SECTION 6

ENGINE GENERAL INFORMATION AND DIAGNOSIS (TBI FOR G10)

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).**

NOTE:
For the descriptions for vehicle without warm up three way catalytic converter (WUTWC), refer to Section 6 and 6E1 of the Service Manual mentioned in the FOREWORD of this manual.

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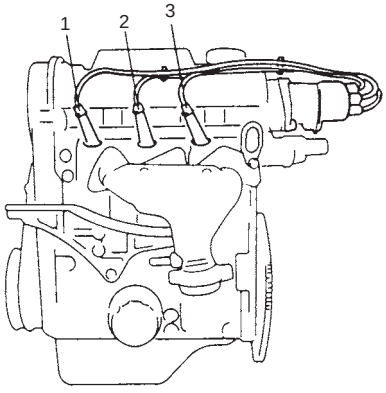


1. No.1 cylinder
2. No.2 cylinder
3. No.3 cylinder

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) and No.3 (3) counted from crankshaft pulley side to flywheel side.

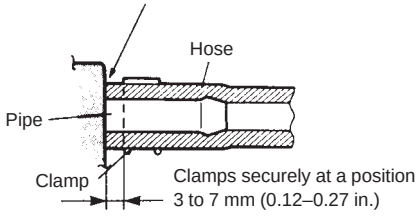
GENERAL INFORMATION ON ENGINE SERVICE

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

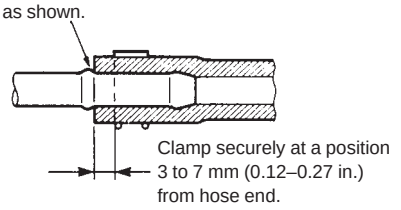
- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, 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

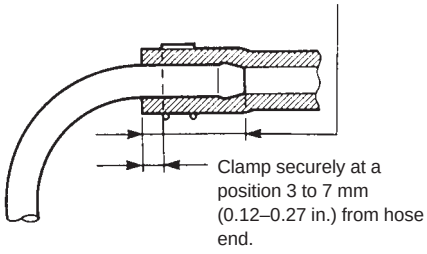
With short pipe, fit hose as far as it reaches pipe joint as shown.



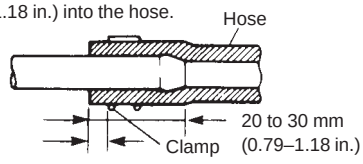
With following type pipe, fit hose as far as its peripheral projection as shown.



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.



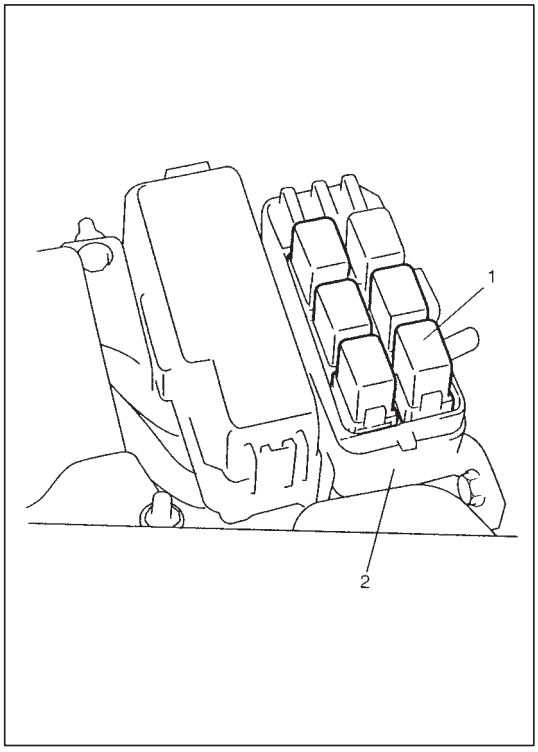
With straight pipe, fit hose till pipe is, about 20 to 30 mm (0.79–1.18 in.) into the hose.



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 (2).
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 to relay box and install relay box cover.

FUEL LEAKAGE CHECK PROCEDURE

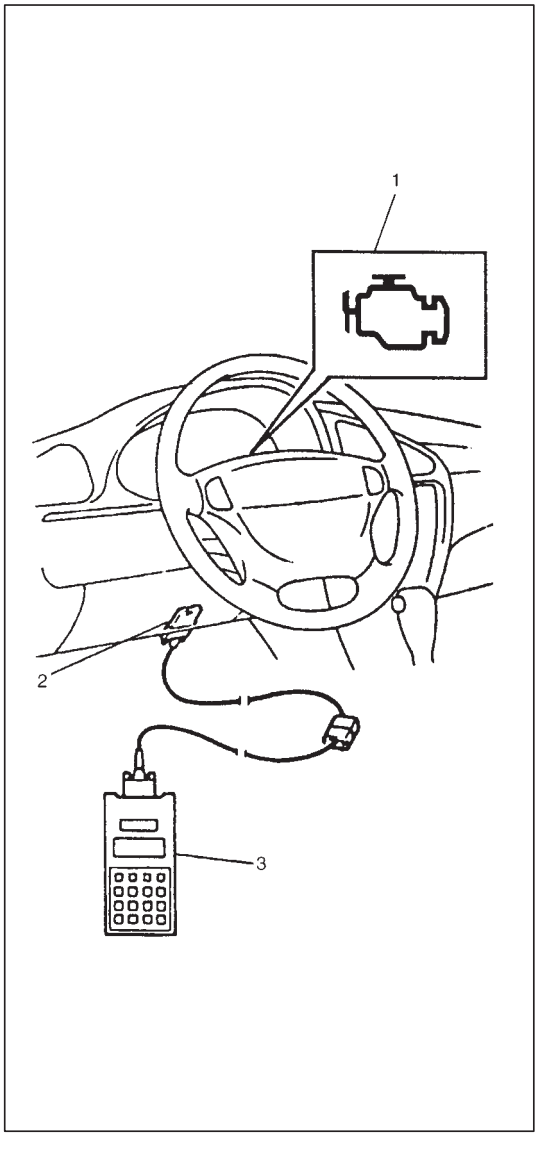
After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1) Turn ON ignition switch for 2 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, driving mode where a malfunction would be detected if present and engine shutoff.

2 Driving Cycles 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 cycles 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:

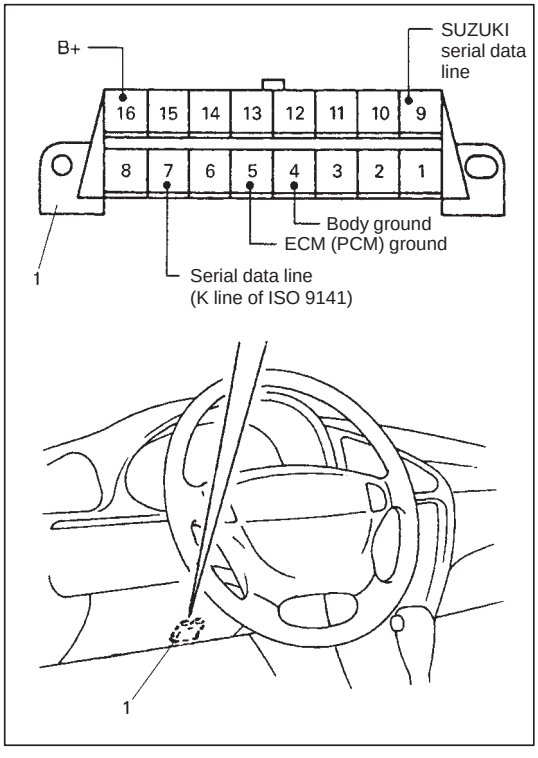
ECM (PCM) has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described below. (If malfunction as described in the upper 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-P0303), 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 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) or generic scan tool to communicate with ECM (PCM).
SUZUKI serial data line is used for SUZUKI scan tool (Tech-1) to communicate with ABS control module and air bay SDM.

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 has detected earliest in the order and follow the instruction in that table.
  If no instructions are given, troubleshoot diagnostic trouble codes according to the following priorities.
  1. Diagnostic trouble codes (DTCs) other than DTC P0171/P0172 (Fuel system too lean/too rich) and DTC P0300/P0301/P0302/P0303 (Misfire detected)
  2. DTC P0171/P0172 (Fuel system too lean/too rich)
  3. DTC P0300/P0301/P0302/P0303 (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 Engine Diag. Table 1) Check and repair according to "Engine Basic Check" and "Engine Diag. 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/P0720/P0753/P0758/P0751/P0756) or Immobilizer DTCs (P1620 – P1623) 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 ENGINE DIAGNOSIS FLOW 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)

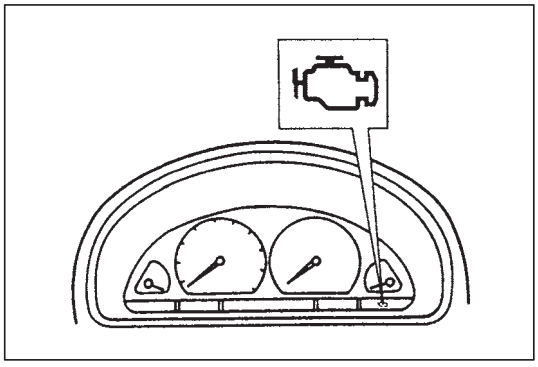
User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

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_____

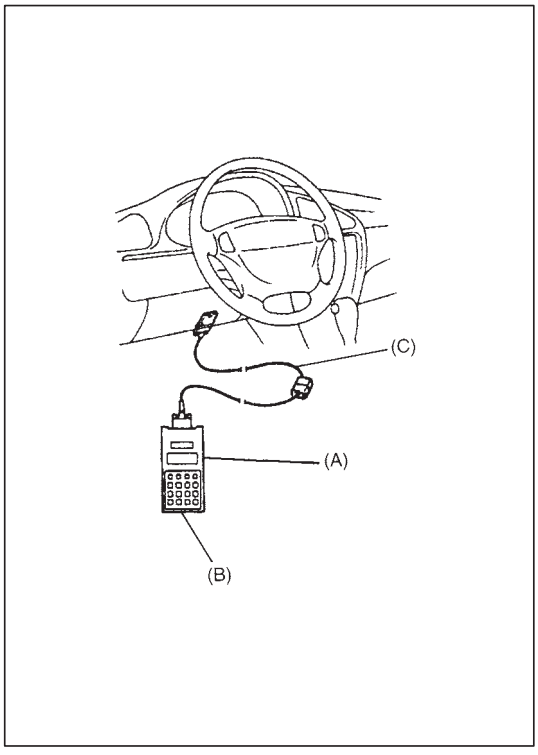
Malfunction indicator lamp condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition	
Diagnostic trouble code	First check:	☐No code ☐Malfunction code ( )
	Second check:	☐No code ☐Malfunction code ( )

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) or generic scan tool.
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

1) Connect SUZUKI scan tool (Tech-1) or generic scan tool 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 for 30 sec. or longer)**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

DIAGNOSTIC TROUBLE CODE (DTC) TABLE

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
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	Random misfire detected Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 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 during engine running	1 driving cycle
P0340	Camshaft position sensor circuit malfunction	No signal for 2 sec. during engine cranking	1 driving cycle
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	EVAP 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	Throttle opening change is small as compared with electrically live time. Throttle valve opening is not within its target range with CTP switch ON or drive voltage exists though ECM (PCM) is not outputting ISC drive command.	1 driving cycle
P0510	Closed throttle position switch malfunction	Switch does not change from ON to OFF (or from OFF to ON) even when vehicle speed reaches over (or below) specification.	2 driving cycle
P1250	Early Fuel Evaporation Heater Circuit Malfunction	Heater monitor terminal voltage is higher than specified value when EFE OFF or it is lower than specified value when EFE ON.	2 driving cycles
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 (switch) circuit malfunction (A/T)	No signal or multiple signals inputted with shifted in “D” range	1 driving cycle
P0720	Output speed sensor circuit malfunction (A/T)	No signal while running vehicle with “D” or “2” range.	1 driving cycle
P0751	Shift solenoid A (#1) performance or stuck off	While running in “D” range, engine speed as compared to vehicle speed is higher or lower than specified value.	2 driving cycles
P0756	Shift solenoid B (#2) performance or stuck off		
P0753	Shift solenoid A (#1) electrical (A/T)	Output command from PCM and output voltage do not agree. (solenoid circuit shorted to ground or open)	1 driving cycle
P0758	Shift solenoid B (#2) electrical (A/T)		
P1620	ECU code not registered	Refer to Section 8A.	
P1621	No ECU code transmitted from Immobilizer Control Module		
P1622	Fault in ECM (PCM)		
P1623	ECU code not matched		

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 EVAP purge 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). ● ECM (PCM) operates radiator fan. ● ECM (PCM) stops A/C and idle speed control.
P0120	Throttle position circuit malfunction	● ECM (PCM) controls actuators assuming that throttle opening is 20°. ● ECM (PCM) stops idle speed control.
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 6E1
● 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 800 – 900 r/min.?	Go to Step 6.	Go to “ENGINE DIAGNOSIS TABLE”.
6	Check ignition timing as follows. 1) Select “MISC” mode on SUZUKI scan tool and fix ignition timing to initial one. See Fig. 2. 2) Using timing light (1), check initial ignition timing. See Fig. 3. Is it 5° ± 3° BTDC at specified idle speed?	Go to “ENGINE DIAGNOSIS TABLE”.	Check ignition control related parts referring to Section 6F.
7	Check immobilizer system malfunction as follows. 1) Check immobilizer indicator lamp for flashing. Is it flashing when ignition switch is turned to ON position?	Go to “DIAGNOSIS” in Section 8A.	Go to Step 8.
8	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 10.	Go to Step 9.
9	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”.
10	Check ignition spark as follows. 1) Disconnect injector coupler. 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 11.	Go to “DIAGNOSIS” in Section 6F.
11	Check fuel injector for operation as follows. 1) Install spark plugs and connect injector connectors. 2) Check that fuel is injected out in conical shape from fuel injector when cranking. Is it in good condition?	Go to “ENGINE DIAGNOSIS TABLE”.	Go to “DIAG. FLOW TABLE B-1”.

Fig. 1 for Step 5

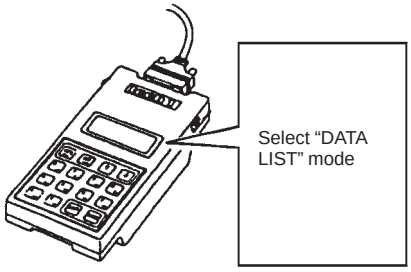


Fig. 2 for Step 6

Fig. 3 for Step 6

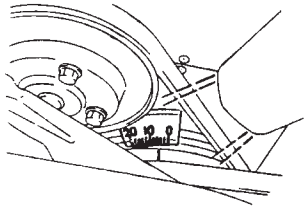


Fig. 4 for Step 8

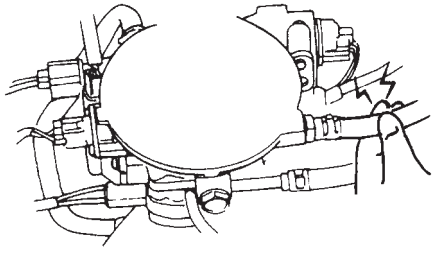
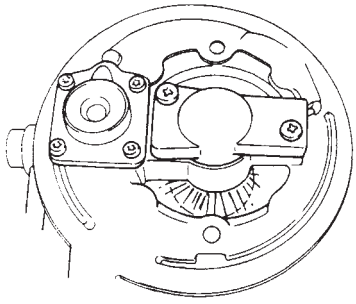


Fig. 5 for Step 11



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 6F
	● Leaky high-tension cord	High-tension cords in Section 6F
	● Loose connection or disconnection of high-tension cords or lead wires	High-tension cords in Section 6F
	● Faulty ignition coil	Ignition coil in Section 6F
	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	
	● Fuel injector resistor malfunction	Fuel injector resistor in Section 6E1
	Engine and emission control system out of order	
	● Faulty idle control system	Diagnostic Flow Table P0505
	● Faulty ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E1
	● Faulty ECM (PCM)	
	Low compression	Compression check in Section 6A
	● Poor spark plug tightening or faulty gasket	Spark plugs in Section 6F
	● Compression leak from valve seat	Valves inspection in Section 6A
	● Sticky valve stem	Valves inspection in Section 6A
	● Weak or damaged valve springs	Valve springs inspection in Section 6A
	● Compression leak at cylinder head gasket	Cylinder head inspection in Section 6A
	● Sticking or damaged piston ring	Cylinders, pistons and piston rings inspection in Section 6A
	● Worn piston, ring or cylinder	Cylinders, pistons and piston rings inspection in Section 6A
	Others	
	● Malfunctioning PCV valve	PCV system in Section 6E1

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 6A
	● Functional deterioration of oil pump	Oil pump in Section 6A
	● Worn oil pump relief valve	Oil pump in Section 6A
	● 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 6A
	● Worn valve stem and guide	Valves inspection in Section 6A
	● Weak or broken valve spring	Valve springs inspection in Section 6A
	● Warped or bent valve	Valves inspection in Section 6A
	Piston, ring and cylinder noise	
	● Worn piston, ring and cylinder bore	Pistons and cylinders inspection in Section 6A
	Connecting rod noise	
	● Worn rod bearing	Crank pin and connecting rod bearing inspection in Section 6A
	● Worn crank pin	Crank pin and connecting rod bearing inspection in Section 6A
	● Loose connecting rod nuts	Connecting rod installation in Section 6A
	● Low oil pressure	Previously outlined
	Crankshaft noise	
	● Low oil pressure	Previously outlined
	● Worn bearing	Crankshaft and bearing inspection in Section 6A
	● Worn crankshaft journal	Crankshaft and bearing inspection in Section 6A
	● Loose bearing cap bolts	Crankshaft inspection in Section 6A
	● Excessive crankshaft thrust play	Crankshaft thrust play inspection in Section 6A

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 6A
	● Poor oil pump performance	Oil pressure check in Section 6A
	● Faulty radiator fan control system	Radiator fan control system in Section 6E1
	● Dragging brakes	Trouble diagnosis in Section 5
	● Slipping clutch	Trouble diagnosis in Section 7C
	● Blown cylinder head gasket	Cylinder head in Section 6A
Poor gasoline mileage	**Ignition system out of order**	
	● Leaks or loose connection of high-tension cord	High-tension cords in Section 6F
	● Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	Spark plugs in Section 6F
	Engine and emission control system out of order	
	● 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 6E1
	● Faulty fuel injector	Diagnostic Flow Table B-1
	● Faulty fuel injector resistor	Fuel injector resistor in Section 6E1
	● Faulty ECM (PCM)	
	Low compression	Previously outlined
	Others	
	● Poor valve seating	Valves inspection in Section 6A
	● 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 6A
	● Leaky camshaft oil seals	Camshaft in Section 6A
	Oil entering combustion chamber	
	● Sticky piston ring	Piston cleaning in Section 6A
	● Worn piston and cylinder	Pistons and cylinders inspection in Section 6A
	● Worn piston ring groove and ring	Pistons inspection in Section 6A
	● Improper location of piston ring gap	Pistons assembly in Section 6A
	● Worn or damaged valve stem seal	Valves removal and installation in Section 6A
	● Worn valve stem	Valves inspection in Section 6A

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 6F
	● Leaky high-tension cord	High-tension cords in Section 6F
	Fuel system out of order	
	● Fuel pressure out of specification	Diagnostic Flow Table B-3
	Engine and emission control system out of order	Trouble diagnosis in Section 6
	● Poor performance of TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E1
	● 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 6F
	● Faulty spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Spark plugs in Section 6F
	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	
	● Poor performance of MAP sensor	MAP sensor in Section 6E1
	● 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 6F
	● Loose connection of high-tension cord	High-tension cords in Section 6F
	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	Trouble diagnosis in Section 6
	● Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E1
	● Faulty fuel injector	Diagnostic Flow Table B-1
	● Faulty ECM (PCM)	
	● Excessive combustion chamber deposits	Piston and cylinder head cleaning in Section 6A

Condition	Possible Cause	Referring Item
Engine has no power	**Ignition system out of order**	
	● Faulty spark plug	Spark plugs in Section 6F
	● Faulty ignition coil with ignitor	Ignition coil in Section 6F
	● Leaks, loose connection or disconnection of high-tension cord	High-tension cords in Section 6F
	Engine overheating	Refer to “Overheating” section
	Fuel system out of order	
	● Clogged fuel hose or pipe	Diagnostic Flow Table B-3 in Section 6
	● 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	
	● Maladjusted accelerator cable play	Accelerator cable play in Section 6E1
	● Poor performance of TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E1
	● Faulty fuel injector	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 in Section 6
	● Leaky manifold, throttle body, or cylinder head gasket	
	Engine and emission control system out of order	
	● Faulty idle control system	Diagnostic Flow Table P0505
	● Faulty evaporative emission control system	EVAP control system in Section 6E
	● Faulty fuel injector	Diagnostic Flow Table B-1
	● Faulty fuel injector resistor	Fuel injector resistor in Section 6E1
	● Poor performance of ECT sensor, TP sensor or MAP sensor	ECT sensor, TP sensor or MAP sensor in Section 6E1
	● 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 6E1

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 6F
	● Leaky or disconnected high-tension cord	High-tension cords in Section 6F
	● Faulty ignition coil with ignitor	Ignition coil assembly in Section 6F
	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 6E1
	● 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 6E1
	– Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E1
	● Faulty injector	Diagnostic Flow Table B-1
	● Faulty fuel injector resistor	Fuel injector resistor in Section 6E1
	● 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.
	● 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 6E1
	– Poor performance of ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E1
	● Faulty injector	Diagnostic Flow Table B-1
	● Faulty fuel injector resistor	Fuel injector resistor in Section 6E1
	● 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 – 5%
		At 2500 r/min with no load after warming up		10 – 18%
☆	COOLANT TEMP. (ENGINE COOLANT TEMP.)	At specified idle speed after warming up		85 – 95°C, 185 – 203°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		29 – 48 kPa, 220 – 360 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		–1 – 18° BTDC
☆	INTAKE AIR TEMP.	At specified idle speed after warming up		Ambient temp. +35°C (+63°F) / –5°C (–9°F)
☆	MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 3.0 gm/sec
		At 2500 r/min with no load after warming up		3.0 – 6.0 gm/sec
☆	THROTTLE POS (ABSOLUTE THROTTLE POSITION)	Ignition switch ON/ engine stopped	Throttle valve fully closed	7 – 18%
			Throttle valve fully open	70 – 90%
☆	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		850 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		0.8 – 2.3 msec.	
		At 2500 r/min with no load after warming up		0.8 – 2.3 msec.	
	IAC FLOW DUTY (IDLE AIR CONTROL FLOW DUTY)	At idling with no load after warming up		20 – 40%	
	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)	At specified idle speed after warming up		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	
	RAD 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	
	PSP SWITCH (if equipped).	Engine running at idle speed and steering wheel at straight-ahead position.		OFF	✳
		Engine running at idle speed and steering wheel turned to the right or left as far as it stops.		ON	✳
	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	

	SCAN TOOL DATA	CONDITION	NORMAL CONDITION/ REFERENCE VALUES
	VSS (for 4-A/T) (Vehicle Speed Sensor)	At stop.	0 km/h 0 MPH
	SHIFT SOL1 CON (Command Signal) MON (Monitor Signal) SHIFT SOL2 CON (Command Signal) MON (Monitor Signal)	Ignition switch ON, selector lever is shifted at P, R or N range	OFF
		Ignition switch ON, selector lever is shifted at D range and vehicle stops	ON
	THROT POS LEVEL (THROTTLE POSITION LEVER FOR A/T)	“0” (about idle position), “1”, “2”, “3”, “4”, “5”, “6” or “7” (about full open) appears according to throttle valve opening.	
	TRANS. RANGE (TRANSMISSION RANGE SENSOR)	“P”, “R”, “N”, “D”, “2” or “L” appears according tho selector lever position.	
	GEAR POSITION	Select lever at D, 2 or L range	1
		Select lever at P, N or R range	–

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 opening of the throttle valve in terms of percentage to opening controllable by the ISC actuator.

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

RAD 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.

PSP SWITCH (ON/OFF)
ON : PSP switch detects P/S operation (high PS pressure).
OFF : PSP switch not detects P/S operation.

BAROMETRIC PRESS (kPa, inHg)
This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity and ISC actuator control.

FUEL PUMP (ON/OFF)
ON is displayed when the ECM (or PCM) activates the fuel pump via the fuel pump relay switch.

VSS (A/T) (km/h, MPH)
If is computed by using pulse signals from vehicle (output) speed sensor on automatic transmission.

TRANS RANGE (TRANSMISSION RANGE SENSOR, P, R, N, D, 2 OR L)
It is indicated transmission range detected by transmission range sensor.

SHIFT SOL 1-CON (SHIFT SOLENOID-1, ON/OFF)
ON : ON command being output to shift solenoid-1
OFF : ON command not being output.

SHIFT SOL 2-CON (SHIFT SOLENOID-2, ON/OFF)
ON : ON command being output to shift solenoid-2
OFF : ON command not being output.

SHIFT SOL 1-MON (SHIFT SOLENOID-1, ON/OFF)
The monitor result of the shift solenoid-1 circuit is displayed.
ON : Electricity being passed to shift solenoid-1 or circuit open.
OFF : Electricity not being passed or circuit short.

SHIFT SOL 2-MON (SHIFT SOLENOID-2, ON/OFF)
The monitor result of the shift solenoid-2 circuit is displayed.
ON : Electricity being passed to shift solenoid-2 or circuit open.
OFF : Electricity not being passed or circuit short.

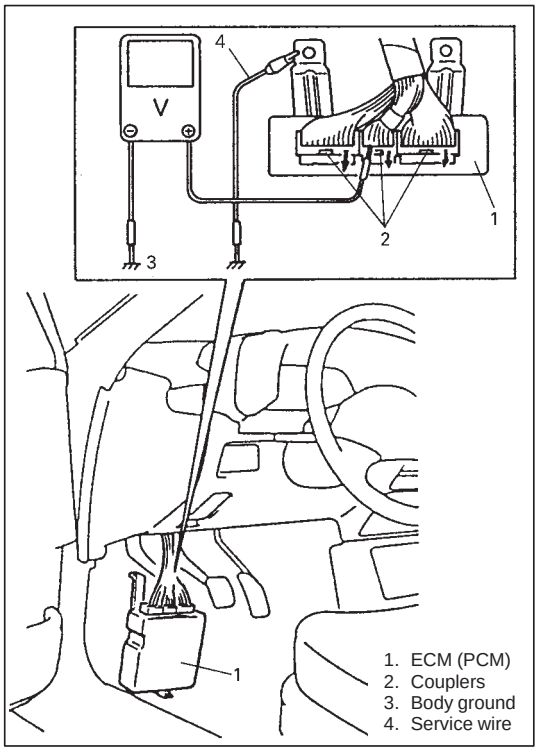
THROT POS LEVEL (THROTTLE POSITION LEVEL FOR A/T, “0”, “1”, “2”, “3”, “4”, “5”, “6” or “7”)
This parameter indicates which level (zone) the throttle valve opening is in. The throttle opening is divided into 8 levels (zones) from “0” (about idle position) to “7” (about full open) and signals are assigned to each opening level (zone). ECM (PCM) control the automatic gear change of the automatic transmission by using these signals according to the signal from the TP sensor.

GEAR POSITION
This parameter indicates the A/T gear position which is computed on signals from the Transmission Range Switch, VSS, TP Sensor, and so forth.

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.

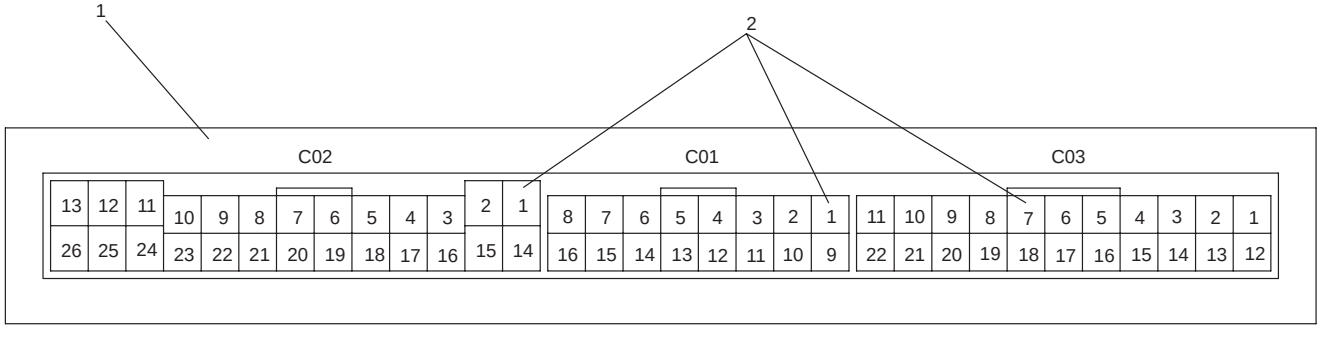
CAUTION:
ECM (PCM) cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM (PCM) with coupler disconnected from it.



Voltage Check

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

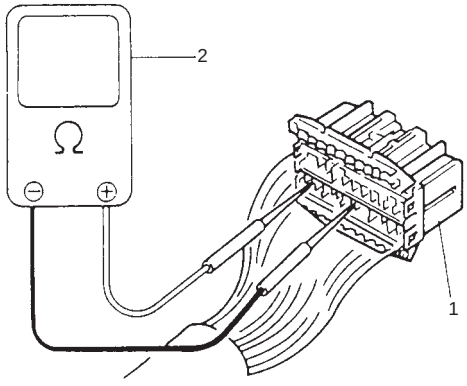
NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.



	TER-MINAL	WIRE COLOR	CIRCUIT	STANDARD VOLTAGE	CONDITION
CONNECTOR "C02"	1	B	ECM (PCM) ground	–	–
	2	W/Bl	Power source	10 – 14 V	Ignition switch ON
	3	—	Blank	—	—
	4	—	Blank	—	—
	5	—	Blank	—	—
	6	—	Blank	—	—
	7	R/G	EVAP canister purge valve	10 – 14 V	Ignition switch ON
	8	G/Or	Shift solenoid-B (A/T)	0 V	Ignition switch ON, selector lever at "P" range
				10 – 14 V	Ignition switch ON, selector lever at "D" range
	9	G/W	Shift solenoid-A (A/T)	0 V	Ignition switch ON, selector lever at "P" range
				10 – 14 V	Ignition switch ON, selector lever at "D" range
	10	Or	Igniter (IGT)	—	—
	11	Gr/Y	ISC actuator	—	—
	12	Y/B	Fuel injector	10 – 14 V	Ignition switch ON
	13	B/Bl	Ground for injector	—	—
	14	W	Power source for back-up	10 – 14 V	Ignition switch ON and OFF
	15	W/Bl	Power source	10 – 14 V	Ignition switch ON
	16	Gr/B	ISC actuator relay	0.3 – 1.0 V	Ignition switch ON
	17	V/Y	Malfunction indicator lamp	0.2 – 2.0 V	Ignition switch ON
				10 – 14 V	When engine running
	18	V/G	Immobilizer indicator lamp	0.2 – 2.0 V	Ignition switch ON
				10 – 14 V	When engine running at idle
	19	Lg/B	Heater of H02S-2	10 – 14 V	Ignition switch ON
	20	Bl	Radiator fan control relay	10 – 14 V	Ignition switch ON, Engine coolant temp: Below 91.5°C (197°F)
				0.3 – 1.0 V	Ignition switch ON, Engine coolant temp: 96.0°C (205°F) or higher
	21	P/W	Fuel pump relay	0.3 – 1.3 V	For 2 seconds after ignition switch ON
				10 – 14 V	After the above time
	22	Bl/B	Main relay	0.4 – 1.5 V	Ignition switch ON
	23	–	Blank	—	—
	24	Gr/R	ISC actuator	—	—
	25	Y/R	EFE heater relay	10 – 14 V	Ignition switch ON
	26	B/R	Ground for injector	—	—

	TER-MINAL	WIRE COLOR	CIRCUIT	STANDARD VOLTAGE	CONDITION
CONNECTOR "C01"	1	Lg	Power source for sensor	4.75 – 5.25 V	Ignition switch ON
	2	Or	Camshaft position sensor (+)	—	—
	3	W/B	Crankshaft position sensor (+)	—	—
	4	Gr/G	Closed throttle position switch (In ISC actuator)	0 – 1 V	Ignition switch ON, ISC actuator plunger is in contact with throttle lever screw
				4 – 6 V	Ignition switch ON Plunger is apart from throttle lever screw
	5	Lg/R	Manifold absolute pressure sensor	3.3 – 4.0 V	Ignition switch ON Barometric pressure: 100 kPa, 760 mmHg
	6	Lg/W	Throttle position sensor	0.2 – 1.0 V	Ignition switch ON, when clearance between throttle lever and throttle stop screw is less than 0.35 mm (0.014 in.)
				2.8 – 4.8 V	Ignition switch ON Throttle valve at full open position
	7	Gr/W	Engine coolant temp. sensor	0.55 – 0.95 V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
	8	P/B	Heater of H02S-1	10 – 14 V	Ignition switch ON
	9	G	Ground for sensors	—	—
	10	W	Camshaft position sensor (–)	—	—
	11	W/R	Crankshaft position sensor (+)	—	—
	12	W/B	EFE heater monitor	0 – 1 V	Heater relay OFF
				10 – 14 V	Heater relay ON
	13	R	Heated oxygen sensor-1	Refer to DTC flow chart	
	14	Gr	Intake air temp. sensor	2.0 – 2.7 V	Ignition switch ON Sensor ambient temp. (Intake air temp): 20°C (68°F)
	15	Bl/W	Power steering pressure switch (If equipped)	10 – 14 V	Ignition switch ON
				0 – 1 V	With engine running at idle speed, turning steering wheel to the right or left as far as it stops, repeating it a few times
	16	B/Y	Engine start switch (Engine start signal)	6 – 12 V	While engine cranking
				0 – 1 V	Other than above

	TER-MINAL	WIRE COLOR	CIRCUIT		STANDARD VOLTAGE	CONDITION	
CONNECTOR "C03"	1	V/W	Data link connector (SUZUKI serial data line)		4 – 6 V	Ignition switch ON	
	2	Bl	Vehicle speed sensor (+) (A/T)		0.4 – 0.8 V	Ignition switch ON	
		Y/G	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	
	3	G	Transmis-sion range sensor (switch) (A/T only).	"2" range	10 – 14 V	Ignition switch ON, Selector lever at "2" range	
	4	Or/Y		"N" range		Ignition switch ON, Selector lever at "N" range	
	5	Or/B		"P" range		Ignition switch ON, Selector lever at "P" range	
	6	—	Blank		–	—	
	7	—	Blank		–	—	
	8	R	Heated oxygen sensor-2		Refer to DTC flow chart		
	9	—	—		—	—	
	10	Y/R	Fuel level sensor (gauge)		0 – 1.5 V	Ignition switch ON, fuel tank fully filled	
					3 – 5.5 V	Ignition switch ON, fuel tank emptied	
	11	—	Blank		—	—	
	12	R/G	Data link connector (OBD serial data line)		10 – 14 V	Ignition switch ON	
	13	P	Vehicle speed sensor (–) (A/T)		0.4 – 0.8 V	Ignition switch ON	
	14	G/Bl	Transmis-sion range sensor (switch) (A/T)	"L" range	10 – 14 V	Ignition switch ON	Selector lever at "L" range
	15	G/R		"D" range			Selector lever at "D" range
	16	R		"R" range			Selector lever at "R" range
	17	Lg/R	A/C ON (output) signal for A/C controller (if equipped)		0 – 1 V	While engine running and A/C not operating	
					10 – 14 V	While engine running and A/C operating	
	18	Br/Y	Electric load signal		0 –1 V	Ignition switch ON Headlight, small light, heater fan and rear window defogger turned OFF	
					10 – 14 V	Ignition switch ON Headlight, small light, heater fan and rear window defogger turned ON	
	19	Bl/R	A/C (input) signal for A/C amplifier		10 – 14 V	While engine running and A/C not operating	
					0 – 0.6 V	While engine running and A/C operating	
	20	B/W	Ignition switch		10 – 14 V	Ignition switch ON	
	21	—	Blank		—	—	
	22	—	Blank		—	—	



1. ECM (PCM) coupler disconnected
2. Ohmmeter

RESISTANCE CHECK

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

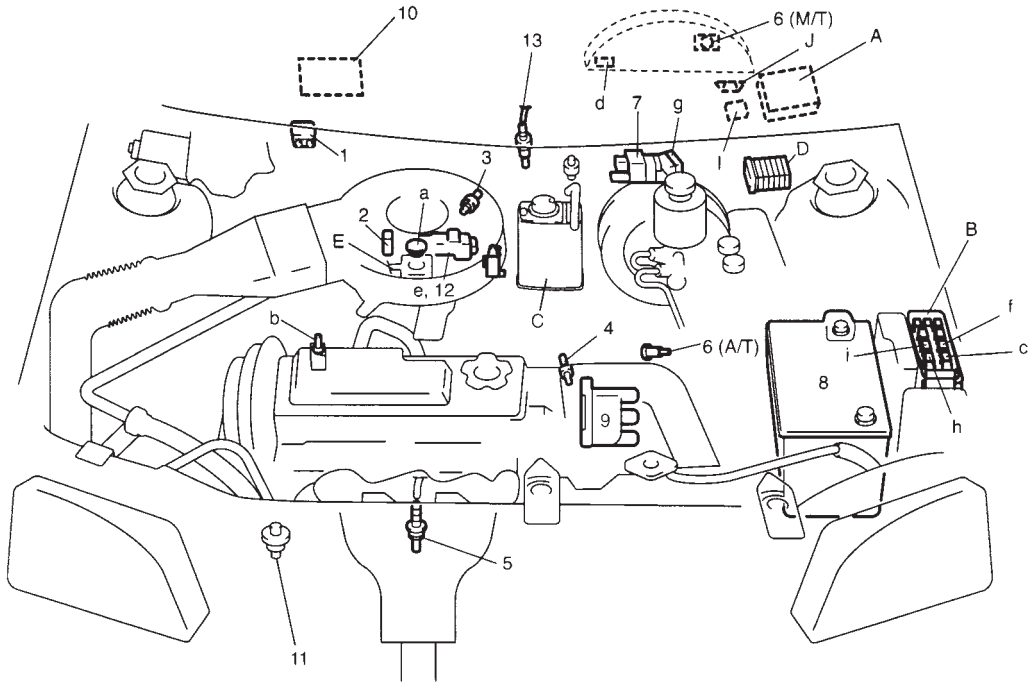
CAUTION:
Never touch terminals of ECM (PCM) itself or connect voltmeter or ohmmeter.

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
C01-8 to C03-20	H02S-1 heater	11.7 – 14.3 Ω
C02-19 to C03-20	H02S-2 heater	11.7 – 14.3 Ω
C02-12 to C02-2/15	Fuel injector	2.4 – 3.6 Ω
C02-7 to C02-2/15	EVAP canister purge valve	30 – 34 Ω
C02-21 to C03-20	Fuel pump relay	100 – 120 Ω
C02-16 to C02-2/15	ISC actuator relay	100 – 120 Ω
C02-25 to C02-2/15	EFE heater relay	100 – 120 Ω
C02-8 to Body ground	Shift solenoid-B	8 – 20 Ω
C02-9 to Body ground	Shift solenoid-A	8 – 20 Ω
C02-20 to C02-2/15	Radiator fan control relay	100 – 120 Ω
C02-22 to C02-14	Main relay	100 – 120 Ω
C02-1 to Body ground	Ground	Continuity
C02-13 to Body ground	Ground	Continuity
C02-26 to Body ground	Ground	Continuity

COMPONENT LOCATION



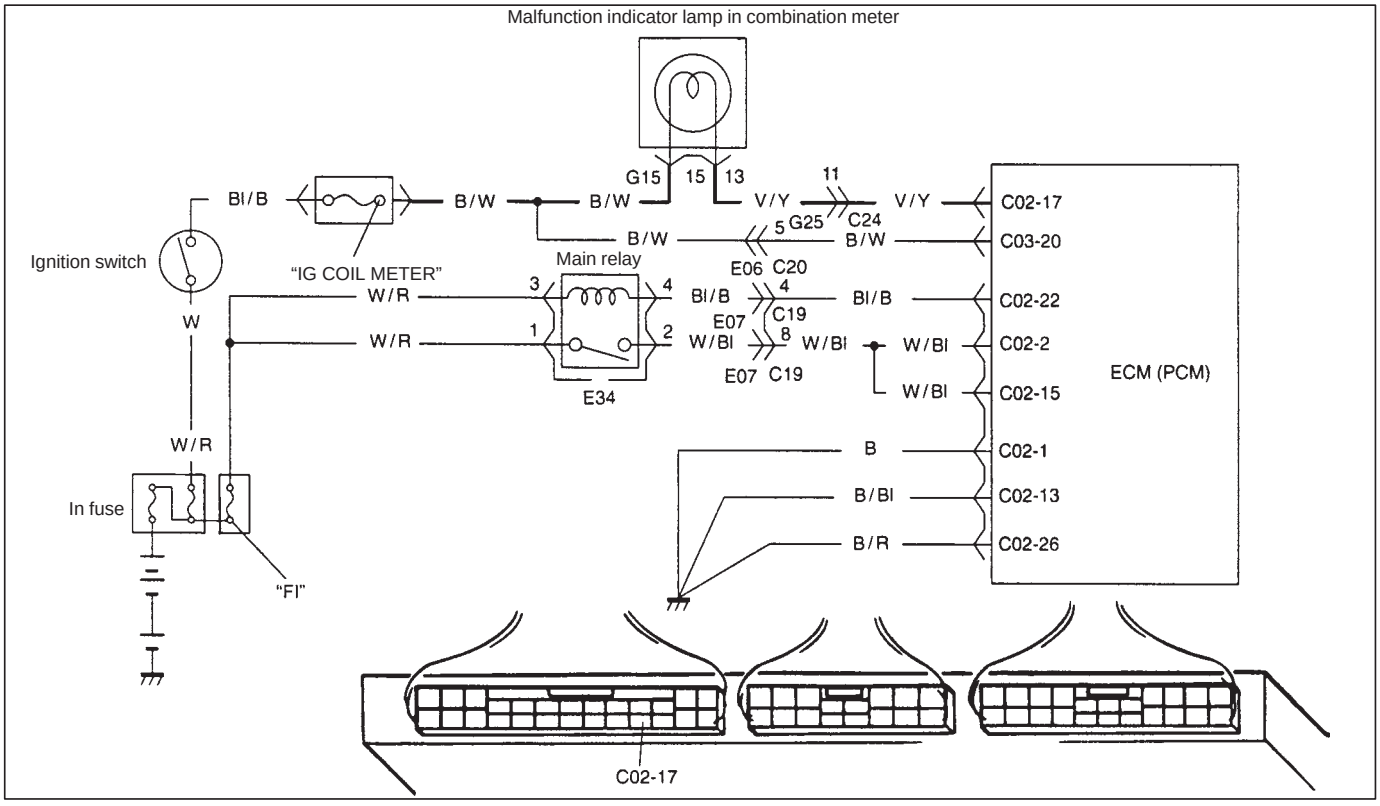
INFORMATION SENSORS
1. MAP sensor
2. TP sensor
3. IAT sensor
4. ECT sensor
5. Heated oxygen sensor-1
6. VSS
7. Ignition coil
8. Battery
9. CMP sensor (in Distributor)
10. A/C contoller (if equipped)
11. CKP sensor
12. CTP switch (in ISC actuator)
13. Heated oxygen sensor-2

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

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

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 COIL METER" fuse blown, main fuse blown, ignition switch malfunction, "B/W" circuit between "IG COIL METER" 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 8A.
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 C02-17. 3) If OK, then using service wire, ground terminal C02-17 in connector disconnected. Does MIL turn on at ignition switch ON?	Substitute a known-good ECM (PCM) and recheck.	Bulb burned out or "V/Y" wire circuit open.

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

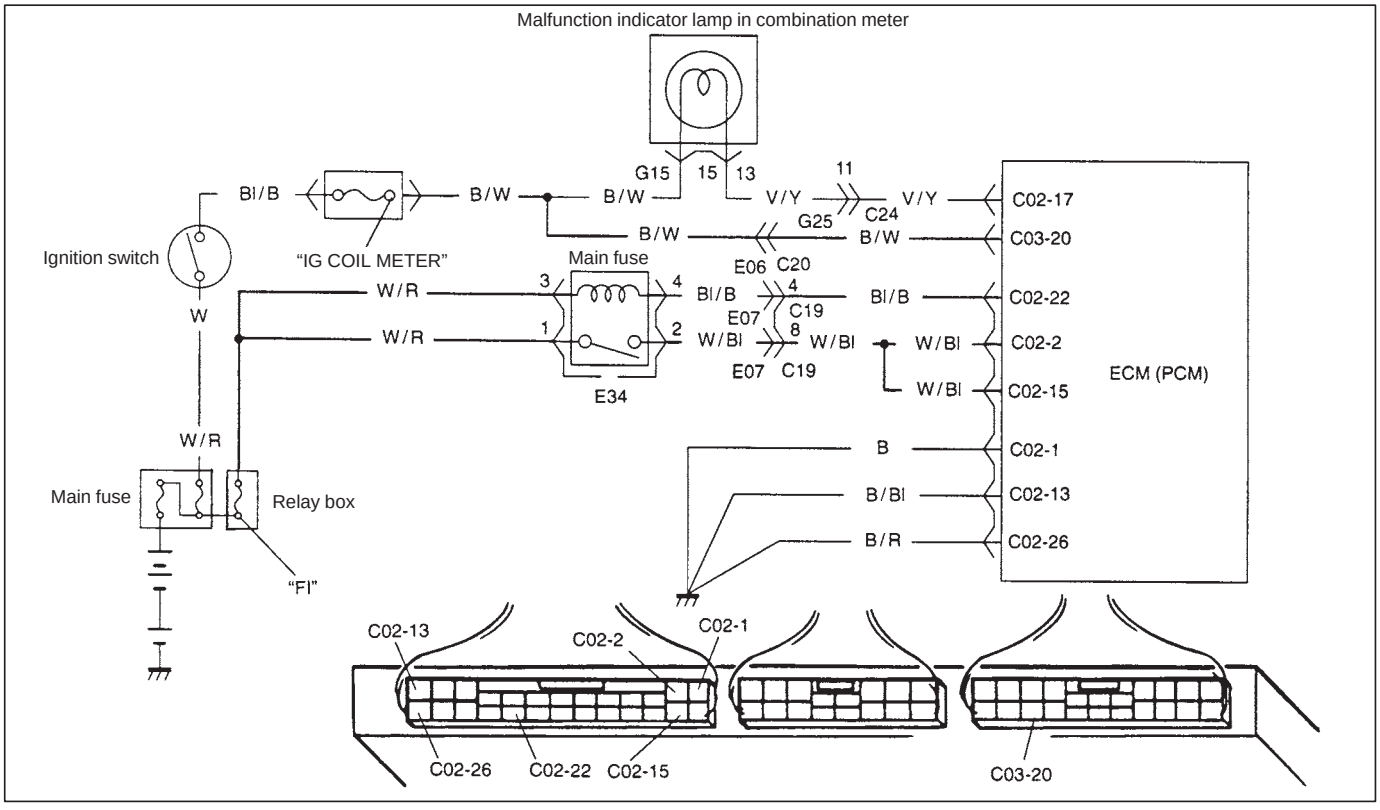
WIRING DIAGRAM/CIRCUIT DESCRIPTION – Refer to table A-1.

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/Y" 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



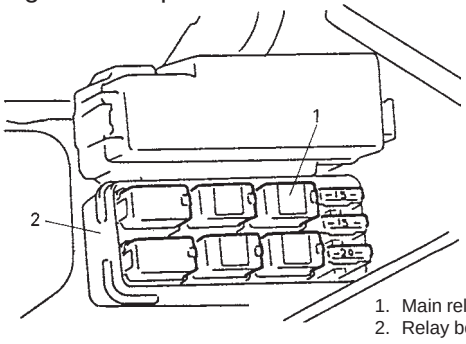
When the ignition switch tuned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM (PCM).

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 – 120 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 C03-20, C02-2, C02-15 and C02-22. 3) If OK, then measure voltage between terminal C03-20 and ground, C02-22 and ground with ignition switch ON. Is each voltage 10 – 14 V?	Go to Step 5.	"B/W", "W/R" or "Bl/B" circuit open.

STEP	ACTION	YES	NO
5	ECM (PCM) Power Circuit Check 1) Using service wire, ground terminal C02-22 and measure voltage between terminal C02-2 and ground at ignition switch ON. Is it 10 – 14 V?	Check ground circuits "Bl/B" and "W/Bl" 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 "W/Bl" 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 "W/Bl" wire open.	Replace main relay.

Fig. 1 for Step 2



1. Main relay
2. Relay box

Fig. 2 for Step 2

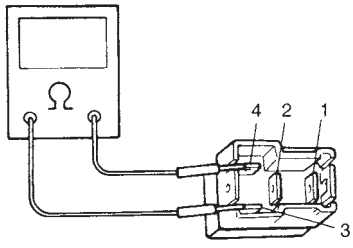
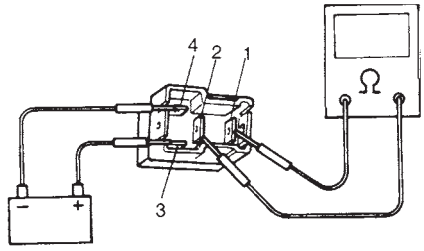
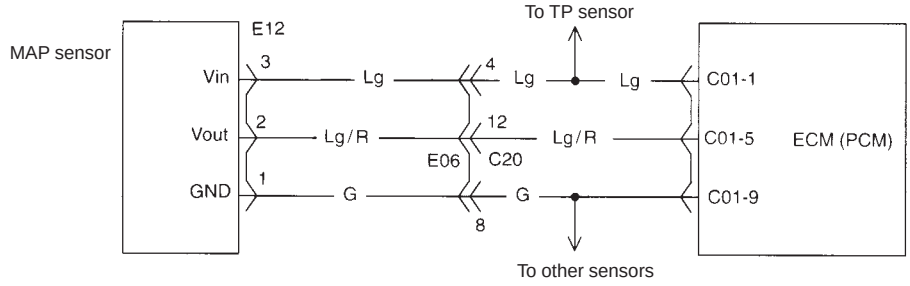


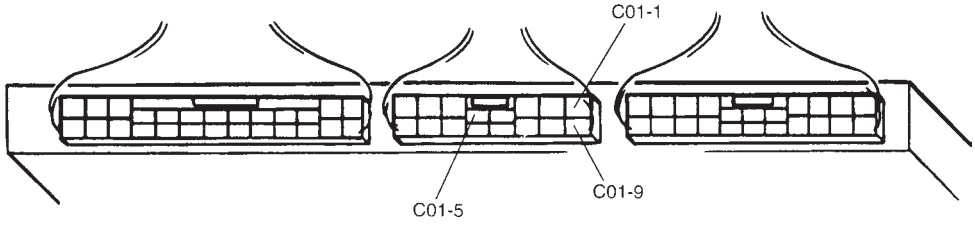
Fig. 3 for Step 2



DTC P0105 MANIFOLD ABSOLUTE PRESSURE (MAP) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION





DTC DETECTING CONDITION	POSSIBLE CAUSE
● MAP: 5 kPa, 37.5 mmHg or less (Low pressure – High vacuums – Low voltage) or ● MAP: 130 kPa, 975 mmHg or more (High pressure – Low vacuums – High voltage)	● "G" circuit open ● "Lg" circuit open or shorted to ground ● "Lg/R" circuit open or shorted to ground ● MAP sensor malfunction ● ECM (PCM) malfunction

NOTE:

- **When DTC P0105, and/or P0120, P0510 are indicated together, it is possible that "Lg" circuit is open.**
- **When DTC P0105, P0110, P0115 and/or P0120 are indicated together, it is possible that "G" 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 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 130 kPa or more or 5 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 “Lg/R” and “G” wire terminals. 3) If OK, then with ignition switch ON, check voltage at each of “Lg” and “Lg/R” wire terminals. See Fig. 2. Is voltage about 4 – 6 V at each terminal?	Go to Step 4.	“Lg” wire open or shorted to ground circuit or shorted to power circuit, “Lg/R” wire open or shorted to ground, poor C01-5 connection or C01-1 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 “Lg” wire, it is possible that MAP sensor is also faulty.**
4	Check MAP sensor according to “MAP Sensor Individual Check” in Section 6E1. Is it in good condition?	“Lg” wire shorted to “Lg/R” wire, “G” wire open, poor C01-9 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace MAP sensor.

Fig. 1 for Step 2

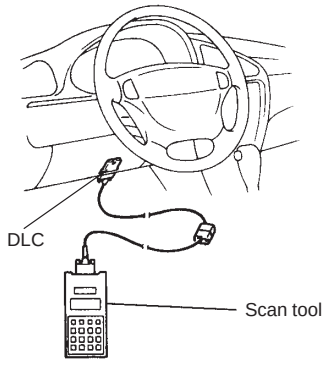
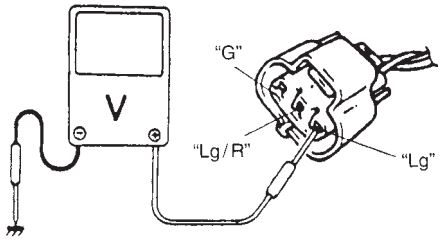
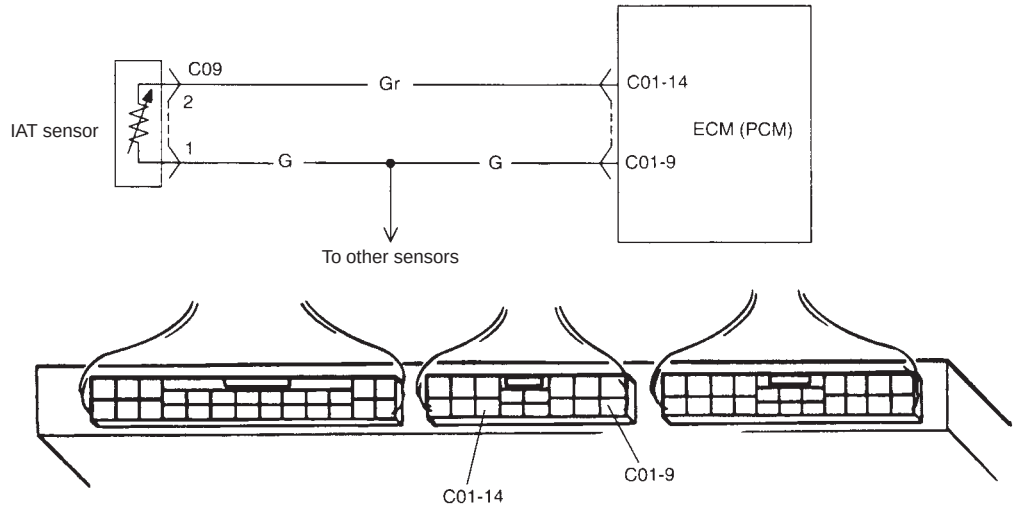


Fig. 2 for Step 3



DTC P0110 INTAKE AIR TEMP. (IAT) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



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

NOTE:

- **When DTC P0105, P0110, 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” and “G” wire terminals. 3) If OK, then with ignition switch ON, is voltage applied to “Gr” wire terminal about 4 – 6 V? See Fig. 2.	Go to Step 5.	“Gr” 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.
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” 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” wire open or poor C01-9 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.

Fig. 1 for Step 2

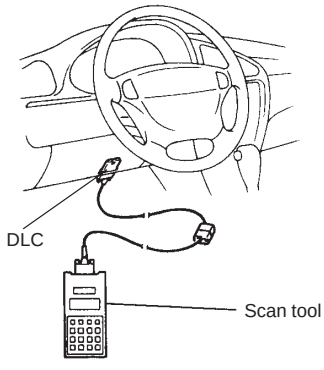


Fig. 2 for Step 3

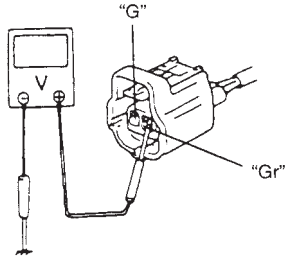
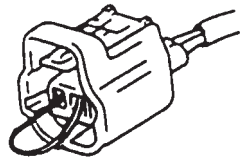
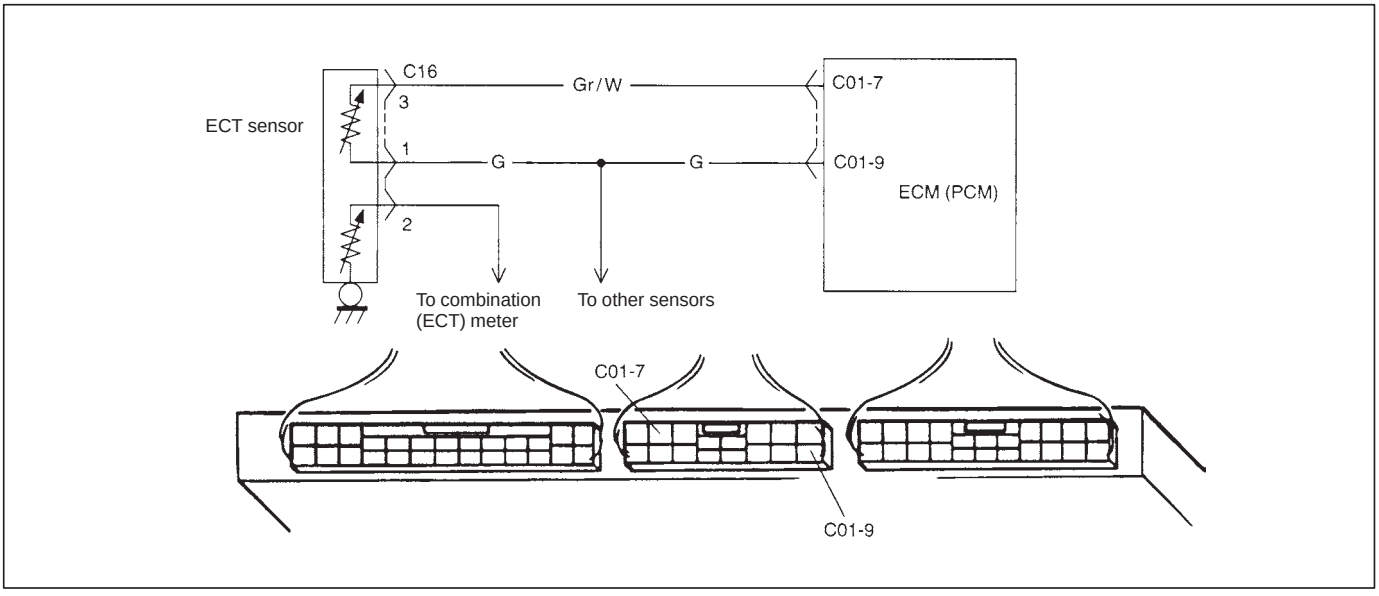


Fig. 3 for Step 4



DTC P0115 ENGINE COOLANT TEMPERATURE (ECT) CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



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

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

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 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.	“Gr/W” 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 “Gr/W” 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.	“Gr/W” wire open or shorted to power, or poor C01-7 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 C01-9 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.

Fig. 1 for Step 2

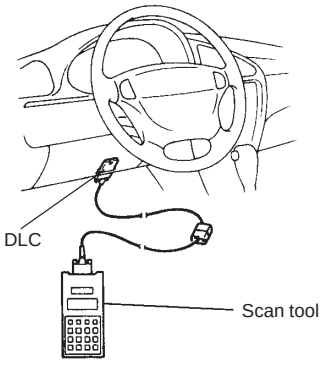


Fig. 2 for Step 3

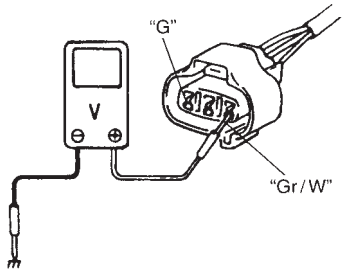
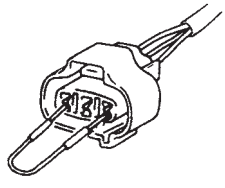
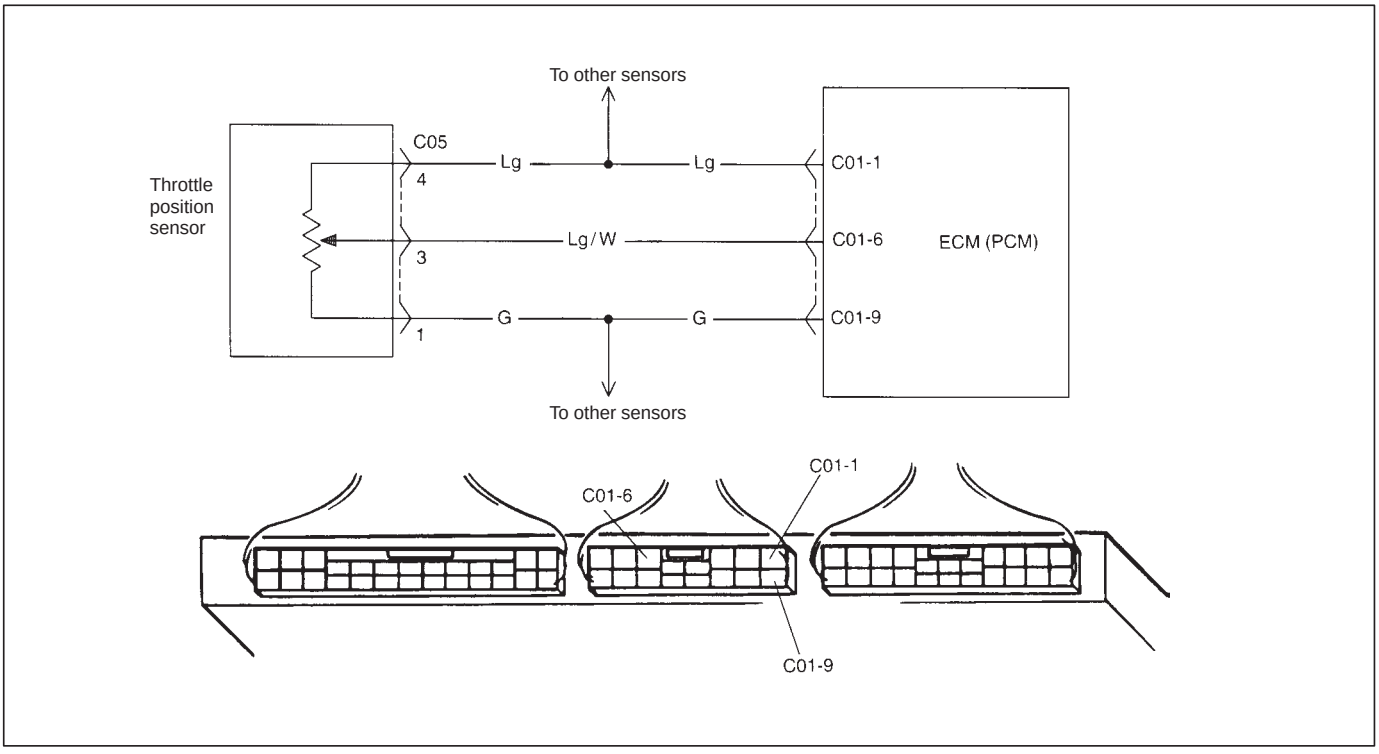


Fig. 3 for Step 4



DTC P0120 THROTTLE POSITION CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



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

NOTE:

- **When DTC P0105, P0110, P0115 and/or P0120 are indicated together, it is possible that "G" circuit is open.**
- **When DTC P0105, P0120 and/or P0510 are indicated together it is possible that "Lg" 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 0 A.
3	Check Wire Harness. 1) Disconnect connector from TP sensor with ignition switch OFF. 2) Check for proper connection to TP sensor at “Lg”, “Lg/W” and “G” wire terminal. 3) If OK, then with ignition switch ON, check voltage at each of “Lg” and “Lg/W” wire terminals. See Fig. 2. Is voltage about 4 – 6 V at each terminal?	Go to Step 4.	“Lg” wire open, “Lg” wire shorted to ground circuit or power circuit or “G” wire, “Lg/W” wire open or shorted to ground circuit or poor C01-1 or C01-6 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 4: 2.87 – 5.33 kΩ Between 1 and 3: 100 Ω – 20 kΩ, varying according to throttle valve opening. Are measured values within specifications?	“G” wire open or poor C01–9 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace TP sensor.

Fig. 1 for Step 2

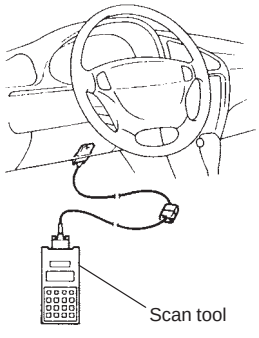


Fig. 2 for Step 3

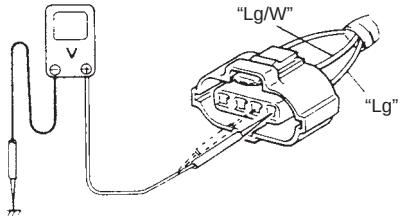
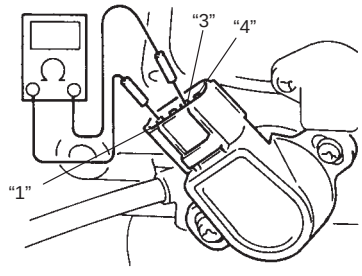
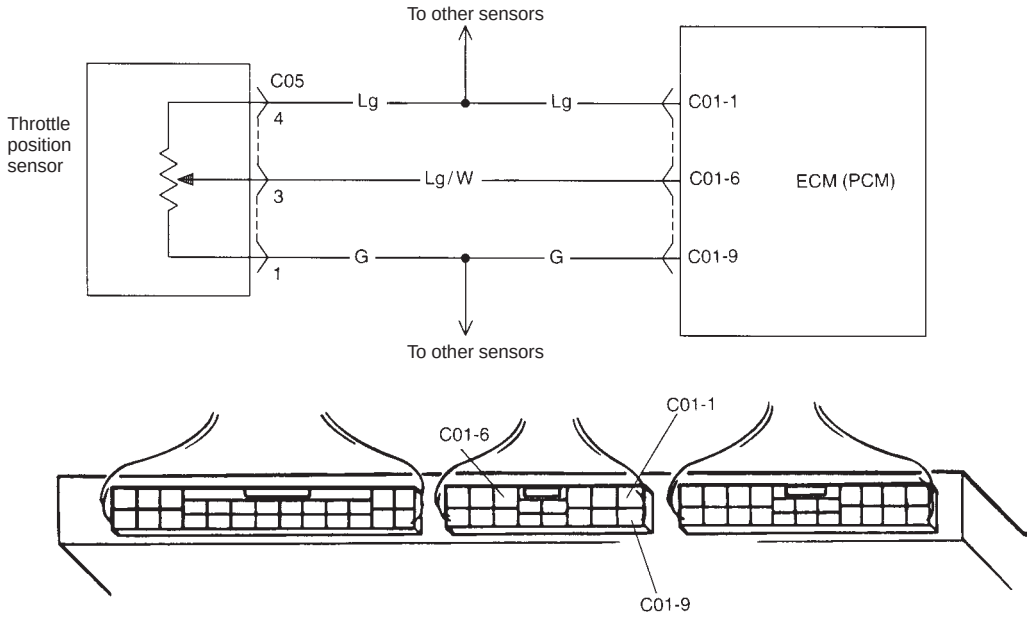


Fig. 3 for Step 4



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:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
   – Engine coolant temp.: 70 – 110°C, 158 – 230°F
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. 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 2. Dose voltage vary within specified value linearly as shown in figure?	If voltmeter was used, check terminal C01-6 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. 3. Between 1 and 4: 2.87 – 5.33 kΩ Between 1 and 3: 100 Ω – 20 kΩ, varying according to throttle valve opening. Are measured values as specified?	High resistance in “Lg”, “Lg/W” 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

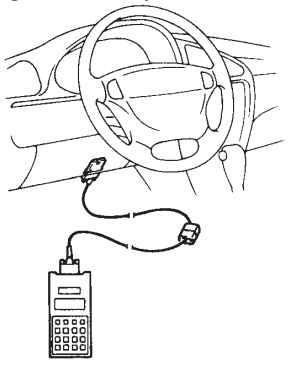
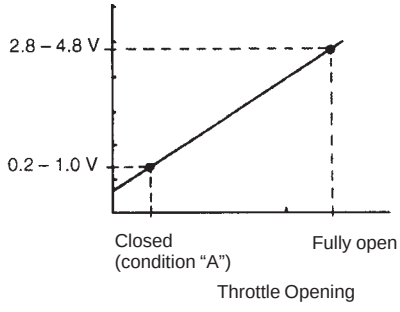


Fig. 2 for Step 2



Condition “A”
Clearance between throttle lever and throttle stop screw is less than 0.35 mm (0.014 in.).

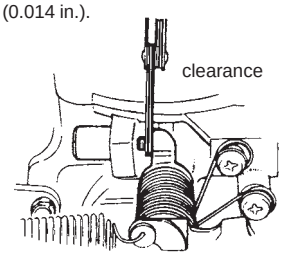
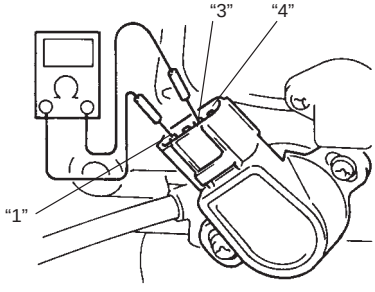
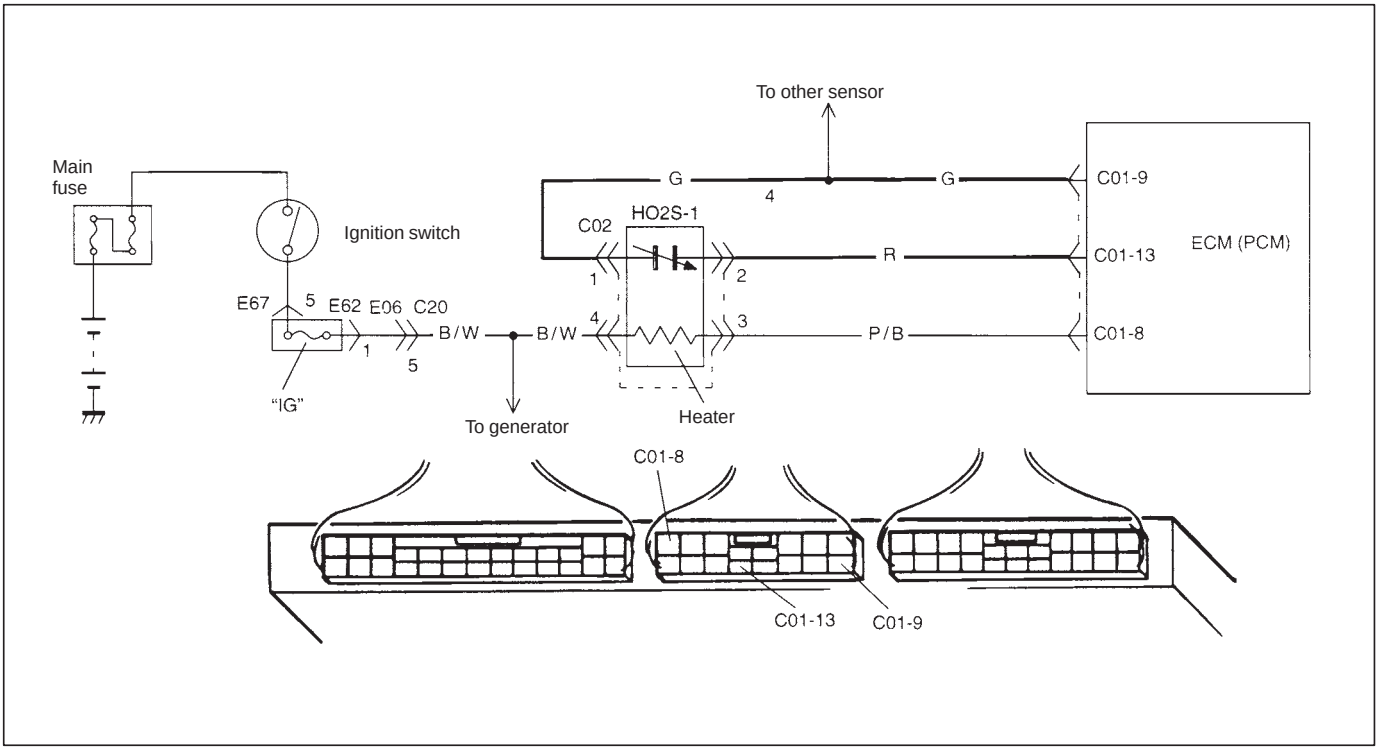


Fig. 3 for Step 3



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 below 0.3 V 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)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
2) Warm up engine to normal operating temperature.
3) Drive vehicle at 30 – 40 mph, 50 – 60 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

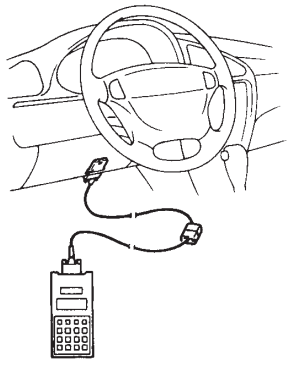
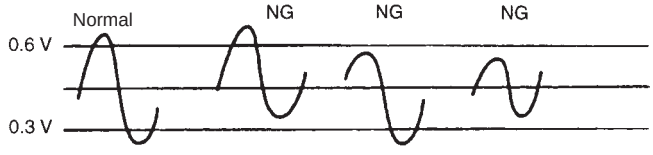


Fig. 2 for Step 3

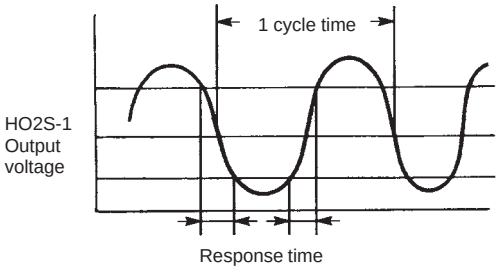


DTC P0133 HEATED OXYGEN SENSOR (HO2S) CIRCUIT SLOW RESPONSE (SENSOR-1)

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)

WIRING DIAGRAM/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

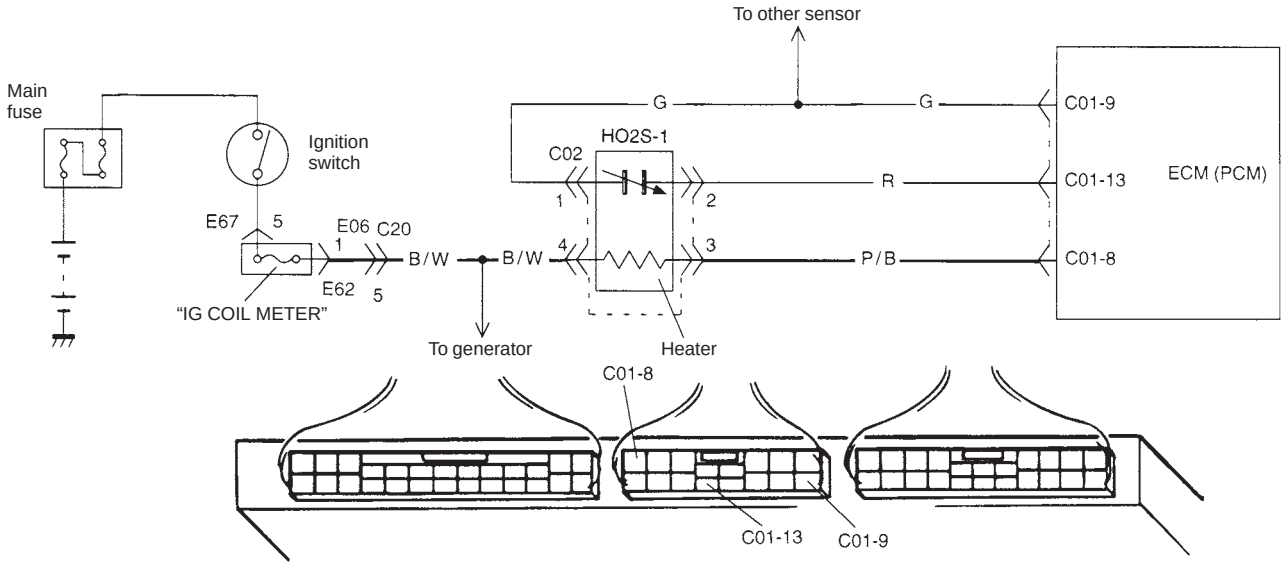
DTC CONFIRMATION PROCEDURE – Refer to DTC P0130 section.

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). 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.

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 C01-8 when engine is running at high load. B: ● High voltage at terminal C01-8 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 to “ENGINE DIAG. FLOW TABLE”.
2	Check Heater for Operation. 1) Check voltage at terminal C01-8. See Fig. 1. 2) Warm up engine to normal operating temperature. 3) Stop engine. 4) Turn ignition switch ON and Check voltage at terminal C01-8. 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 “P/B” wire terminals. 3) If OK, then check heater resistance. See Fig. 2. Is it 11.7 – 14.3 Ω at 20°C, 68°F?	“P/B” wire open or shorted to ground or poor connection at C01-8. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace HO2S-1.

Fig. 1 for Step 2

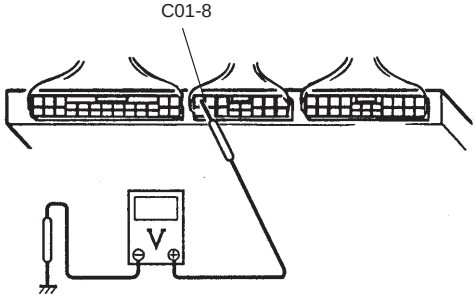
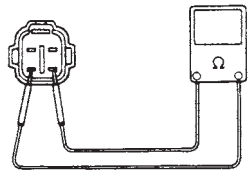
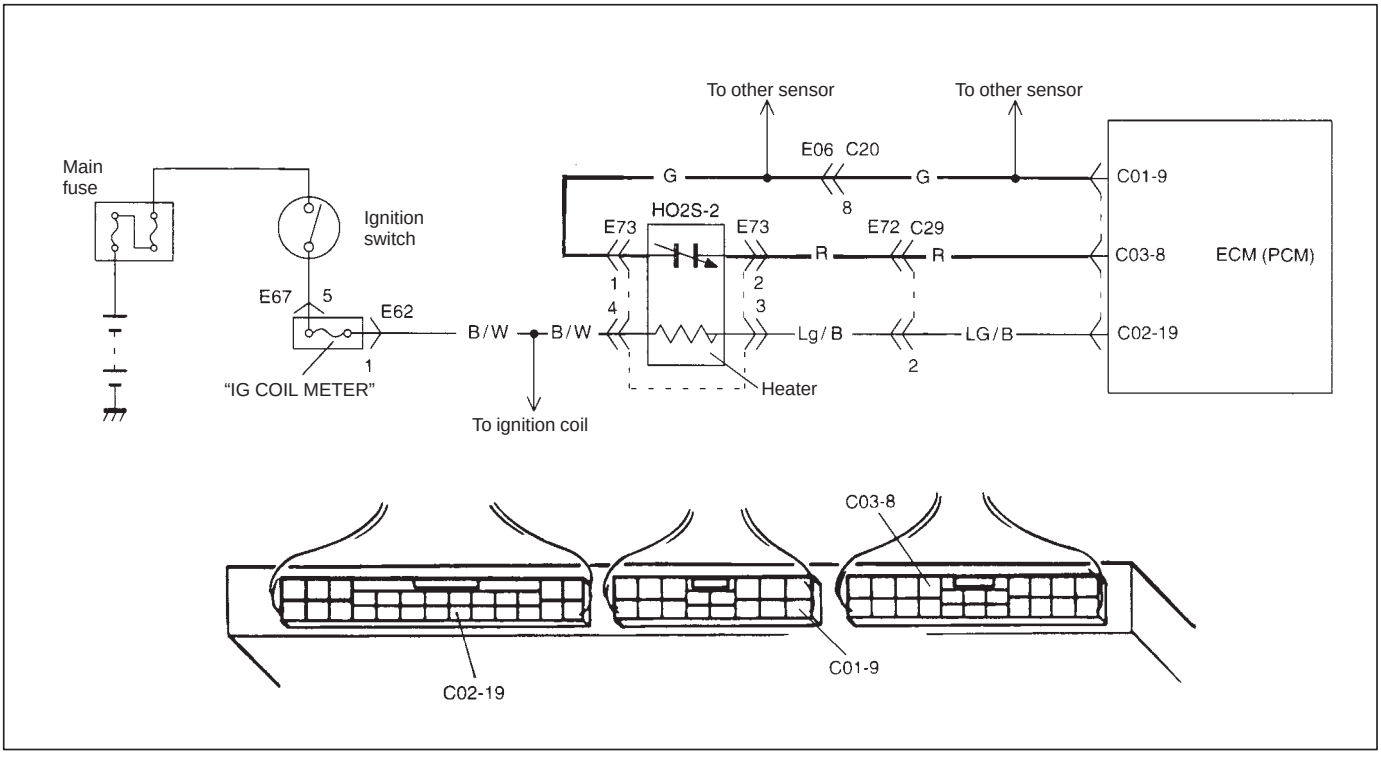


Fig. 2 for Step 3



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

CIRCUIT DESCRIPTION

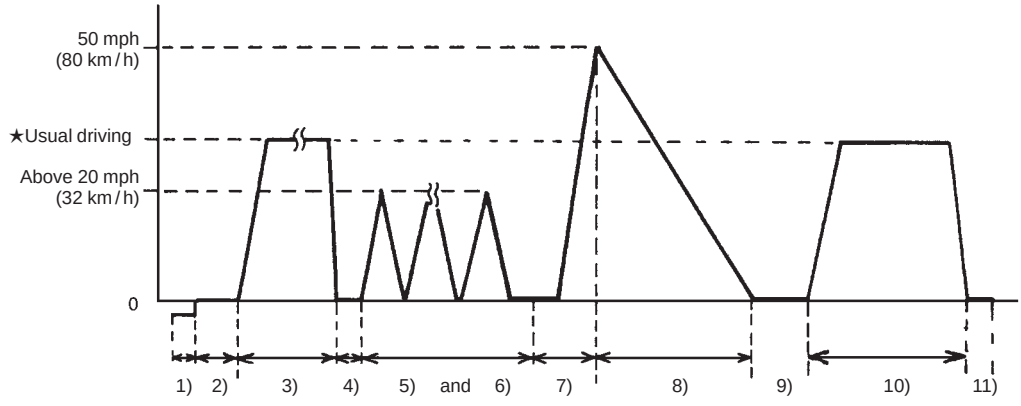


DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC will set when A or B condition is detected. A. Max. output voltage of HO2S-2 is lower than specified value or Min. output voltage is higher than specified value while vehicle driving. B. Engine is warmed up and HO2S-2 voltage is 4.5 V or more. (circuit open) ⁎ 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)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
   – 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.



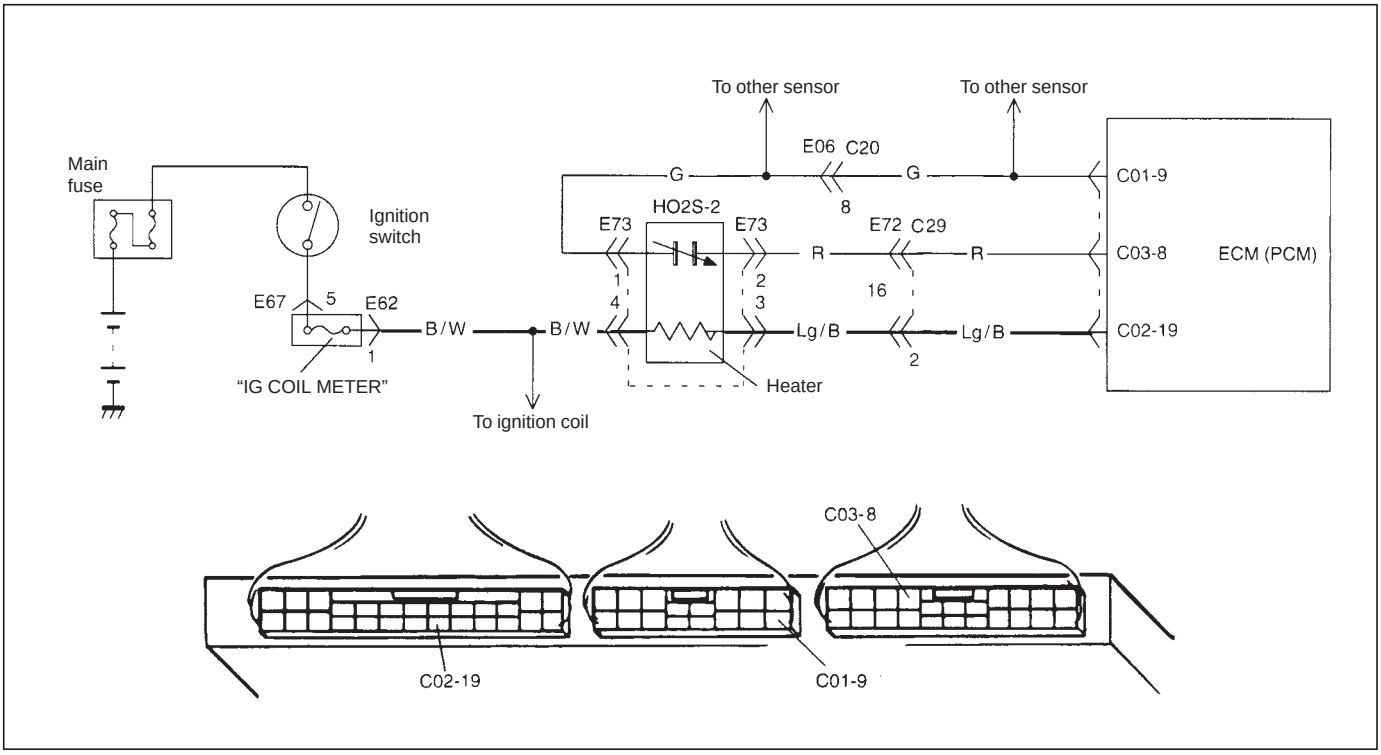
★Usual driving: Driving at 30 – 40 mph, 50 – 60 km/h including short stop according to traffic signal. (under driving condition other than high-load, high-engine speed, rapid accelerating and decelerating)

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.	“Lg/B” 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 “Lg/B” 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 C02-19 for specified time after engine start or while engine running at high load. B. High voltage at terminal C02-19 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

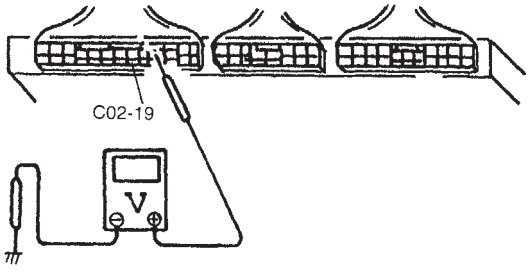
DTC CONFIRMATION PROCEDURE

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

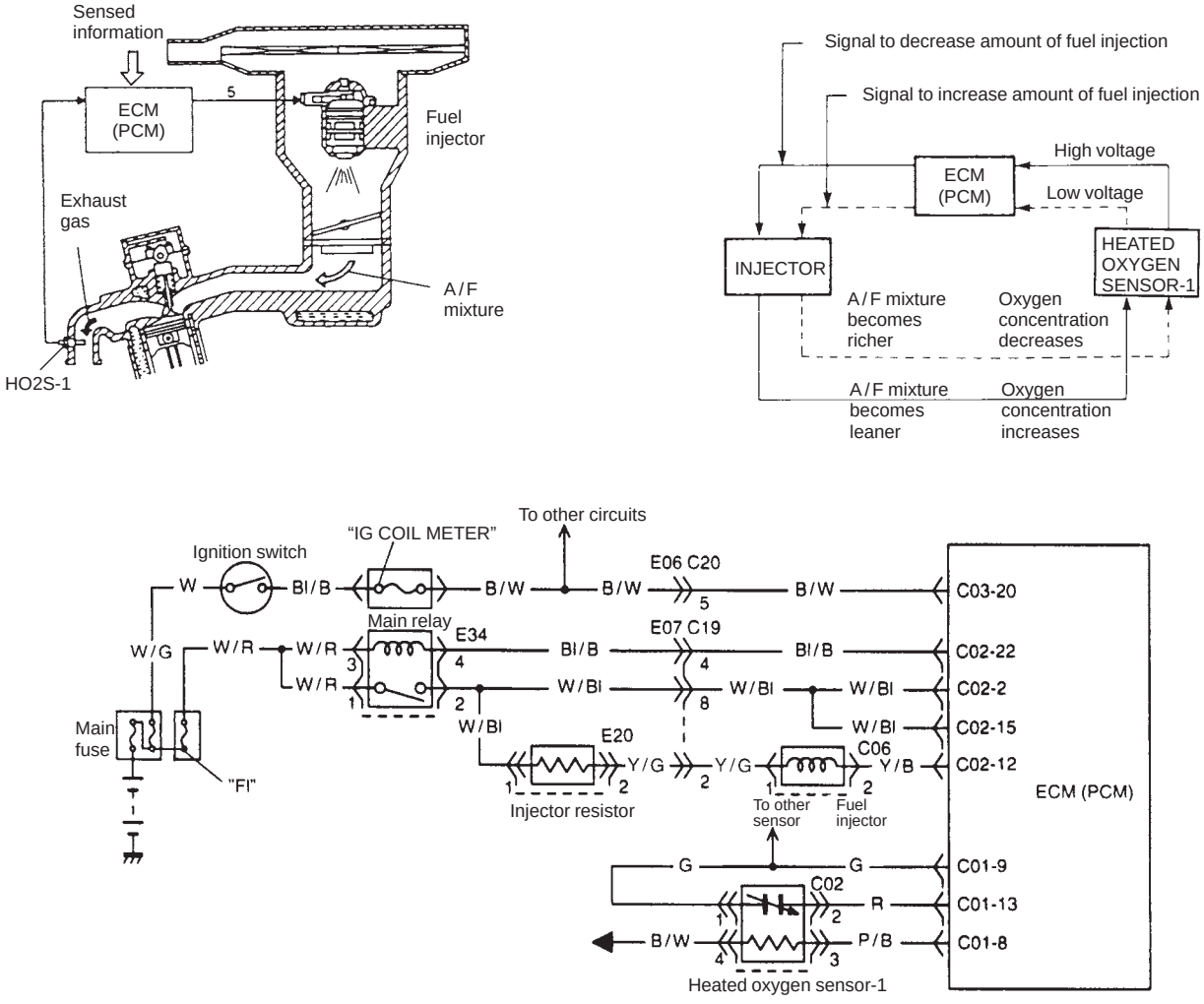
STEP	ACTION	YES	NO
1	Was “ENGINE DIAG. FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAG. FLOW TABLE”.
2	Check HO2S-2 Heater and Its Circuit. 1) Warm up engine to normal operating temperature. 2) Stop engine. 3) Turn ignition switch ON and check voltage at terminal C02-19 See Fig. 1. Voltage should 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 C02-19. 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)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
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 6E1 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 : 160 – 210 kPa, 1.6 – 2.1 kg/cm^2, 22.7 – 29.9 psi. At specified idle speed : 90 – 140 kPa, 0.9 – 1.4 kg/cm^2, 12.8 – 20.0 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) Turn ignition switch OFF and disconnect fuel injector connector. 2) Check for proper connection to fuel injector at each terminals. 3) If OK, then check injector resistance. See Fig. 3. **Injector resistance: 0.5 – 1.5 Ω at 20°C (68°F)** 4) Connect injector, connector. 5) Check that fuel is injected out in conical shape from fuel injector when running engine. 6) Check injector for fuel leakage after engine stop. **Fuel leakage: Less than 1 drop/min.** Is check result satisfactory?	Go to Step 6.	Check injector circuit or replace fuel injector.
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. 4. Is vacuum felt?	Check EVAP control system (See Section 6E1).	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 6E1). Is it in good condition?	Go to Step 9.	Replace engine coolant temp. sensor.
9	Check intake air temp. sensor for performance (See Section 6E1). Is it in good condition?	Go to Step 10.	Replace intake air temp. sensor.
10	Check throttle position sensor for performance (See Step 4 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 6E1). Is it good condition?	Substitute a known-good ECM (PCM) and recheck.	Replace PCV valve.

Fig. 1 for Step 3

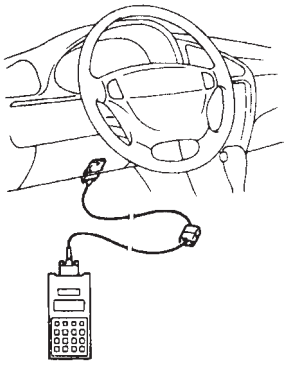
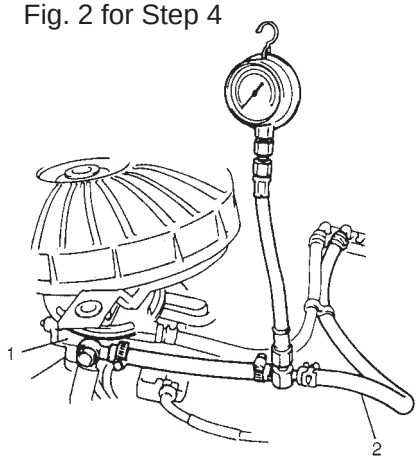


Fig. 2 for Step 4



1. Throttle body
2. Fuel feed hose

Fig. 3 for Step 5

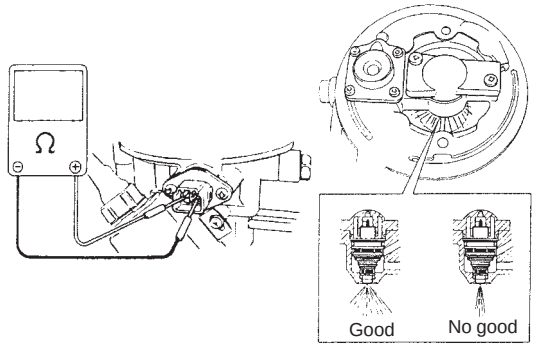
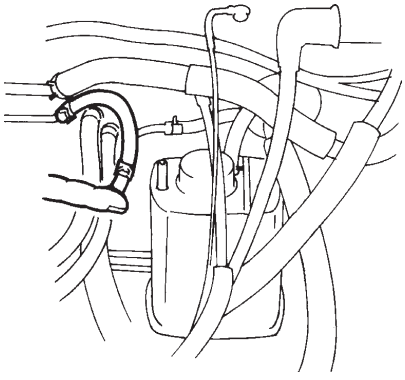
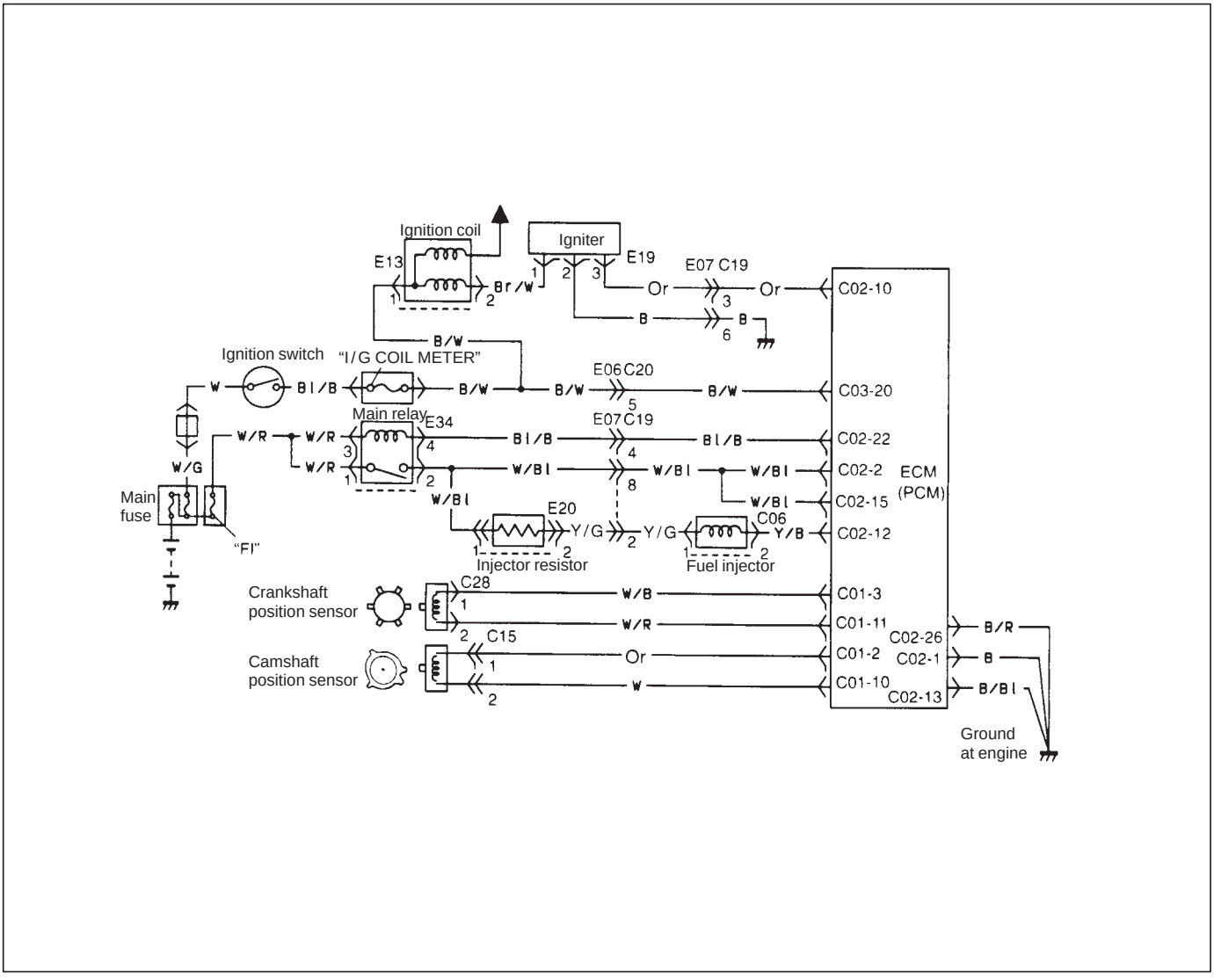


Fig. 4 for Step 6



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



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

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.
3) Check vehicle and environmental condition for:
   – Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
   – Engine coolant temp.: –10 – 110°C, 14 – 230°F
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”.

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-P0303)?	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 injector connector. 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 6F).
4	Check Fuel Pressure (Refer to Section 6E1 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 : 160 – 210 kPa, 1.6 – 2.1 kg/cm^2, 22.7 – 29.9 psi. At specified idle speed : 90 – 140 kPa, 0.9 – 1.4 kg/cm^2, 12.8 – 20.0 psi. Is measured value as specified?	Go to Step 5.	Go to Diag. Flow Table B-3 fuel pressure check.
5	Check Fuel Injector and Circuit. 1) Turn ignition switch OFF and disconnect fuel injector connector. 2) Check for proper connection to fuel injector at each terminal. 3) If OK, then check injector resistance. See Fig. 4. Injector resistance: 0.5 – 1.5 Ω at 20°C (68°F). 4) Connect injector connector. 5) Check that fuel is injected out in conical shape from fuel injector when running engine. 6) Check injector for fuel leakage after engine stop. Fuel leakage: Less than 1 drop/min. Is check result satisfactory?	Go to Step 6.	Check injector circuit or replace fuel injector.

STEP	ACTION	YES	NO
6	Check PCV valve for clogging (See Section 6E1). 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. 5. Is vacuum felt?	Check EVAP control system (See Section 6E1).	Go to Step 8.
8	Check intake manifold pressure sensor for performance (See Section 6E1). Is it in good condition?	Go to Step 9.	Repair or replace.
9	Check engine coolant temp. sensor for performance (See Section 6E1). 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 6A). – Valve lash (See Section 6A). – Valve timing (Timing belt installation. See Section 6A). 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

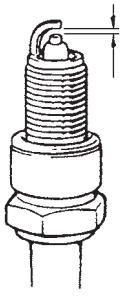
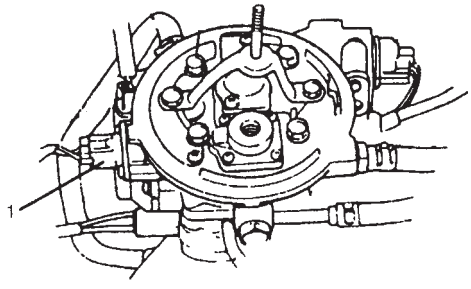
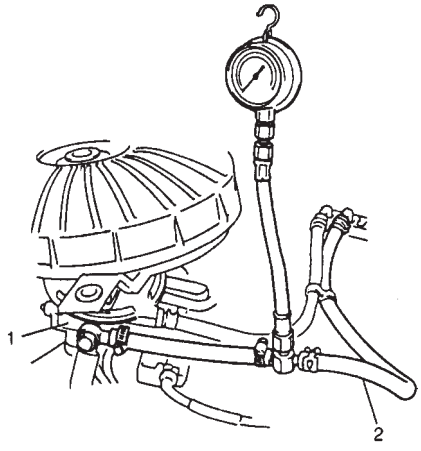


Fig. 2 for Step 3



1. Injector connector

Fig. 3 for Step 4



1. Throttle body
2. Fuel feed hose

Fig. 4 for Step 5

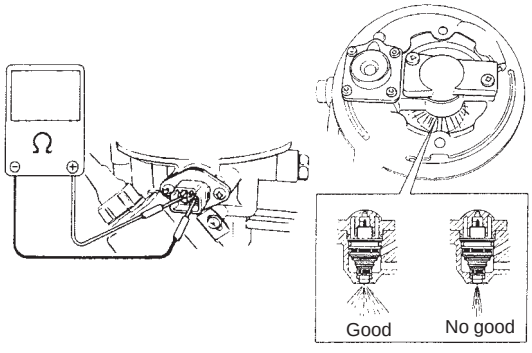
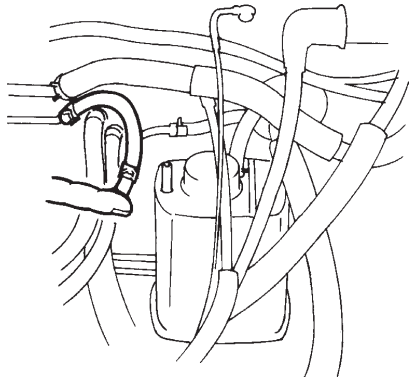
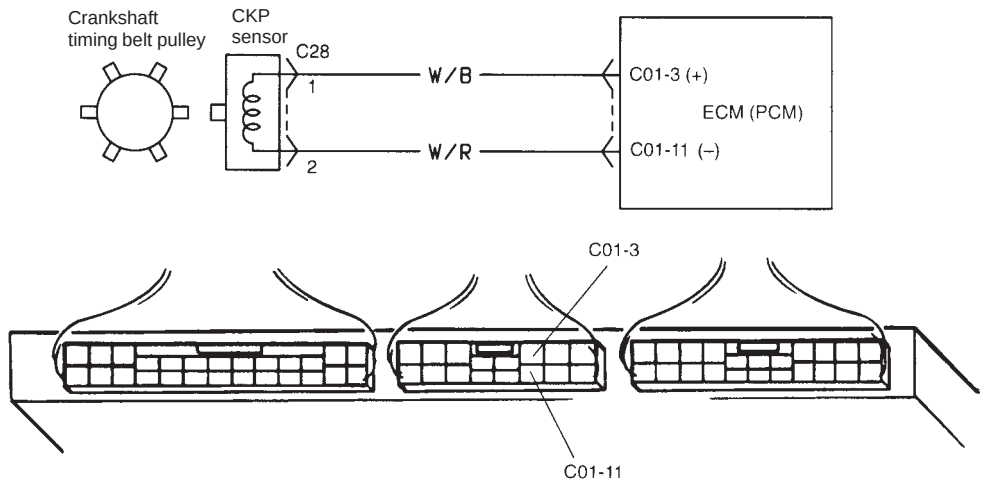


Fig. 5 for Step 7



DTC P0335 CRANKSHAFT POSITION (CKP) SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

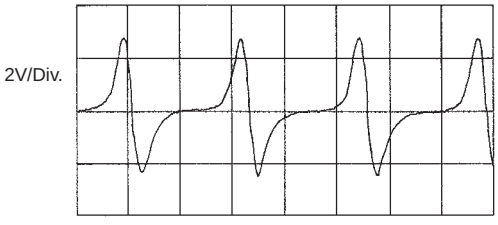


DTC DETECTING CONDITION	POSSIBLE CAUSE
● No CKP sensor signal during 1 revolution of camshaft.	● CKP sensor circuit open or short. ● Crankshaft timing belt pulley teeth damaged. ● CKP sensor malfunction, foreign material being attached or improper installation. ● ECM (PCM) malfunction.

Reference

Connect oscilloscope between terminals C01-3 (+) and C01-11 (–) of ECM (PCM) connector connected to ECM (PCM) and check CKP sensor signal.

Oscilloscope Waveforms



5ms/Div.
Waveforms at specified idle speed

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 CKP Sensor for Resistance. 1) Disconnect CKP sensor connector with ignition switch OFF. 2) Then check for proper connection to CKP sensor at “W/B” and “W/R” 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 3.	Replace CKP sensor.
3	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/B” or “W/R” wire open or shorted to ground, or poor connection at C01-3 or C01-11. 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 2

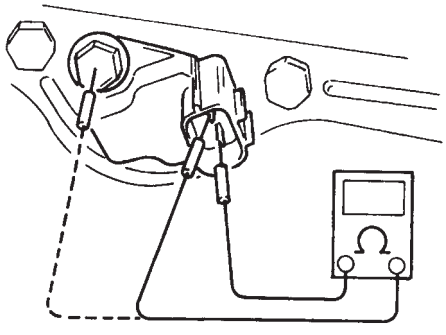
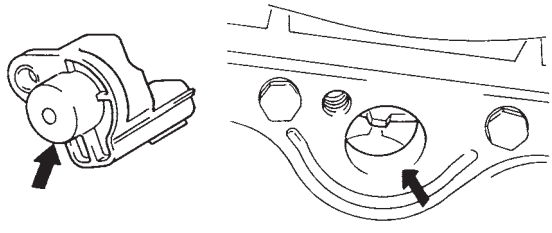
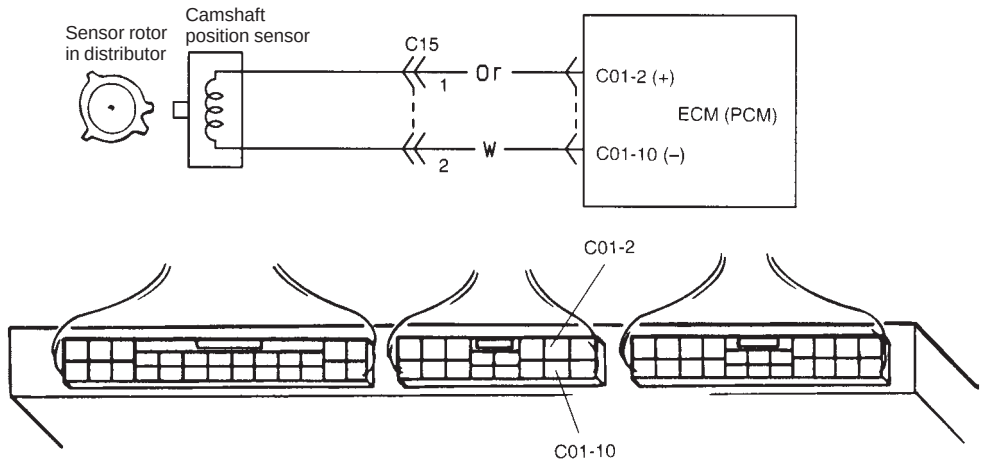


Fig. 2 for Step 3



DTC P0340 CAMSHAFT POSITION (CMP) SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

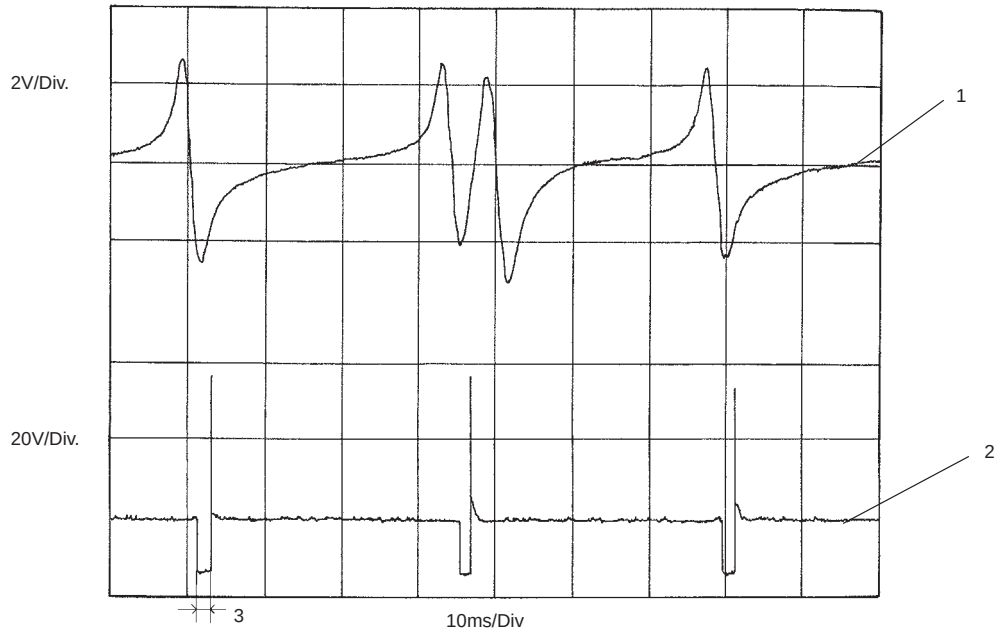


DTC DETECTING CONDITION	POSSIBLE CAUSE
● No CMP sensor signal for 2 seconds at engine cranking (CKP sensor signal is inputted).	● CMP sensor circuit open or short. ● Signal rotor teeth damaged. ● CMP sensor malfunction, foreign material being attached or improper installation. ● ECM (PCM) malfunction.

Reference

Connect oscilloscope between terminals C01-2 and C01-10 of ECM (PCM) connector connected to ECM (PCM) and check CMP sensor signal.

Display of fuel injection signal using oscilloscope



1. CMP sensor signal
2. Fuel injector signal
3. Fuel injection time

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	Is DTC P1500 (Engine starter signal circuit malfunction) detected?	Go to DTC P1500 Diag. Flow Table.	Go to Step 3.
3	Check CMP Sensor for Resistance. 1) Measure resistance of CMP sensor by referring to “CMP SENSOR (PICK UP COIL) RESISTANCE” in SECTION 6F. Is resistance within specified value?	Go to Step 4.	Faulty CMP sensor.
4	Check Wire Harness. 1) With ignition switch at OFF position, disconnect ECM (PCM) electrical connectors. 2) Measure resistance from terminal “C01-2” to “C01-10” of ECM (PCM) connector. See Fig. 1. Is resistance within 185 – 275 Ω at 20°C (68°F)?	Go to Step 5.	“W” or “Or” wire open or short. Poor connection of CMP sensor connector terminal.
5	Check Air Gap Between Rotor Tooth and Sensor. See Fig. 2. 1) Remove Distributor cap. 2) Visually inspect CMP sensor signal rotor for damage. 3) Measure air gap by referring “SIGNAL ROTOR AIR GAP” in Section 6F. Was any damage found?	Faulty CMP sensor signal rotor.	Poor connection of ECM (PCM) connector terminal. If OK, substitute a known-good ECM (PCM) and recheck CMP.

Fig. 1 for Step 3

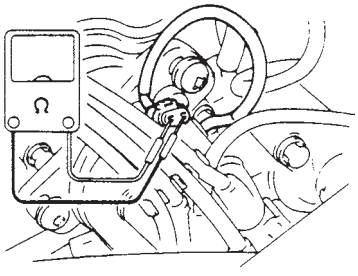
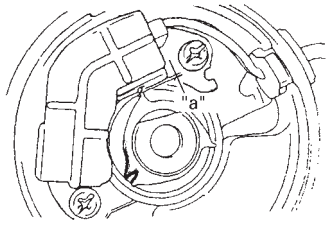


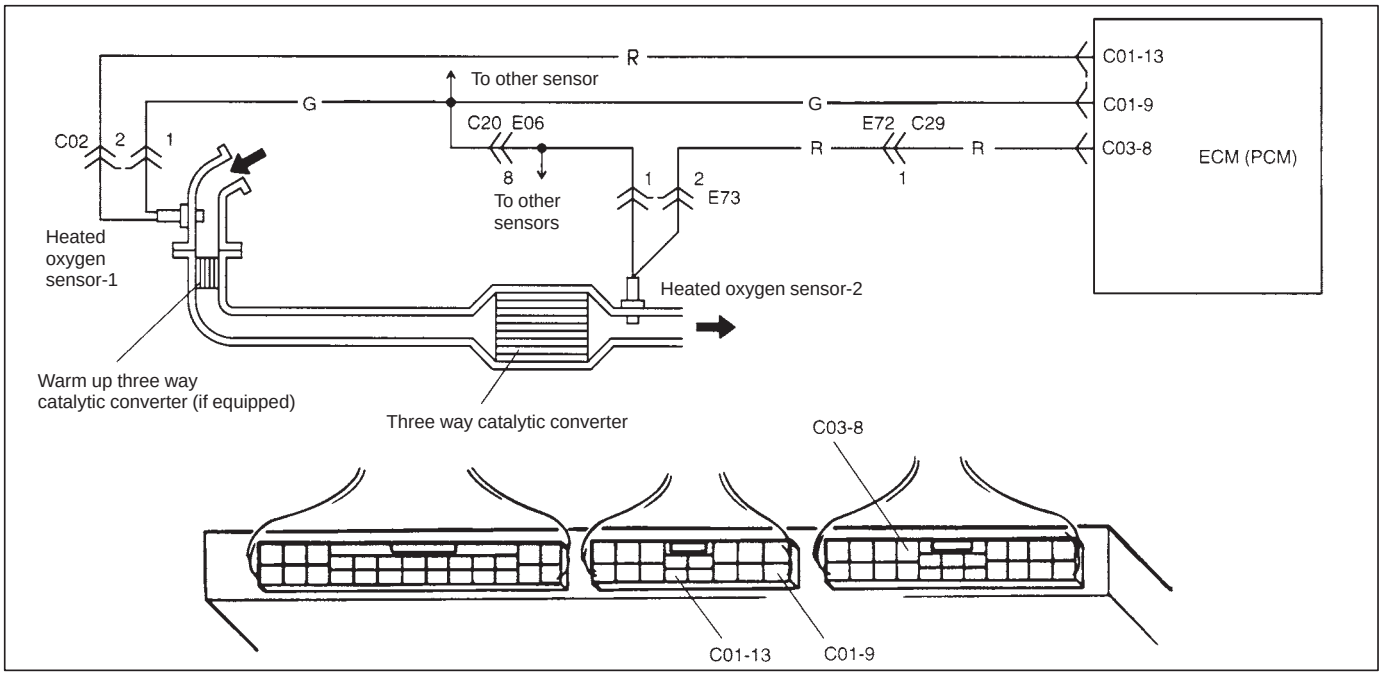
Fig. 2 for Step 5



“a”: Air gap

DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD

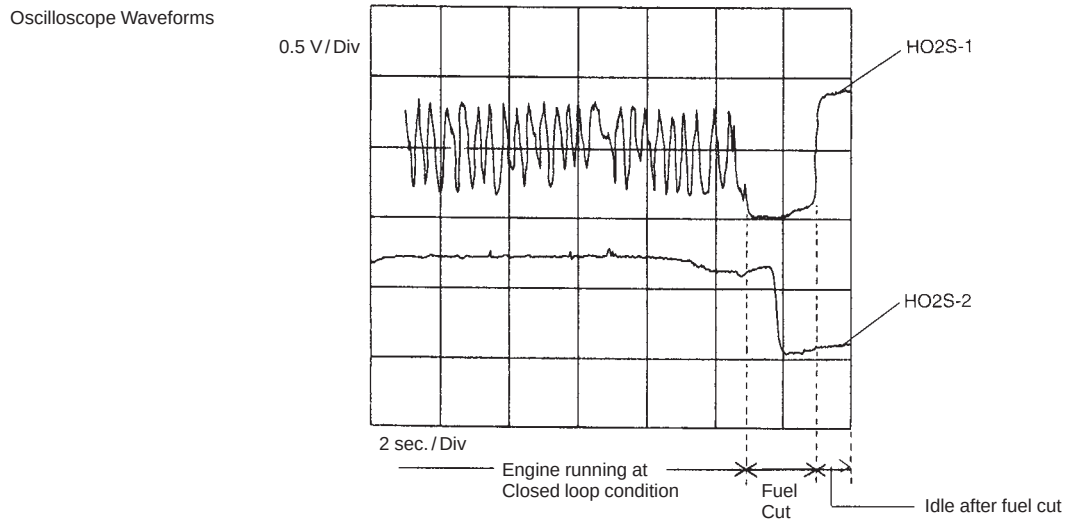
CIRCUIT DESCRIPTION



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

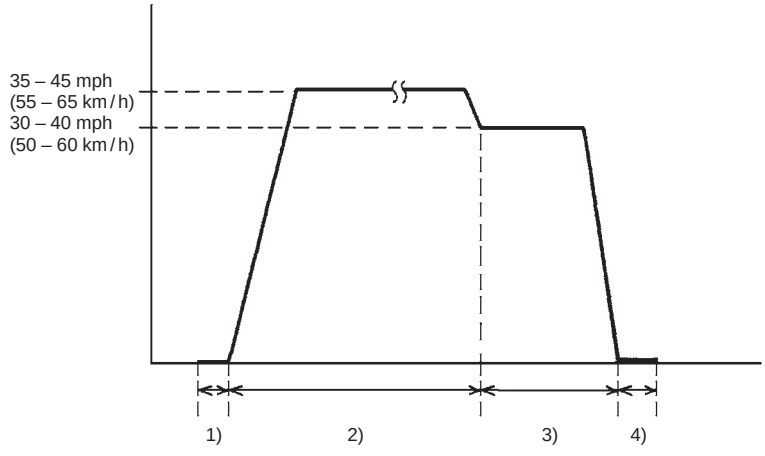


DTC DETECTING CONDITION	POSSIBLE CAUSE
● While vehicle running at constant speed under other than high load. ● Time from rich or lean switching command is output till HO2S-2 output voltage crosses 0.45 V is less than specified value. ⁎ 2 driving cycle detection logic, monitoring once / 1 driving.	● Exhaust 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)
   – Ambient temp.: –10°C, 14°F or higher
   – Intake air temp.: 70°C, 158°F or lower
   – Engine coolant temp.: 70 – 110°C, 158 – 230°F
2) Start engine and drive vehicle at 40 – 47 mph, 65 – 75 km/h for 15 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

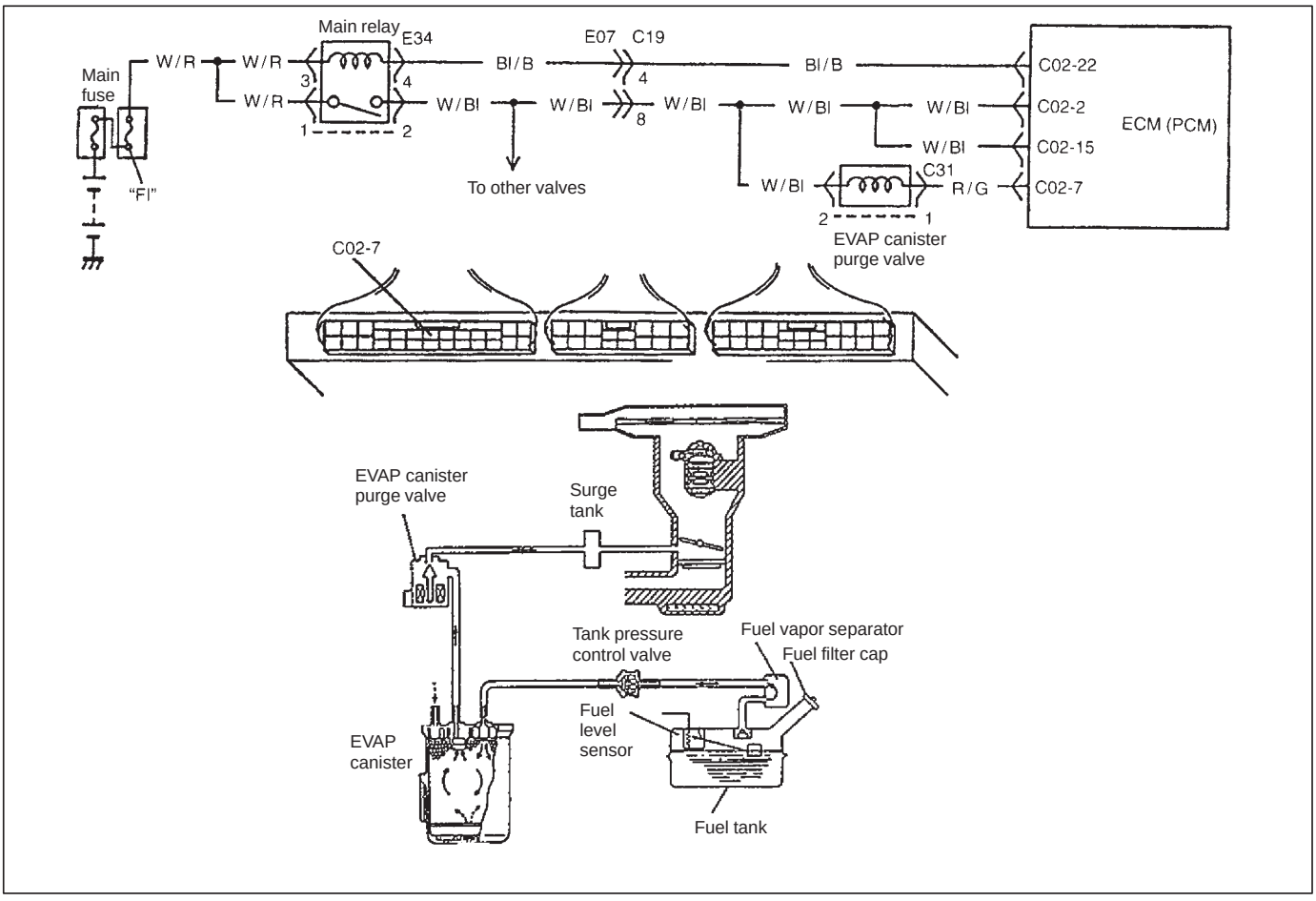
STEP	ACTION	YES	NO
1	Check DTC in "DTC" mode and pending DTC in "ON BOARD TEST" or "PENDING DTC" mode. Is DTC or pending DTC displayed?	Proceed to applicable DTC Diag. Flow Table.	Go to Step 2.
2	Set scan tool to "READINESS TESTS" mode and check if testing has been completed. Is test completed?	No DTC 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 “G” and “R” wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-2.

DTC P0443 PURGE CONTROL VALVE CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



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

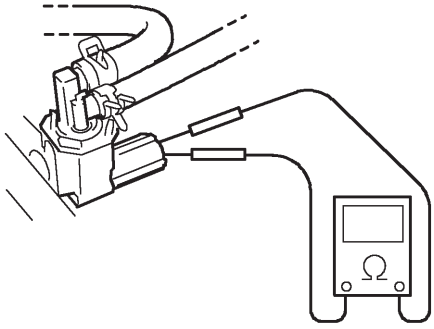
DTC CONFIRMATION PROCEDURE

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

INSPECTION

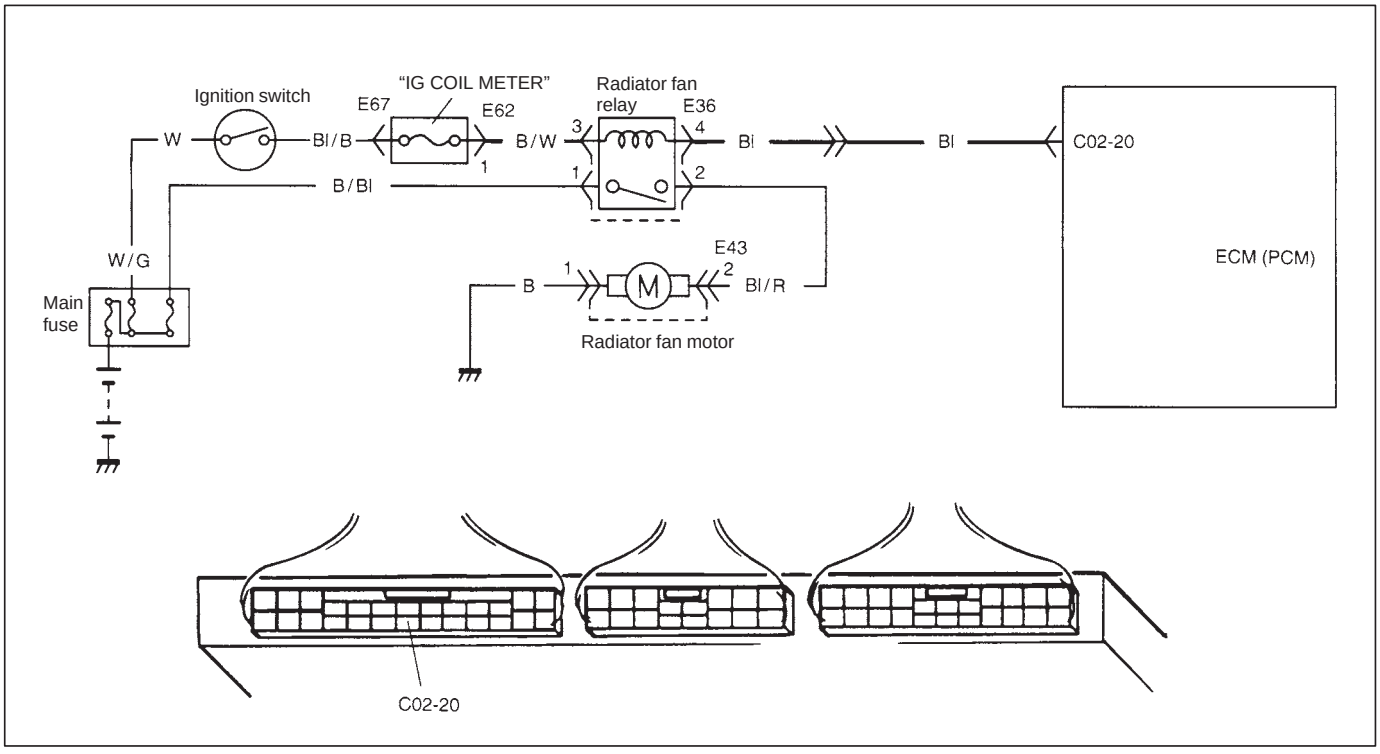
STEP	ACTION	YES	NO
1	Check EVAP canister purge valve operation 1) With ignition switch OFF, disconnect coupler from canister purge valve. 2) Check resistance of EVAP canister purge valve. See Fig. 1. Resistance between two terminals : 30 – 34 Ω at 20°C (68°F) Resistance between terminal and body : 1M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

Fig. 1 for Step 1



DTC P0480 RADIATOR FAN CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Low voltage at terminal C02-20 when engine coolant temp. is below 91°C, 195°F. ⁎ 2 driving cycle detection logic, continuous monitoring.	● "B/W" or "Bl" circuit open or short ● Radiator 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 C02-20 of ECM (PCM) connector connected, under following condition. See Fig. 1. When engine coolant temp. is lower than 96°C, 205°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 Fan Control Relay. 1) Turn ignition switch OFF and remove radiator fan relay. 2) Check for proper connection to the relay at “B/W” and “Bl” wire terminals. 3) If OK, then measure resistance between terminals a and b. See Fig. 2. Is it 100 – 120 Ω?	“B/W” or “Bl” circuit open or short. If wires and connections are OK, substitute a known-good ECM (PCM) and recheck.	Replace radiator fan relay.

Fig. 1 for Step 2

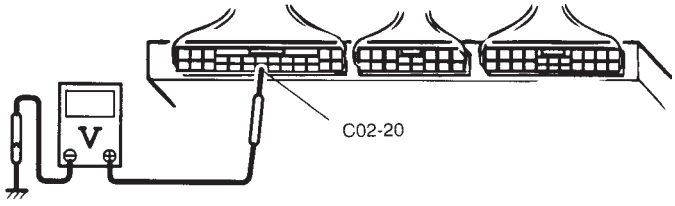
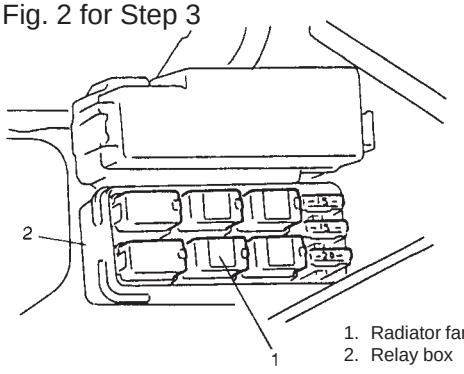


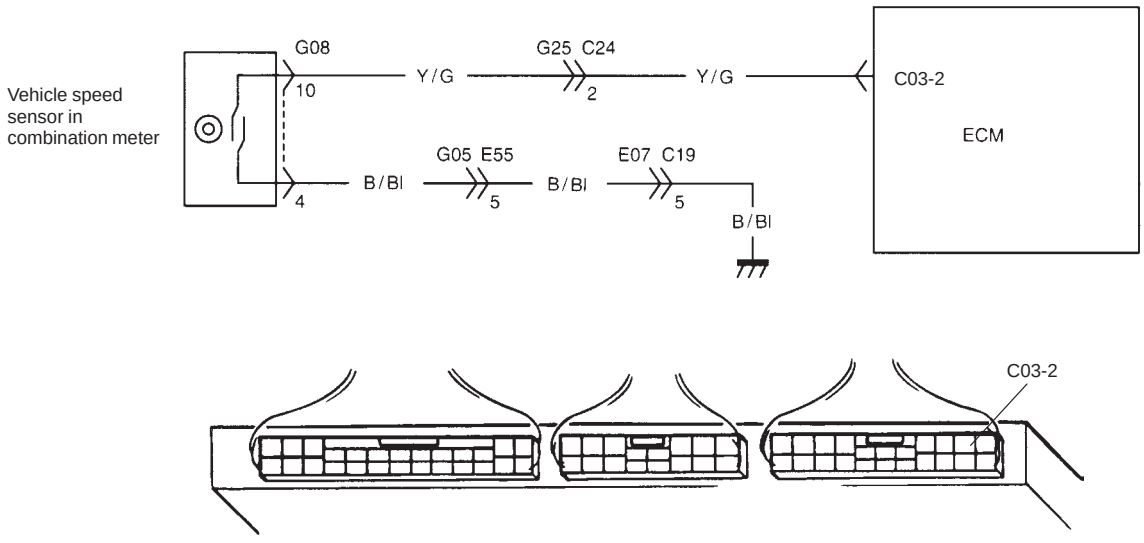
Fig. 2 for Step 3



1. Radiator fan relay
2. Relay box

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

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● VSS signal not inputted while vehicle running in "D" range or during fuel cut at deceleration. ⁎ 2 driving cycle detection logic, continuous monitoring	● "B/Bl" circuit open ● "Y/G" circuit open or short ● VSS malfunction ● ECM malfunction ● Speedometer cable 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 or "2" range while observing vehicle speed displayed on scan tool.
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 at terminal C03-2. 3) If OK, then connect ohmmeter between terminal C03-2 of ECM connector and body ground. See Fig. 1. 4) Hoist front end of vehicle and lock front right tire. 5) Turn front left tire slowly. Does ohmmeter indicator deflect between 0 and ∞ a few times while tire is turned one revolution?	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 (No.10) and “GND” (No.4) terminal of combination meter and turn cable joint of speedometer with a screwdriver. Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution. See Fig. 2. Is it in good condition?	“Y/G” or “B/Bl” wire open or short, or poor connector connection.	Replace VSS.

Fig. 1 for Step 3

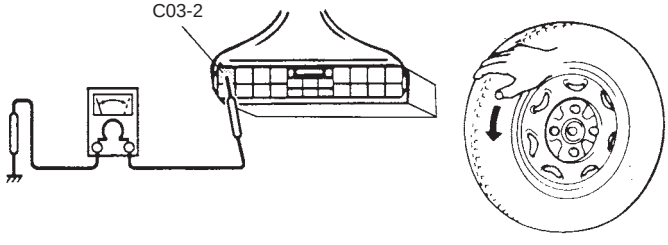
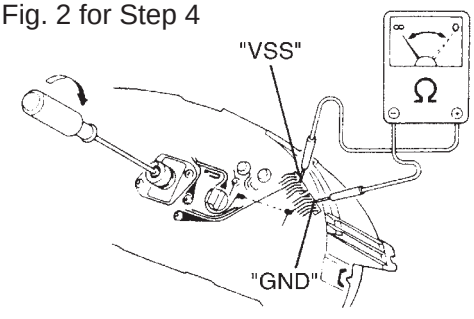
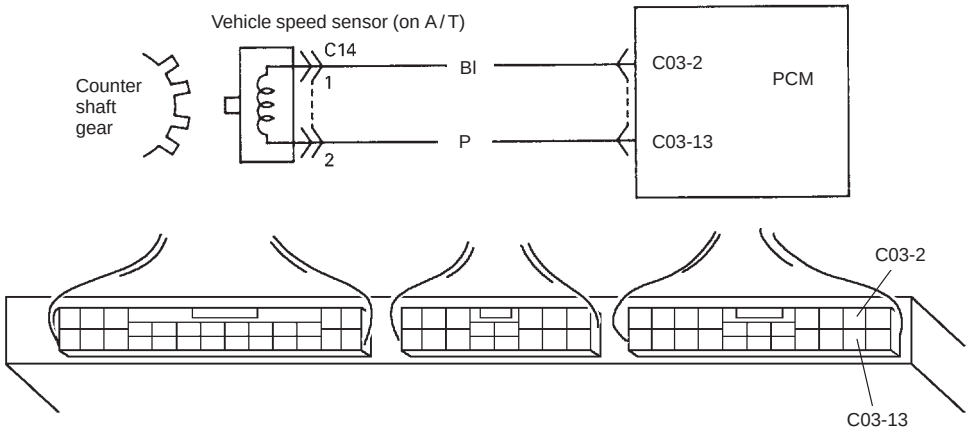


Fig. 2 for Step 4



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



CIRCUIT DESCRIPTION – Refer to Section 6E1 for VSS operation.

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.	● "Bl" or "P" 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 “Bl” and “P” 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?	“BI” or “P” wire open or shorted to ground or poor C03-2 or C03-13 connection. If wires and connections are OK, intermittent trouble or faulty PCM. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Clean, repair or replace.

Fig. 1 for Step 2

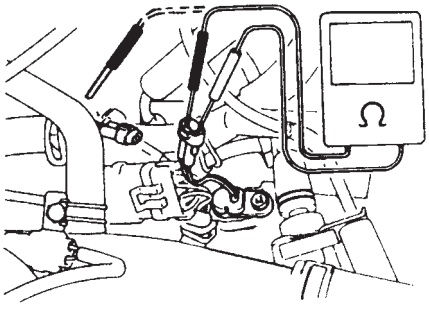
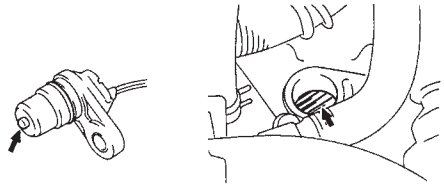
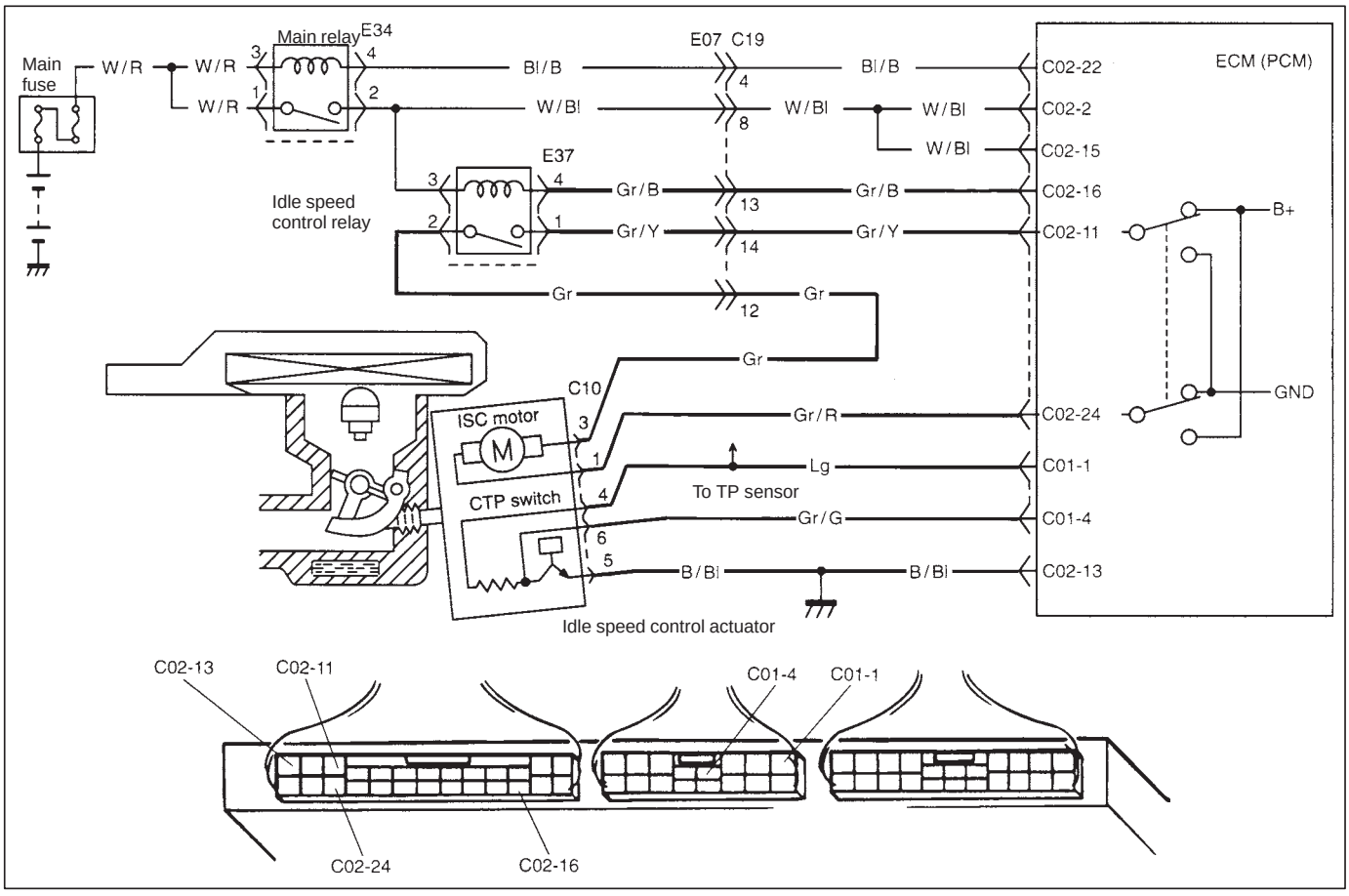


Fig. 2 for Step 3



DTC P0505 IDLE CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
DTC will set when A, B or C condition is met. A: Throttle opening change is small as compared with electrically live time. B: Throttle valve opening is not within its target range with CTP switch ON. C: Drive voltage exists though ECM (PCM) is not outputting ISC drive command.	● Malajusted accelerater cable ● Poor movement of throttle valve ● Closed throttle position switch malfunction ● Idle speed control actuator malfunction ● Idle speed control relay malfunction ● "Gr/B", "Gr/Y", "Gr", "Gr/R", "Gr/G", "Lg" or "B/Bl" circuit open or short ● Throttle position sensor malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON.
3) Start cold engine.
4) Run it idle for 5 min.
5) Select "DTC" mode on scan tool and check DTC.

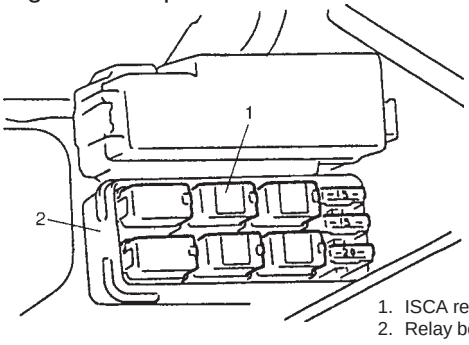
NOTE:
If engine speed changes up and down when engine speed is increased by opening throttle valve more than half but not changing its opening, it is possible that closed throttle position switch is malfunctioning.

DTC P0505

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 Control System. 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. Is it possible to control (increase and reduce) engine idle speed by using SUZUKI scan tool?	Check TP sensor (Go to DTC P0121 Flow Table) If TP sensor is OK, intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check ISC Relay. 1) Ignition switch OFF and remove ISC relay (“ISCA”). 2) Check for proper connection to ISC relay at terminals 3 and 4. 3) Check resistance between each two terminals. Between terminals 1 and 2: Infinity Between terminals 3 and 4: 100 – 120 Ω 4) Check that there is continuity between terminals 1 and 2 when battery is connected to terminals 3 and 4. Is ISC relay in good condition?	Go to Step 4.	Replace ISC relay.
4	Check Idle Speed Control Actuator. 1) Check ISC actuator operation by referring to ISC ACTUATOR INSPECTION in Section 6. Is it good condition?	Check “Gr/B”, “Gr/Y”, “Gr” and “Gr/R” circuit for open and short. If wires and connections are OK, substitute a known-good ECM (PCM) and recheck.	Replace throttle lower body with ISC actuator.

Fig. 1 for Step 3



1. ISCA relay
2. Relay box

Fig. 2 for Step 3

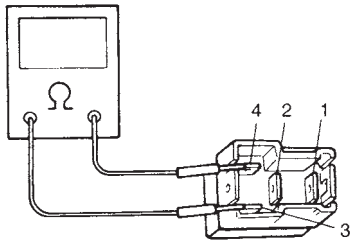
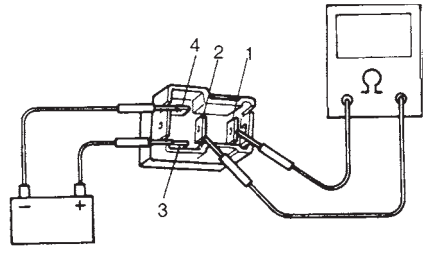


Fig. 3 for Step 3



DTC P0510 CLOSED THROTTLE POSITION (CTP) SWITCH MALFUNCTION

CIRCUIT DESCRIPTION – Refer to DTC P0505 section.

DTC DETECTING CONDITION	POSSIBLE CAUSE
● Even when vehicle is started from stop and accelerated to specified vehicle speed, CTP switch does not turn from ON to OFF (or from OFF to ON). ✳ 2 driving cycle detection logic, continuous monitoring	● "Lg", "Gr/G" or "B/Bl" circuit open or short ● CTP switch malfunction ● ECM (PCM) malfunction

NOTE:

When DTC P0105, P0120 and/or P0510 are indicated together, it is possible that "Lg" circuit is open.

DTC CONFIRMATION PROCEDURE

1) Turn ignition switch OFF, clear DTC with ignition switch ON and start engine.
2) Increase vehicle speed to 20 mph, 32 km/h and then stop vehicle.
3) Repeat above step 2) 15 times.
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 CTP Switch Operation. 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. Does CTP switch operate properly under following conditions respectively? Condition "A": ON displayed on scan tool Condition "B": OFF displayed on scan tool Is test result satisfactory?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection in Section 0A.	Go to Step 3.
3	Check CTP switch. 1) Arrange 3 new 1.5 V batteries in series (4.5 V in total). 2) Connect these batteries to CTP switch terminals "4" and "5". 3) Under following each condition, check voltage between CTP switch terminals "6" and "5". Condition "A": 0 – 1 V Condition "B": 3.5 – 5.5 V Is measured voltage as specified?	Check "Lg", "Gr/G" and "B/Bl" wires and connections for open or short. If wires and connections are OK, substitute a known-good ECM (PCM) and recheck.	Replace ISC motor set (throttle lower body with ISC actuator).

Fig. 1 for Step 2

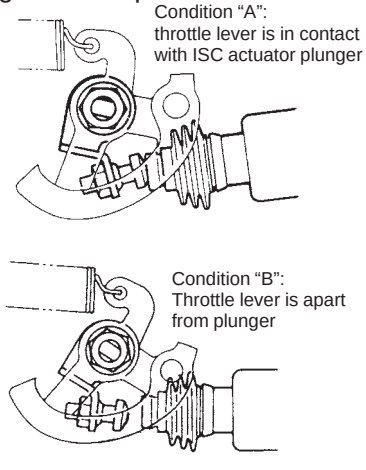
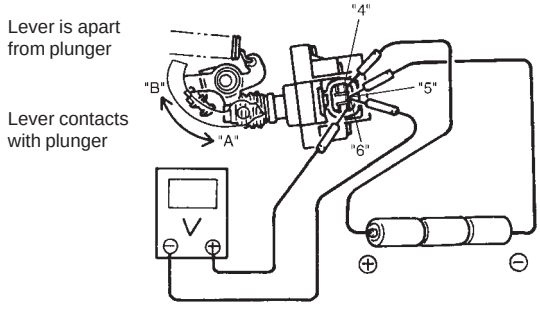


Fig. 2 for Step 3



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) ⁎ 2 driving cycle detection logic, continuous monitoring.	ECM (PCM)

DTC CONFIRMATION PROCEDURE

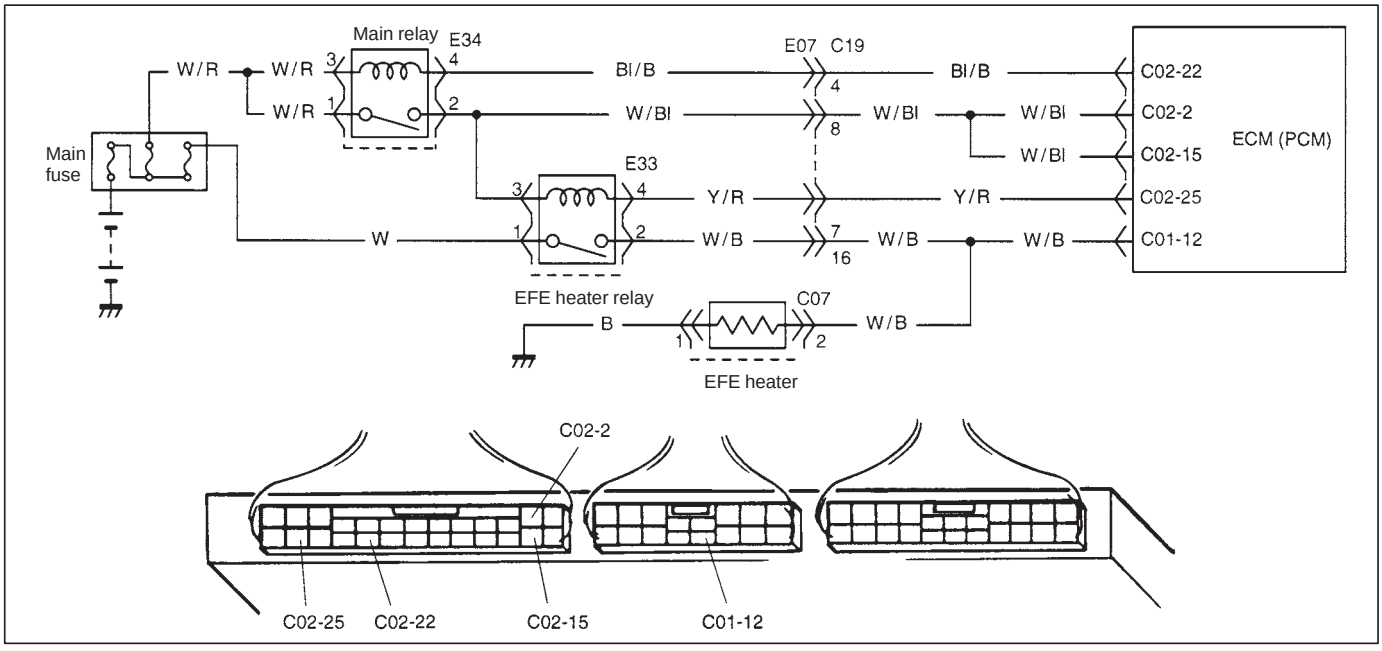
1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON and then turn ignition switch OFF.
3) Start engine and run it at idle if possible.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

INSPECTION

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

DTC P1250 EARLY FUEL EVAPORATION (EFE) HEATER CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● Voltage low at terminal C01-12 during engine warming up or ● Voltage high at terminal C01-12 after engine warming up ⁎ 2 driving cycle detection logic, continuous monitoring	● "Y/R", "W" or "W/B" circuit open or short ● EFE heater relay malfunction ● EFE heater malfunction ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

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)
   – Ambient temp: –10°C, 14°F or higher
   – Intake air temp: 70°C, 158°F or lower
4) Start cool engine and warm it up to normal operating temperature.
5) 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 EFE Heater and Its Circuit. Check for voltage at terminal C01-12 of ECM (PCM) connector connected, under following each condition. During engine warming up (Coolant temp.: Below 80°C, 176°F, Engine speed: Over 750 r/min): Over 1.0 V After warming up: Below 1.0 V Is each voltage as specified?	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.	Go to Step 3.
3	Check EFE Heater Relay. 1) Turn OFF ignition switch and remove EFE heater relay (“PTC”). See Fig. 2. 2) Check for proper connection to relay at terminal 3 and 4. See Fig. 3. 3) Check resistance between each two terminals. Between terminals 1 and 2: Infinity Between terminals 3 and 4: 100 – 120 Ω 4) Check that there is continuity between terminals 1 and 2 when battery is connected to terminals 3 and 4. See Fig. 4. Is EFE heater relay in good condition?	Go to Step 4.	Replace EFE heater relay.
4	Check EFE Heater and Its Circuit. 1) Turn ignition switch OFF and disconnect ECM (PCM) connectors. 2) Check for proper connection to ECM (PCM) at terminals C02-25 and C01-12. 3) If OK, then measure resistance between terminal C01-12 and ground. Is it 0.5 – 30 Ω at 20°C (68°F)?	“W”, “Y/R” or “W/B” circuit open or short. If wire and connections are OK, substitute a known-good ECM (PCM) and recheck.	“W/B” circuit open or short. If wire and connections are OK, replace EFE heater.

Fig 1. for Step 4

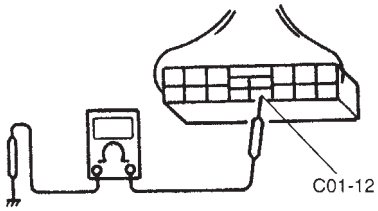
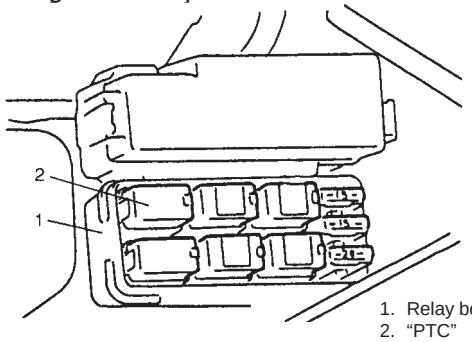


Fig. 2 for Step 3



1. Relay box
2. “PTC”

Fig. 3 for Step 3

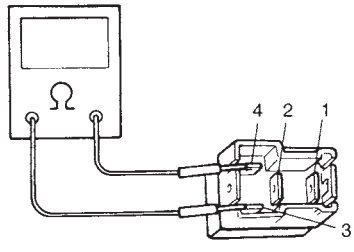
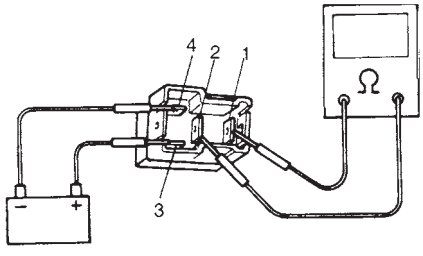


Fig. 4 for Step 3



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.

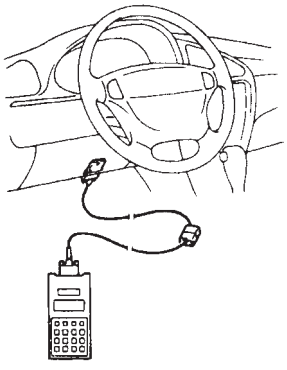
DTC P1451:

NOTE:

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

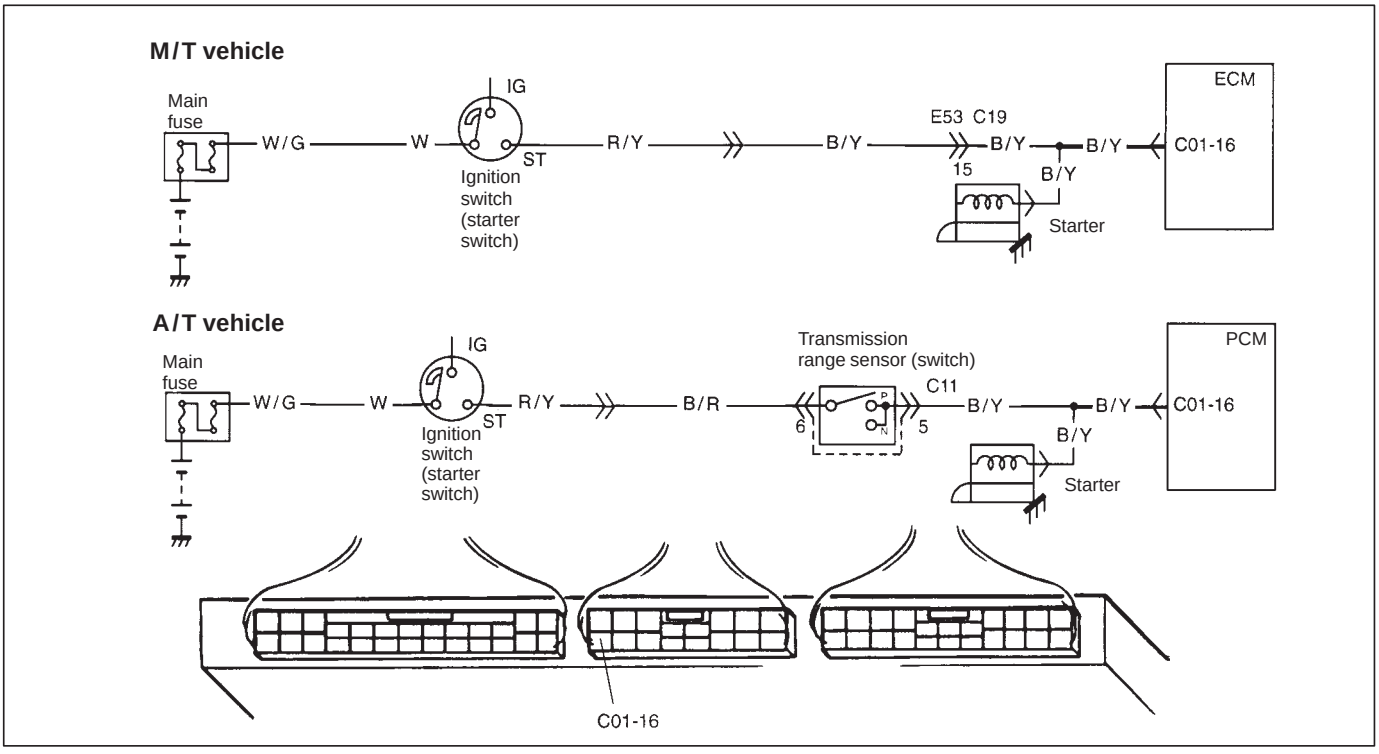
STEP	ACTION	YES	NO
1	1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and select “DATA LIST” mode on scan tool. 3) Check manifold absolute pressure. See Fig. 1. Is it barometric pressure (approx. 100 kPa, 760 mmHg) at sea level?	Substitute a known-good ECM (PCM) and recheck.	Check intake manifold pressure sensor and its circuit. Go to P0105 DIAG. FLOW TABLE.

Fig. 1 for Step 1



DTC P1500 ENGINE STARTER SIGNAL CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



DTC DETECTING CONDITION	POSSIBLE CAUSE
● High voltage at terminal C01-16 for 3 min. after engine start. ● Low voltage at terminal C01-16 during starting engine. ∗ 2 driving cycle detection logic, continuous monitoring.	● "B/Y" circuit open ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

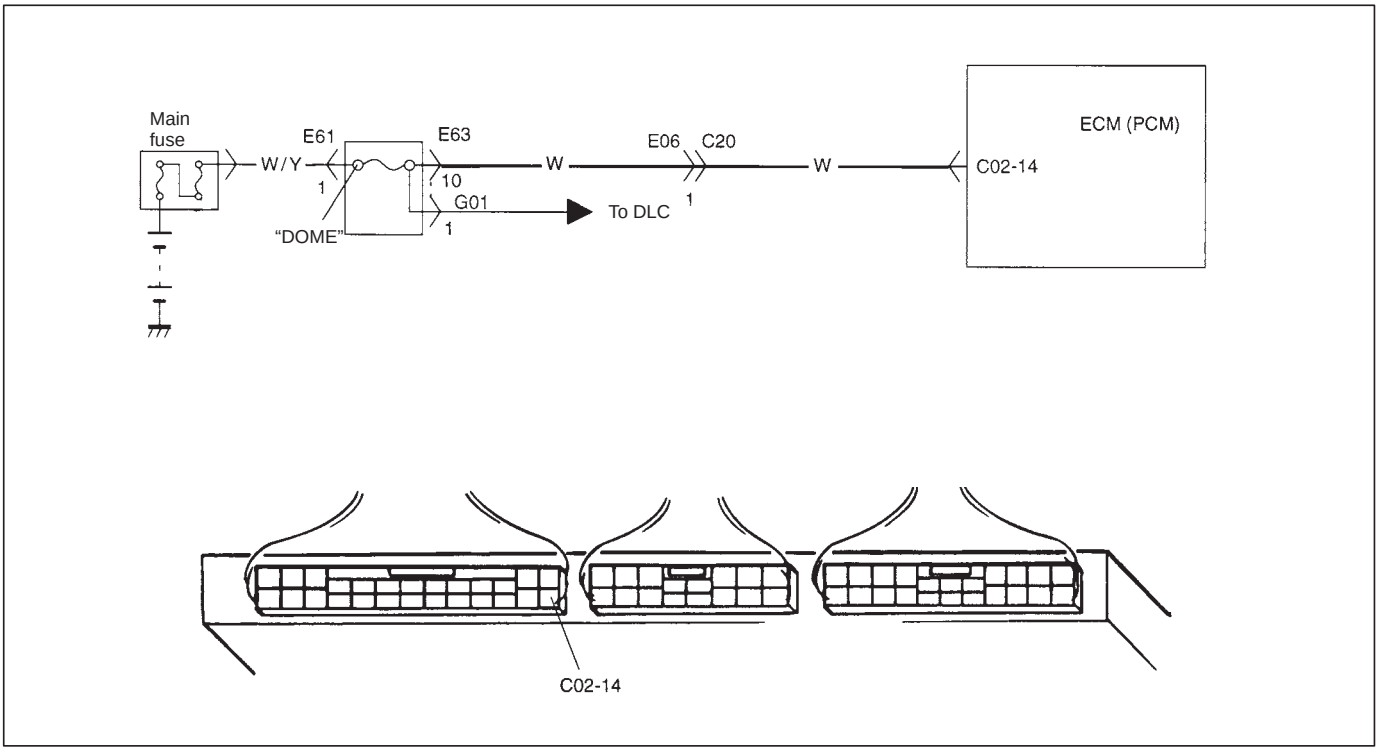
1) Turn ignition switch OFF.
2) Clear DTC with ignition switch ON, crank engine and run it at idle for 3 min.
3) Check pending DTC in "ON BOARD TEST" or "PENDING DTC" mode and DTC in "DTC" mode.

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 C01-16 of ECM (PCM) connector connected, under following condition. While engine cranking : 6 – 10 V After starting engine : 0 V Is voltage as specified?	Poor C01-16 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 C02-14 after starting engine.	● "W" circuit open ● ECM (PCM) malfunction

DTC CONFIRMATION PROCEDURE

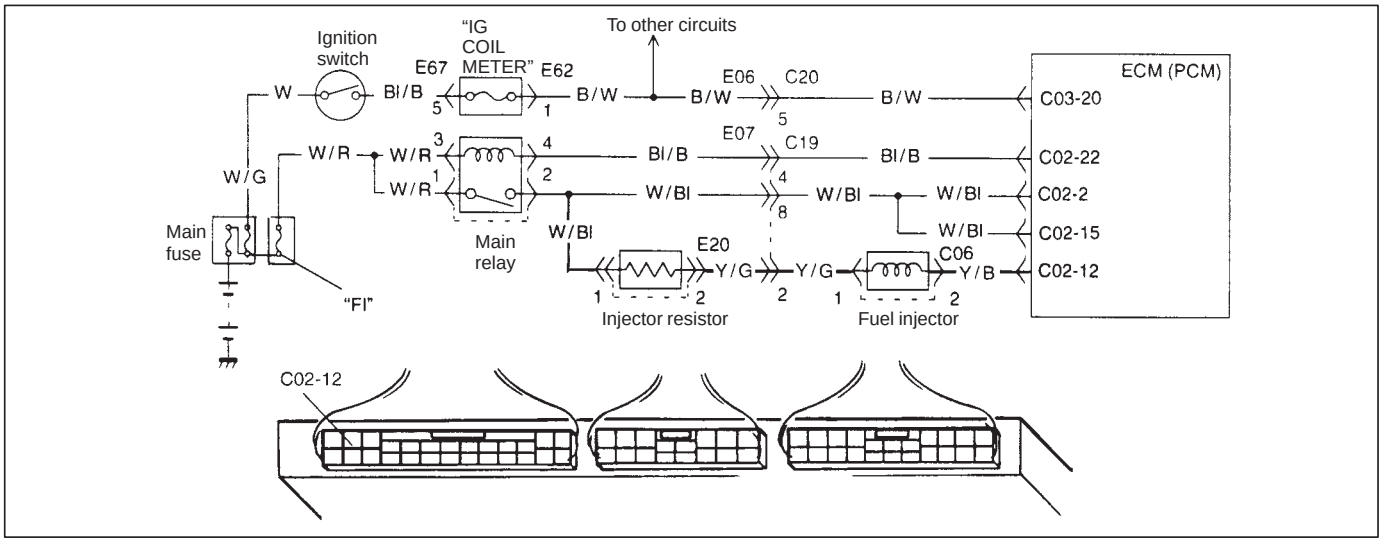
1) Clear DTC, start engine and run it at idle for 1 min.
2) Select "DTC" mode on scan tool and check DTC.

INSPECTION

STEP	ACTION	YES	NO
1	Check for voltage at terminal C02-14 of ECM (PCM) connector connected, under each condition, ignition switch OFF and engine running. Is it 10 – 14 V at each condition?	Poor C02-14 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.

BLANK

TABLE B-1 FUEL INJECTOR CIRCUIT CHECK

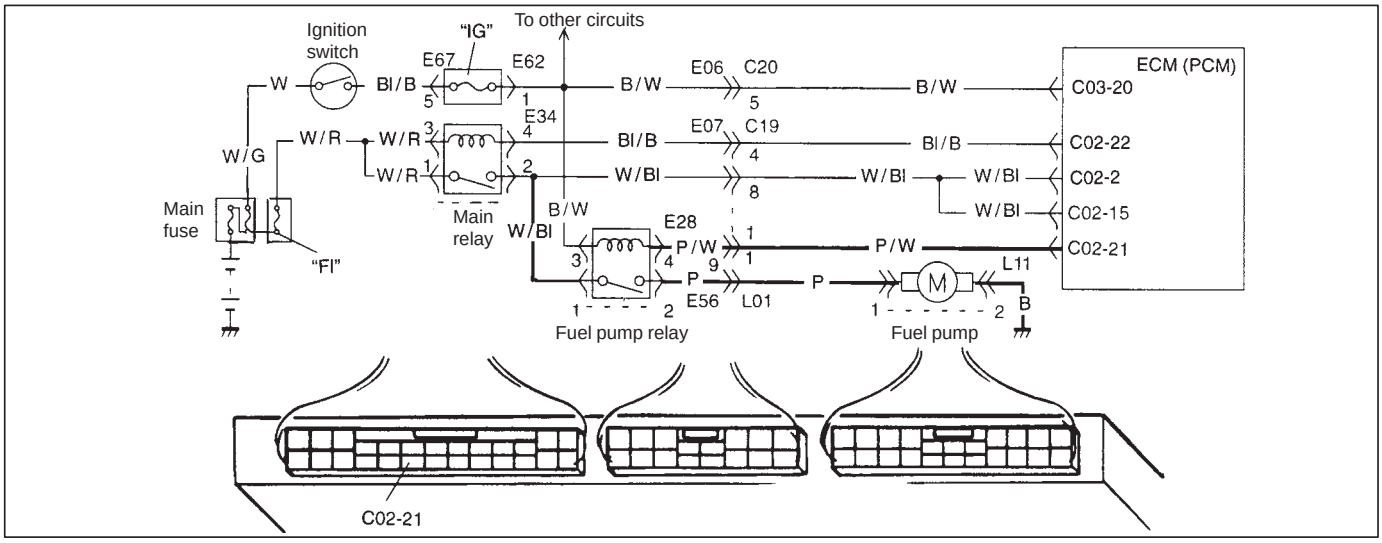


INSPECTION

STEP	ACTION	YES	NO
1	Was "ENGINE DIAG. FLOW TABLE" performed?	Go to Step 2.	Go to "ENGINE DIAG. FLOW TABLE".
2	Injector Circuit Check 1) Check injector circuit for short. Is fuel injected from injector at ignition switch ON?	"Y/B" wire shorted to ground or faulty injector. If wire and injector is as specified respectively and then substitute known-good ECM (PCM) and recheck.	Go to Step 3.
3	Injector Check 1) Check injector for fuel Injection referring to FUEL INJECTOR ON-VEHICLE INSPECTION in Section 6E1. Is fuel injected from injector at engine cranking?	Go to Step 4.	Go to Step 5.
4	Injector Leakage Check 1) Check injector for leaks referring to FUEL INJECTOR ON-VEHICLE INSPECTION in Section 6E1. Is it in good condition?	Injector and its circuit are in good condition.	Faulty fuel injector.
5	Check Injector for Operating Sound. 1) Using sound scope, check injector for operating sound at engine cranking. Is it detected?	Proceed to DIAG. FLOW TABLE B-2 and B-3.	Go to Step 6.

STEP	ACTION	YES	NO
6	Check Injector Resistor for Resistance. 1) Disconnect resistor connector with ignition switch OFF. 2) Check for proper connection to resistor at each terminals. 3) If connection is OK, check resistance. Is resistance 1.9 – 2.1 Ω (at 20°C, 68°F)?	"W/Bl", "Y/G" or "Y/B" wire open or poor C02-12 connection. If wires and connections are OK, substitute a known-good ECM (PCM) and recheck.	Replace resistor.

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 E28-1 and E28-2 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 "W/Bl" 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 "1" and "2": Infinity Between terminals "3" and "4": 100 – 120 Ω 2) Check that there is continuity between terminals "1" and "2" when battery is connected to terminals "3" and "4". See Fig. 4. Is fuel pump relay in good condition?	"P/W" circuit open or poor C02-21 connection. If wire and connection are OK, substitute a known-good ECM (PCM) and recheck.	Replace fuel pump relay.

Fig. 1 for Step 2

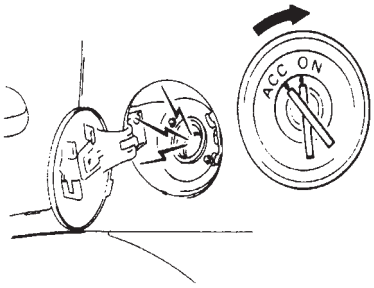
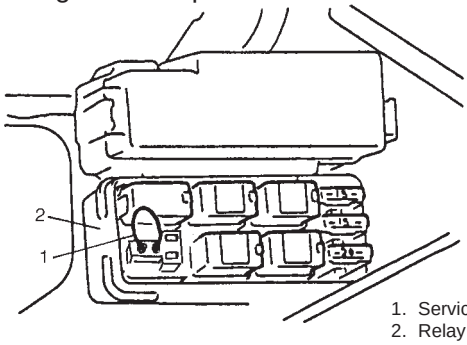


Fig. 2 for Step 3



1. Service wire
2. Relay box

Fig. 3 for Step 4

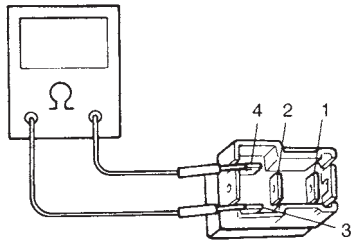


Fig. 4 for Step 4

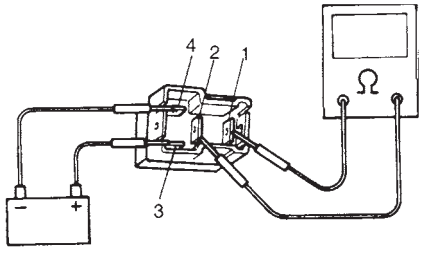
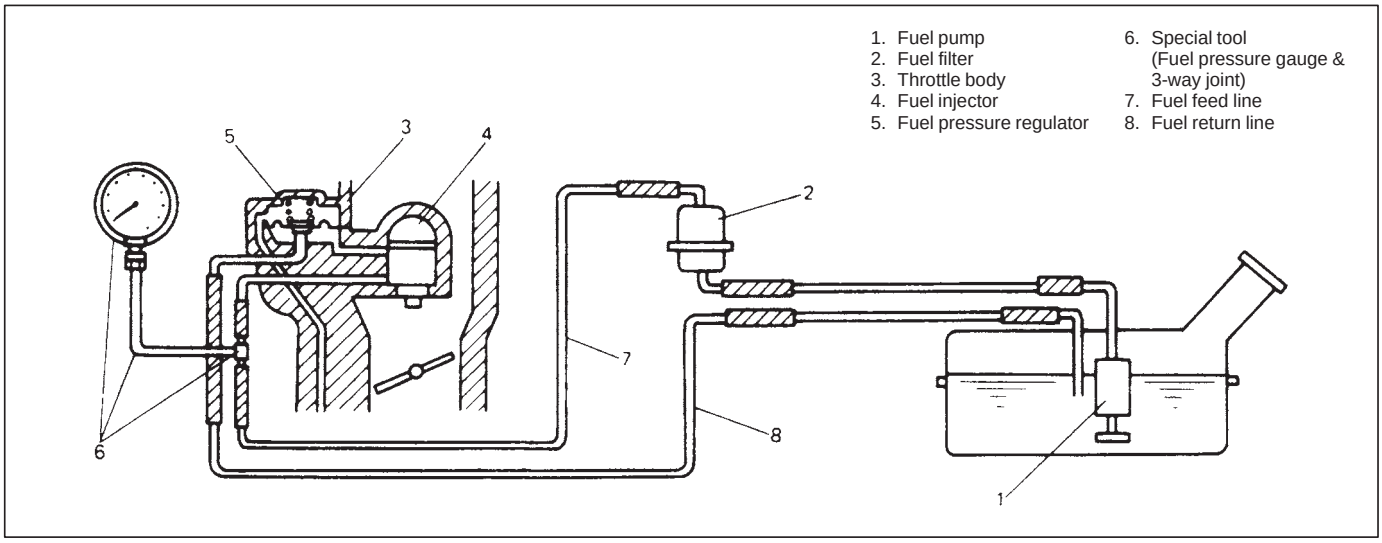


TABLE B-3 FUEL PRESSURE CHECK

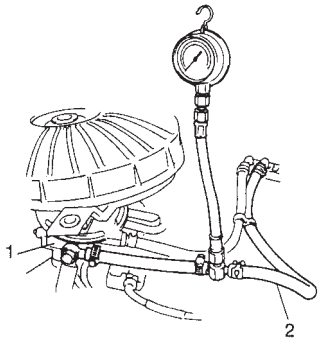


INSPECTION

STEP	ACTION	YES	NO
1	Check Fuel Pressure (Refer to Section 6E1 for details). 1) Release fuel pressure from fuel feed line. 2) Install fuel pressure gauge. 3) Check fuel pressure by repeating ignition switch ON and OFF. See Fig. 1. Is fuel pressure then 160 – 210 kPa (1.6 – 2.1 kg/cm^2, 22.7 – 29.9 psi)?	Go to Step 2.	Go to Step 4.
2	Is 90 kPa (0.9 kg/cm^2, 12.8 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped at Step 1?	Normal fuel pressure.	Go to Step 3.
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 90 – 140 kPa (0.9 – 1.4 kg/cm^2, 12.8 – 20.0 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 specification in Step 1?	Go to Step 6.	Go to Step 7.
6	1) Disconnect fuel return hose from throttle body and connect new return hose to it. 2) Insert 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.
7	Was no fuel pressure supplied in Step 1?	Go to Step 8.	Go to Step 9.

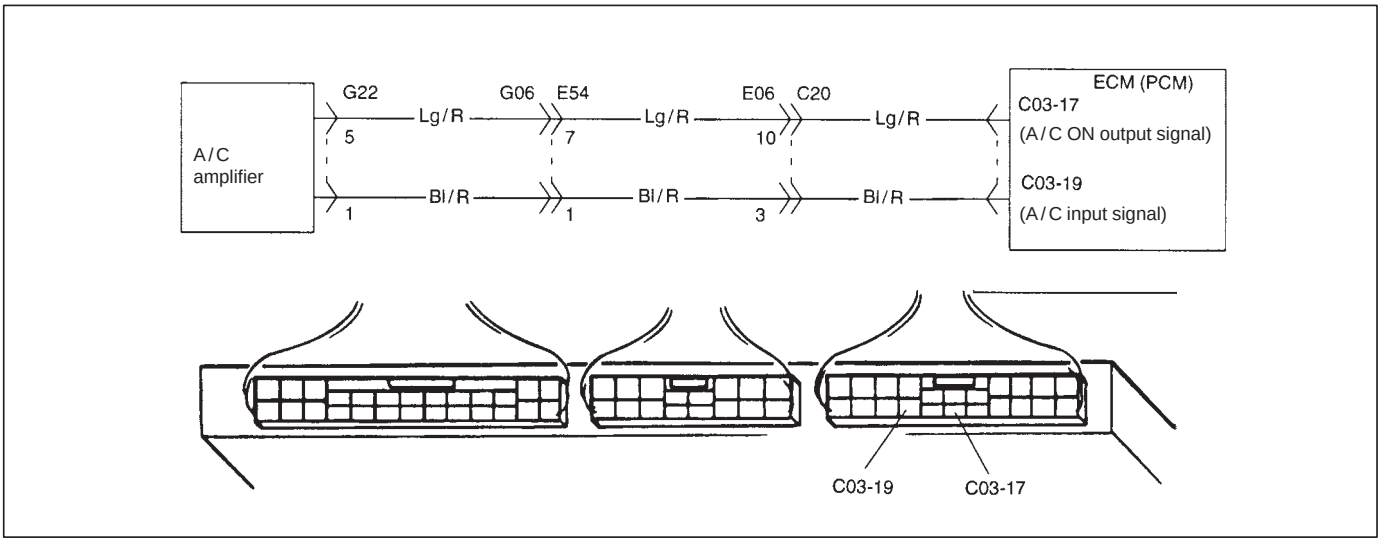
STEP	ACTION	YES	NO
8	With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied?	Faulty fuel pressure regulator.	Shortage of fuel or fuel pump or its circuit defective (refer to B-2 FUEL PUMP ANDITS CIRCUIT CHECK).
9	1) Operate fuel pump. 2) With fuel return hose blocked 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 throttle body 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 retained. While doing so, does fuel come out of return hose?	Faulty fuel pressure regulator.	● Fuel leakage from injector, ● Fuel leakage from between injector and throttle body, ● Faulty fuel pump (faulty check valve in fuel pump) or ● Fuel leakage from fuel pressure regulator diaphragm.

Fig. 1 for Step 1



1. Fuel pressure gauge & 3way joint

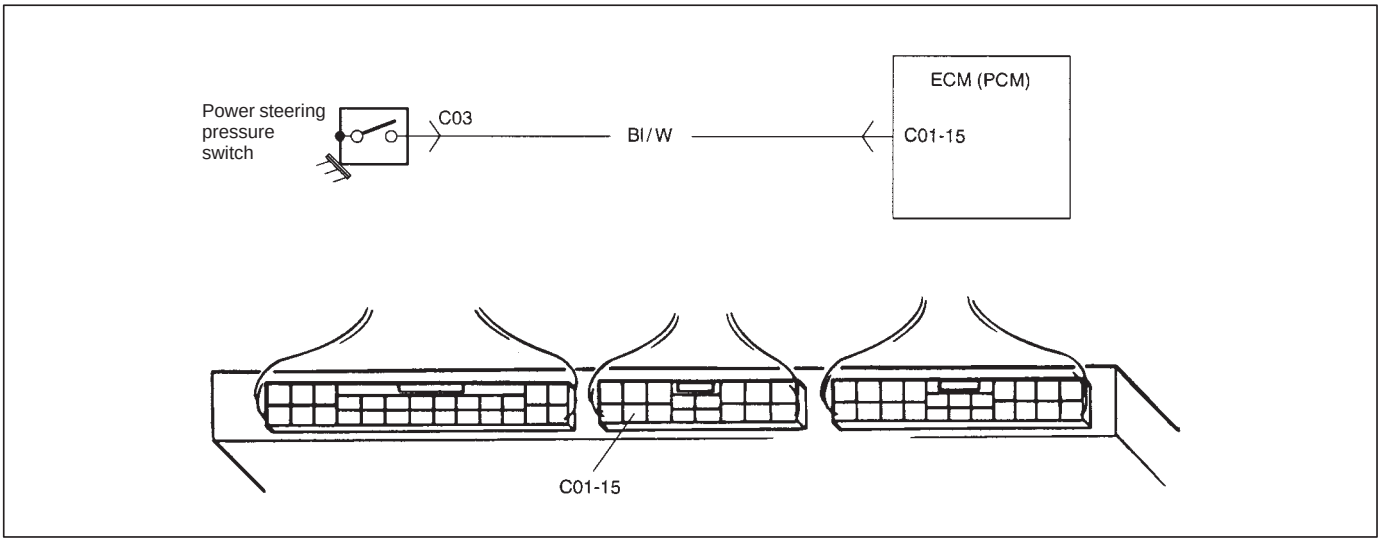
TABLE B-4 A/C SIGNAL CIRCUITS CHECK (VEHICLE WITH A/C)



INSPECTION

STEP	ACTION	YES	NO
1	Check A/C (Input) Signal Circuit. 1) Check voltage at terminal C03-19. 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 results as specified?	Go to Step 2.	● "Bl/R" wire open or short. ● Poor C03-19 connection. ● Poor A/C amplifier coupler connection or faulty A/C system.
2	Check A/C ON (Output) Signal Circuit. 1) Check voltage at terminal C03-17. 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 results as specified?	A/C control signal circuits are in good condition.	● "Lg/R" wire open or short. ● Poor performance of ECT sensor, TP sensor. ● Engine start signal inputted or ● Poor C03-17 connection. If none of the above exists, substitute a known-good ECM (PCM) and recheck.

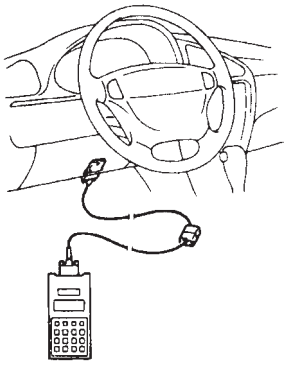
TABLE B-5 POWER STEERING PRESSURE (PSP) SWITCH SIGNAL CIRCUIT CHECK (IF EQUIPPED)



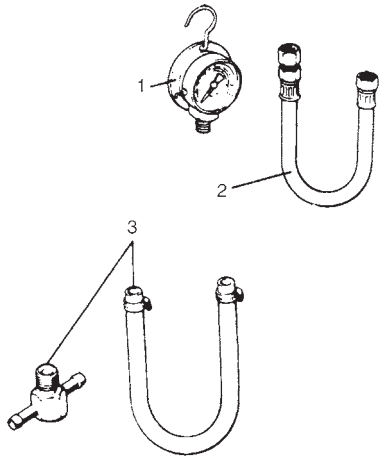
INSPECTION

STEP	ACTION	YES	NO
1	Check PSP Switch Signal Circuit. 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check PSP switch signal under following each condition. See Fig. 1. Engine running and steering wheel at straight-ahead position : OFF Engine running and steering wheel turned to the right on left as far as it stops : ON Is check result satisfactory?	PSP switch signal circuit is in good condition.	“Bl/W” circuit open or short, PSP switch malfunction or power steering system malfunction.

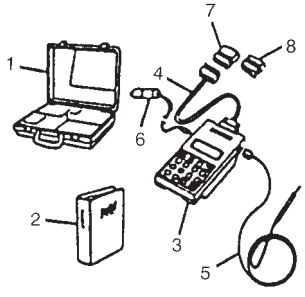
Fig. 1 for Step 1



SPECIAL TOOL

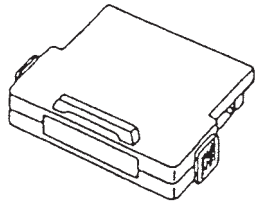


1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. 3-way joint & hose
   09912-58490

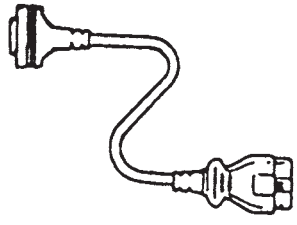


1. Storage case
2. Operator's manual
3. Tech 1 A
4. DLC cable (14/26 pin, 09931-76040)
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

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



Mass storage cartridge



09931-76030
16/14 pin DLC cable

SECTION 6

ENGINE GENERAL INFORMATION AND DIAGNOSIS (TBI FOR G13)

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