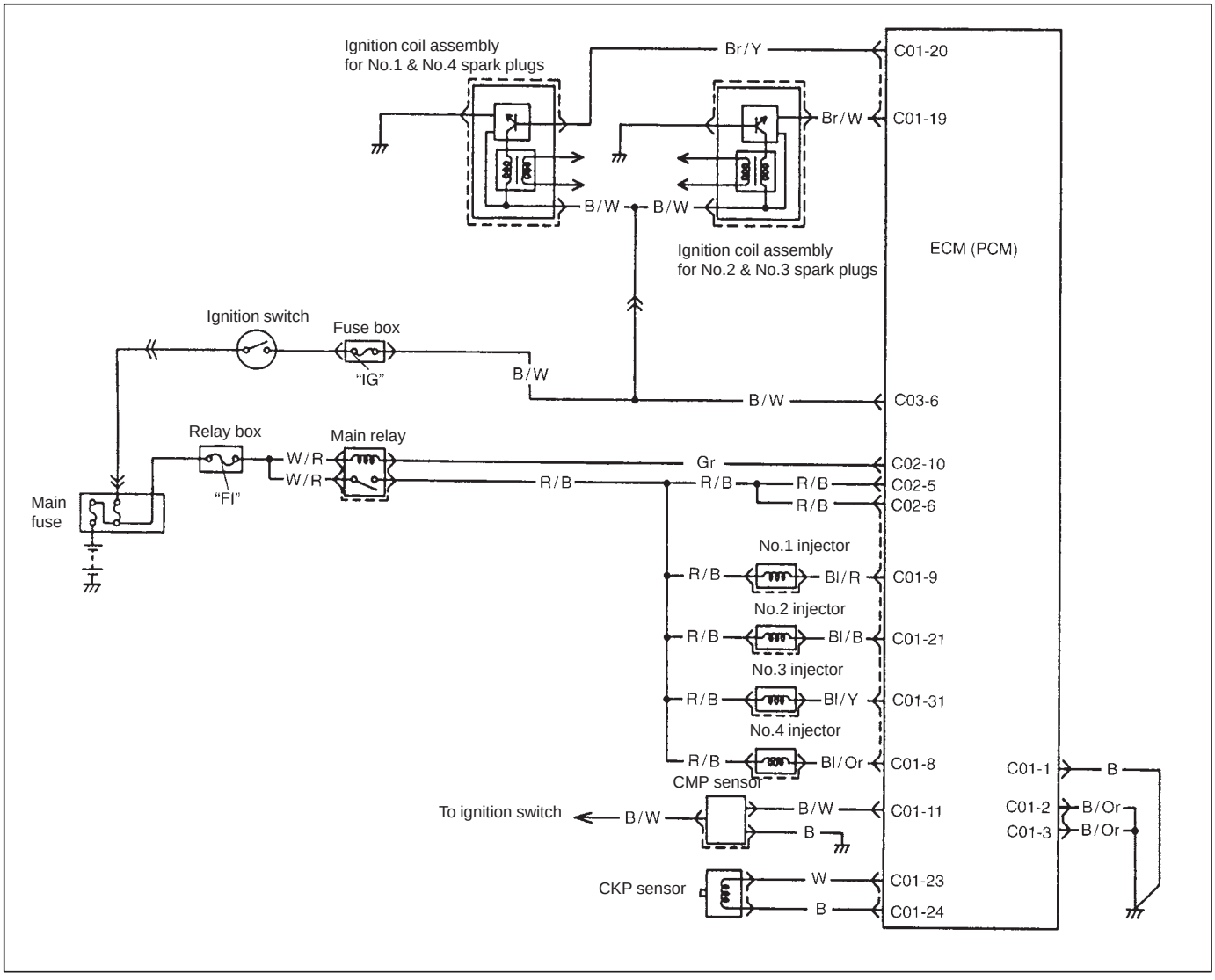


Fig. 6 for Step 6



DTC P0300 RANDOM MISFIRE DETECTED (Misfire detected at 2 or more cylinders)
DTC P0301 CYLINDER 1 MISFIRE DETECTED
DTC P0302 CYLINDER 2 MISFIRE DETECTED
DTC P0303 CYLINDER 3 MISFIRE DETECTED
DTC P0304 CYLINDER 4 MISFIRE DETECTED



CIRCUIT DESCRIPTION

ECM (PCM) monitors crankshaft revolution speed and engine speed via the crankshaft position sensor and cylinder No. via the camshaft position sensor. Then it calculates the change in the crankshaft revolution speed and from how many times such change occurred in every 200 or 1000 engine revolutions, it detects occurrence of misfire.
When ECM (PCM) detects a misfire (misfire rate per 200 revolutions) which can cause overheat and damage to the three way catalytic converter, it makes the malfunction indicator lamp (MIL) flash as long as misfire occurs at that rate.
After that, however, when the misfire rate drops, MIL remains ON until it has been judged as normal 3 times under the same driving conditions.
Also, when ECM (PCM) detects a misfire (misfire rate per 1000 revolutions) which will not cause damage to three way catalytic converter but can cause exhaust emission to be deteriorated, it makes MIL light according to the 2 driving cycle detection logic.

DTC DETECTING CONDITION	POSSIBLE CAUSE
● Engine under other than high revolution condition ● Not on rough road ● Engine speed changing rate ● Manifold absolute pressure changing rate ● Throttle opening changing rate (Below specified value) ● Misfire rate per 200 or 1000 engine revolutions (how much and how often crankshaft revolution speed changes) is higher than specified value	● Engine overheating ● Vacuum leaks (air inhaling) from air intake system ● Ignition system malfunction (spark plug(s), high-tension cord(s), ignition coil assembly) ● Fuel pressure out of specification ● Fuel injector malfunction (clogged or leakage) ● Engine compression out of specification ● Valve lash (clearance) out of specification ● Manifold absolute pressure sensor malfunction ● Engine coolant temp. sensor malfunction ● PCV valve malfunction ● EVAP control system malfunction ● EGR system malfunction

DTC CONFIRMATION PROCEDURE

NOTE:

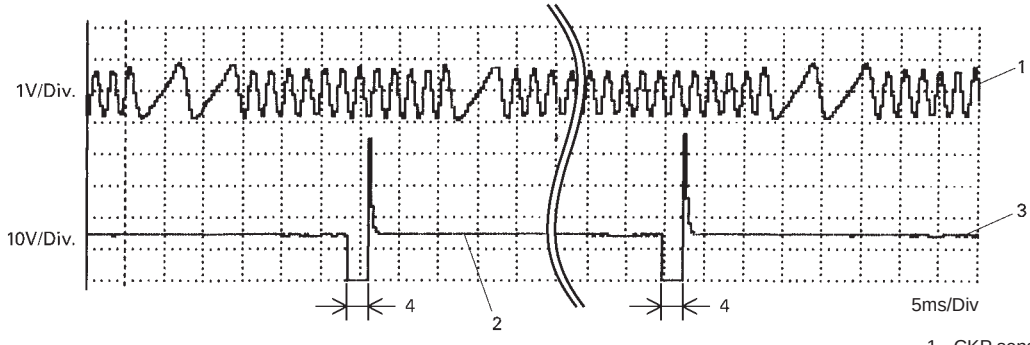
Among different types of random misfire, if misfire occurs at cylinders 1 and 4 or cylinders 3 and 2 simultaneously, it may not possible to reconfirm DTC by using the following DTC confirmation procedure. When diagnosing the trouble of DTC P0300 (Random misfire detected) of the engine which is apparently misfiring, even if DTC P0300 cannot be reconfirmed by using the following DTC confirmation procedure, proceed to the following Diag. Flow Table.

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

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 176°F)
   – Engine coolant temp.: –10°C, 14°F or higher
4) Start engine and keep it at idle for 2 min. or more.
5) Check DTC in “DTC” mode and pending DTC in “ON BOARD TEST” or “PENDING DTC” mode.
6) If DTC is not detected at idle, consult usual driving based on information obtained in “Customer complaint analysis” and “Freeze frame data check”.

Reference

Display of fuel injection signal using oscilloscope



Waveforms at specified idle speed

1. CKP sensor signal
2. No.1 fuel injector signal
3. No.3 fuel injector signal
4. Fuel injection time

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE“.
2	Is there DTC other than Fuel system (DTC P0171/P0172) and misfire (DTC P0300-P0304)?	Go to applicable DTC Diag. Flow Table.	Go to Step 3.
3	Check Ignition System. 1) Remove spark plugs and check them for; ● Air gap: 1.0 – 1.1 mm (0.040 – 0.043 in.) See Fig. 1. ● Carbon deposits ● Insulator damage ● Plug type If abnormality is found, adjust, clean or replace. 2) Disconnect all injector connectors. See Fig. 2. 3) Connect spark plugs to high tension cords and then ground spark plugs. 4) Crank engine and check that each spark plug sparks. Are above check results satisfactory?	Go to Step 4.	Check ignition system parts (Refer to Section 6F1).
4	Check Fuel Pressure (Refer to Section 6E2 for details). 1) Release fuel pressure from fuel feed line. 2) Install fuel pressure gauge. See Fig. 3. 3) Check fuel pressure. With fuel pump operating and engine at stop : 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 kg/cm^2, 28.4 – 34.1 psi. Is measured value as specified?	Go to Step 5.	Go to Diag. Flow Table B-3 fuel pressure check.
5	Check Fuel Injectors and Circuit. 1) Using sound scope (1) or such, check operating sound of each injector (2) when engine is running. Cycle of operating sound should very according to engine speed. See Fig 4. If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector. 2) Turn ignition switch OFF and disconnect a fuel injector connector. 3) Check for proper connection to fuel injector at each terminal. See Fig. 5. 4) If OK, then check injector resistance. Injector Resistance: 12 – 13 ohm at 20°C (68°F) 5) Carry out steps 1) and 3) on each injector. 6) Check each injector for injected fuel volume referring to Section 6E2. See Fig. 6. Injected Fuel Volume: 38 – 48 cc/15 sec (1.28/1.34 – 1.62/1.69 US/Imp. oz/15 sec) 7) Check each injector for fuel leakage after injector closed. Fuel Leakage: Less than 1 drop/min. Is check result in step 1) and 3) to 7) satisfactory?	Go to Step 6.	Check injector circuit or replace fuel injector(s).

STEP	ACTION	YES	NO
6	Check PCV valve for clogging (See Section 6E2). Is it in good condition?	Go to Step 7.	Replace PCV valve.
7	Check EVAP Canister Purge Valve for Closing. 1) Disconnect purge hose (1) from EVAP canister. 2) Place finger against the end of disconnected hose. 3) Check that vacuum is not felt there, when engine is cool and running at idle. See Fig. 7. Is vacuum felt?	Check EVAP control system (See Section 6E2).	Go to Step 8.
8	Check intake manifold pressure sensor for performance (See DTC P0105 Diag. Flow Table). Is it in good condition?	Go to Step 9.	Repair or replace.
9	Check engine coolant temp. sensor for performance (See Section 6E2). Is it in good condition?	Go to Step 10.	Replace engine coolant temp. sensor.
10	Check parts or system which can cause engine rough idle or poor performance. – Engine compression (See Section 6A1). – Valve lash (See Section 6A1). – Valve timing (Timing belt installation. See Section 6A1). Are they in good condition?	Check wire harness and connection of ECM (PCM) ground, ignition system and fuel injector for intermittent open and short.	Repair or replace.

Fig. 1 for Step 3

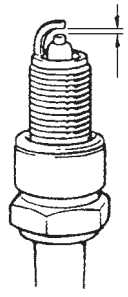
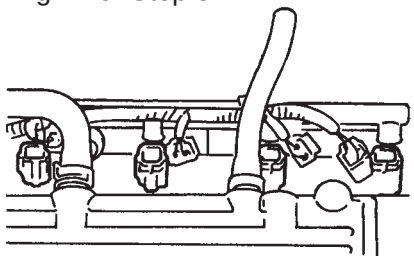
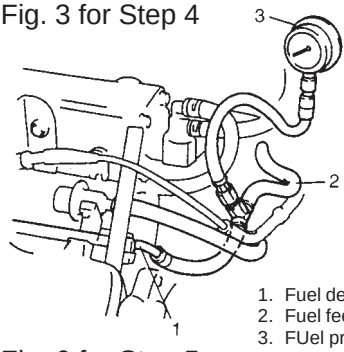


Fig. 2 for Step 3



Disconnect connectors when checking plugs for spark

Fig. 3 for Step 4



1. Fuel delivery pipe
2. Fuel feed hose
3. FUel pressure gauge & 3 way joint

Fig. 4 for Step 5

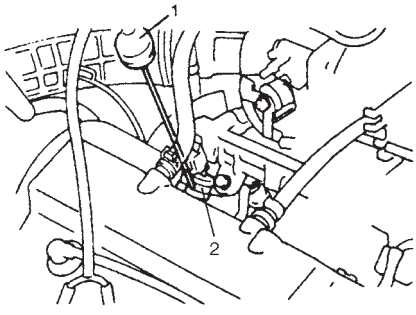


Fig. 5 for Step 4

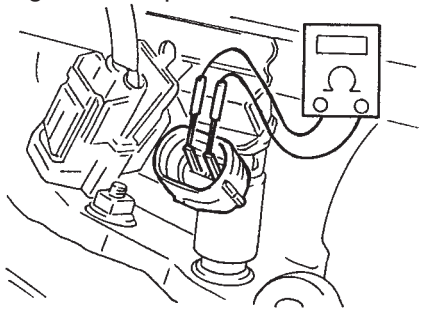


Fig. 6 for Step 5

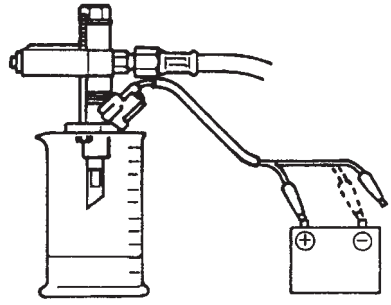
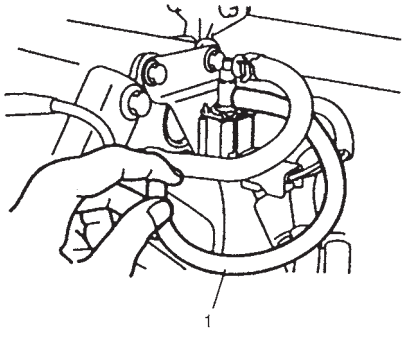
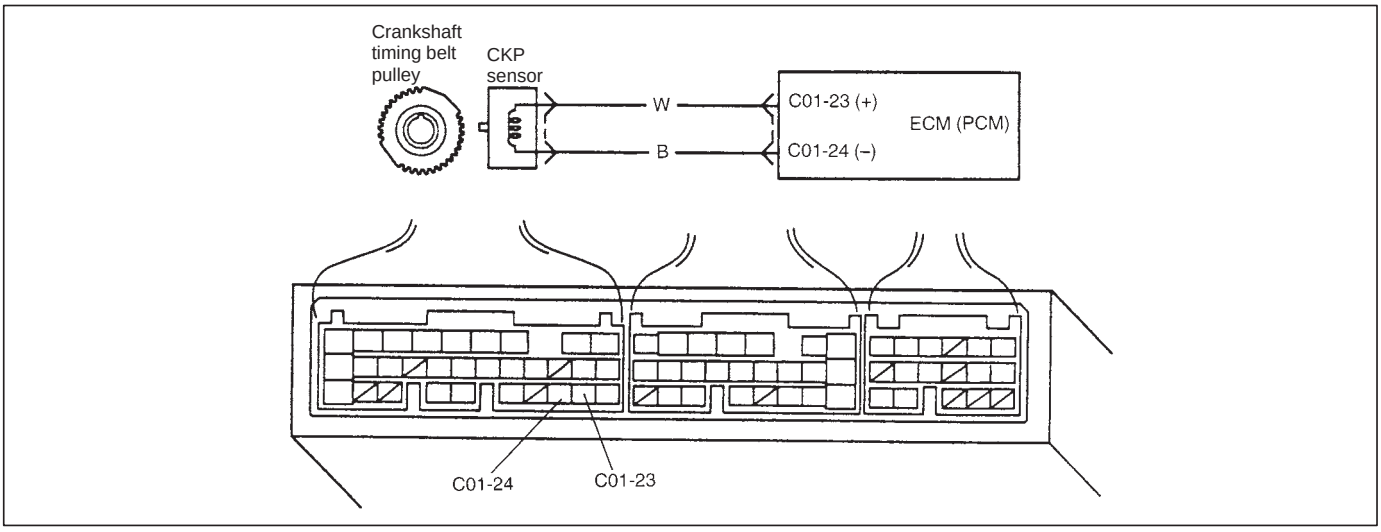


Fig. 7 for Step 7



DTC P0335 CRANKSHAFT POSITION (CKP) SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

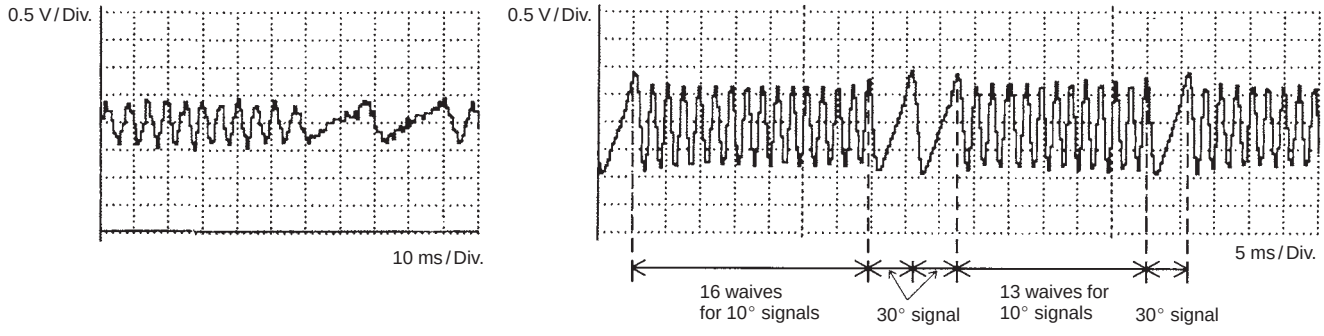


DTC DETECTING CONDITION	POSSIBLE CAUSE
● NO CKP sensor signal for 2 seconds at engine cranking.	● CKP sensor circuit open or short. ● Crankshaft timing belt pulley teeth damaged. ● CKP sensor malfunction, foreign material being attached or improper installation. ● ECM (PCM) malfunction.

Reference

Connect oscilloscope between terminals C01-23 (+) and C01-24 (–) of ECM (PCM) connector connected to ECM (PCM) and check CKP sensor signal.

Oscilloscope Waveforms



Waveforms at engine cranking (260 r/min)

Waveforms at specified idle speed

DTC CONFIRMATION PROCEDURE

1) Clear DTC and crank engine for 2 sec.
2) Select “DTC” mode on scan tool and check DTC.

INSPECTION

NOTE:

If starter circuit is open (i.e., start signal circuit is OK but starter fails to run), this DTC is stored in memory at starter switch ON, even though CKP sensor is in good condition.

When starter motor fails to run and this DTC appears, check starter circuit first.

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Is there DTC P1500 (Engine starter signal circuit)?	Go to DTC P1500 Diag. Flow Table.	Go to Step 3.
3	Check CKP Sensor for Resistance. 1) Disconnect CKP sensor connector with ignition switch OFF. 2) Then check for proper connection to CKP sensor at “W” and “B” wire terminals. 3) If OK, measure sensor resistance between terminals. See Fig. 1. CKP sensor resistance: 360 – 460 Ω at 20°C, 68°F 4) Measure resistance between each terminal and ground. Insulation resistance: 1 MΩ or more. Were measured resistance valves in step 3) and 4) as specified?	Go to Step 4.	Replace CKP sensor.
4	Check visually CKP sensor and pulley for the following. See Fig. 2. ● Damage ● No foreign material attached. ● Correct installation. Are they in good condition?	“W” or “B” wire open or shorted to ground, or poor connection at C01-23 or C01-24. If wire and connection are OK, intermittent trouble or faulty ECM (PCM). Recheck for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Clean, repair or replace.

Fig. 1 for Step 3

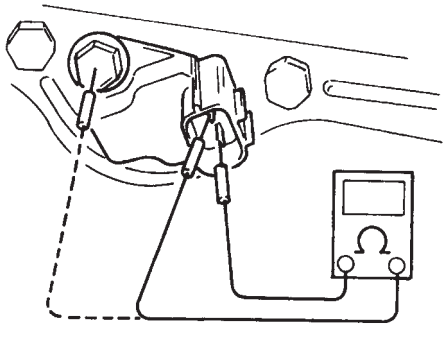
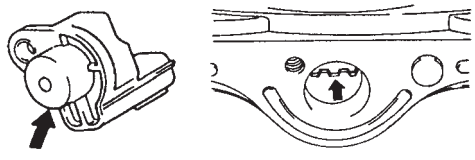
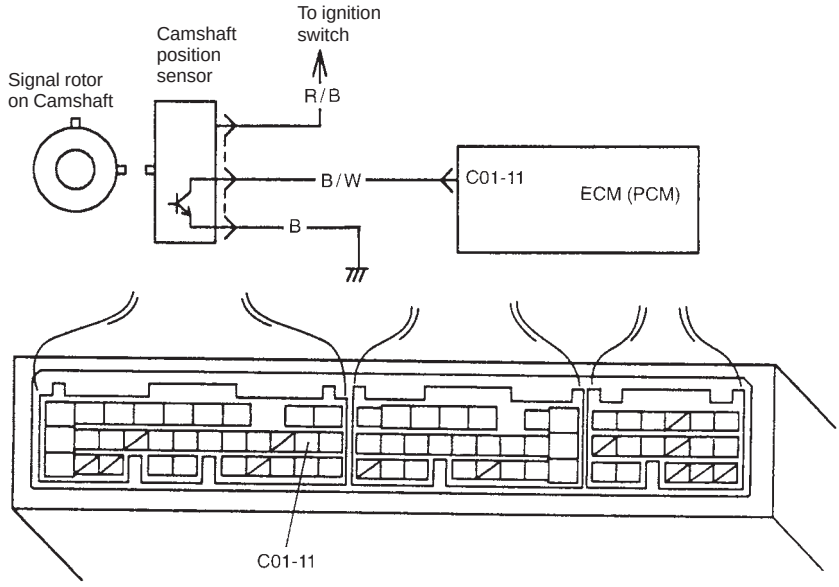


Fig. 2 for Step 4



DTC P0340 CAMSHAFT POSITION (CMP) SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

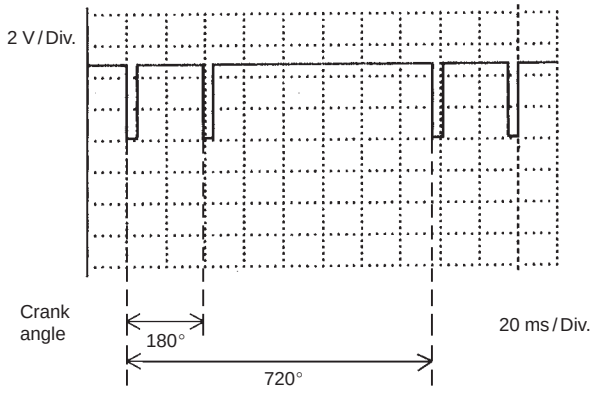


DTC DETECTING CONDITION	POSSIBLE CAUSE
● No CMP sensor signal during engine running (CKP sensor signal is inputted).	● CMP sensor circuit open or short. ● Signal rotor teeth damaged. ● CMP sensor malfunction, foreign material being attached or improper installation. ● ECM (PCM) malfunction.

Reference

Connect oscilloscope between terminals C01-11 of ECM (PCM) connector connected to ECM (PCM) and body ground and check CKP sensor signal.

Oscilloscope Waveforms



Waveforms at specified idle speed

DTC CONFIRMATION PROCEDURE

1) Clear DTC.
2) Start engine and keep it at idle for 1 min.
3) Select “DTC” mode on scan tool and check DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check CMP Sensor and connector for proper installation. Is CMP sensor installed properly and connector connected securely?	Go to Step 3.	Correct.
3	Check Wire Harness and Connection. 1) Disconnect connector from CMP sensor. 2) Check for proper connection to CMP sensor at each terminal. 3) If OK, turn ignition switch ON and check for voltage at each terminal of sensor connection disconnected. See Fig. 1. Terminal “B+” : 10 – 14 V Terminal “Vout” : 4 – 5 V Terminal “GND” : 0 V Is check result satisfactory?	Go to Step 5.	Go to Step 4.
4	Was terminal “Vout” voltage out of specification in Step 3 check?	“B/W” wire open, short or poor connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	“B/W” or “B” wire open, short or poor connection.
5	Check Ground Circuit for Open. 1) Turn ignition switch OFF. 2) Check for continuity between “GND” terminal of CMP sensor connector and engine ground. Is continuity indicated?	Go to Step 6.	“B” wire open or poor ground connection.
6	Check CMP Sensor for Operation. 1) Remove CMP sensor from sensor case. 2) Remove metal particles on end face of CMP sensor, if any. 3) Connect each connector to ECM (PCM) and CMP sensor. 4) Turn ignition switch ON. 5) Check for voltage at terminal C01-11 of connector connected to ECM (PCM) by passing magnetic substance (iron) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CMP sensor. See Fig. 2 and 3. Does voltage vary from low (0 – 1 V) to high (4 – 5 V) or from high to low?	Go to Step 7.	Replace CMP sensor.

STEP	ACTION	YES	NO
7	Check signal rotor for the following, using mirror. See Fig. 4. ● Damage ● No foreign material attached Is it in good condition?	Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A.	Clean rotor teeth or replace CMP sensor.

Fig. 1 for Step 3

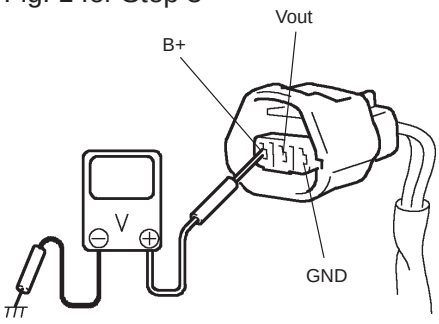


Fig. 2 for Step 4

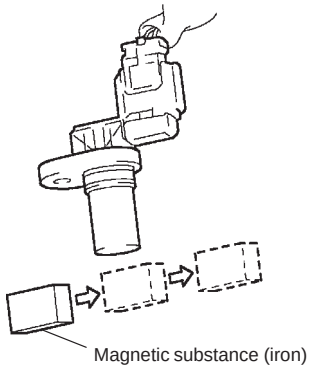


Fig. 3 for Step 6

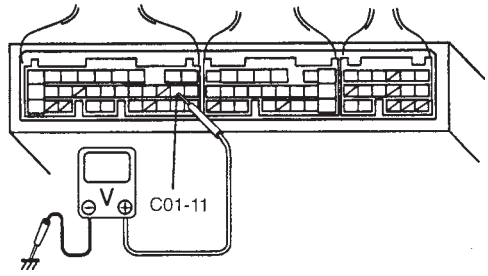
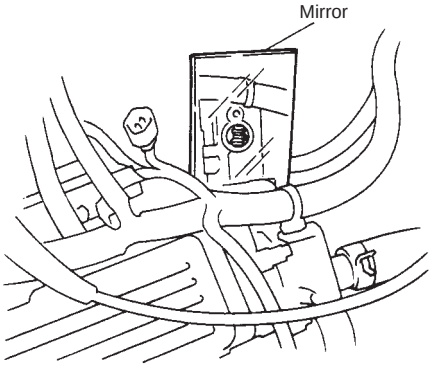
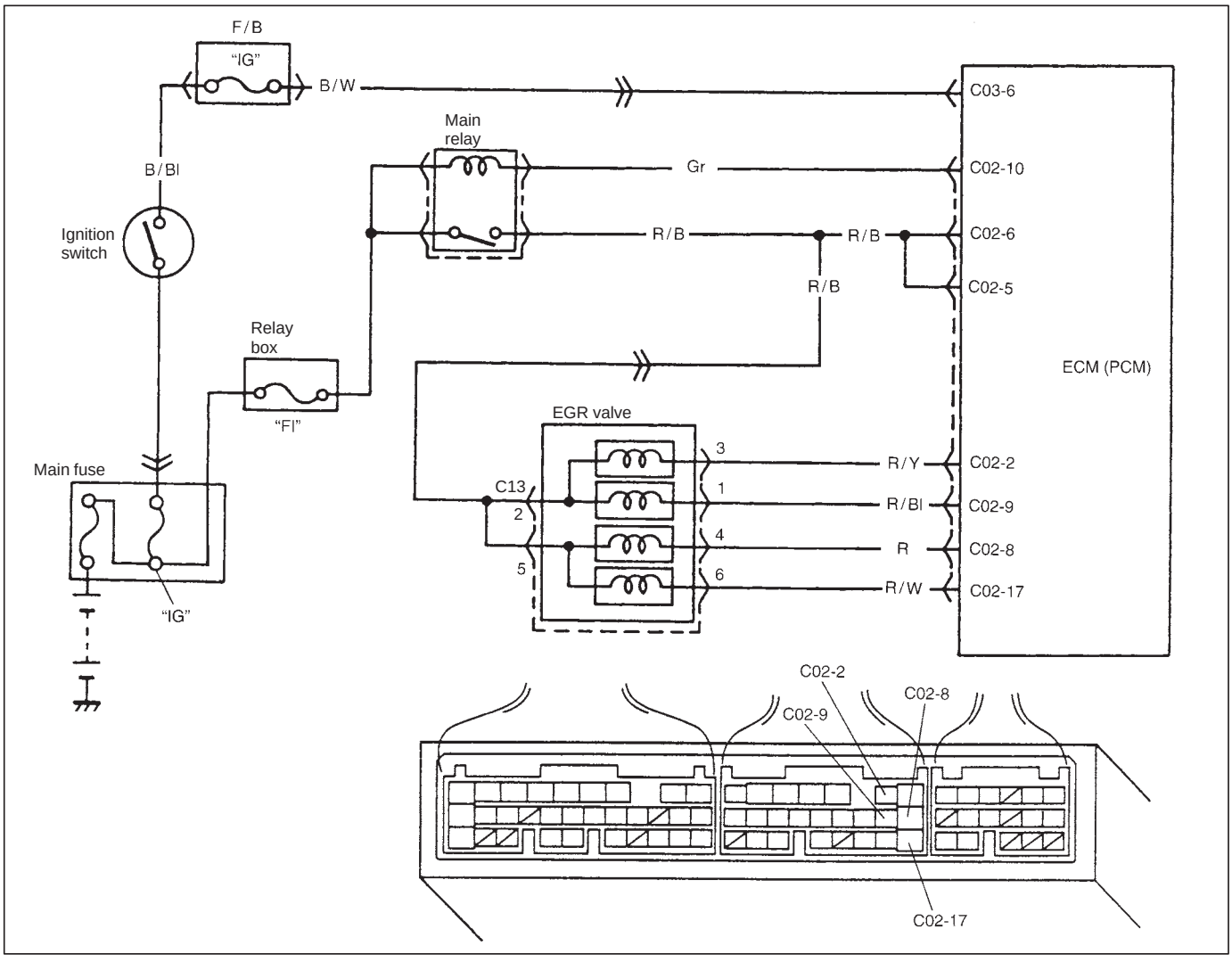


Fig. 4 for Step 7



DTC P0400 EXHAUST GAS RECIRCULATION FLOW MALFUNCTION

CIRCUIT DESCRIPTION

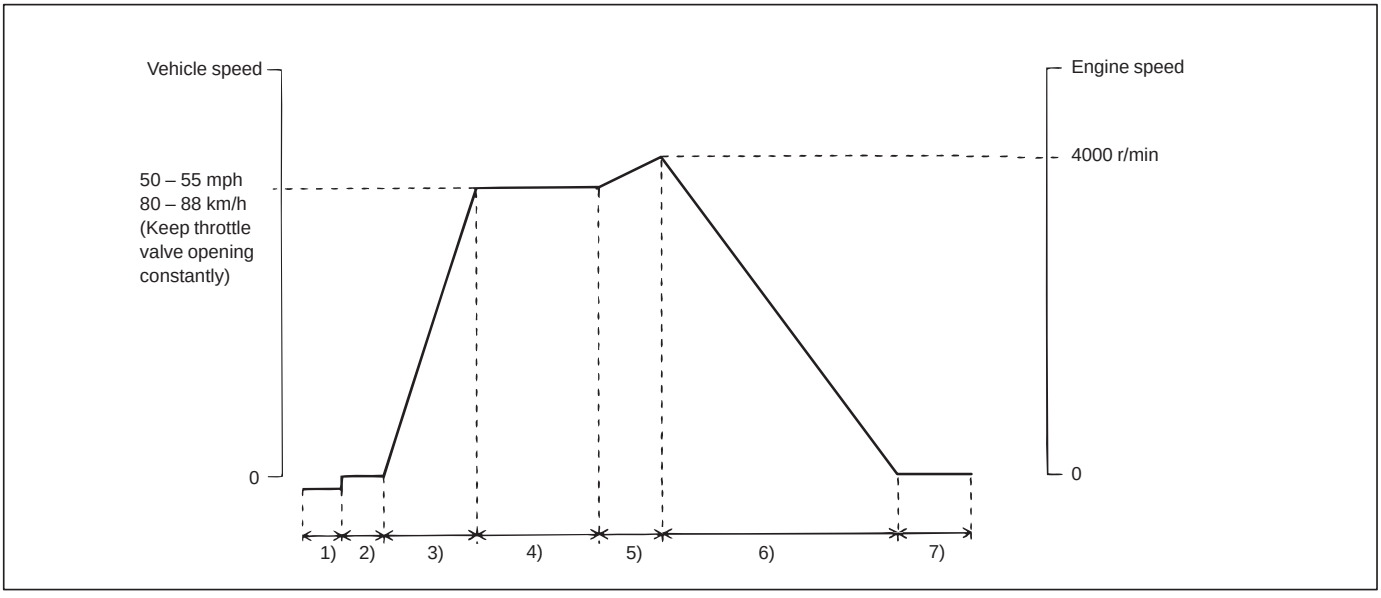


DTC DETECTING CONDITION	POSSIBLE CAUSE
● While running at specified vehicle speed after engine warm-up ● During deceleration (engine speed high with closed throttle position ON) in which fuel cut is involved, difference in intake manifold absolute pressure between when EGR valve is opened at specified value and when it is closed is larger or smaller than specified value. ⁎ 2 driving cycle detection logic, monitoring once/1 driving	● EGR valve or its circuit ● EGR passage ● ECM (PCM)

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF.
   Clear DTC with ignition switch ON, check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 158°F)
2) Start engine and warm it up to normal operating temperature (70 – 110°C, 158 – 230°F) and run it at idle for 5 min.
3) Increase vehicle speed to 50 – 55 mph, 80 – 88 km/h in 5th gear or in “D” range.
4) Hold throttle valve at that opening position for 2 min. or longer.
5) Increase engine speed to 4000 r/min. in 3rd gear or in “2” range.
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (fuel cut condition) till engine speed reaches 1500 r/min.
7) Stop vehicle (don’t turn ignition switch OFF) and confirm test results according to following “Test Result Confirmation Flow Table.”



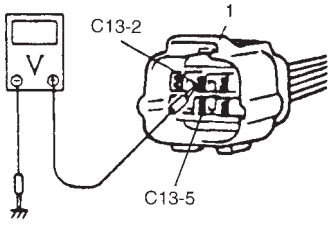
Test Result Confirmation Flow Table

STEP	ACTION	YES	NO
1	Check DTC in “DTC” mode and pending DTC in “ON BOARD TEST”. Is DTC or pending DTC displayed?	Proceed to applicable DTC flow table.	Go to Step 2.
2	Set scan tool to “READINESS TESTS” mode and check if testing has been completed. Is test completed?	No DTC is detected. (Confirmation test is completed)	Repeat DTC confirmation procedure.

INSPECTION

STEP	ACTION	YES	NO
1	Was ENGINE DIAG. FLOW TABLE performed?	Go to Step 2.	Go to ENGINE DIAG. FLOW TABLE.
2	Do you have SUZUKI scan tool?	Go to Step 3.	Go to Step 5.
3	EGR Valve Operation Check 1) With ignition switch OFF, install SUZUKI scan tool. 2) Check EGR system referring to section 6E2. Is it in good condition?	Go to Step 4.	Go to Step 5.
4	MAP Sensor Check 1) Check MAP sensor for performance referring to "MAP Sensor Check" in DTC P0105 Diag. Flow Table. Is check result satisfactory?	Intermittent trouble or faulty ECM (PCM) Check for intermittent referring to "Intermittent and Poor Connection" in section 0A.	Repair or replace.
5	EGR Valve Power Supply Circuit Check 1) With ignition switch OFF, disconnect EGR valve coupler. 2) With ignition switch ON, check voltage between C13-2 and ground, C13-5 and ground. See Fig. 1. Is each voltage 10 – 14 V?	Go to Step 6.	"R/B" wire.
6	EGR Valve Stepping Motor Coil Circuit Check 1) With ignition switch OFF, connect EGR valve coupler and disconnect ECM (PCM) couplers. 2) Check resistance between C02-6 and C02-2, C02-8, C02-9, C02-17. Is each resistance 20 – 24 Ω at 20°C, 68°F?	Go to Step 7.	Faulty "R/Y", "R/Bl", "R", "R/W" wire or EGR valve.
7	MAP Sensor Check 1) Check MAP sensor for performance referring to "MAP Sensor Check" in DTC P0105 Diag. Flow Table. Is check result satisfactory?	EGR passage clogged or EGR valve malfunction. If all above are OK, intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection" in section 0A.	Repair or replace.

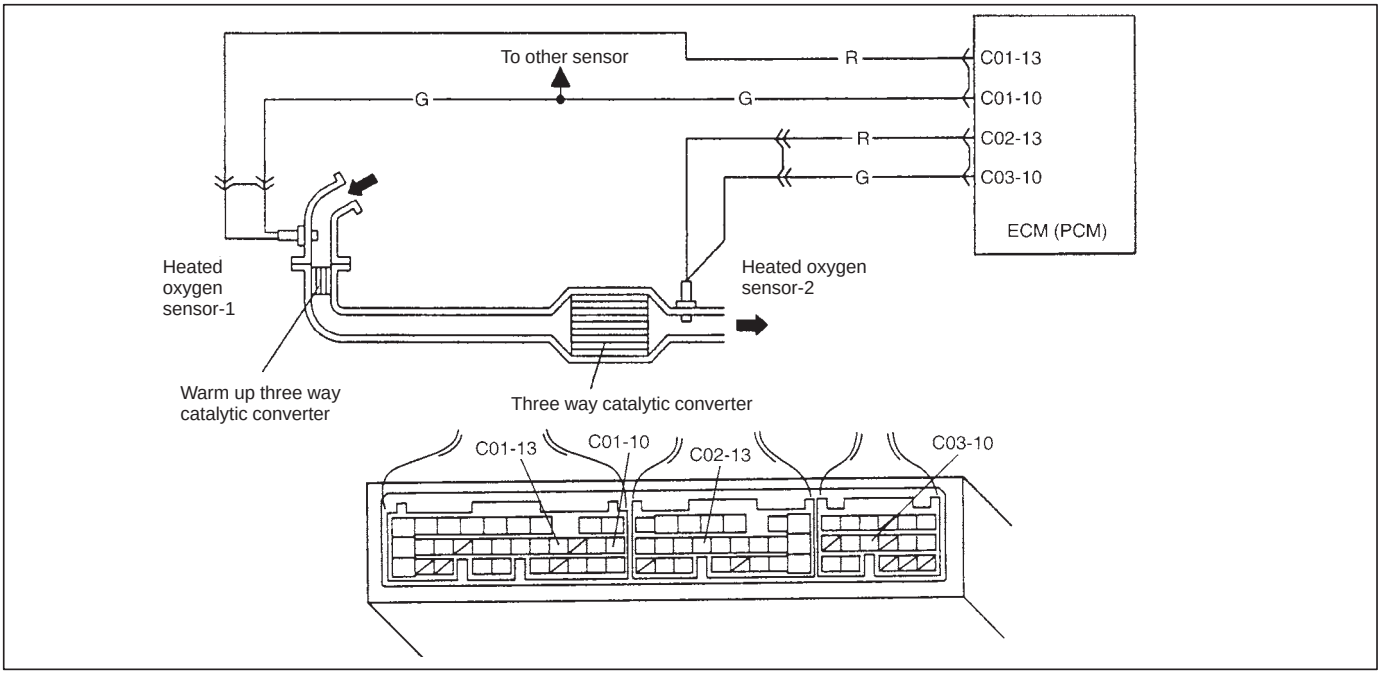
Fig. 1 for step 5



1. EGR valve coupler

DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD

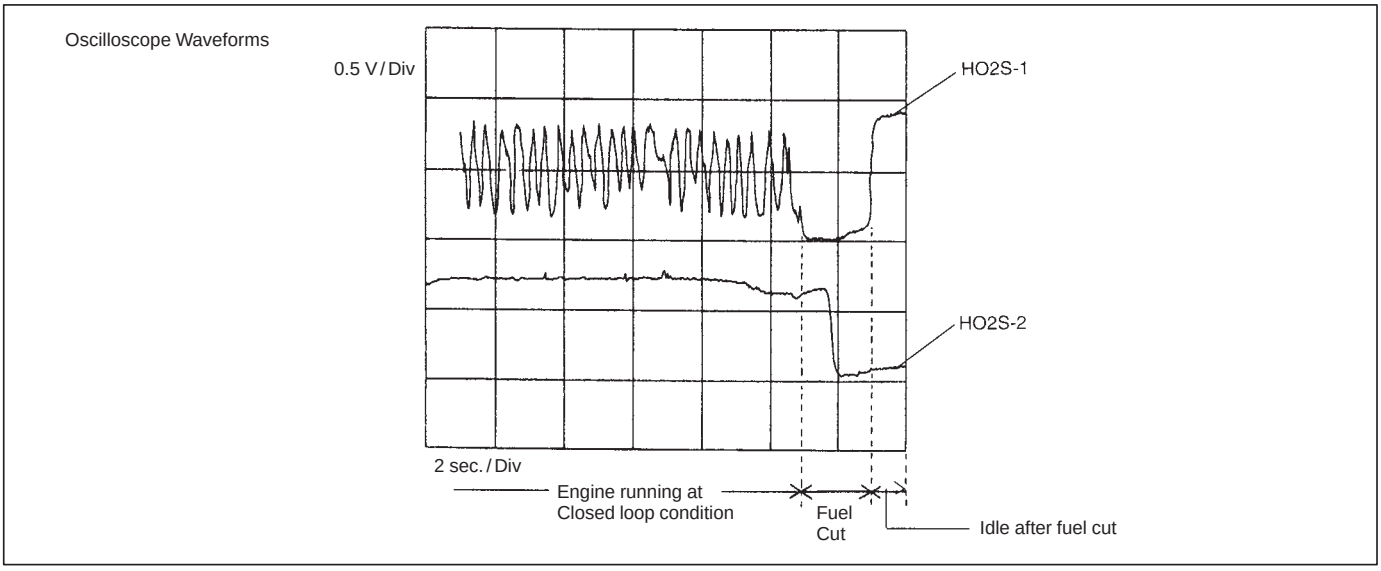
CIRCUIT DESCRIPTION



ECM (PCM) monitors oxygen concentration in the exhaust gas which has passed the three way catalytic converter by HO2S-2.

When the catalyst is functioning properly, the variation cycle of HO2S-2 output voltage (oxygen concentration) is slower than that of HO2S-1 output voltage because of the amount of oxygen in the exhaust gas which has been stored in the catalyst.

Reference

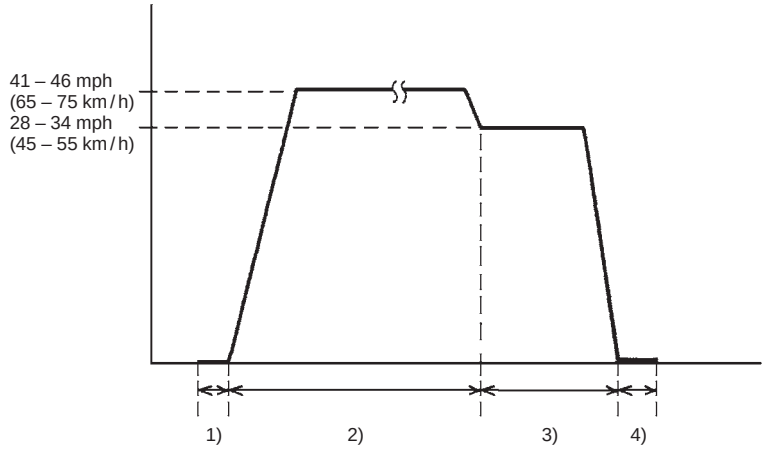


DTC DETECTING CONDITION	POSSIBLE CAUSE
● While vehicle running at constant speed under other than high load. ● Time from rich or lean switching command is output till HO2S-2 output voltage crosses 0.45 V is less than specified value. ※ 2 driving cycle detection logic, monitoring once / 1 driving.	● Exhaust gas leak ● Three way catalytic converter malfunction ● Fuel system malfunction ● HO2S-2 malfunction ● HO2S-1 malfunction

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF.
   Clear DTC with ignition switch ON, check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Intake air temp.: between –10°C and 80°C (14°F and 158°F)
   – Engine coolant temp.: 70°C, 230°F or higher
2) Start engine and drive vehicle at 41 – 46 mph, 65 – 75 km/h for 8 min. or longer.
   While this driving, if "Catalyst Monitoring TEST COMPLETED" is displayed in "READINESS TESTS" mode and DTC is not displayed in "DTC" mode, confirmation test is completed.
   If "TEST NOT COMPLTD" is still being displayed, continue test driving.
3) Decrease vehicle speed at 28 – 34 mph, 45 – 55 km/h, and hold throttle valve at that opening position for 2 min. and confirm that short term fuel trim vary within –20% – +20% range.
4) Stop vehicle (do not turn ignition switch OFF) and confirm test results according to following "Test Result Confirmation Flow Table".



Test Result Confirmation Flow Table

STEP	ACTION	YES	NO
1	Check DTC in "DTC" mode and pending DTC in "ON BOARD TEST" or "PENDING DTC" mode. Is DTC or pending DTC displayed?	Proceed to applicable DTC Diag. Flow Table.	Go to Step 2.
2	Set scan tool to "READINESS TESTS" mode and check if testing has been completed. Is test completed?	No DTC is detected (confirmation test is completed).	Repeat DTC confirmation procedure.

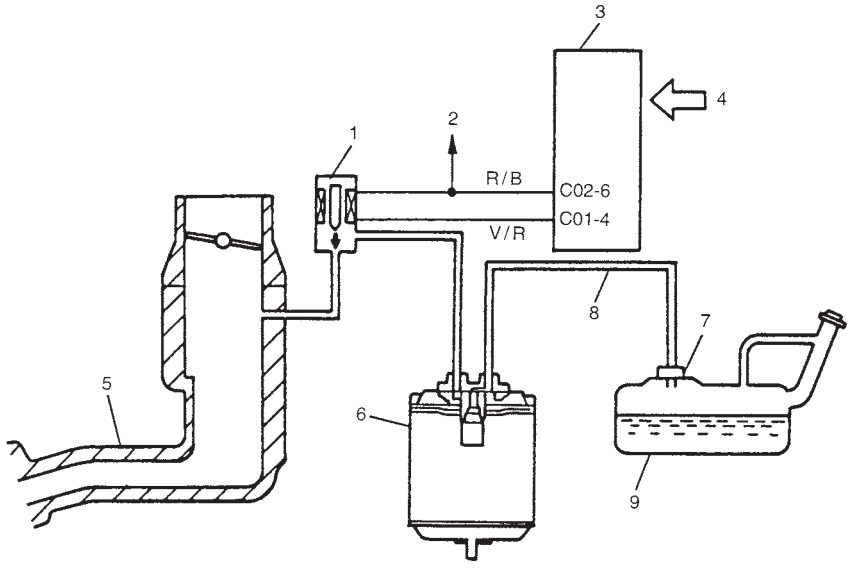
INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check Short Term Fuel Trim. Did short term fuel trim vary within –20% –+20% range in step 3) of DTC confirmation test?	Go to Step 3.	Check fuel system. Go to DTC P0171/P0172 Diag. Flow Table.
3	Check HO2S-2 for Output Voltage. Perform steps 1) through 9) of DTC confirmation procedure for DTC P0136 (HO2S-2 malfunction) and check output voltage of HO2S-2 then. Is over 0.6 V and below 0.3 V indicated?	Replace three way catalytic converter.	Check “R” and “G” wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-2.

DTC P0443 EVAP PURGE CONTROL VALVE CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

1. EVAP canister purge valve
2. To main relay
3. ECM (PCM)
4. Sensed information
5. Intake manifold
6. EVAP canister
7. Tank pressure control valve
8. Fuel vapor line
9. Fuel tank



DTC DETECTING CONDITION	POSSIBLE CAUSE
Canister Purge control valve circuit is opened or shorted.	● "V/R" circuit open or short ● "R/B" circuit open ● Canister purge valve malfunction

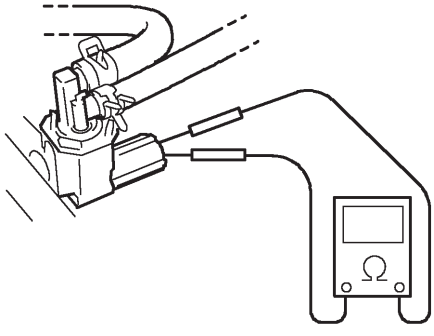
DTC CONFIRMATION PROCEDURE

1) Clear DTC with ignition switch ON.
2) Select "DTC" mode on scan tool and check DTC.

INSPECTION

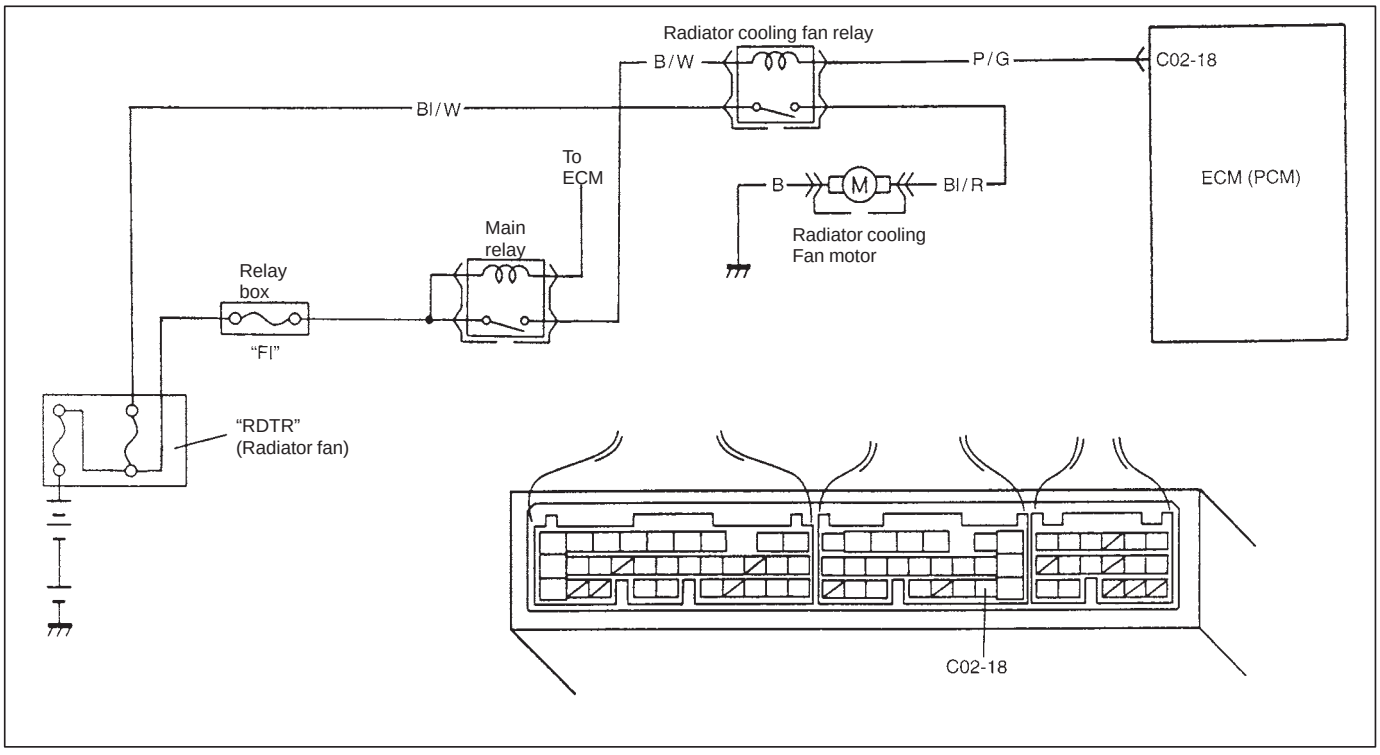
STEP	ACTION	YES	NO
1	Check EVAP canister purge valve operation 1) With ignition switch OFF, disconnect coupler from canister purge valve. 2) Check resistance of EVAP canister purge valve. Resistance between two terminals : 30 – 34 Ω at 20°C (68°F) Resistance between terminal and body : 1M Ω or higher Is it as specified?	"V/R" circuit open or short.	Replace EVAP canister purge valve.

Fig. 1 for Step 1



DTC P0480 RADIATOR COOLING FAN CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low voltage at terminal C02-18 when engine coolant temp. is 92°C, 197°F below. ※ 2 driving cycle detection logic, continuous monitoring.	● "B/W" or "P/G" circuit open or short ● Radiator cooling fan relay malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Warm up engine until radiator cooling fan starts to operate.
4) Check pending DTC in "ON BOARD TEST" or "PENDING DTC" mode and DTC in "DTC" mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check Radiator Cooling Fan Relay and Its Circuit. 1) Turn ignition switch ON. 2) Check for voltage at terminal C02-18 of ECM (PCM) connector connected, under following condition. See Fig. 1. When engine coolant temp. is lower than 92°C, 197°F and A/C switch turns OFF: 10 – 14 V Is voltage as specified?	Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check Radiator Cooling Fan Control Relay. 1) Turn ignition switch OFF and remove radiator cooling fan relay. 2) Check for proper connection to the relay at “B/W” and “P/G” wire terminals. 3) If OK, then measure resistance between terminals a and b. See Fig. 2 and 3. Is it 100 – 150 Ω?	“B/W” or “P/G” circuit open or short. If wires and connections are OK, substitute a known-good ECM (PCM) and recheck.	Replace radiator cooling fan relay.

Fig. 1 for Step 2

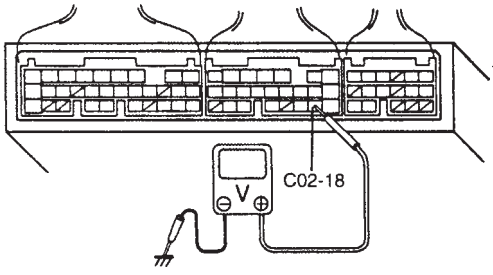


Fig. 2 for Step 3

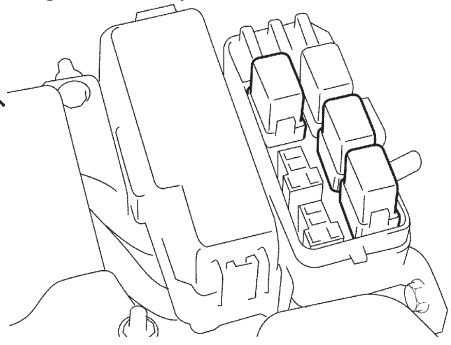
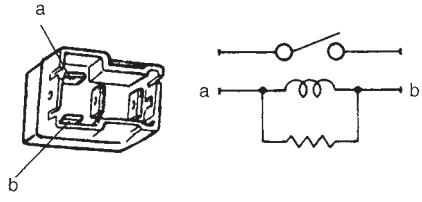
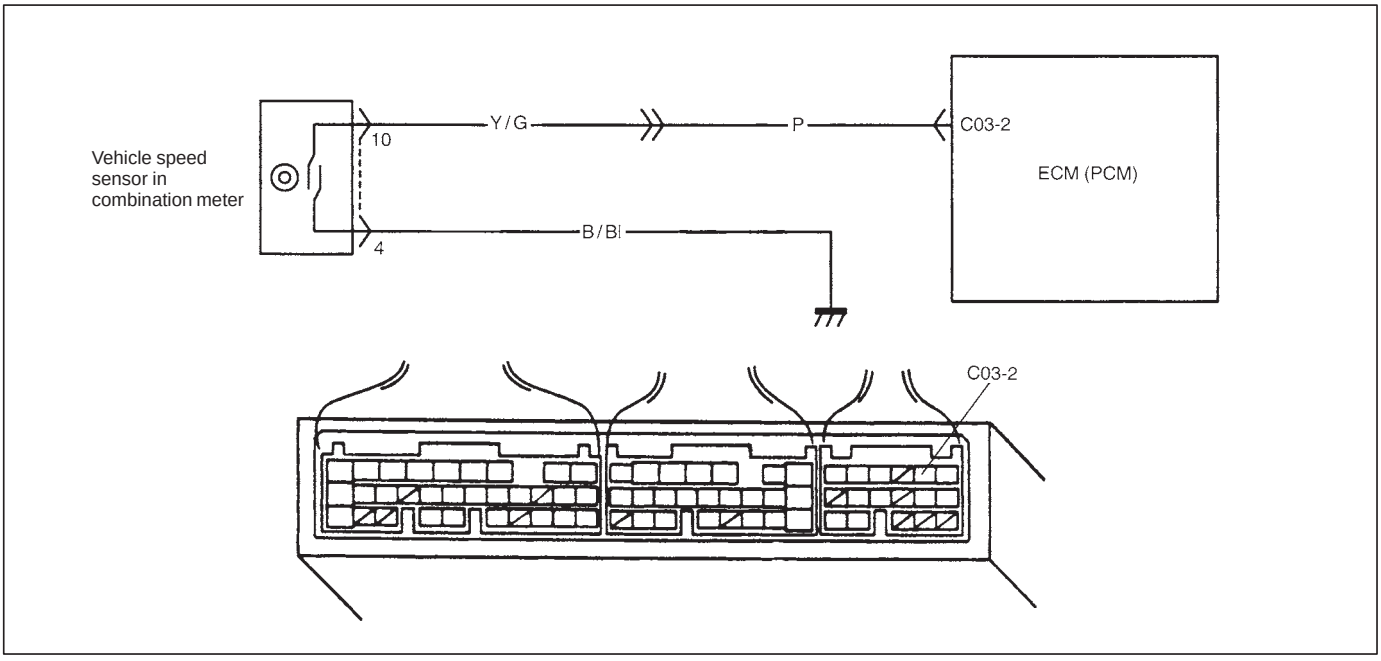


Fig. 3 for Step 3



DTC P0500 VEHICLE SPEED SENSOR (VSS) MALFUNCTION FOR M/T VEHICLE

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● While fuel is kept cut at lower than 4000 r/min for longer than 4 sec. ● VSS signal not inputted. ✳ 2 driving cycle detection logic, continuous monitoring.	● Speedometer cable broken ● "P", "Y/G" or "B/Bl" circuit open or short ● VSS malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

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

1) Clear DTC and warm up engine to normal operating temperature.
2) Increase vehicle speed to 50 mph, 80 km/h in 3rd gear.
3) Release accelerator pedal and with engine brake applied, keep vehicle coasting (fuel cut condition) for 4 sec. or more.
4) Check pending DTC and DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Does speedometer indicate vehicle speed?	Go to Step 3.	Speedometer cable disconnected or broken.
3	Check VSS and Its Circuit. 1) Disconnect ECM connector with ignition switch OFF. 2) Check for proper connection to ECM (PCM) at terminal C03-2. 3) If OK, then connect ohmmeter between terminal C03-2 of ECM (PCM) connector and body ground. 4) Hoist front end of vehicle and lock front right tire. 5) Turn front left tire slowly. Does ohmmeter indicator deflect between 0 and infinity a few times while tire is turned one revolution? See Fig. 1.	Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection” in section 0A.	Go to Step 4.
4	Check VSS. 1) Remove combination meter. 2) Connect ohmmeter between “VSS” terminal and “GND” terminal of combination meter and turn cable joint of speedometer with a screwdriver. Ohmmeter indicator should move back and forth between 0 and infinity 4 times while cable joint is turned one full revolution. See Fig. 2. Is it in good condition?	“P”, “Y/G” or “B/Bl” wire open or short, or poor connection.	Replace VSS.

Fig. 1 for Step 3

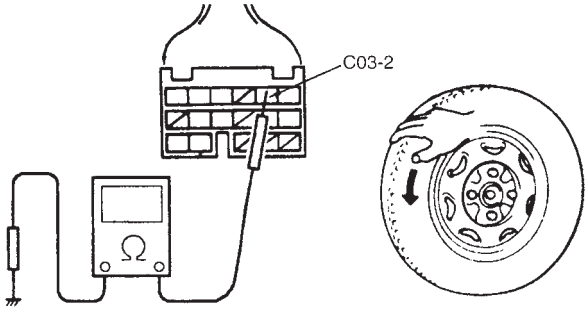
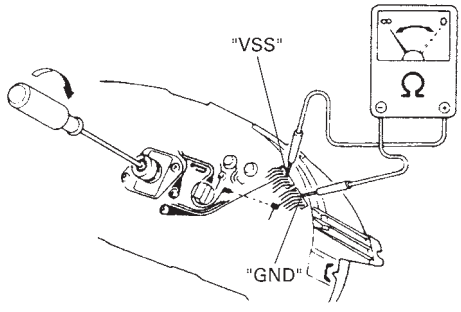
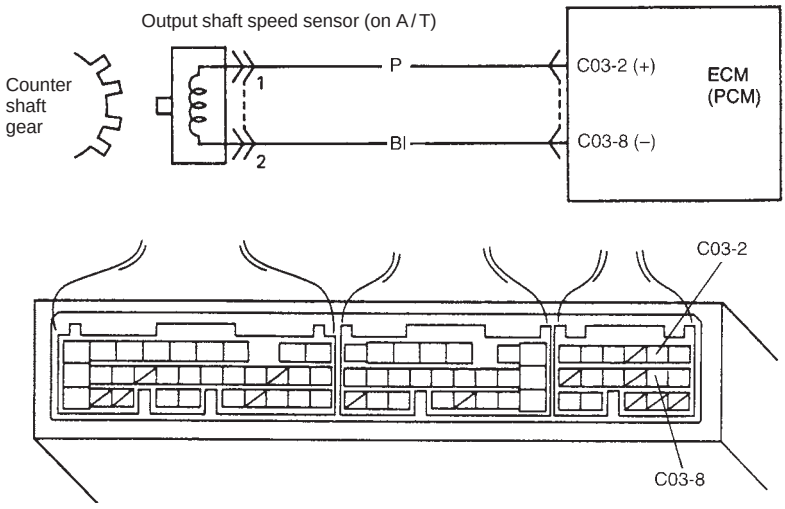


Fig. 2 for Step 4



DTC P0500 VEHICLE SPEED SENSOR (VSS) MALFUNCTION FOR A/T VEHICLE

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● While fuel is kept cut at lower than 4000 r/min for longer than 4 sec. ● VSS signal not inputted. ∗ 2 driving cycle detection logic, continuous monitoring.	● "P" or "Bl" circuit open or short. ● Vehicle speed sensor malfunction. ● Foreign material being attached or sensor installed improperly. ● Gear damaged.

DTC CONFIRMATION PROCEDURE

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

1) Turn ignition switch OFF and then ON.
2) Clear DTC and warm up engine to normal operating temperature.
3) Increase vehicle speed to 50 mph, 80 km/h in "2" range.
4) Release accelerator pedal and with engine brake applied, keep vehicle coasting (fuel cut condition) for 4 sec. or more.
5) Stop vehicle and check DTC and pending DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check VSS for Resistance. 1) Disconnect VSS connection with ignition switch OFF. 2) Check for proper connection to VSS at “P” and “Bl” wire terminals. 3) If OK, then check resistance of VSS. See Fig. 1. Resistance between terminals : 100 – 300 Ω Resistance between terminal and transmission : 1 MΩ or more Are check result satisfactory?	Go to Step 3.	Replace VSS.
3	Check Visually VSS and Counter Shaft Gear for the Following. See Fig. 2. ● No damage ● No foreign material attached ● Correct installation Are they in good condition?	“P” or “Bl” wire open or shorted to ground or poor C03-2 or C03-8 connection. If wires and connections are OK, intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in section 0A.	Clean, repair or replace.

Fig. 1 for Step 2

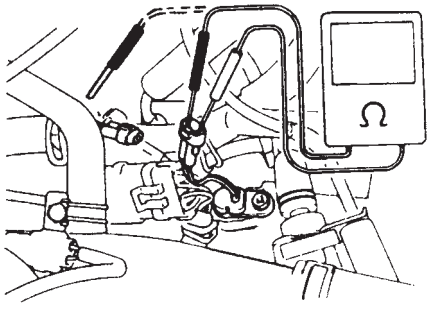
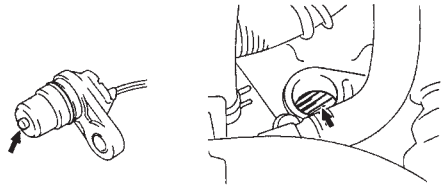
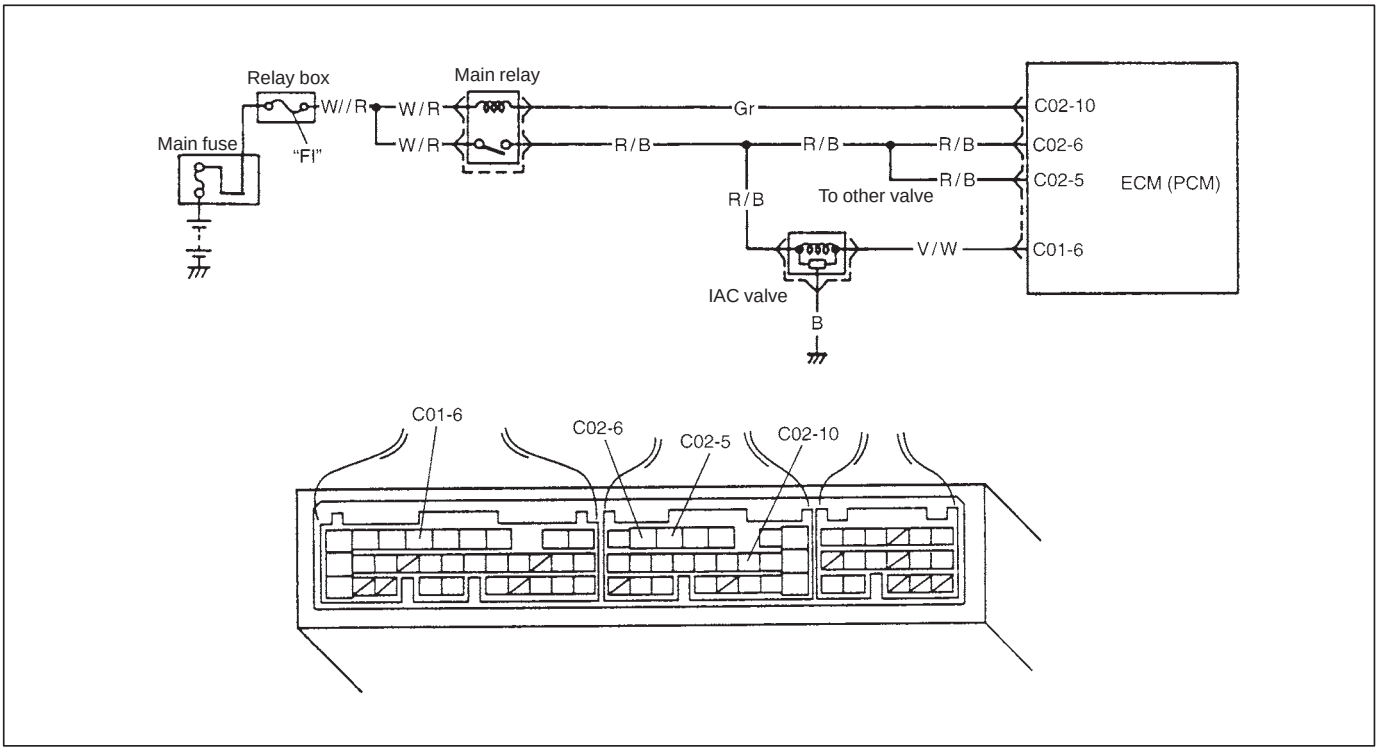


Fig. 2 for Step 3



DTC P0505 IDLE CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● No closed signal to IAC valve is detected after engine start. ※ 2 driving cycle detection logic, continuous monitoring.	● "R/B", "V/W" or "B" circuit open or short ● IAC valve malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Start engine and run it at idle for 1 min.
4) Check DTC and pending DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check Idle Air Control System. When using SUZUKI scan too: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF, set parking brake and block drive wheels. 2) Warm up engine to normal operating temperature. 3) Clear DTC and select “MISC TEST” mode on SUZUKI scan tool. See Fig. 1. Is it possible to control (increase and reduce) engine idle speed by using SUZUKI scan tool? When not using SUZUKI scan tool: 1) Remove IAC valve from throttle boy referring to “IAC Valve Removal” in Section 6E2. 2) Check IAC valve for operation referring to “IAC Valve Inspection” in Section 6E2. See Fig. 2. Is check result satisfactory?	Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check Wire Harness for Open and Short. 1) Turn ignition switch OFF. 2) Disconnect IAC valve connector. 3) Check for proper connection to IAC valve at each terminals. 4) If OK, disconnect ECM (PCM) connector. 5) Check for proper connection to ECM (PCM) at C01-6 terminal. 6) If OK, check “R/B”, “V/W” and “B” circuit for open and short. Are they in good condition?	Replace IAC valve and recheck.	Repair or replace.

Fig. 1 for Step 1

When using SUZUKI scan tool:

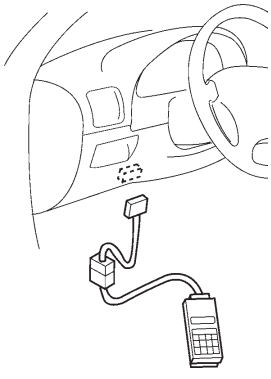
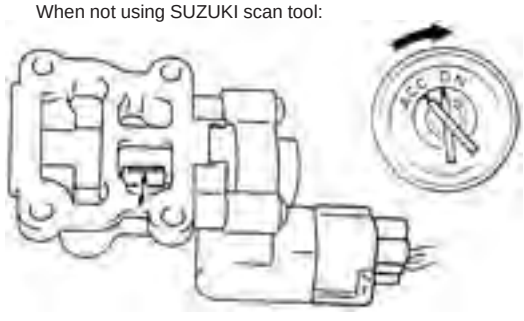


Fig. 2 for Step 2

When not using SUZUKI scan tool:



DTC P0601 INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR

DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC P0601: Data write error (or check sum error) when written into ECM (PCM) ※ 1 driving cycle detection logic, continuous monitoring.	ECM (PCM)

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON and then turn ignition switch OFF.
3) Start engine and run it at idle if possible.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

INSPECTION

Substitute a known-good ECM (PCM) and recheck.

DTC P1450 BAROMETRIC PRESSURE SENSOR LOW/HIGH INPUT
DTC P1451 BAROMETRIC PRESSURE SENSOR PERFORMANCE PROBLEM

WIRING DIAGRAM/CIRCUIT DESCRIPTION

Barometric pressure sensor is installed in ECM (PCM).

DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC P1450: ● Barometric pressure: 136 kPa 1025 mmHg or higher, or 33 kPa 250 mmHg or lower	● ECM (PCM) (barometric pressure sensor) malfunction
DTC P1451: ● Vehicle stopped ● Engine cranking ● Difference between barometric pressure and intake manifold absolute pressure is 26 kPa, 200 mmHg or more ✳ 2 driving cycle detection logic, monitoring once/1 driving.	● Manifold absolute pressure sensor and its circuit malfunction ● ECM (PCM) (barometric pressure sensor) malfunction

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Turn ignition switch ON for 2 sec., crank engine for 2 sec. and run it at idle for 1 min.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

INSPECTION

DTC P1450:

Substitute a known-good ECM (PCM) and recheck.

DTC P1451:

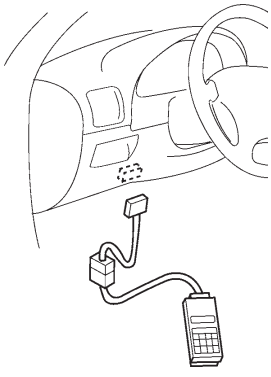
NOTE:

Note that atmospheric pressure varies depending on weather conditions as well as altitude. Take that into consideration when performing these check.

STEP	ACTION	YES	NO
1	1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and select “DATA LIST” mode on scan tool. 3) Check manifold absolute pressure. See Fig. 1. Is it barometric pressure (approx. 100 kPa, 760 mmHg) at sea level?	Substitute a known-good ECM (PCM) and recheck.	Go to Step 2.

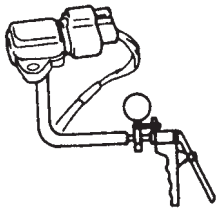
Fig. 1 for Step 1

When using SUZUKI scan tool:



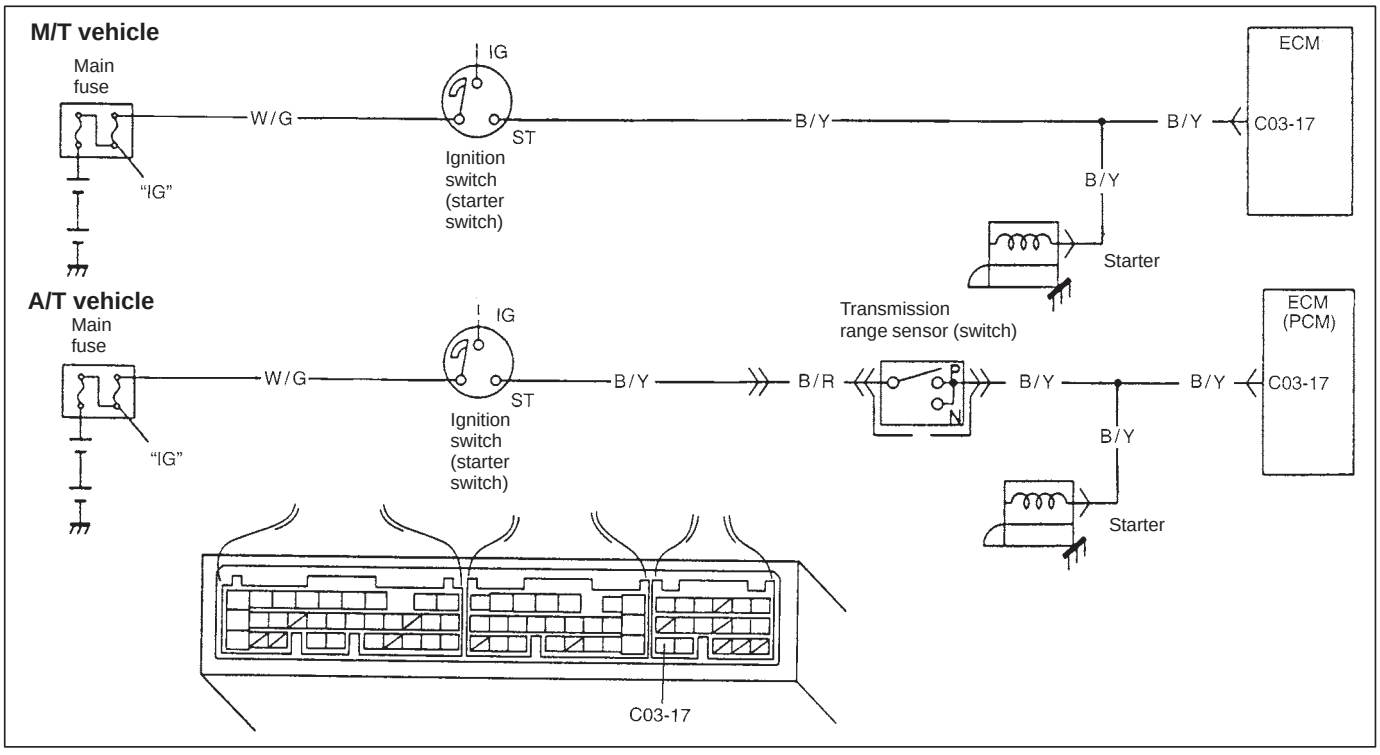
<table>
<tr><th>STEP</th><th>ACTION</th><th>YES</th><th>NO</th></tr>
<tr><td>2</td><td>Check MAP Sensor
1) Remove MAP sensor from intake manifold and connect vacuum pump gauge to MAP sensor. See Fig. 2.
2) Connect scan tool to DLC and turn ignition switch ON.
3) Check intake manifold absolute pressure displayed on scan tool under following conditions.
<table><tr><th>Applying Vacuum</th><th>Displayed Value on Scan Tool</th></tr><tr><td>0</td><td>Barometric pressure
(Approx. 100 kPa, 760 mmHg)</td></tr><tr><td>27 kPa
200 mmHg</td><td>Barometric pressure –27 kPa
(Approx. 73 kPa, 560 mmHg</td></tr><tr><td>67 kPa
500 mmHg</td><td>Barometric pressure –67 kPa
(Approx. 33 kPa, 260 mmHg)</td></tr></table>Is check result satisfactory?</td><td>Check air intake system for air being drawn in and engine compression.
If OK, then substitute a known-good ECM (PCM) and recheck.</td><td>Replace MAP sensor.</td></tr>
</table>

Fig. 2 for Step 2



DTC P1500 ENGINE STARTER SIGNAL CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low voltage at terminal C03-17 when cranking engine or ● High voltage at terminal C03-17 after starting engine. ∗ 2 driving cycle detection logic, continuous monitoring.	● "B/Y" circuit open ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

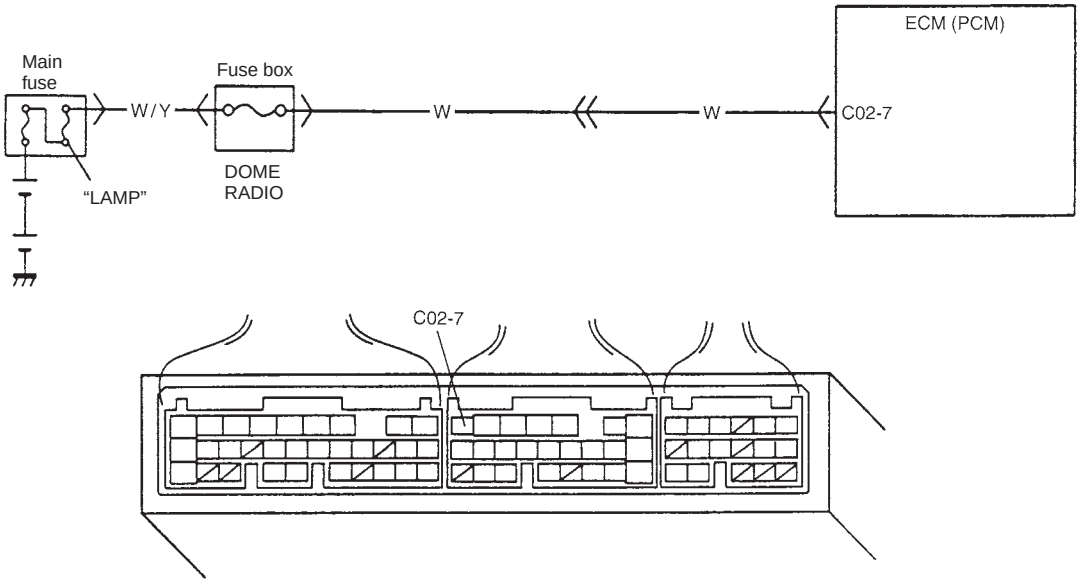
1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON, crank engine and run it at idle for 3 min.
3) Check pending DTC in "ON BOARD TEST" or "PENDING DTC" mode and DTC in "DTC" mode.

INSPECTION

STEP	ACTION	YES	NO
1	Was "ENGINE DIAG. FLOW TABLE" performed?	Go to Step 2.	Go to "ENGINE DIAG. FLOW TABLE".
2	Check for voltage at terminal C03-17 of ECM (PCM) connector connected, under following condition. While engine cranking : 6 – 10 V After starting engine : 0 V Is voltage as specified?	Poor C03-17 connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. If wire and connections are OK, substitute a known-good ECM (PCM) and recheck.	"B/Y" circuit open.

DTC P1510 ECM (PCM) BACK-UP POWER SUPPLY MALFUNCTION

CIRCUIT DESCRIPTION



Battery voltage is supplied so that diagnostic trouble code memory, values for engine control learned by ECM (PCM), etc. are kept in ECM (PCM) even when the ignition switch is turned OFF.

DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low voltage at terminal C02-7 after starting engine.	● "W" circuit open ● ECM (PCM) malfunction

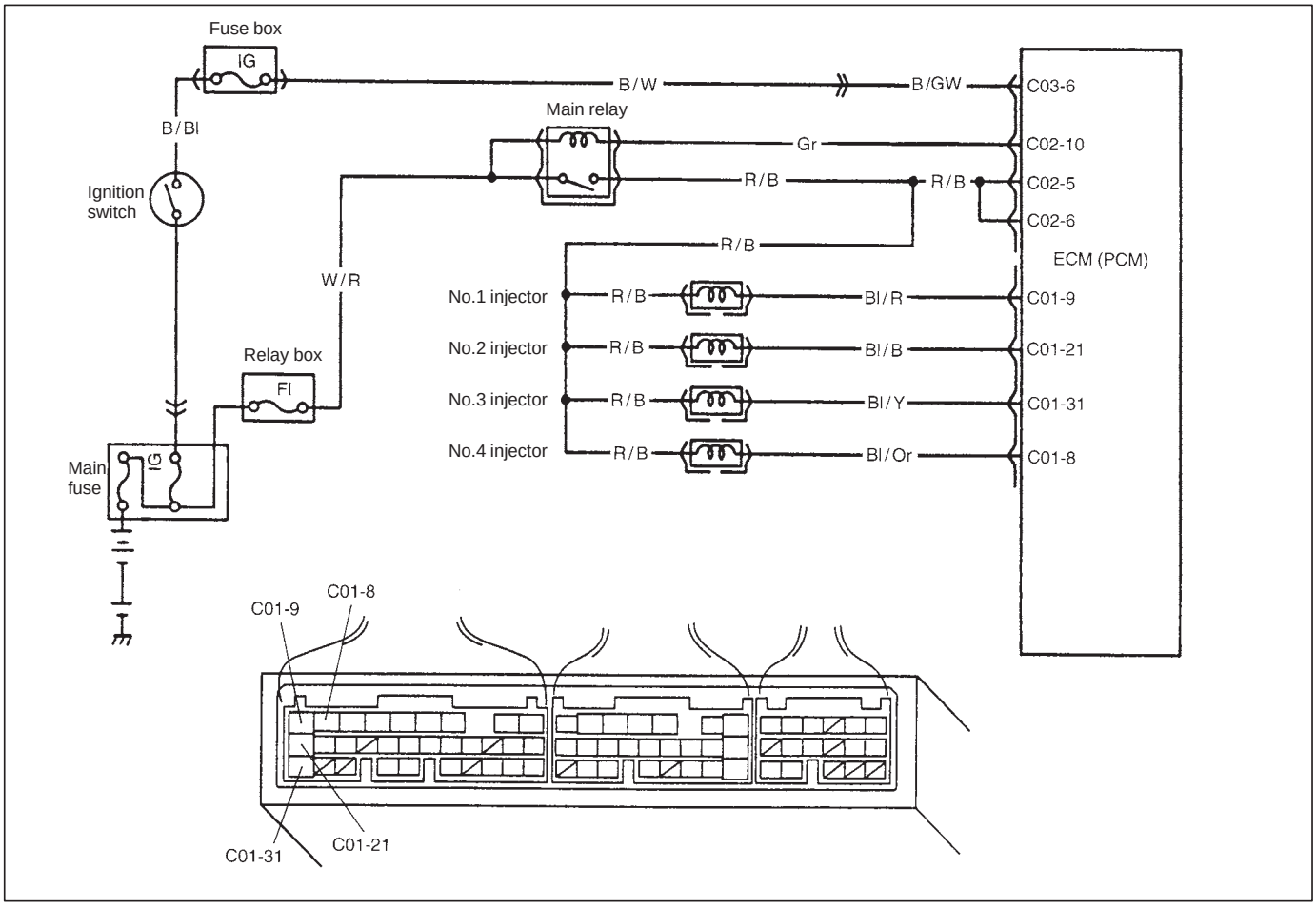
DTC CONFIRMATION PROCEDURE

1) Clear DTC, start engine and run it at idle for 1 min.
2) Select "DTC" mode on scan tool and check DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Check for voltage at terminal C02-7 of ECM (PCM)connector connected, under each condition, ignition switch OFF and engine running. Is it 10 – 14 V at each condition?	Poor C02-7 connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. If wire and connections are OK, substitute a known- good ECM (PCM) and recheck.	"W" circuit open.

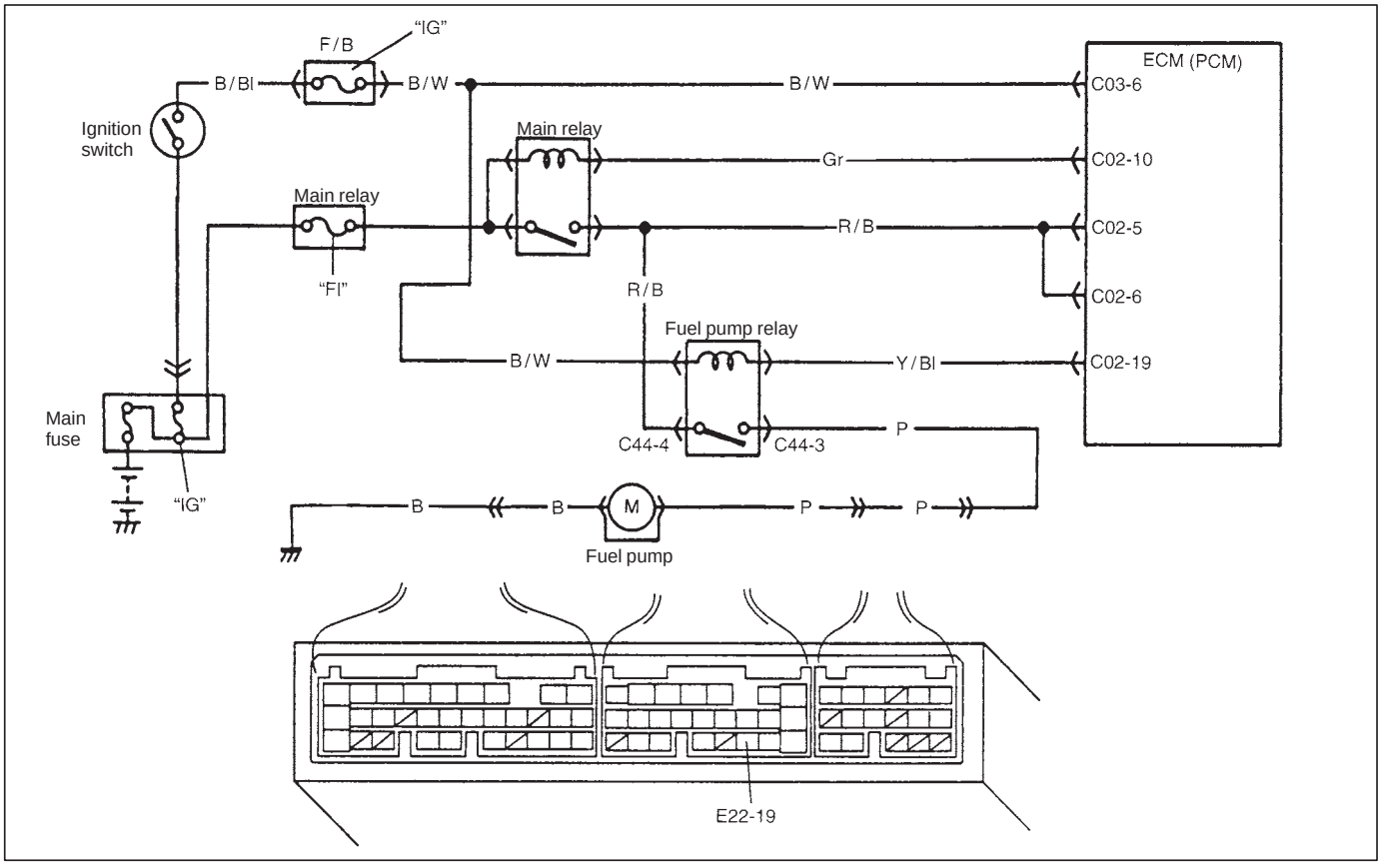
TABLE B-1 FUEL INJECTOR CIRCUIT CHECK



INSPECTION

STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check Injector for Operating Sound. Using sound scope, check each injector for operating sound at engine cranking. Do all 4 injector make operating sound?	Fuel injector circuit is in good condition.	Go to Step 3.
3	Dose none of 4 injectors make operating sound at Step 2?	Go to Step 4.	Check coupler connection and wire harness of injector not making operating sound and injector itself (Refer to Section 6E2).
4	Check power circuit of injectors for open and short. Is it normal?	Check all 4 injectors for resistance respectively. If resistance is OK, substitute a known-good ECM (PCM) and recheck.	Power circuit open or short.

TABLE B-2 FUEL PUMP AND ITS CIRCUIT CHECK



INSPECTION

STEP	ACTION	YES	NO
1	Was "ENGINE DIAG. FLOW TABLE" performed?	Go to Step 2.	Go to "ENGINE DIAG. FLOW TABLE".
2	Check Fuel Pump Control System for Operation. See Fig. 1. Is fuel pump heard to operate for 2 sec. after ignition switch ON?	Fuel pump circuit is in good condition.	Go to Step 3.
3	Check Fuel Pump for Operation. 1) Remove fuel pump relay from relay box with ignition switch OFF. 2) Check for proper connection to relay at each terminals. 3) If OK, using service wire, connect terminals C44-3 and C44-4 of relay connector. See Fig. 2. **CAUTION: Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM (PCM), wire harness, etc.** Is fuel pump heard to operate at ignition switch ON?	Go to Step 4.	"P", "B" or "R/B" circuit open or fuel pump malfunction.
4	Check Fuel Pump Relay for Operation. 1) Check resistance between each two terminals of fuel pump relay. See Fig.3. Between terminals "c" and "d": Infinity Between terminals "a" and "b": 100 – 150 Ω 2) Check that there is continuity between terminals "c" and "d" when battery is connected to terminals "a" and "b". See Fig. 3. Is fuel pump relay in good condition?	"Y/Bl" circuit open or poor C02-19 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace fuel pump relay.

Fig. 1 for Step 2

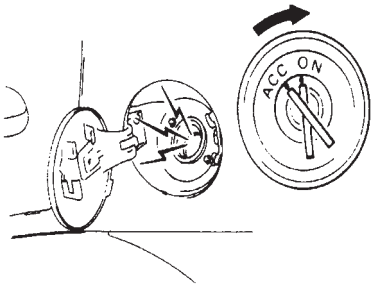


Fig. 2 for Step 3

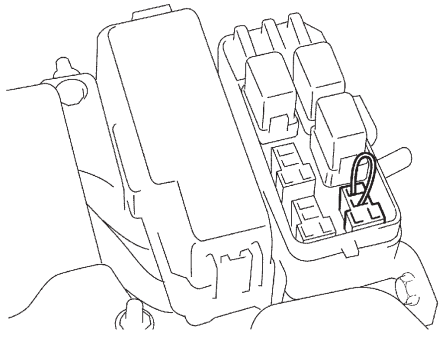


Fig. 3 for Step 4

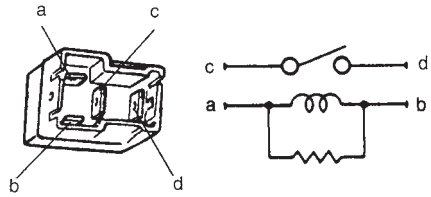
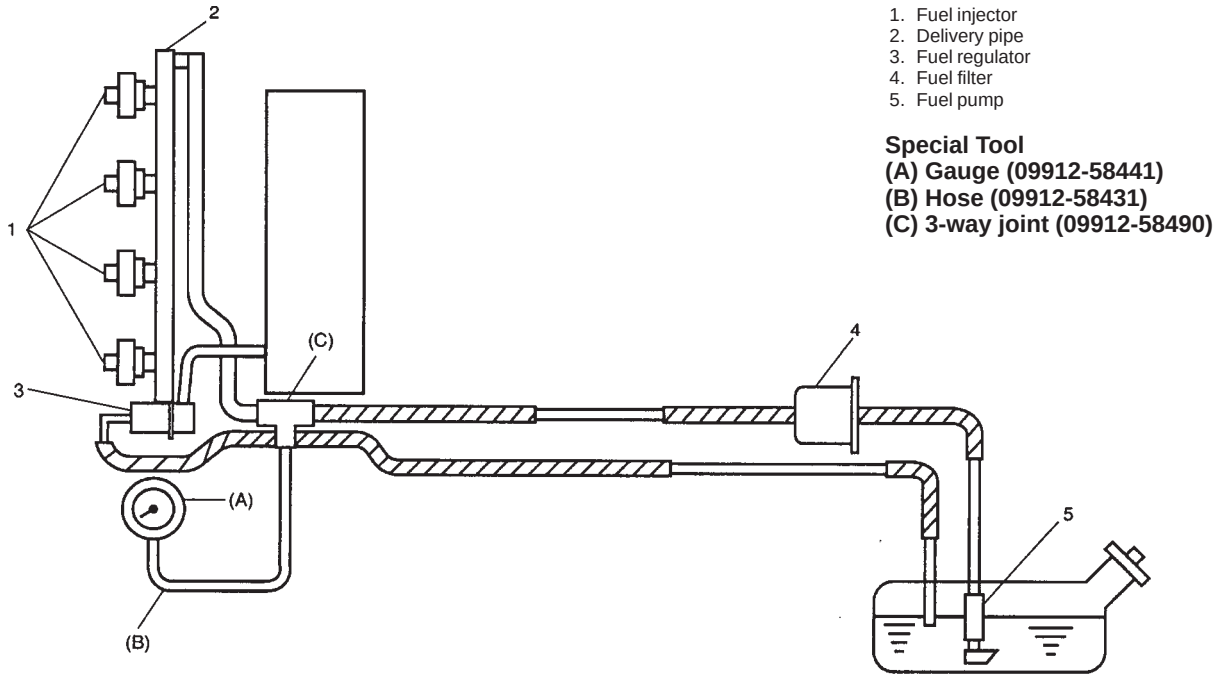


TABLE B-3 FUEL PRESSURE CHECK

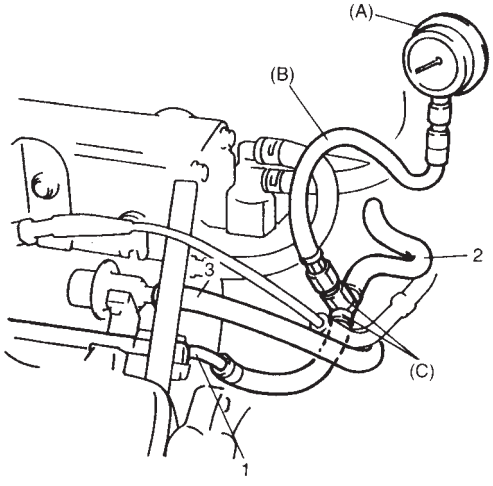


INSPECTION

STEP	ACTION	YES	ON
1	1) Release fuel pressure from fuel feed line. 2) Install fuel pressure gauge. 3) Check fuel pressure by repeating ignition switch ON and OFF. Is fuel pressure then 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)?	Go to Step 2.	Go to Step 5.
2	Is 200 kPa (2.0 kg/cm^2, 28.4 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped at step 1?	Go to Step 3.	Go to Step 4.
3	1) Start engine and warm it up to normal operating temperature. 2) Keep it running at specified idle speed. Is fuel pressure then within 200 – 240 kPa (2.0 – 2.4 kg/cm^2, 28.4 – 34.1 psi)?	Normal fuel pressure.	Clogged vacuum passage for fuel pressure regulator or faulty fuel pressure regulator.
4	Is there fuel leakage from fuel feed line hose, pipe or their joint?	Fuel leakage from hose, pipe or joint.	Go to Step 10.
5	Was fuel pressure higher than spec. in step 1?	Go to Step 6.	Go to Step 7.
6	1) Disconnect fuel return hose from fuel pressure regulator and connect new return hose to it. 2) Put the other end of new return hose into approved gasoline container. 3) Operate fuel pump. Is specified fuel pressure obtained then?	Restricted fuel return hose or pipe.	Faulty fuel pressure regulator.

STEP	ACTION	YES	ON
7	Was no fuel pressure applied in step 1?	Go to Step 8.	Go to Step 9.
8	With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied?	Faulty fuel pressure regulator.	Shortage of fuel or fuel pump or its circuit malfunction.
9	1) Operate fuel pump. 2) With fuel return hose blocked by pinching it, check fuel pressure. Is it 450 kPa (4.5 kg/cm^2, 63.9 psi) or more?	Faulty fuel pressure regulator.	Clogged fuel filter, restricted fuel feed hose or pipe, Faulty fuel pump or fuel leakage from hose connection in fuel tank.
10	1) Disconnect fuel return hose from pressure regulator and connect new return hose to it. 2) Insert the other end of new return hose into approved gasoline container. 3) Check again if specified pressure is obtained. While doing so, does fuel come out of return hose?	Faulty fuel pressure regulator.	Fuel leakage from injector, Fuel leakage from between injector and delivery pipe, Faulty fuel pump (faulty check valve in fuel pump) or Fuel leakage from fuel pressure regulator diaphragm.

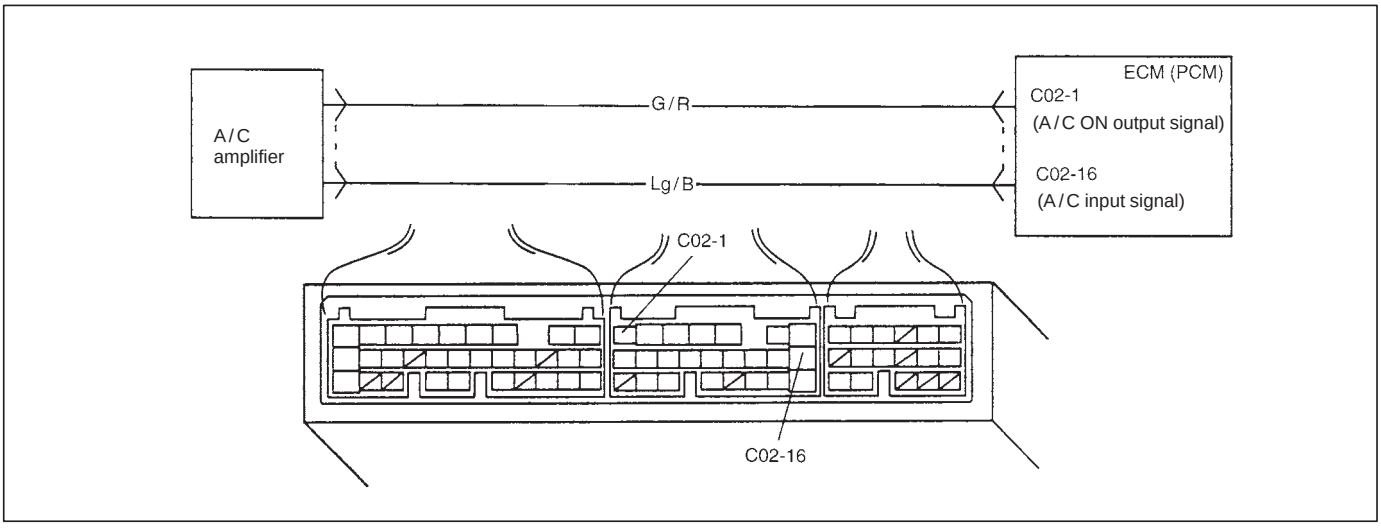
Fig. for STEP 1



1. Fuel delivery pipe
2. Fuel feed hose
3. Fuel return hose

Special Tool
(A) Gauge
(B) Hose
(C) 3-way joint

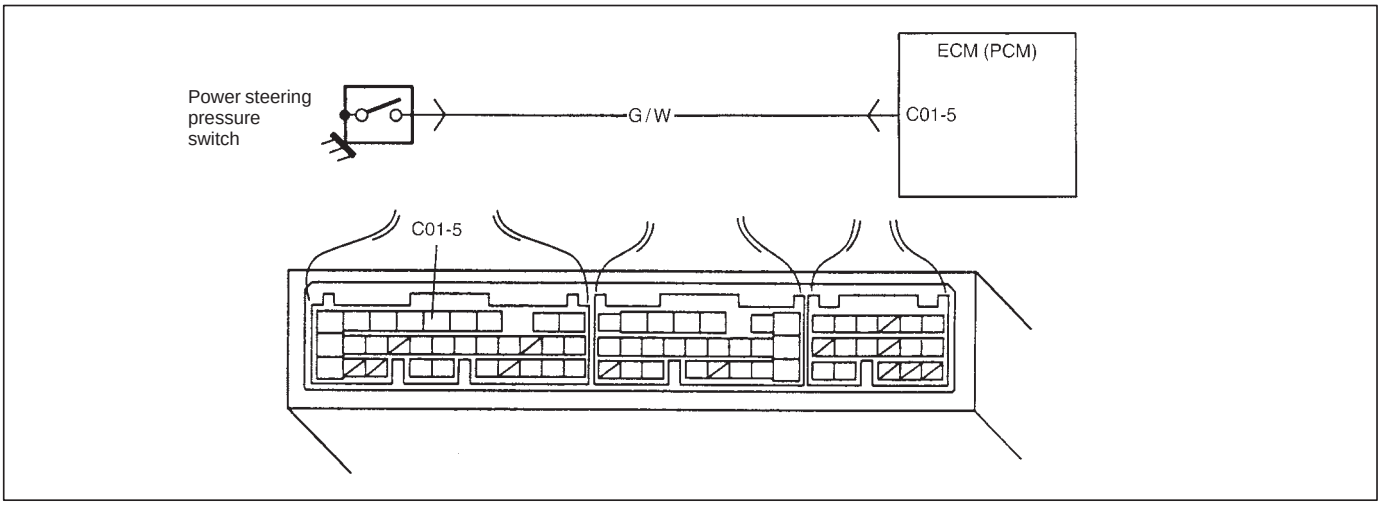
TABLE B-4 A/C SIGNAL CIRCUITS CHECK (VEHICLE WITH A/C)



INSPECTION

STEP	ACTION	YES	NO
1	Check A/C (input) Signal Circuit. 1) Check voltage at terminal C02-16. See Fig. 1. While engine running and A/C switch and/or heater blower switch OFF (A/C is not operating) : 10 – 14 V While engine running and both A/C switch and heater blower switch ON (A/C is operating) : About 0 V Are check result as specified?	Go to Step 2.	"Lg/B" circuit open or short, Evaporative temperature is 1°C (34°F) below or faulty A/C system.
2	Check A/C ON (Output) Signal Circuit. 1) Check voltage at terminal C02-1. See Fig. 2. While engine running and A/C switch and/or heater blower switch OFF (A/C is not operating) : About 0 V While engine running at idle speed and both A/C switch and heater blower switch ON (A/C is operating) : 10 – 14 V Are check result as specified?	A/C control signal circuits are in good condition.	"G/R" circuit open or short, Poor performance of ECT sensor, TP sensor, Engine start signal inputted or A/C amplifier malfunction. If none of the above exists, substitute a known-good ECM and recheck.

TABLE B-5 POWER STEERING PRESSURE (PSP) SWITCH SIGNAL CIRCUIT CHECK (If equipped)



INSPECTION

STEP	ACTION	YES	NO
1	Check PSP Switch Signal Circuit. When using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Check power steering pressure switch. See Fig. 1. Engine running and steering wheel at straight-ahead position : OFF, 10 – 14 V Engine running and steering wheel turned to the right or left as far as it stops : ON, 0 – 1 V Is it in good condition? When not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check for voltage at terminal C01-5 of ECM connector connected, under above each condition. Is each voltage as specified?	Signal circuit is in good condition.	Go to Step 2.
2	Check Wire Harness. 1) Turn ignition switch OFF and disconnect PSP switch connector. 2) Check for proper connection to PSP switch. 3) If OK, then check voltage at PSP switch wire terminal with ignition switch ON. See Fig. 2. Is it 10 – 14V?	Power steering switch malfunction or power steering system malfunction.	"G/W" wire open or shorted to ground or poor C01-5 connection. If wire and connection are OK, substitute a known-good ECM and recheck.

Fig. 1 for Step 1

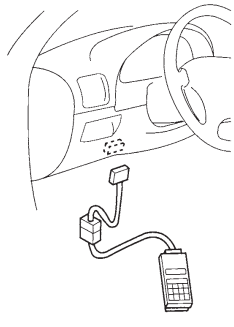


Fig. 2 for Step 2

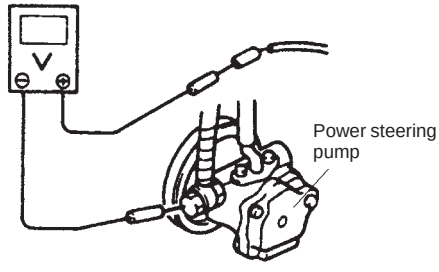
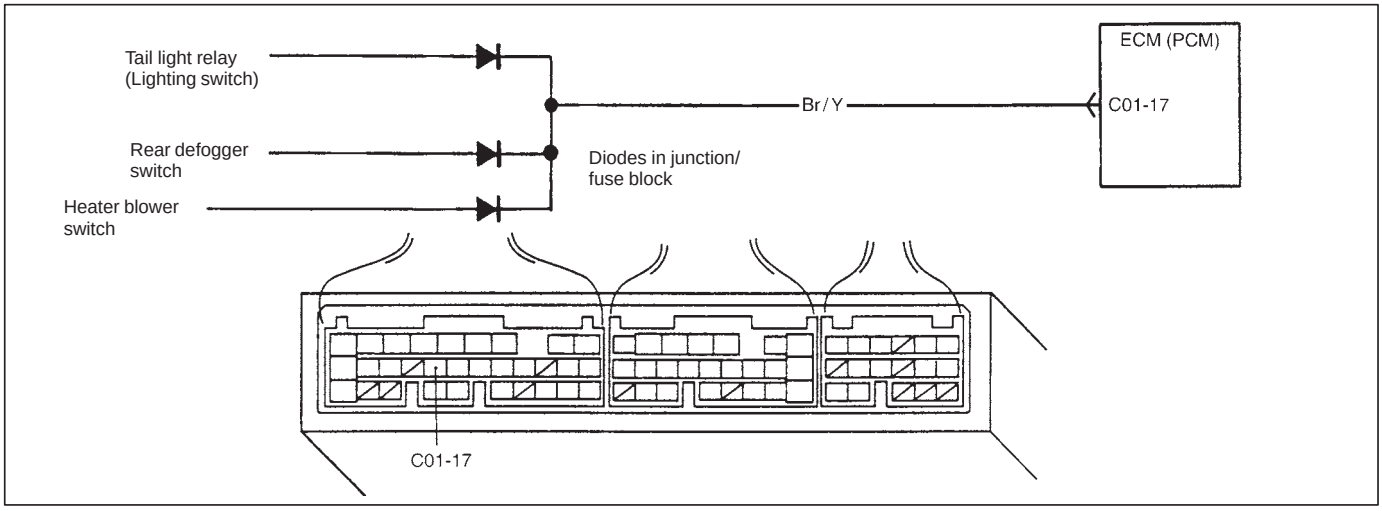


TABLE B-6 ELECTRIC LOAD SIGNAL CIRCUIT CHECK



INSPECTION

STEP	ACTION	YES	NO
1	Check Electric Load Signal Circuit. When using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check electric load signal under following each condition. See Fig. 1. Ignition switch ON, Small light, heater blower fan and rear defogger all turned OFF : OFF 0 V (C01-17) Ignition switch ON, Small light, heater blower fan or rear defogger turned ON : ON 10 – 14 V (C01-17) Is check result satisfactory? When not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals C01-17 of ECM (PCM) connector connected, under above each condition. See Fig. 2. Is each voltage as specified?	Electric load signal circuit is in good condition.	“Br / Y” circuit open or short, Electric load diodes malfunction or Each electric load circuit malfunction.

Fig. 1 for Step 1

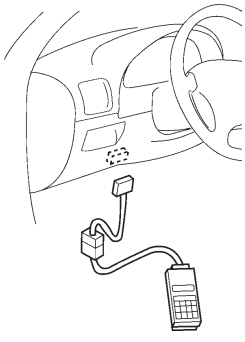


Fig. 2 for Step 1

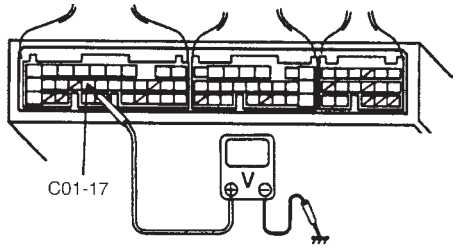
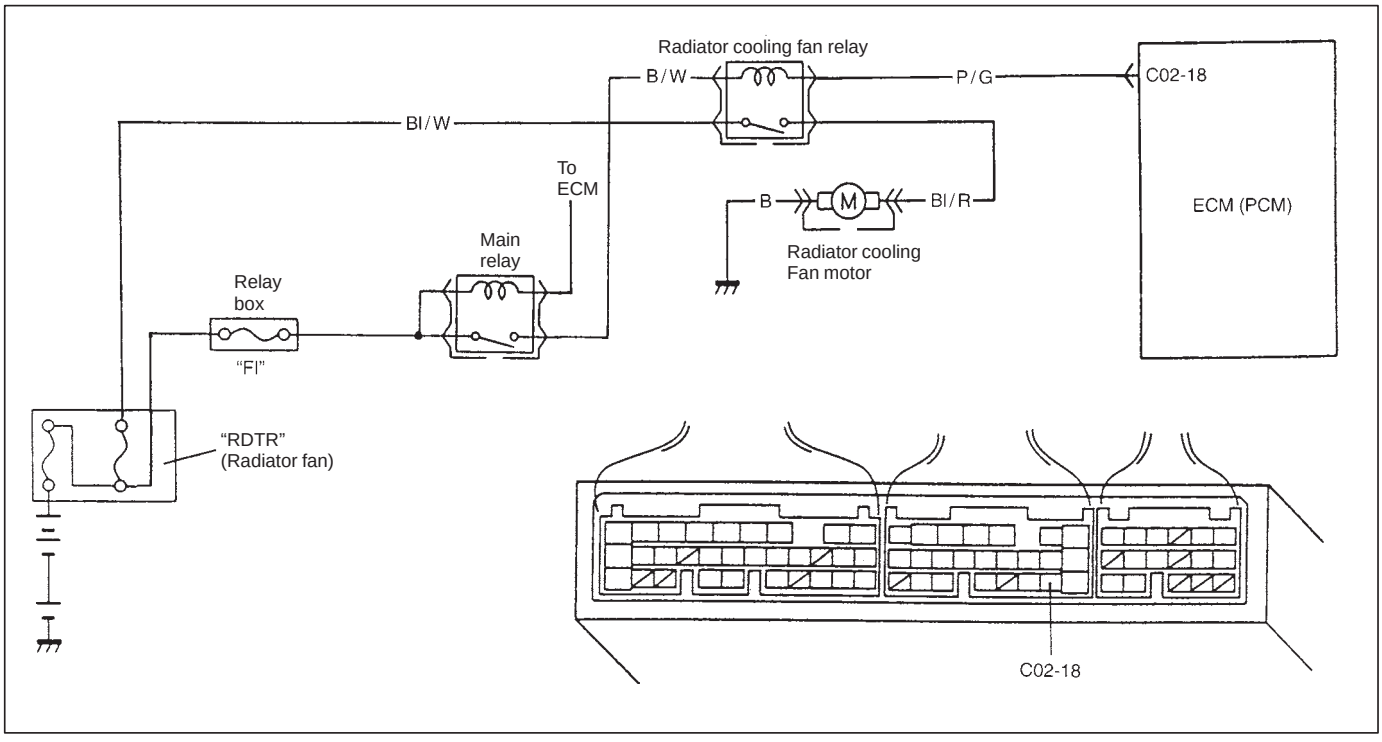


TABLE B-7 RADIATOR COOLING FAN CONTROL SYSTEM CHECK



INSPECTION

STEP	ACTION	YES	NO
1	Check Fan Control System. 1) Connect scan tool to DLC with ignition switch OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Warm up engine until coolant temp. is 97.5°C, 208°F or higher and A/C switch turn OFF. (If engine coolant temp. does not rise, check engine cooling system or ECT sensor.) See Fig. 1. Is radiator cooling fan started when engine coolant temp. reached above temp.?	Radiator cooling fan control system is in good condition.	Go to Step 2.
2	Check Radiator Cooling Fan Relay and Its Circuit. 1) Check DTC and pending DTC with scan tool. Is DTC P0480 displayed?	Go to DTC P0480 Diag. Flow Table.	Go to Step 3.
3	Check Radiator Cooling Fan Relay. 1) Turn ignition switch OFF and remove radiator cooling fan relay. 2) Check for proper connection to relay at terminals "c" and "d". 3) If OK, check that there is continuity between "c" and "d" when battery is connected to terminals "a" and "b". See Fig. 2. Is check result satisfactory?	Go to Step 4.	Replace radiator fan relay.
4	Check Radiator Cooling Fan. 1) Turn ignition switch OFF. 2) Disconnect cooling fan motor connector. 3) Check for proper connection to motor at "Bl/R" and "B" terminals. 4) If OK, connect battery to motor and check for operation. See Fig. 3. Is it in good condition?	"Bl/W", "Bl/R" or "B" circuit open.	Replace radiator cooling fan motor.

Fig. 1 for Step 1

When using SUZUKI scan tool:

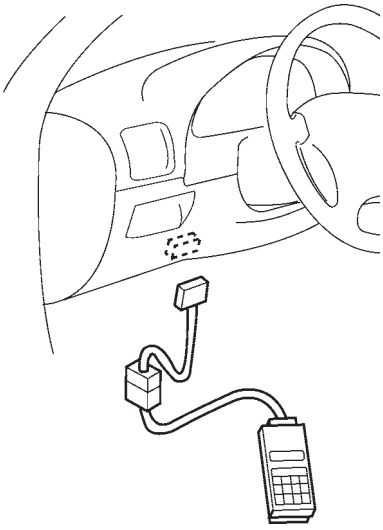
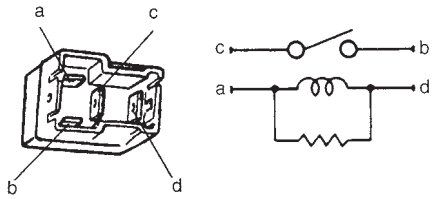
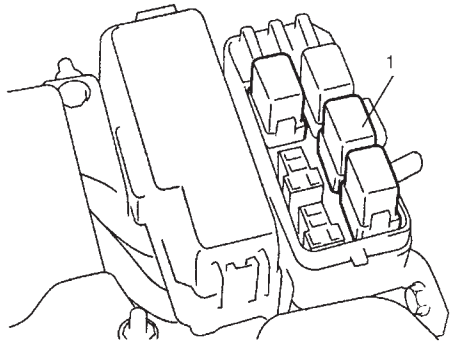


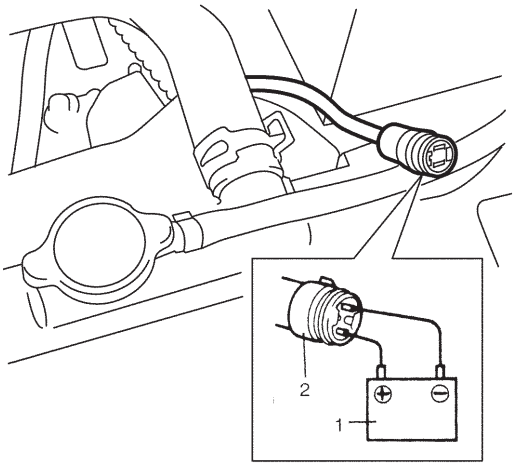
Fig. 2 for Step 3





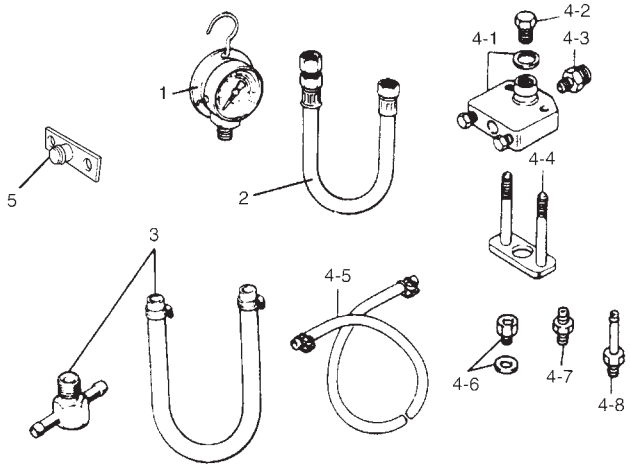
1. Radiator cooling fan relay

Fig. 3 for Step 4



1. Battery
2. Radiator fan motor coupler

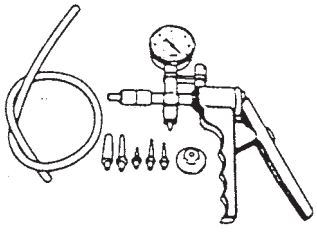
SPECIAL TOOLS



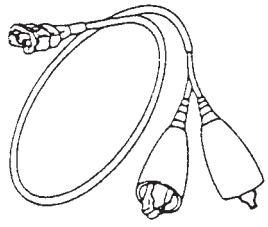
1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. 3-way joint & hose
   09912-58490
4. Checking tool set
   09912-58421

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

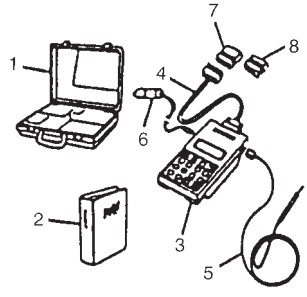
5. Checking tool plate
   09912-57610



09917-47910
Vacuum pump gauge

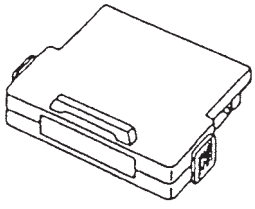


09930-88530
Injector test lead

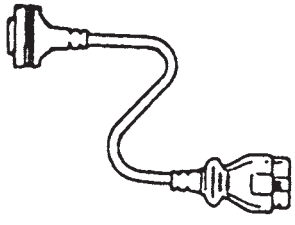


1. Storage case
2. Operator's manual
3. Tech 1 A
4. DLC cable (14/26 pin, 09931-76040)
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

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



Mass storage cartridge



09931-76030
16/14 pin DLC cable