GROUP 13

FUEL

CONTENTS

GROUP 13A

MULTIPORT FUEL INJECTION (MFI) <2.4L>

CONTENTS

GENERAL DESCRIPTION

M1131000100109

The Multiport Fuel Injection System consists of sensors, actuators and the powertrain control module (PCM). The sensors detect the engine condition. The module controls the system based on signals from these sensors. The actuators work under the control of the PCM. The PCM carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the PCM has several diagnostic test modes which simplify troubleshooting when a problem develops. In addition, the PCM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The PCM controls injector drive times and injector timing to supply the optimum air/fuel mixture to the engine according to the continually-changing engine operation conditions. A single injector is mounted at the intake port of each cylinder. The fuel pump supplies pressurized fuel from the fuel tank to the fuel injectors. The fuel pressure regulator controls the fuel pressure. Thus, the regulated fuel is distributed to each injector. Fuel is normally injected for each cylinder every two rotations of the crankshaft. The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called "multiport." The PCM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or running under high load conditions. Thus, engine performance is maintained. In addition, when the engine is under normal operating temperature after warming-up, the PCM controls the air/fuel mixture according to the heated oxygen sensor signal. This control is a "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtain the maximum cleaning performance.

IDLE AIR CONTROL

The engine control module controls the amount of air that bypasses the throttle valve according to changes in idling conditions and engine load during idling. Thus, idle speed is kept at an optimum speed. The PCM drives the idle air control (IAC) motor according to engine coolant temperature, A/C, and other electrical load. Thus, idle speed is kept at an optimum speed. In addition, when the air conditioning switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount. Thus, idle speed is maintained at constant speed regardless of various engine load conditions.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns on and off to control primary current flow to the ignition coil. This maintains ignition timing at an optimum level regardless of various engine operating conditions. The PCM determines the ignition timing according to engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When a fault is detected in any of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When a fault is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the fault is stored in the PCM.
- The RAM data inside the PCM that is related to the sensors and actuators can be read with the scan tool. In addition, the actuators can be controlled by the scan tool MUT-II (MB991502) under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control Turns on the fuel pump relay so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control Turns on and off the air conditioning compressor clutch.
3. Evaporative Emission Purge Control (Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – General Information.P.17-83)
4. EGR Control (Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information.P.17-88)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

SENSE

★1 HEATED OXYGEN SENSOR (FRONT)
★2 VOLUME AIR FLOW SENSOR
★3 INTAKE AIR TEMPERATURE SENSOR
★4 THROTTLE POSITION SENSOR
★5 CAMSHAFT POSITION SENSOR
★6 CRANKSHAFT POSITION SENSOR
★7 BAROMETRIC PRESSURE SENSOR
★8 ENGINE COOLANT TEMPERATURE SENSOR
★9 HEATED OXYGEN SENSOR (REAR)
★10 MANIFOLD DIFFERENTIAL PRESSURE SENSOR
★11 FUEL TANK DIFFERENTIAL PRESSURE SENSOR

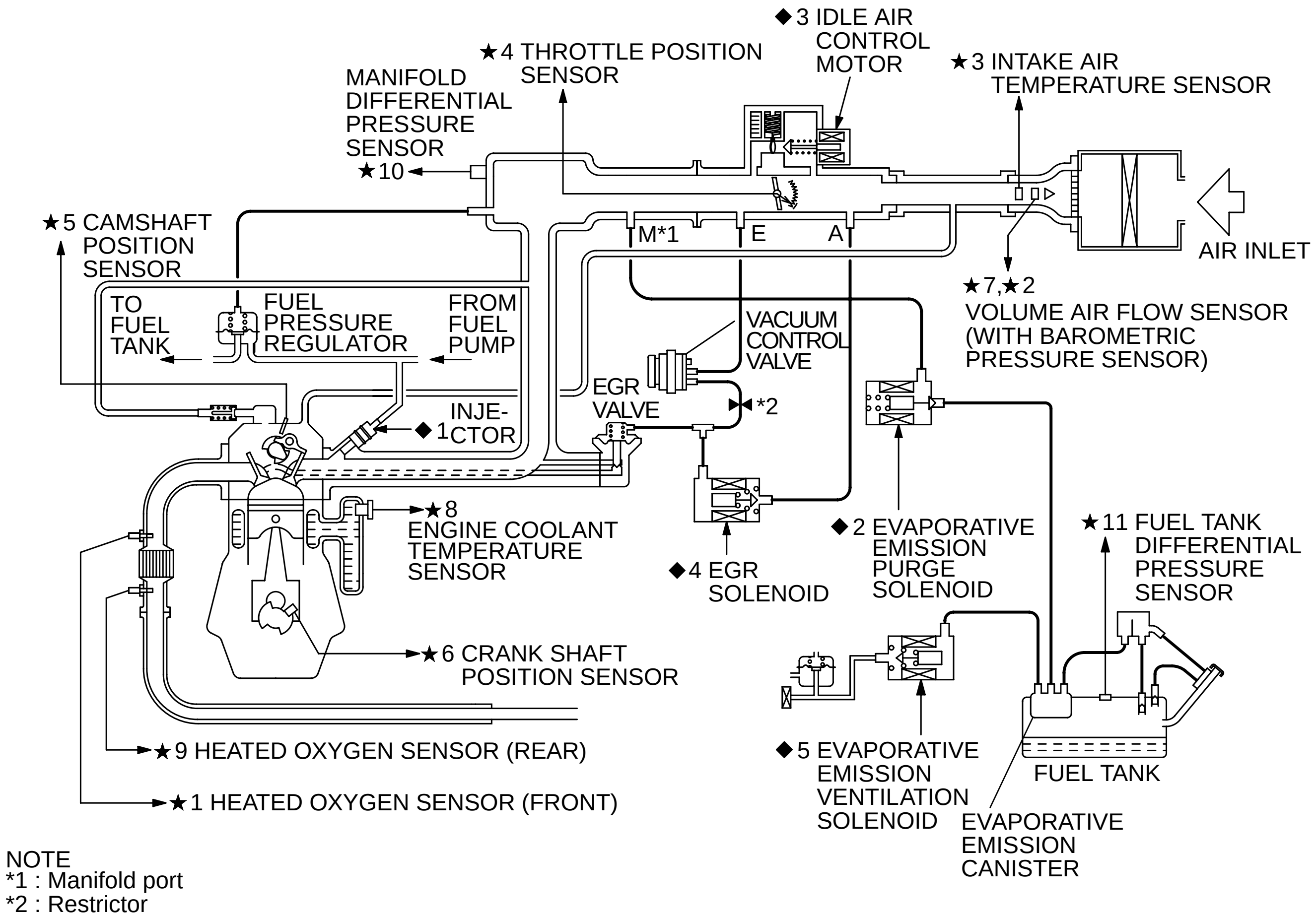
- POWER SUPPLY
- VEHICLE SPEED SENSOR
- A/C SWITCH
- PARK/NEUTRAL POSITION SWITCH
- POWER STEERING PRESSURE SWITCH
- IGNITION SWITCH - ST

⇨ **DECIDE**: PCM ⇨

ACT

◆1 INJECTOR
◆2 EVAPORATIVE EMISSION PURGE SOLENOID
◆3 IDLE AIR CONTROL MOTOR
◆4 EGR SOLENOID
◆5 EVAPORATIVE EMISSION VENTILATION SOLENOID\

- FUEL PUMP RELAY
- MULTIPORT FUEL INJECTION (MFI) RELAY
- A/C COMPRESSER CLUTCH RELAY
- SERVICE ENGINE SOON/ MALFUNCTION INDICATOR LAMP
- DIAGNOSTIC OUTPUT
- IGNITION COIL, IGNITION POWER TRANSISTER



AK000583 AB

*NOTE: For the vacuum hose routing, refer to GROUP 17, Vacuum Hoses**P.17-77**.*

MULTIPORT FUEL INJECTION(MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131008500093

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any MFI Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent MalfunctionP.00-8
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, record the number of the code, then erase the code from the memory using the scan tool.

NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, store the "freeze frame" data before erasing the DTC.

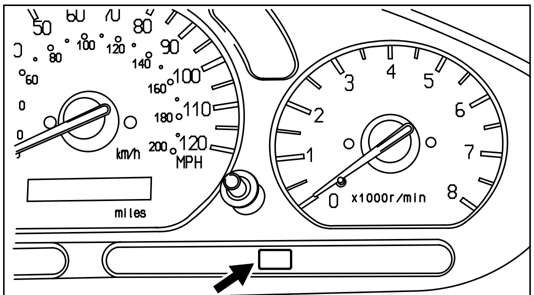
7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with the inspection procedure for diagnostic trouble codes of that code.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent MalfunctionP.00-8
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been eliminated.

NOTE: If the powertrain control module (PCM) is replaced, the immobilizer-ECU should be replaced together with it. Each PCM has an individual information for immobilizer-ECU, and the individual information is registered in the immobilizer-ECU.

TROUBLE CODE DIAGNOSIS

M1131008600090

SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP



SERVICE ENGINE SOON/
MALFUNCTIONINDICATOR LAMP AK000605AB

Among the on-board diagnostic items, a Service Engine Soon/ Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.
Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.
Immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for five seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Indicator Lamp

DTC NO.	ITEMS
-	Powertrain control module (PCM) malfunction
P0101	Volume air flow circuit range/performance problem
P0102	Volume air flow circuit low input

DTC NO.	ITEMS
P0103	Volume air flow circuit high input
P0107	Barometric pressure circuit low input
P0108	Barometric pressure circuit high input
P0111	Intake air temperature circuit range/performance problem
P0115	Engine coolant temperature circuit high input
P0116	Engine coolant temperature circuit range/performance problem
P0117	Engine coolant temperature circuit low input
P0121	Throttle position circuit range/performance problem
P0122	Throttle position circuit low input
P0123	Throttle position circuit high input
P0128	Coolant thermostat malfunction
P0130	O_2 sensor circuit malfunction (sensor 1)
P0133	O_2 sensor circuit slow response (sensor 1)
P0134	O_2 sensor circuit no activity detected (sensor 1)
P0135	O_2 sensor heater circuit malfunction (sensor 1)
P0136	O_2 sensor circuit malfunction (sensor 2)
P0139	O_2 sensor circuit slow response (sensor 2)
P0141	O_2 sensor heater circuit malfunction (sensor 2)
P0171	System too lean
P0172	System too rich
P0201	Injector circuit malfunction-cylinder 1
P0202	Injector circuit malfunction-cylinder 2
P0203	Injector circuit malfunction-cylinder 3
P0204	Injector circuit malfunction-cylinder 4
P0300	Random misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0335	Crankshaft position sensor circuit malfunction
P0340	Camshaft position sensor circuit malfunction
P0401	Exhaust gas recirculation flow insufficient detected
P0403	Exhaust gas recirculation solenoid malfunction
P0421	Warm up catalyst efficiency below threshold (bank 1)
P0442	Evaporative emission control system leak detected
P0443	Evaporative emission control system purge control valve circuit malfunction
P0446	Evaporative emission control system vent control malfunction
P0450	Evaporative emission control system pressure sensor malfunction
P0451	Evaporative emission control system pressure sensor range/performance

DTC NO.	ITEMS
P0455	Evaporative emission control system leak detected (Gross leak)
P0500	Vehicle speed sensor malfunction
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0551	Power steering pressure sensor circuit range/performance
P0705	Transmission range sensor circuit malfunction (RPNDL input)
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Input/Turbine speed sensor circuit malfunction
P0720	Output speed sensor circuit malfunction
P0725	Engine speed input circuit malfunction
P0740	Torque converter clutch system malfunction
P0750	Shift solenoid A malfunction
P0755	Shift solenoid B malfunction
P0760	Shift solenoid C malfunction
P0765	Shift solenoid D malfunction
P1400	Manifold differential pressure sensor circuit malfunction
P1751	A/T control relay malfunction

NOTE: If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the powertrain control module (PCM), transmission between scan tool MUT-II (MB991502) and the PCM is impossible. In this case, the diagnostic trouble code (DTC) cannot be read.

NOTE: After the PCM has detected a malfunction, the Service Engine Soon/Malfunction Indicator Lamp illuminates when the engine is next turned on and the same malfunction is re-detected.

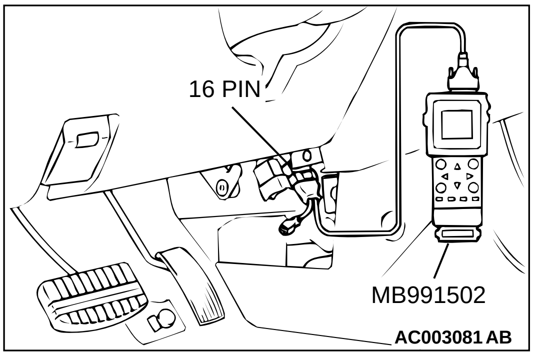
NOTE: After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.

- *When the PCM monitored the power train malfunction three times* it met set condition requirements, it detected no malfunction. *: In this case, "one time" indicates from engine start to stop.*
- *For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODE

Required Special Tool:
MB991502: Scan Tool (MUT-II)



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

NOTE: If Battery positive voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.

NOTE: If battery cable is disconnected or if the powertrain control module (PCM) connector is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery cable or PCM connector until the diagnostic trouble codes have been recorded.

NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, store the "freeze frame" data before erasing the DTC.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Read the diagnostic trouble codes for MFI.
4. Refer to the DIAGNOSTIC TROUBLE CODE CHART(P.13A-20).
5. Turn the ignition switch to the "LOCK" (OFF) position and then back to "ON" again.
6. Erase the diagnostic trouble code(s) using MUT-II screen prompts.
7. Confirm that the diagnostic trouble code output is normal.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502 from the data link connector.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode – Results (Mode 5)]

The MUT-II will display the Provisional DTCs reported by powertrain control module (PCM) if the PCM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle. The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle. Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the MIL will be illuminated and a DTC will set.

MODE 6 REFERENCE TABLE

The powertrain control module (PCM) monitors the condition of emission control system.

By selecting MODE 6 using scan tool, Test Result and Limit Value (minimum) *1 or (maximum) *2 about the main items of emission control system which PCM monitors can be confirmed. The value at the last monitoring is output by PCM as a test result.

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL*3	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL*4
01	Catalyst monitor	PCM monitors the deterioration of catalyst at right bank side by the output frequency ratio between heated oxygen sensor (front) and heated oxygen sensor (rear).	Catalyst Frequency Ratio Bank 1 Test Result and Limit Value (max.)	×0.39
03	EGR monitor	PCM monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold differential pressure sensor.	EGR Monitor Pressure Value Test Result and Limit Value (min.) kPa	×0.43 kPa
06	Evaporation leak monitor (Small leak)	PCM monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 1mm Pressure Value Test Result and Limit Value (max.) Pa	×0.065 Pa
07	Evaporation leak monitor (Large leak)	PCM monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. Gross Pressure Value Test Result and Limit Value (max.) Pa	×0.065 Pa

*NOTE: *1 : The test fails if test value is less than this value.*

*NOTE: *2 : The test fails if test value is greater than this value.*

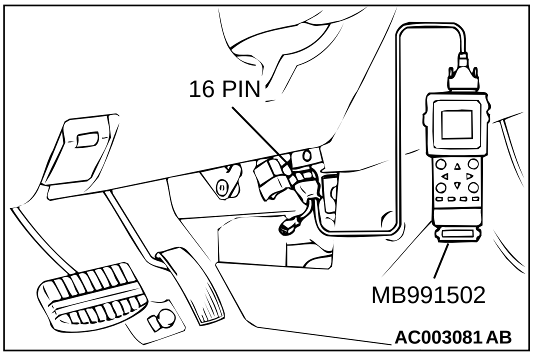
*NOTE: *3 : When the test result indicates the following, it means the monitoring of PCM is incomplete.*

- *"Test incomplete." <in case of Scan tool>*
- *"00" or "FF" <in case of General scan tool>*

*NOTE: *4 : In case that the value output by General scan tool is HEX, convert them after decimalized.*

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

Required Special Tool:
MB991502: Scan Tool (MUT-II)



⚠ CAUTION

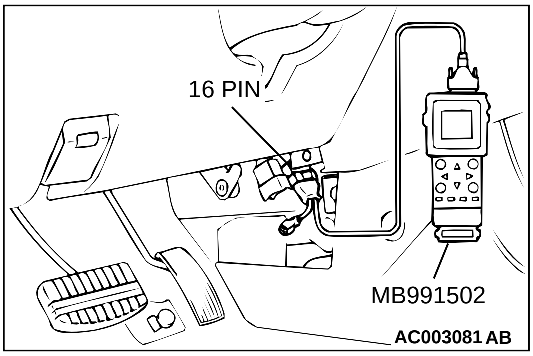
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

NOTE: When mode II is selected with MUT-II, the Service Engine Soon/Malfunction Indicator Lamp will light when the powertrain control module (PCM) first detects the trouble (Note that this is only for emission-related trouble). At the same time, the relevant diagnostic trouble codes will be registered. In respect to the comprehensive component electrical faults (opens/shorts), the time for the diagnostic trouble code to be registered after the fault occurrence is four seconds → one second. Therefore, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced. To return to the normal mode I after mode II has been selected once, the ignition switch must be turned "OFF" once or mode I must be reselected with MUT-II. The diagnostic trouble code, readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these before returning to mode I.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Change the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY).
4. Road test the vehicle.
5. Read the diagnostic trouble code and repair the malfunctioning part.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.

INSPECTION USING SCAN TOOL MB991502, DATA LIST AND ACTUATOR TESTING

Required Special Tool:
MB991502: Scan Tool (MUT-II)



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list and the actuator test function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to Data List Reference Table (P.13A-405).
   Refer to Actuator Test Reference Table(P.13A-416).
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.

5. Erase the diagnostic trouble code(s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

ON-BOARD DIAGNOSTICS

The powertrain control module (PCM) monitors the input/output signals (some signals all the time and others under specified conditions) of the PCM. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the PCM judges that a malfunction has occurred. After the PCM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*," a diagnostic trouble code is recorded on the first detection of the malfunction. There are 55 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the PCM connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from scan tool MUT-II (MB991502) to the PCM.

NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the PCM in order to erase the diagnostic memory. The 51 diagnostic items are all indicated sequentially from the smallest code number. The PCM records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" date. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows:

DATA	UNIT
Engine coolant temperature	° C or ° F
Engine speed	r/min
Vehicle speed	km/h or mph
Long-term fuel compensation (long-term fuel trim)	%
Short-term fuel compensation (short-term fuel trim)	%
Fuel control condition	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
Calculation load value	%
Diagnostic trouble code during data recording	-

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a short drive according to the following six drive cycle pattern. In other words, doing such a drive regenerates any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and verifies the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

⚠ CAUTION

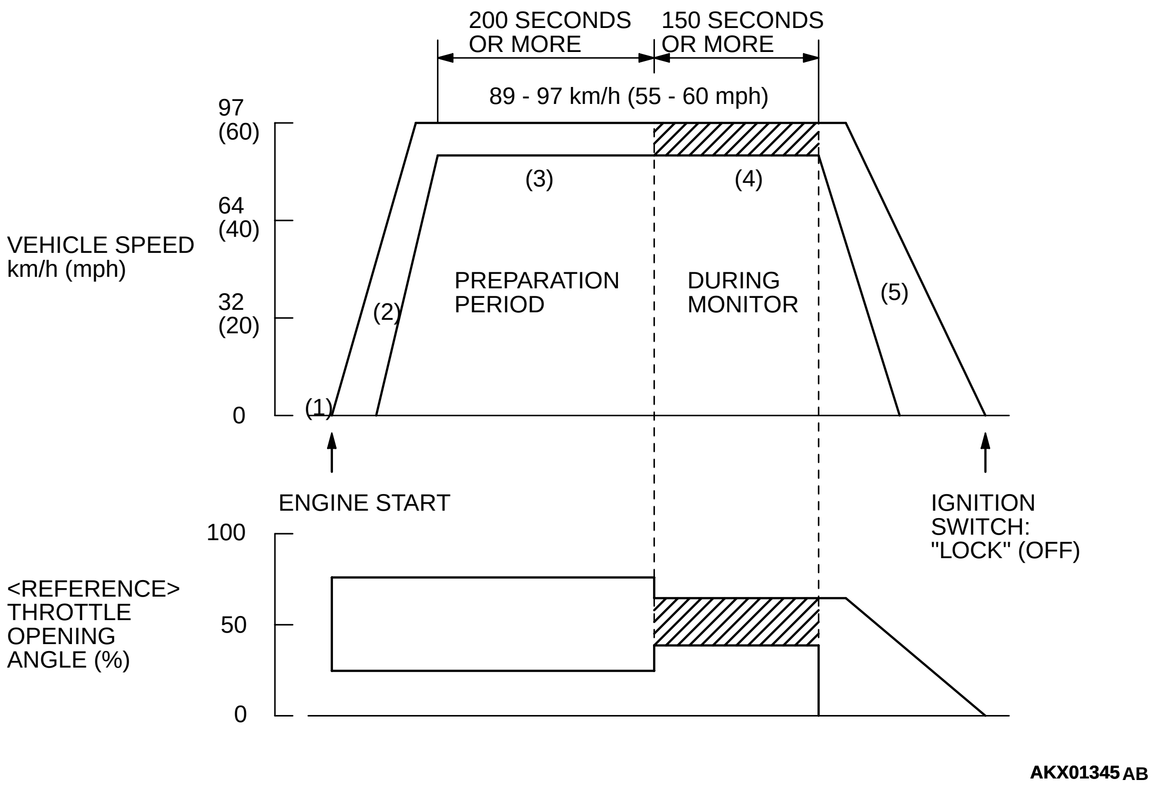
Two technicians should always be in the vehicle when carrying out a test drive.

NOTE: Check that the diagnosis trouble code (DTC) is not output before traveling in the drive cycle pattern. Erase the DTC if it has been output.

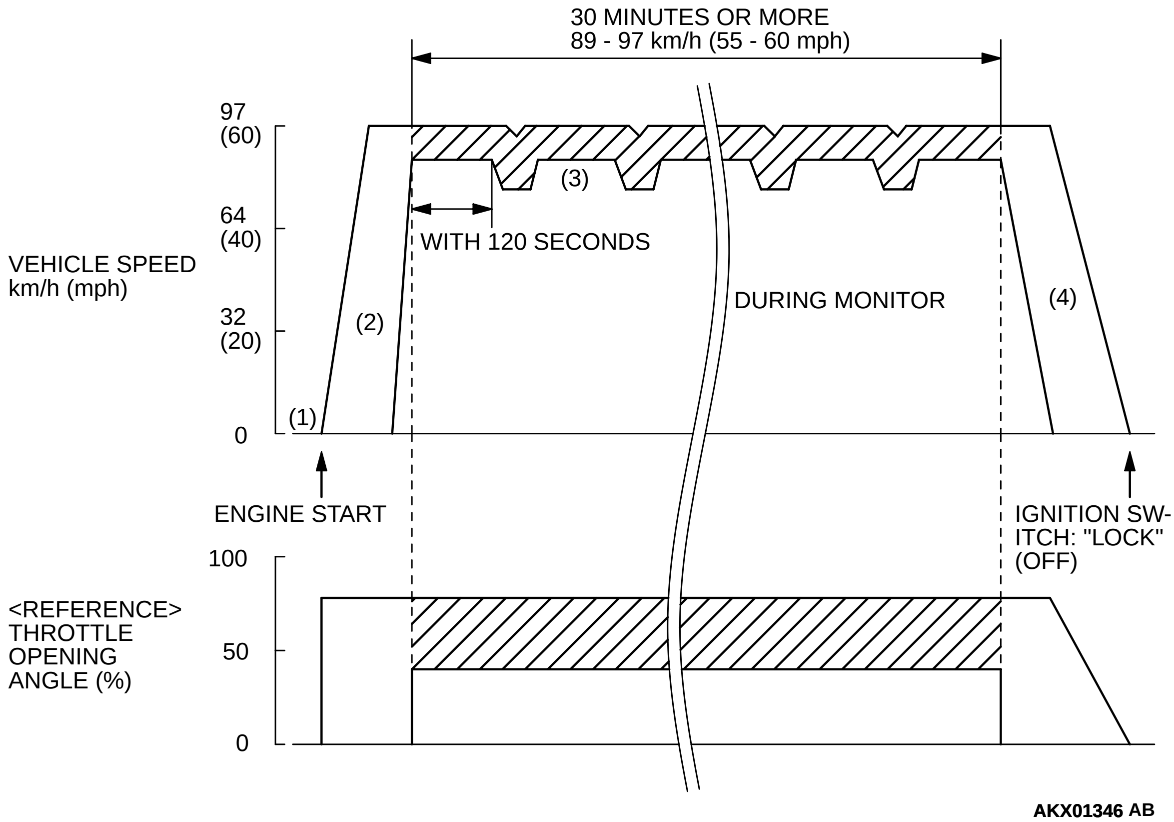
DRIVE CYCLE PATTERN LIST

PROCEDURE	MONITOR ITEM		DIAGNOSTIC TROUBLE CODE (DTC)
1	Evaporative emission control system leak monitor		P0442, P0450,P0451, P0455
2	Fuel trim monitor		P0171,P0172
3	Catalytic converter monitor		P0421
4	Heated oxygen sensor monitor		P0130, P0133,P0136,P0139
5	Exhaust gas recirculation (EGR) system monitor		P0401
6	Other monitor	Main components	P0134, P0300, P0301, P0302, P0303, P0304, P0506, P0507,P1400
		Sensors and switches	P0101,P0102,P0103, P0107,P0108, P0111, P0115,P0116,P0117, P0121,P0122,P0123, P0335, P0340, P0551
		Wire breakage and short circuit	P0130, P0135, P0136, P0141, P0201, P0202, P0203, P0204, P0403, P0443, P0446, P1500

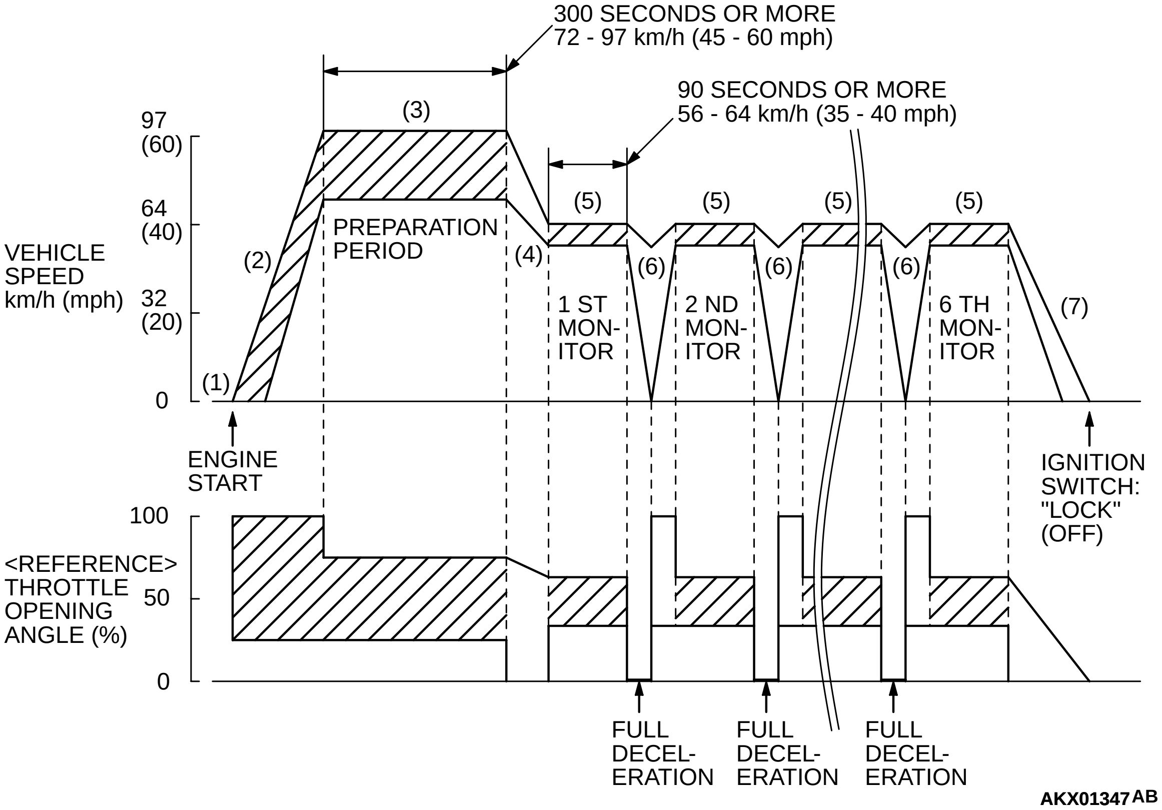
PROCEDURE 1

<table>
<tr><th colspan="2">EVAPORATIVE EMISSION CONTROL SYSTEM LEAK MONITOR</th></tr>
<tr><td>DTC</td><td>P0442, P0450,P0451, P0455</td></tr>
<tr><td>Drive cycle pattern</td><td>This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 8 minutes. You must complete this drive twice.
NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.

</td></tr>
<tr><td>Inspection conditions</td><td>• Engine coolant temperature: 45° C (113° F) or less (The engine is stopped before the test drive is started)
• Atmospheric temperature: 5 – 45° C (41 – 113° F)
• Condition of A/T: Selector lever D range</td></tr>
<tr><td>Test procedure</td><td>1. Engine: start
2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph).
3. Travel for 200 seconds or more while keeping the vehicle speed at 89 – 97 km/h (55 - 60 mph).
4. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 89 – 97 km/h (55 – 60 mph) and travel for 150 seconds or more. (During monitor)
5. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.
6. Confirm that the diagnostic trouble code (DTC) is not output.
7. If DTC P0442 is output, refer to DTC P0442 – Evaporative Emission Control System Leak DetectedP.13A-197.
If DTC P0450 is output, refer to DTC P0450 – Evaporative Emission Control System Pressure Sensor MalfunctionP.13A-221.
If DTC P0451 is output, refer to DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/ performanceP.13A-234.
If DTC P0455 is output, refer to DTC P0455 – Evaporative Emission Control System Leak Detected (Gross Leak)P.13A-248.</td></tr>
</table>

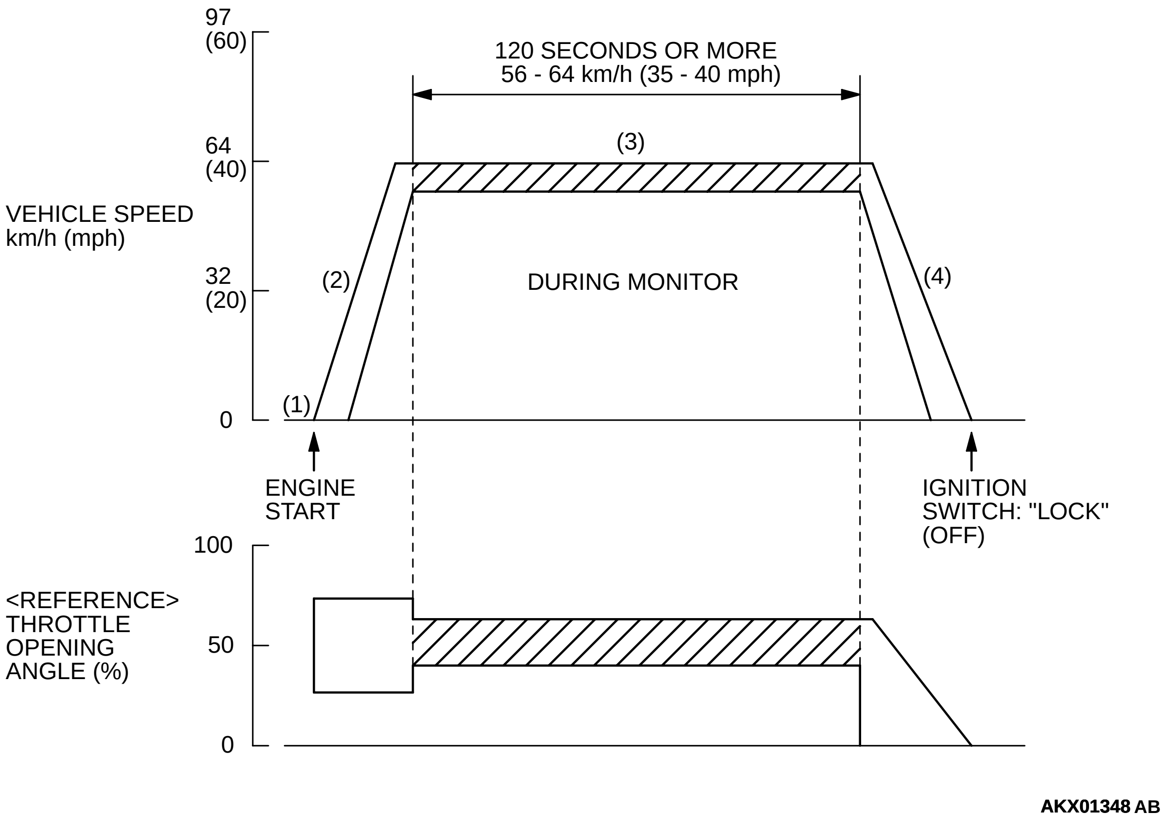
PROCEDURE 2

FUEL TRIM MONITOR	
DTC	P0171,P0172
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 35 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Engine coolant temperature: 80 – 97° C (176 - 207° F) • Atmospheric temperature: -10 – 60° C (14 – 140° F) • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph). 3. Travel for 30 minutes or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph). Carry out one gradual deceleration/acceleration returning to 89 – 97 km/h (55 - 60 mph) within 120 seconds. (During monitor) 4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output. If DTC P0171 is output, refer to DTC P0171 – System too lean (Bank1)P.13A-144 .If DTC P0172 is output, refer to DTC P0171 – System too rich (Bank1)P.13A-150.

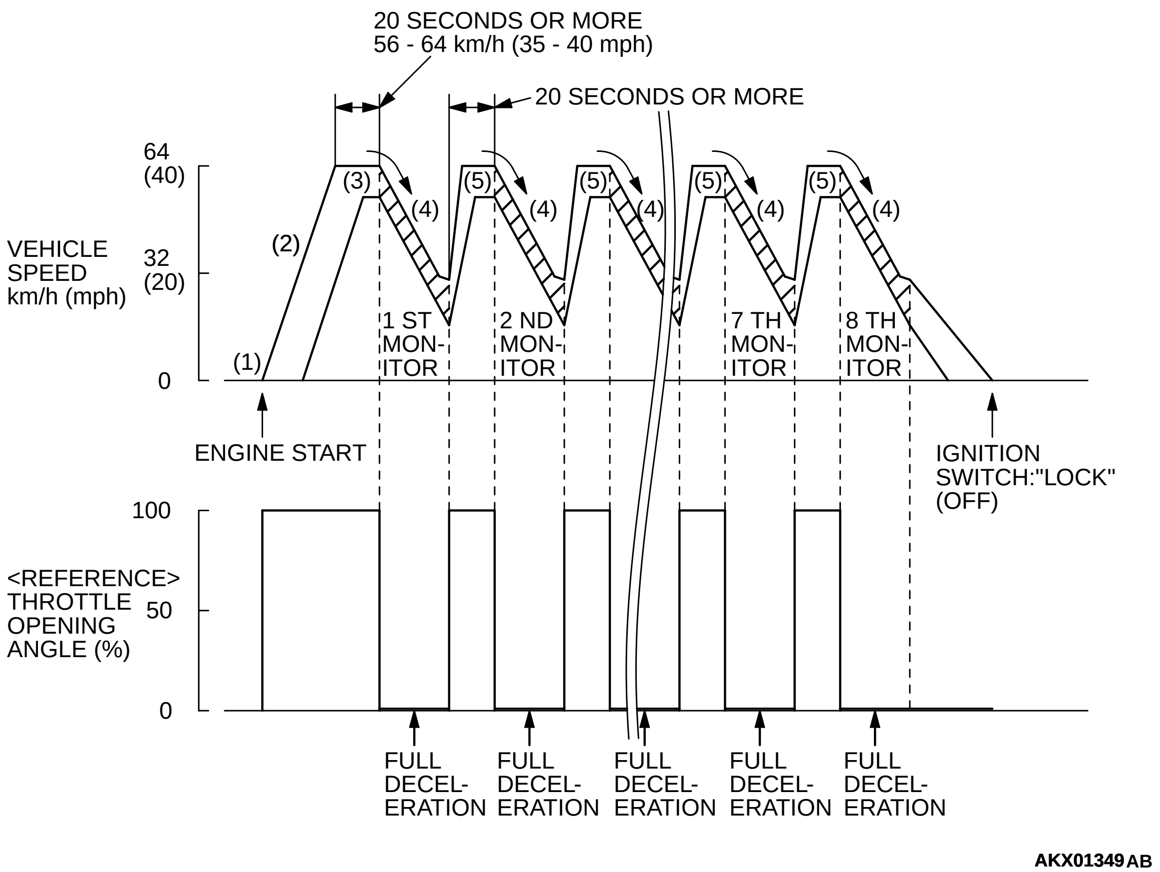
PROCEDURE 3

CATALYTIC CONVERTER MONITOR	
DTC	P0421
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 20 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Atmospheric temperature: -10° C (14° F) or more • A/C switch: OFF • Condition of A/T: Selector lever D range
Test procedure	Engine: start Accelerate until the vehicle speed is 72 km/h (45 mph). Travel for 300 seconds or more while keeping the vehicle speed at 72 – 97 km/h (45 - 60 mph). Decelerate until the vehicle speed is within 56 – 64 km/h (35 – 40 mph). While keeping the accelerator pedal opening degree constant , keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 90 seconds or more. (During monitor) Fully close the throttle and decelerate, and keep the deceleration state for 10 seconds. Then, quickly accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph). Then, repeat steps 5 and 6, and complete six monitor sessions. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. Confirm that the diagnostic trouble code (DTC) is not output. If DTC P0421 is output, refer to DTC P0421 – Warm Up Catalyst Efficiency Below Threshold (Bank 1)P.13A-194.

PROCEDURE 4

HEATED OXYGEN SENSOR MONITOR	
DTC	P0130,P0133,P0136,P0139
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Engine coolant temperature: 80° C (176° F) or more • Atmospheric temperature: -10° C (14° F) or more • Condition of A/T: Selector lever D range
Test procedure	Engine: start Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph). While keeping the accelerator pedal opening degree constant , keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 120 seconds or more. (During monitor) Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. Confirm that the diagnostic trouble code (DTC) is not output. If DTC P0130 is output, refer to DTC P0130 – O_2 Sensor Circuit Malfunction (Bank 1 Sensor 1) P.13A-105. If DTC P0133 is output, refer to DTC P0133 – O_2 Sensor Circuit Slow Responce (Bank 1 Sensor 1) P.13A-113. If DTC P0136 is output, refer to DTC P0136 – O_2 Sensor Circuit Malfunction (Bank 1 Sensor 2)P.13A-127. If DTC P0139 is output, refer to DTC P0139 – O_2 Sensor Circuit Slow Responce (Bank 1 Sensor 2) P.13A-135.

PROCEDURE 5

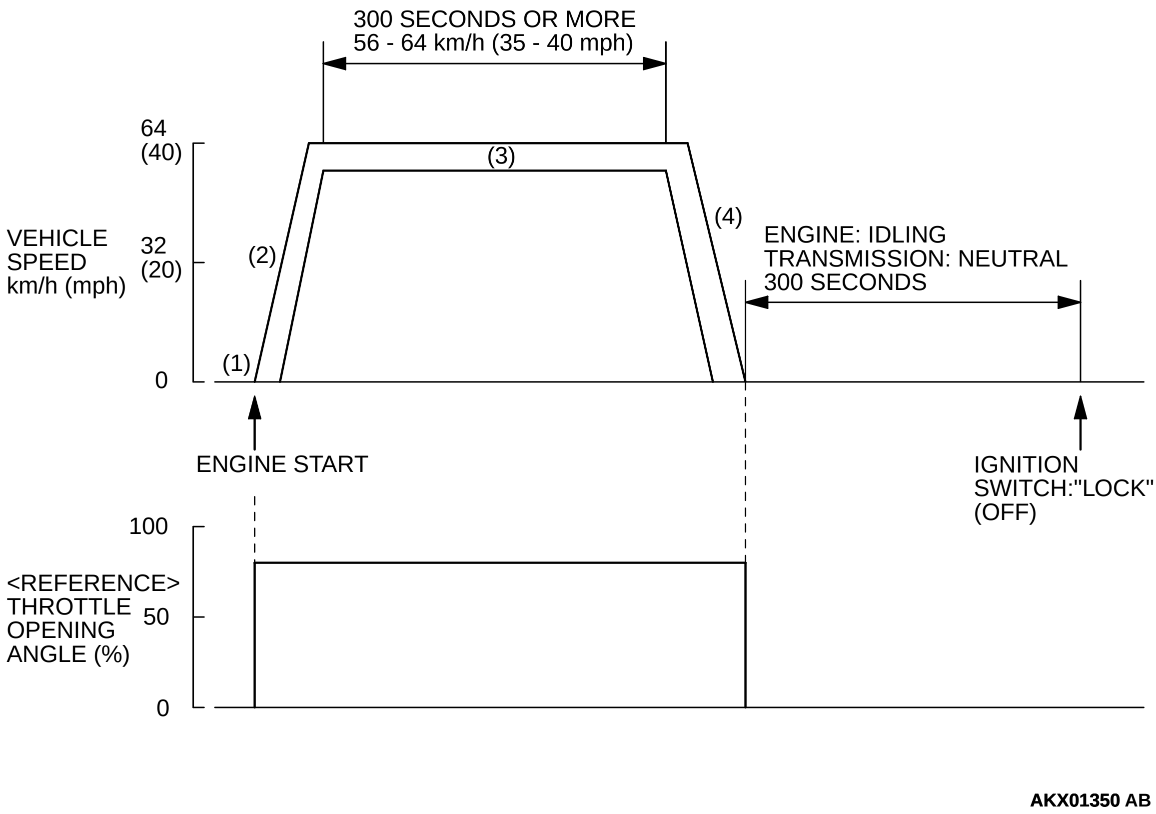
<table>
<tr><th colspan="2">EXHAUST GAS RECIRCULATION (EGR) SYSTEM MONITOR</th></tr>
<tr><td>DTC</td><td>P0401</td></tr>
<tr><td>Drive cycle pattern</td><td>This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice.
NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.

</td></tr>
<tr><td>Inspection conditions</td><td>• Engine coolant temperature: 80° C (176° F) or more
• Atmospheric temperature: 5° C (41° F) or more
• A/C switch: OFF
• Condition of A/T: Selector lever D range</td></tr>
<tr><td>Test procedure</td><td>Engine: start
Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph).
Travel for 20 seconds or more while keeping the vehicle speed at 56 – 64 km/h (35 - 40 mph).
Fully close the throttle from an engine speed of 2,000 – 3,000 r/min, and while keeping the clutch engaged, decelerate to approx. 900 r/min without applying the brakes. Do not steer the handle or turn the light ON/OFF during this time. (During monitor)
Accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph), and travel for 20 seconds or more . Then, repeat steps 4 and 5 and complete 8 monitor sessions.
Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.
Confirm that the diagnostic trouble code (DTC) is not output.
If DTC P0401 is output, refer to DTC P0401 – Exhaust Gas Recirculation Flow Insufficient detectedP.13A-186 .</td></tr>
</table>

PROCEDURE 6

<table>
<tr><th colspan="2">OTHER MONITOR (Main components, sensors and switches, wire breakage and short circuit)</th></tr>
<tr><td>DTC</td><td>

Main components: P0134, P0300, P0301, P0302, P0303, P0304, P0506, P0507,P1400
Sensors and switches: P0101,P0102,P0103, P0107, P0108,P0111, P0115,P0116,P0117, P0121,P0122,P0123, P0335, P0340, P0551
Wire breakage and short circuit: P0130, P0135, P0136, P0141, P0201, P0202, P0203, P0204, P0403, P0443, P0446, P1500

</td></tr>
<tr><td>Drive cycle pattern</td><td>
This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice.
NOTE: . Drive according to the graph below.



</td></tr>
<tr><td>Inspection conditions</td><td>

Engine coolant temperature: 80° C (176° F) or more
Atmospheric temperature: 5° C (41° F) or more
Condition of A/T: Selector lever D range

</td></tr>
<tr><td>Test procedure</td><td>
Engine: start
Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph), and travel for 300 seconds or more.
Return the vehicle to the shop.
After stopping the vehicle, continue idling for 300 seconds, and then turn the ignition switch to the "LOCK" (OFF) position. Moreover, the vehicle should be set to the following conditions for idling.

A/C switch: OFF
Lights and all accessories: OFF
Transmission: Neutral
Steering wheel: Straightforward position

Confirm that the diagnostic trouble code (DTC) is not output.
If a DTC is displayed, refer to Diagnostic Trouble Code ChartP.13A-20 .
</td></tr>
</table>

READINESS TEST STATUS

PURPOSE

The Readiness function also referred as I/M Readiness or I/M Flags indicate if a full diagnostic check has been "Completed" (is "Ready") for each non-continuous monitor. Enhanced I/M State Emission Programs will use the Readiness status (Codes) to see if the vehicle is ready for OBD-II testing. "Incomplete" (Not Ready) codes will be one of the triggers for I/M failure.

OVERVIEW

The powertrain control module (PCM) monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness codes were established for the I/M programs, thereby confirming that the vehicle was not tampered with by erasing the diagnostic trouble code(s) (DTC's) before I/M testing. The Readiness and DTC codes can be reset by disconnecting the battery or by erasing the codes with a scan tool. For this reason all Readiness codes must read "Complete" before I/M testing.
When the monitors run and complete, the MUT-II will record the Readiness Code as "Complete" (General Scan Tools record as "Ready"). If the monitor did not run completely, the system then reads as "Incomplete" (General Scan Tools record as "Not Ready"). When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, Readiness Code will set as "Complete" on the first drive cycle. If during the first drive cycle a fault is detected then, a second drive is required before the Readiness Code will "Complete." If the fault is still there, then a DTC will set.

- Catalyst: P0421
- Evaporative system: P0442, P0455
- Heated oxygen sensor: P0130,P0133, P0136,P0139
- Heated oxygen sensor heater: P0135, P0141
- EGR system: P0401

After the Readiness is "Complete," the technician is assured that any DTC's associated with that monitor will be displayed if the system has a problem. That is why some State's I/M programs require the Readiness Code as "Complete" before they check for DTC's.

NOTE: After a repair is mode for a DTC the technician should drive the OBD-II drive cycle checking that the MUT-II records all Readiness as "Complete".

FAIL-SAFE/BACKUP FUNCTION TABLE

M1131009100087

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Volume air flow sensor	• Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. • Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F). (This control will be continued until the ignition switch is turned to the "LOCK" (OFF) position even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to the "ON," the No.1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in Hg).

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Communication line with transaxle control module	No ignition timing retard control (overall engine-transaxle control) achieved when transaxle speeds are changed.
Misfire detection	The PCM stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

DIAGNOSTIC TROUBLE CODE CHART

M1131008700105

DTC CODE	DIAGNOSTIC ITEMS	REFERENCE PAGE
P0101	Volume air flow circuit range/performance problem	P.13A-26
P0102	Volume air flow circuit low input	P.13A-32
P0103	Volume air flow circuit high input	P.13A-35
P0107	Barometric pressure circuit low input	P.13A-41
P0108	Barometric pressure circuit high input	P.13A-50
P0111	Intake air temperature circuit range/performance problem	P.13A-57
P0115	Engine coolant temperature circuit high input	P.13A-66
P0116	Engine coolant temperature circuit range/performance problem	P.13A-74
P0117	Engine coolant temperature circuit low input	P.13A-79
P0121	Throttle position circuit range/performance problem	P.13A-87
P0122	Throttle position circuit low input	P.13A-94
P0123	Throttle position circuit high input	P.13A-99
P0128	Coolant thermostat malfunction	P.13A-103
P0130	O_2 Sensor circuit malfunction (sensor 1)	P.13A-105
P0133	O_2 Sensor circuit slow response (sensor 1)	P.13A-113
P0134	O_2 Sensor circuit no activity detected (sensor 1)	P.13A-115
P0135	O_2 Sensor heater circuit malfunction (sensor 1)	P.13A-120
P0136	O_2 Sensor circuit malfunction (sensor 2)	P.13A-127
P0139	O_2 Sensor circuit slow response (sensor 2)	P.13A-135
P0141	O_2 Sensor heater circuit malfunction (sensor 2)	P.13A-138
P0171	System too lean	P.13A-144
P0172	System too rich	P.13A-150

DTC CODE	DIAGNOSTIC ITEMS		REFERENCE PAGE
P0201	Injector circuit malfunction – Cylinder 1		P.13A-154
P0202	Injector circuit malfunction – Cylinder 2		
P0203	Injector circuit malfunction – Cylinder 3		
P0204	Injector circuit malfunction – Cylinder 4		
P0300	Random misfire detected		P.13A-161
P0301	Cylinder 1 misfire detected		P.13A-166
P0302	Cylinder 2 misfire detected		
P0303	Cylinder 3 misfire detected		
P0304	Cylinder 4 misfire detected		
P0335	Crankshaft position sensor circuit malfunction		P.13A-170
P0340	Camshaft position sensor circuit malfunction		P.13A-179
P0401	Exhaust gas recirculation flow insufficient detected		P.13A-186
P0403	Exhaust gas recirculation solenoid malfunction		P.13A-188
P0421	Warm up catalyst efficiency below threshold		P.13A-194
P0442	Evaporative emission control system leak detected		P.13A-197
P0443	Evaporative emission control system purge control valve circuit malfunction		P.13A-207
P0446	Evaporative emission control system vent control malfunction		P.13A-214
P0450	Evaporative emission control system pressure sensor malfunction		P.13A-221
P0451	Evaporative emission control system pressure sensor range/performance		P.13A-234
P0455	Evaporative emission control system leak detected (Gross leak)		P.13A-248
P0500	Vehicle speed sensor malfunction		P.13A-264
P0506	Idle control system rpm lower than expected		P.13A-265
P0507	Idle control system rpm higher than expected		P.13A-274
P0551	Power steering pressure sensor circuit range/performance		P.13A-282
P0705	Transmission range sensor circuit malfunction (PRNDL input)	• A/T DTC No.27 (Park/Neutral position switch system: Open circuit) • A/T DTC No.28 (Park/Neutral position switch system: Short circuit)	P.13A-288
P0710	Transmission fluid temperature sensor circuit malfunction	• A/T DTC No.15 (Oil temperature sensor system: Open circuit) • A/T DTC No.16 (Oil temperature sensor system: Short circuit)	P.13A-289
P0715	Input/turbine speed sensor circuit malfunction	• A/T DTC No.22 (Input shaft speed sensor system)	P.13A-290
P0720	Output speed sensor circuit malfunction	• A/T DTC No.23 (Output shaft speed sensor system)	P.13A-291
P0725	Engine speed input circuit malfunction	• A/T DTC No.21 (Crankshaft position sensor system)	P.13A-292

DTC CODE	DIAGNOSTIC ITEMS		REFERENCE PAGE
P0740	Torque converter clutch system malfunction	• A/T DTC No.36 (Torque converter clutch solenoid system: Short circuit/Open circuit) • A/T DTC No.52 (Torque converter clutch solenoid system: Faulty system) • A/T DTC No.53 (Torque converter clutch solenoid system: Lock-up stuck on)	P.13A-293
P0750	Shift solenoid A malfunction	• A/T DTC No.31 (Low and reverse solenoid valve system)	P.13A-294
P0755	Shift solenoid B malfunction	• A/T DTC No.32 (Underdrive solenoid valve system)	P.13A-295
P0760	Shift solenoid C malfunction	• A/T DTC No.33 (Second solenoid valve system)	P.13A-296
P0765	Shift solenoid D malfunction	• A/T DTC No.34 (Overdrive solenoid valve system)	P.13A-297
P1400	Manifold differential pressure sensor circuit malfunction		P.13A-299
P1500	Generator FR terminal circuit malfunction		P.13A-305
P1610	Immobilizer malfunction		P.13A-310
P1751	A/T control relay malfunction	• A/T DTC No.54 (A/T control relay system)	P.13A-310

NOTE: Do not replace the powertrain control module (PCM) until a through terminal check reveals there are no short/open circuits.

NOTE: Check that the PCM ground circuit is normal before checking for the cause of the problem.

NOTE: After the PCM detects a malfunction, a diagnostic trouble code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a "," the diagnostic trouble code is recorded on the first detection of the malfunction.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

SYMPTOM CHART

M1131008800094

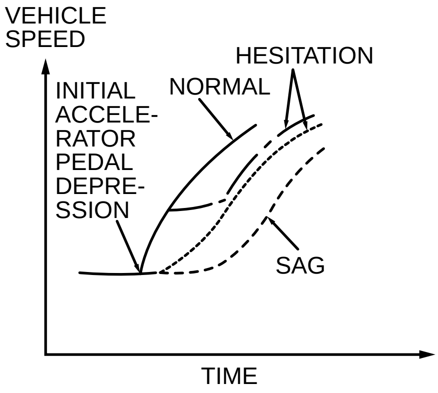
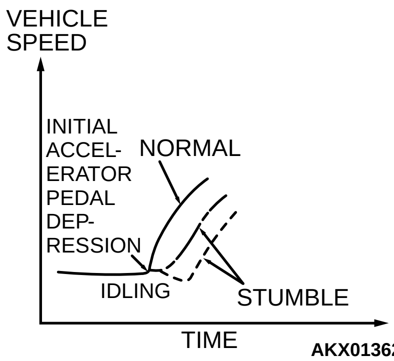
NOTE: Check that the powertrain control module (PCM) ground circuit is normal before checking for the cause of the problem.

SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with all systems is not possible	1	P.13A-312
	Communication with PCM only is not possible	2	P.13A-314
Service engine soon/ malfunction indicator lamp and related parts	The service engine soon/malfunction indicator lamp does not illuminate right after the ignition switch is turned to the "ON" position	3	P.13A-317
	The service engine soon/malfunction indicator lamp remains illuminated and never goes out	4	P.13A-322

SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Starting	Cranks, won't start	5	P.13A-324
	Fires up and dies	6	P.13A-328
	Hard starting	7	P.13A-332
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	8	P.13A-335
	Idle speed is high (improper idle speed)	9	P.13A-340
	Idle speed is low (improper idle speed)	10	P.13A-341
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	11	P.13A-342
	When the engine is hot, it stalls at idle (die out)	12	P.13A-345
	The engine stalls when accelerating (pass out)	13	P.13A-349
	The engine stalls when decelerating	14	P.13A-350
Driving	Hesitation, sag or stumble	15	P.13A-352
	Acceleration shock	16	P.13A-355
	Deceleration shock	17	P.13A-356
	Poor acceleration	18	P.13A-357
	Surge	19	P.13A-360
	Knocking	20	P.13A-363
Dieseling		21	P.13A-363
Too high CO and HC concentration when idling		22	P.13A-363
IM240 test failure	Transient, mass emission tailpipe test failure	23	P.13A-365
	Purge flow test of the evaporative emission canister failure	24	P.13A-369
	Pressure test of the evaporative system failure	25	P.13A-369
Generator output voltage is low (approximately 12.3 volts)		26	P.13A-371
Improper engine idle speed when the A/C is on (A/C switch 2 signal)		27	P.13A-374
Fans (radiator fan, A/C condenser fan) are inoperative		28	P.13A-376
Power supply system and ignition switch-IG system		29	P.13A-379
Fuel pump system		30	P.13A-385
Ignition switch-ST system and park/neutral position switch system		31	P.13A-392
Ignition circuit system		32	P.13A-396
A/C system		33	P.13A-403

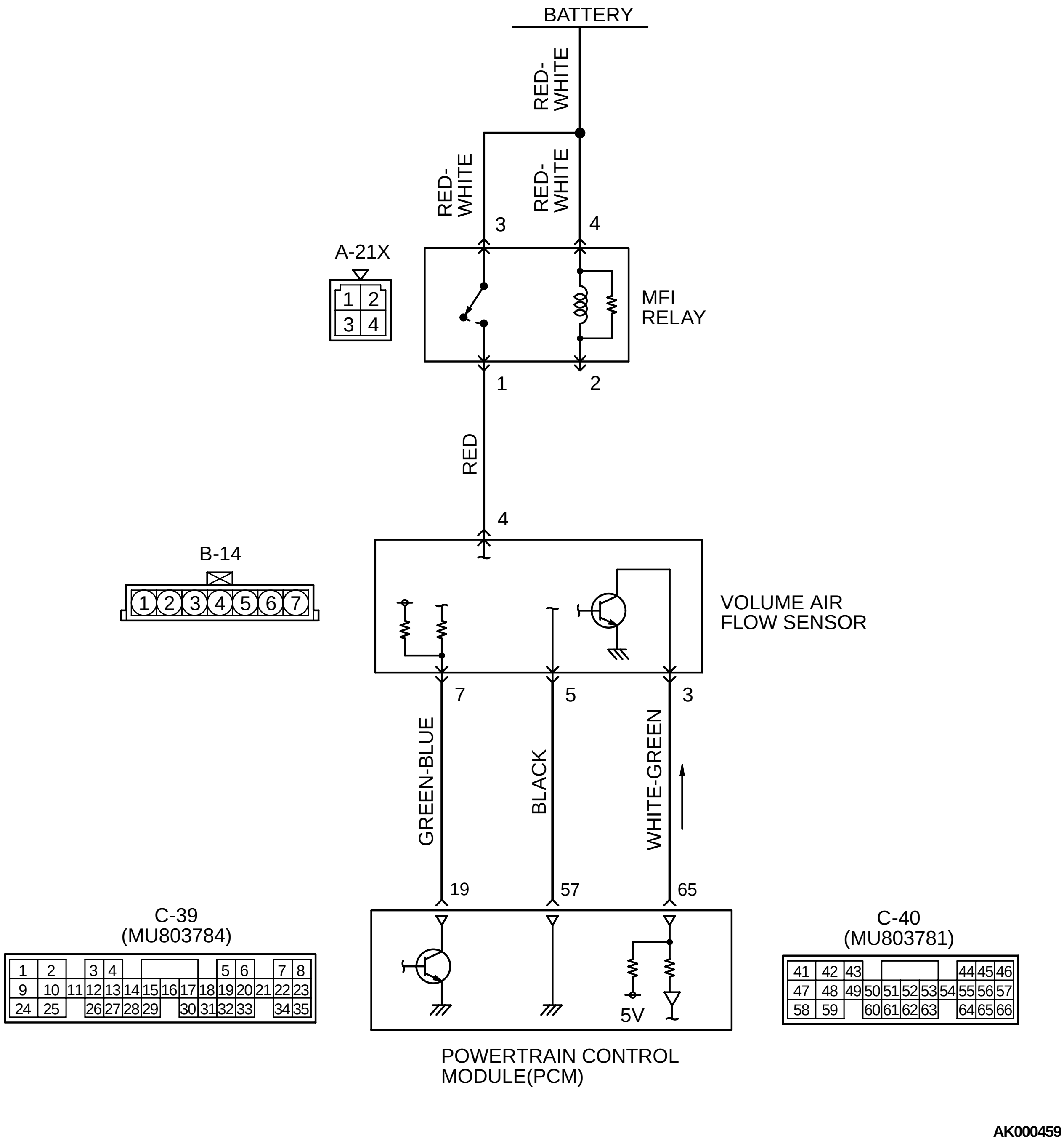
PROBLEM SYMPTOMS TABLE(FOR YOUR INFORMATION)

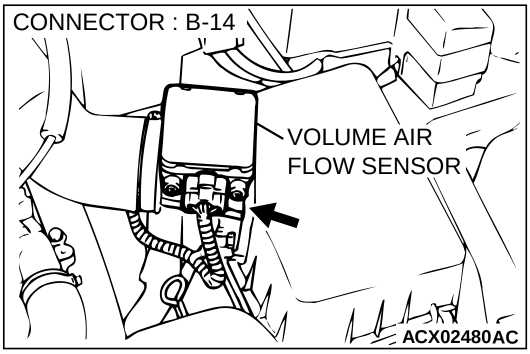
ITEMS		SYMPTOM
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	The engine starts, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.

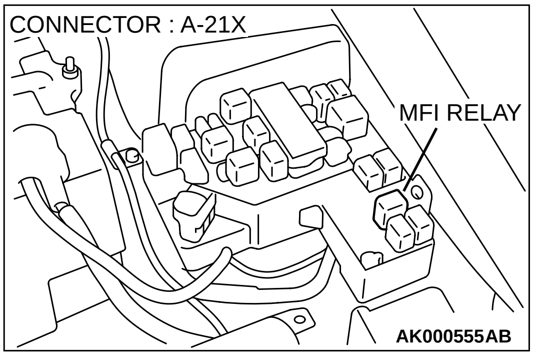
ITEMS		SYMPTOM
Driving	Hesitation Sag	" Hesitation " is the delay in response of the vehicle speed (engine speed). This occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called " sag. "  AKX01361AB
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.  AKX01362
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound during driving like a hammer striking the cylinder walls.
Stopping	Run on ("dieseling ")	The condition in which the engine continues to run after the ignition switch is turned to off. Also called " dieseling. "

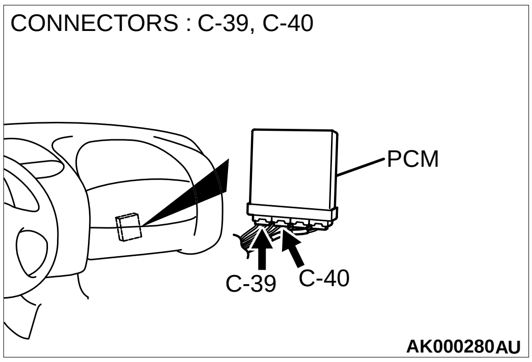
DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P0101: Volume Air Flow Circuit Range/Performance Ploblem









CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 1), and the ground is provided on the PCM (terminal 57).
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the PCM (terminal 65). The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The PCM checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 500 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 3.3 Hz or lower for 2 seconds.

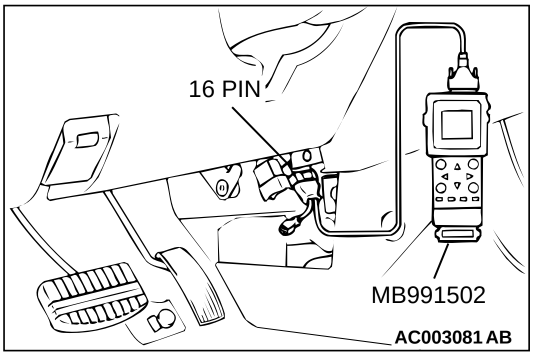
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- PCM failed.
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

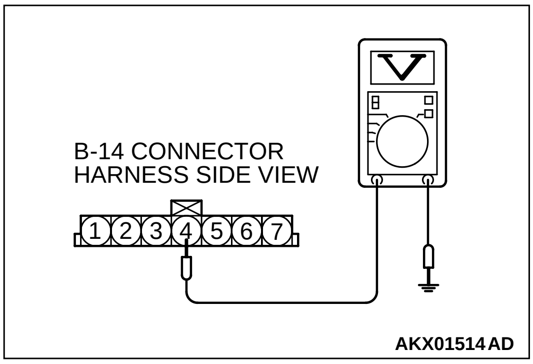
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 96° C(176° F to 205° F).
- The standard value during idling should be 10Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



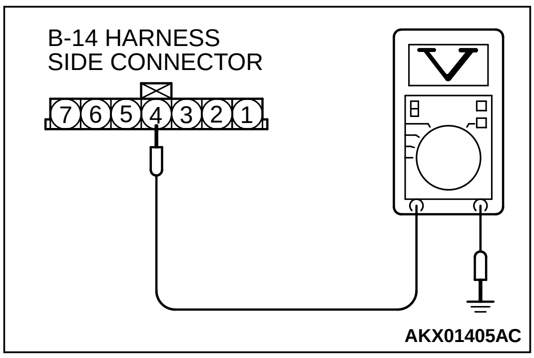
STEP 2. Check the power supply voltage at volume air flow sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.



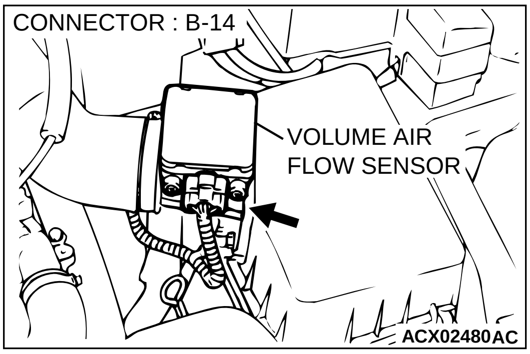
STEP 3. Check the power supply voltage at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Repair harness wire between MFI relay connector A-21X terminal 1 and volume air flow sensor connector B-14 terminal 4 because of open circuit or short circuit to ground. Then go to Step 13.

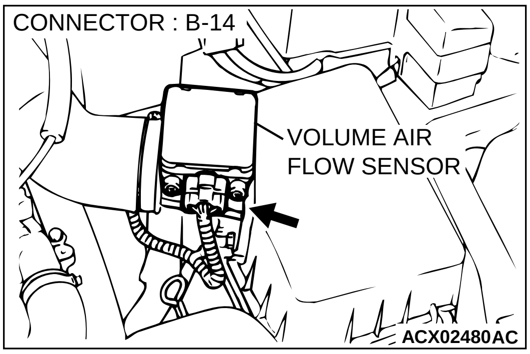


STEP 4. Check connector B-14 at the volume air flow sensor for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and volume air flow sensor connector B-14 terminal 4 because of harness damage.Then go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.

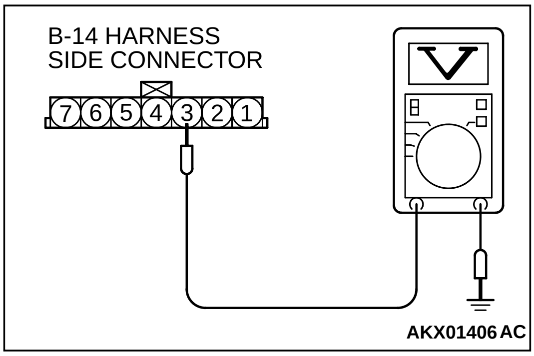


STEP 5. Check connector B-14 at volume air flow sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.



STEP 6. Check the sensor supply voltage at volume air flow sensor harness side connector B-14.

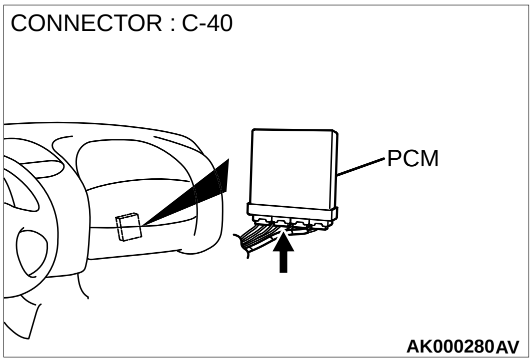
(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Go to Step 7.

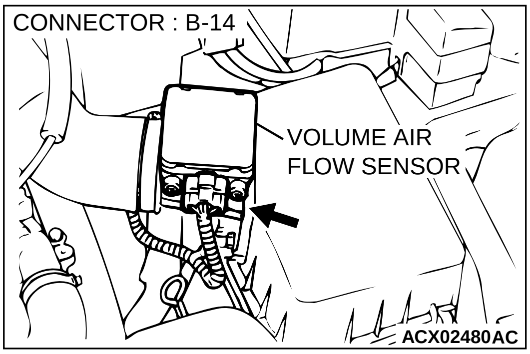


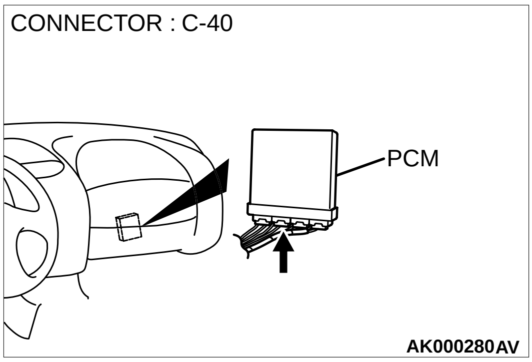
STEP 7. Check connector C-40 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.

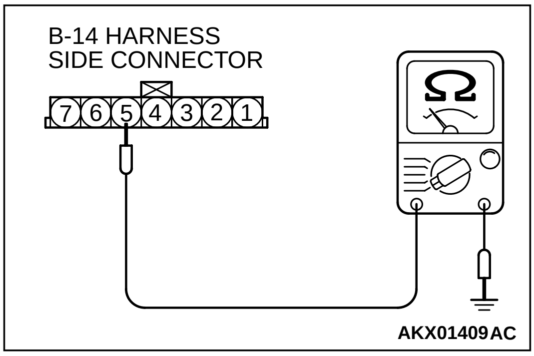




STEP 8. Check for short circuit to ground between volume air flow sensor connector B-14 terminal 3 and PCM connector C-40 terminal 65.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 13.
NO : Repair it. Then go to Step 13.

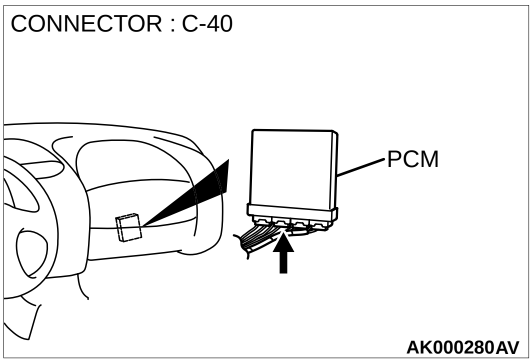


STEP 9. Check the continuity at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

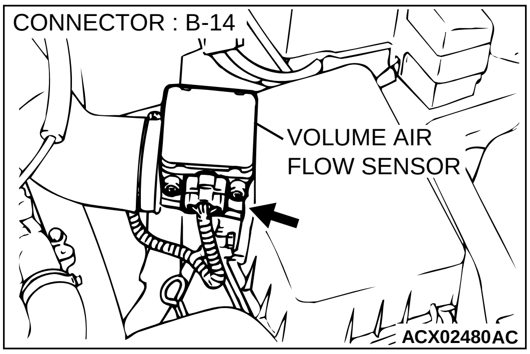
YES : Go to Step 12.
NO : Go to Step 10.

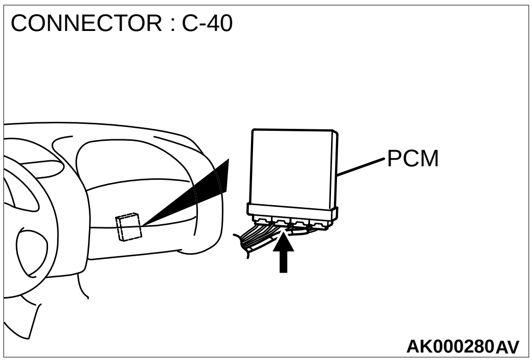


STEP 10. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.



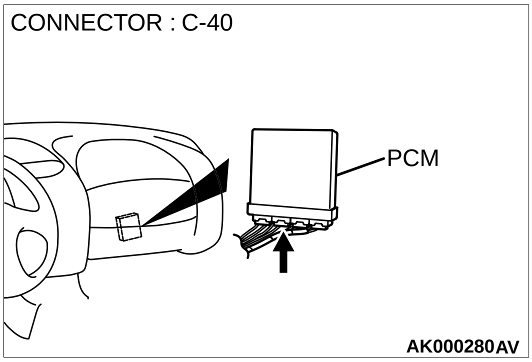


STEP 11. Check for open circuit and harness damage between volume air flow sensor connector B-14 terminal 5 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 13.

NO : Repair it. Then go to Step 13.



STEP 12. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.

STEP 13. Test the OBD-II drive cycle.

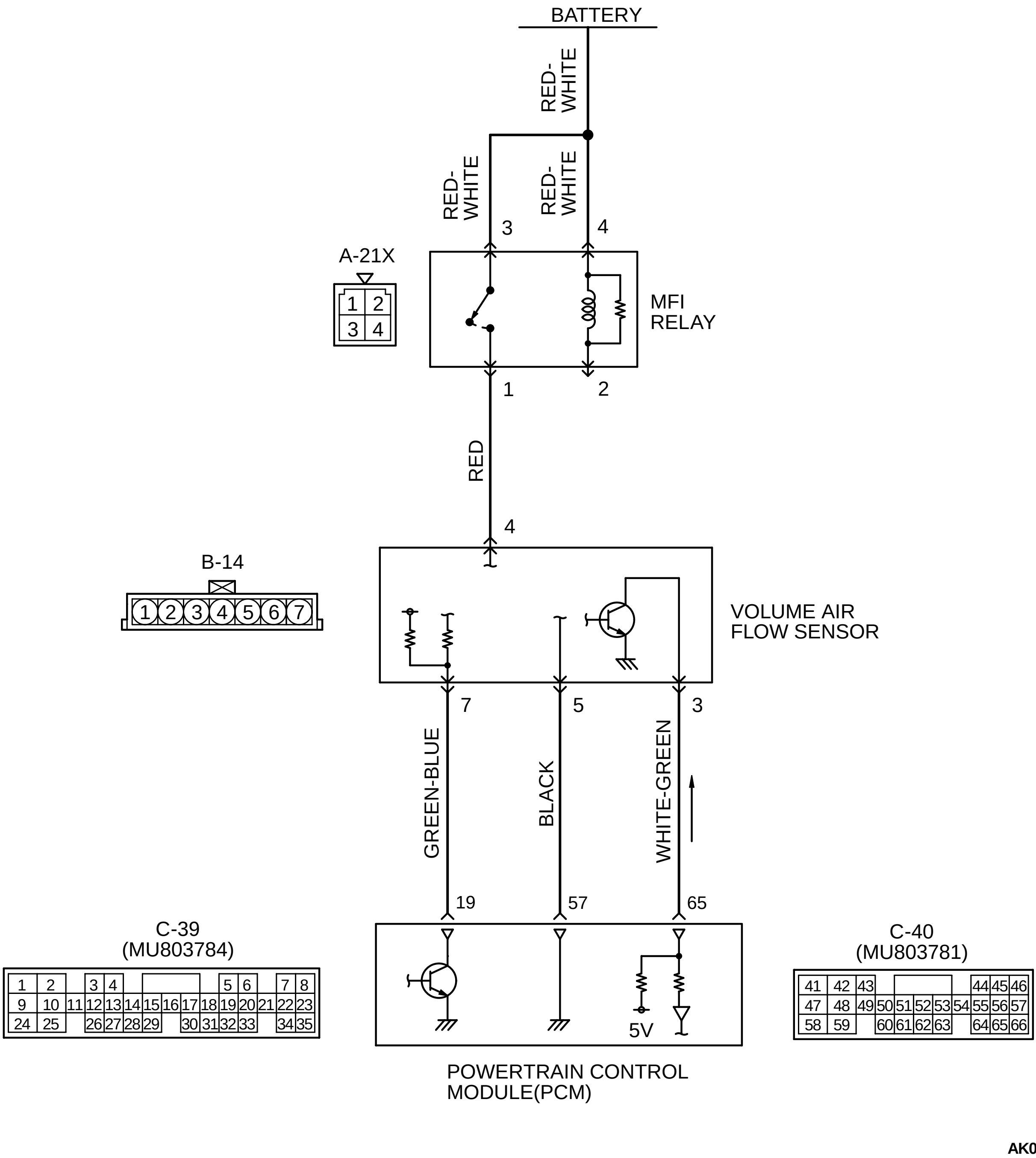
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

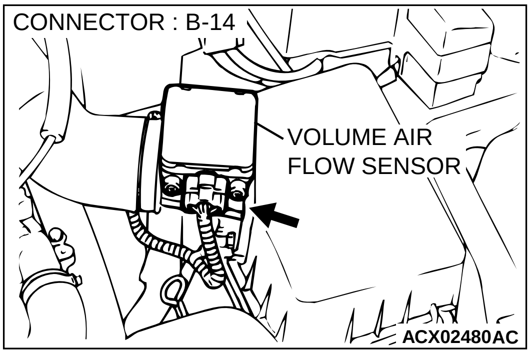
Q: Is the DTC P0101 is output?

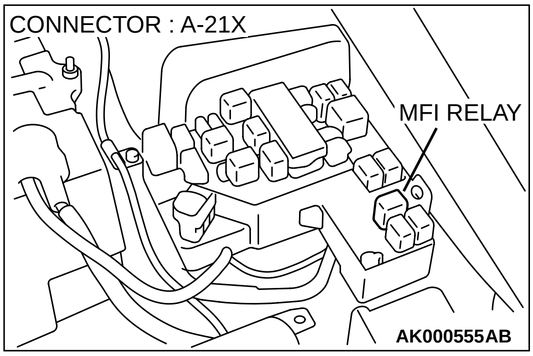
YES : Retry the troubleshooting.

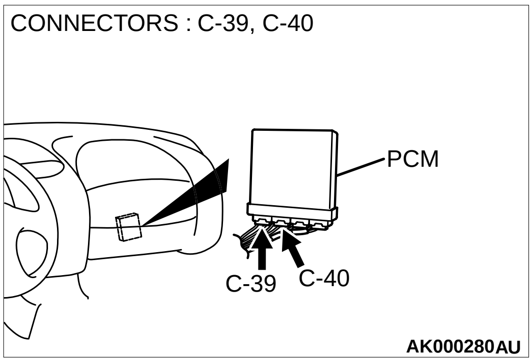
NO : The inspection is complete.

DTC P0102: Volume Air Flow Circuit Low Input









CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 1), and the ground is provided on the PCM (terminal 57).
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the PCM (terminal 65). The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The PCM checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.

DTC SET CONDITIONS

Check Conditions

- Throttle position sensor voltage is 1.5 volts or higher.
- Engine speed is higher than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 60 Hz or lower for 2 seconds.

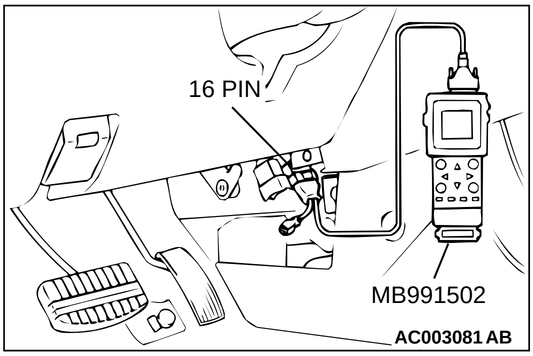
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- PCM failed.
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

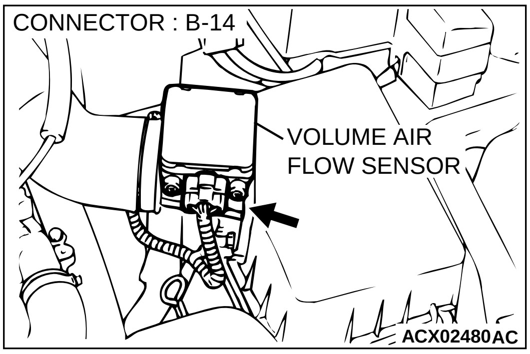
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature:80° C to 96° C(176° F to 205° F).
- The standard value during idling should be 10Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



STEP 2. Replace the volume air flow sensor.

(1) Replace the volume air flow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0102 is output?

YES : Replace the PCM. Then go to Step 3.
NO : The inspection is complete.

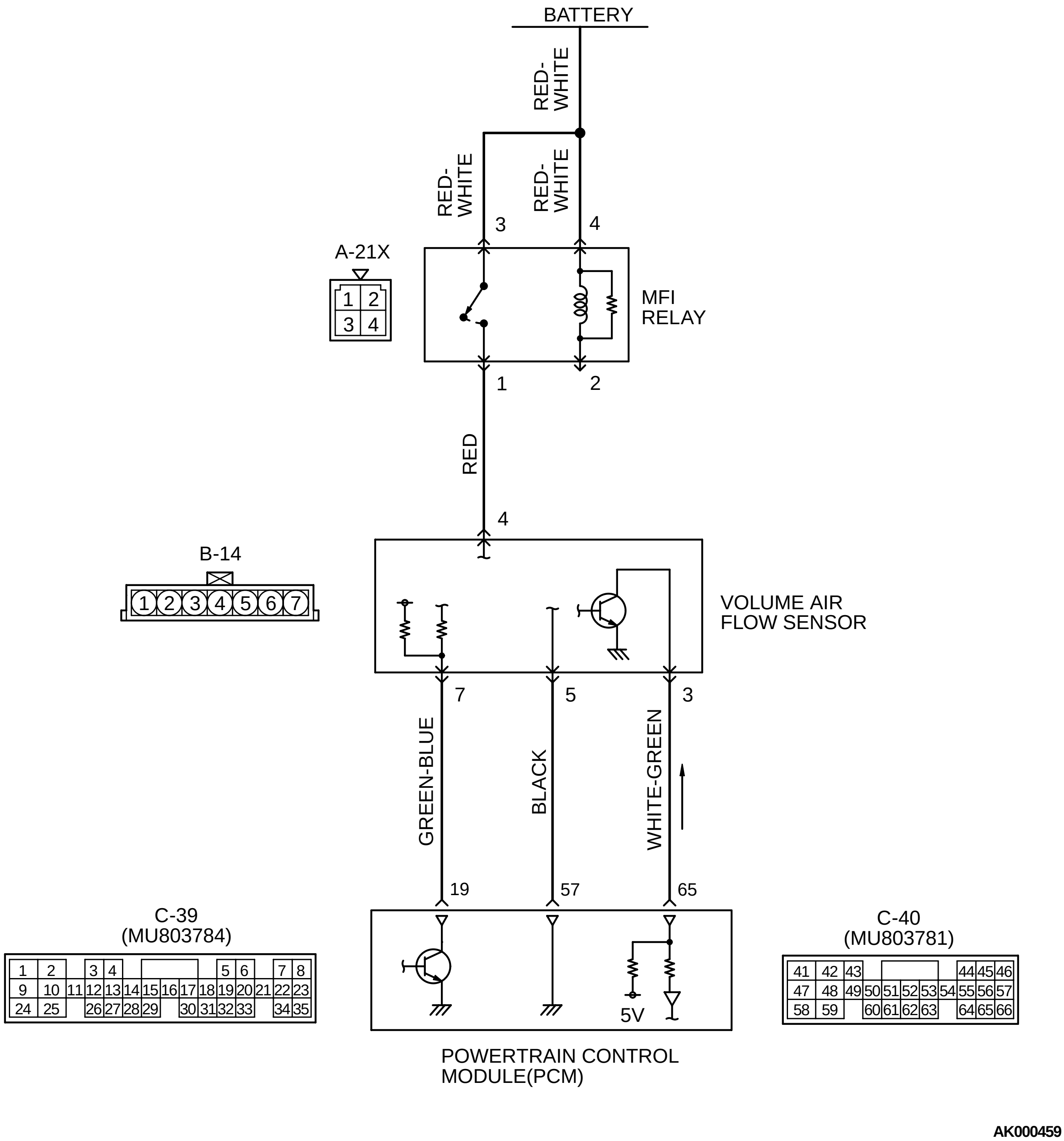
STEP 3. Test the OBD-II drive cycle.

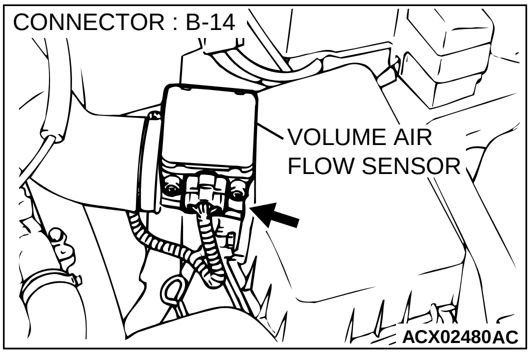
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

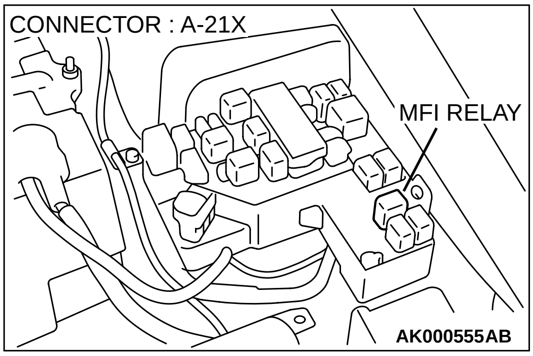
Q: Is the DTC P0102 is output?

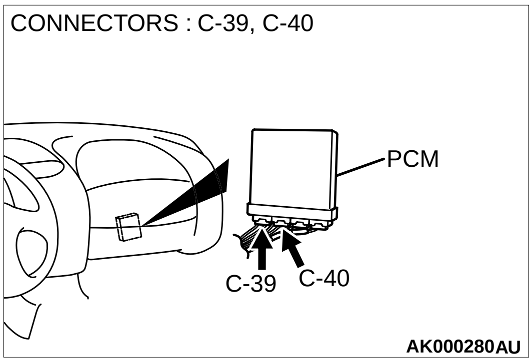
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0103: Volume Air Flow Circuit High Input









CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 1), and the ground is provided on the PCM (terminal 57).
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the PCM (terminal 65). The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/ short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The PCM checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.
- When the throttle position sensor output voltage is low, the PCM causes the power transistor to be "ON" to send an air flow sensor reset signal to the air flow sensor. In response to the reset signal, the air flow sensor resets the filter circuit and improves the ability of the air flow sensor to measure the amount of air in a small air intake region.

DTC SET CONDITIONS

Check Conditions

- Throttle position sensor voltage is 2 volts or lower.
- Engine speed is lower than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 800 Hz or higher for 2 seconds.

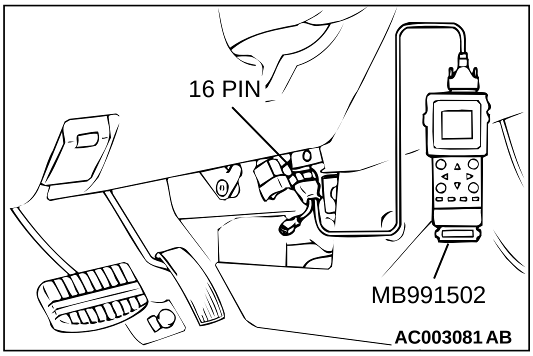
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- PCM failed.
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ **CAUTION**

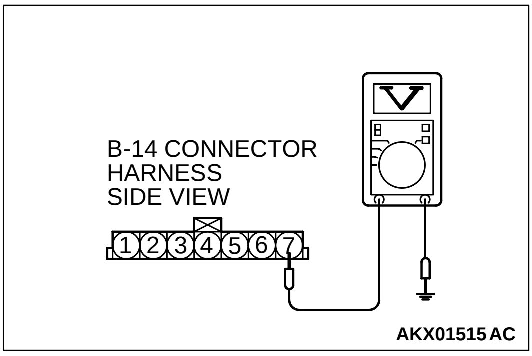
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature:80° C to 96° C(176° F to 205° F).
- The standard value during idling should be 10Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



STEP 2. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- Voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

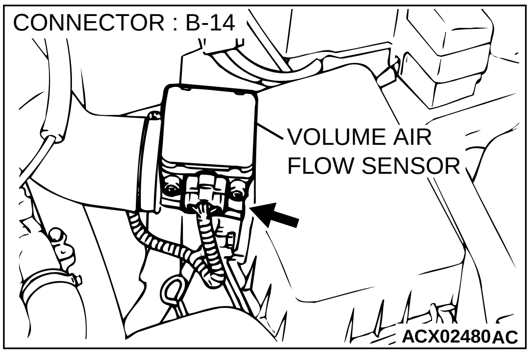
YES : Go to Step 5.
NO : Go to Step 3.

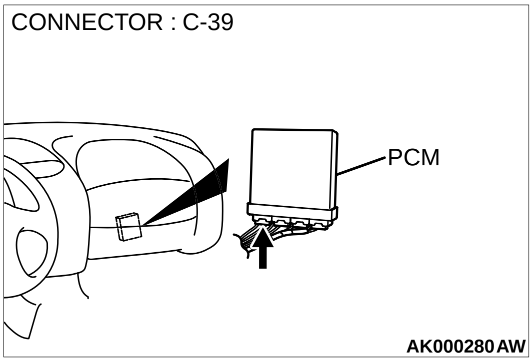
STEP 3. Check connector B-14 at volume air flow sensor and connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 9.



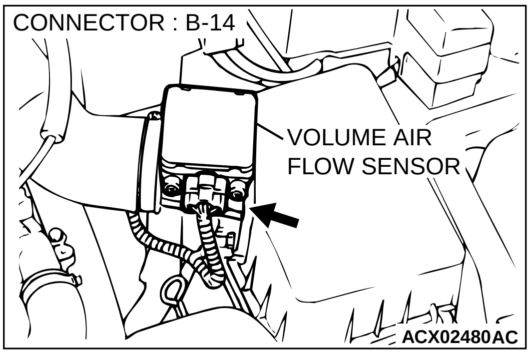


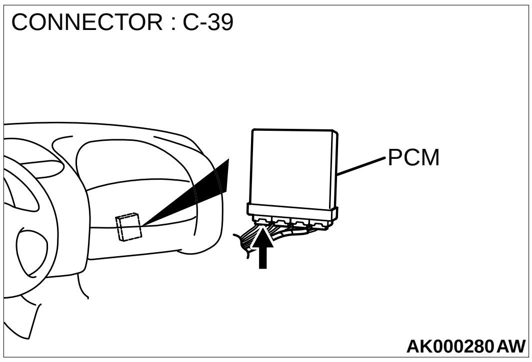
STEP 4. Check for short circuit to ground between volume air flow sensor connector B-14 terminal 7 and PCM connector C-39 terminal 19.

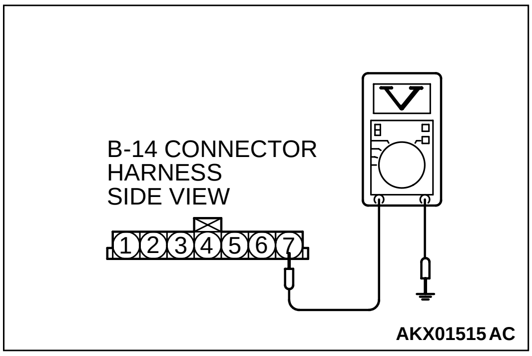
Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 9.

NO : Repair it. Then go to Step 9.







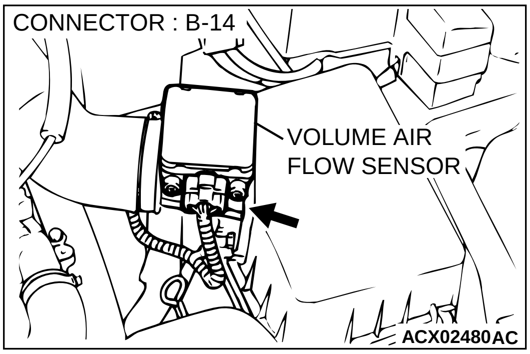
STEP 5. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing.

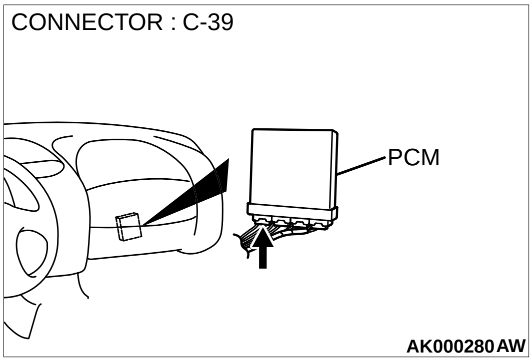
(1) Do not disconnect the connector B-14.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- When the engine idling, voltage should be 1.0 volt or less.
- When the engine speed is 3000r/min, voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.

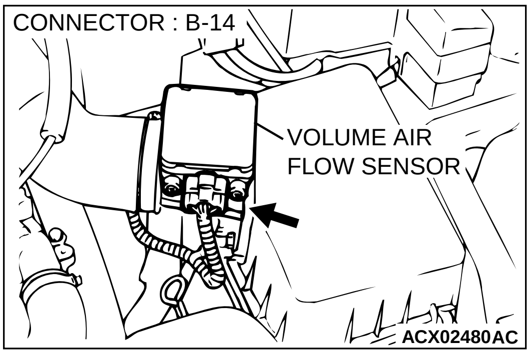


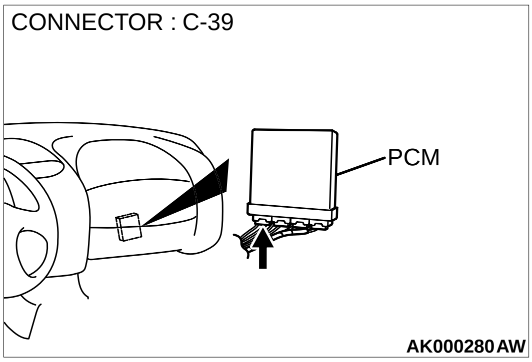


STEP 6. Check connector B-14 at volume air flow sensor and connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 9.

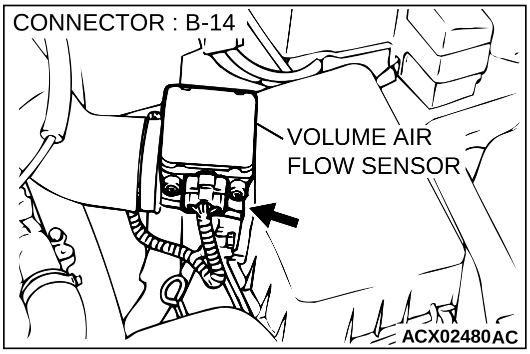




STEP 7. Check for open circuit and harness damage between volume air flow sensor connector B-14 terminal 7 and PCM connector C-39 terminal 19.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 9.
NO : Repair it. Then go to Step 9.



STEP 8. Replace the volume air flow sensor.

(1) Replace the volume air flow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0103 is output?

YES : Replace the PCM. Then go to Step 9.
NO : The inspection is complete.

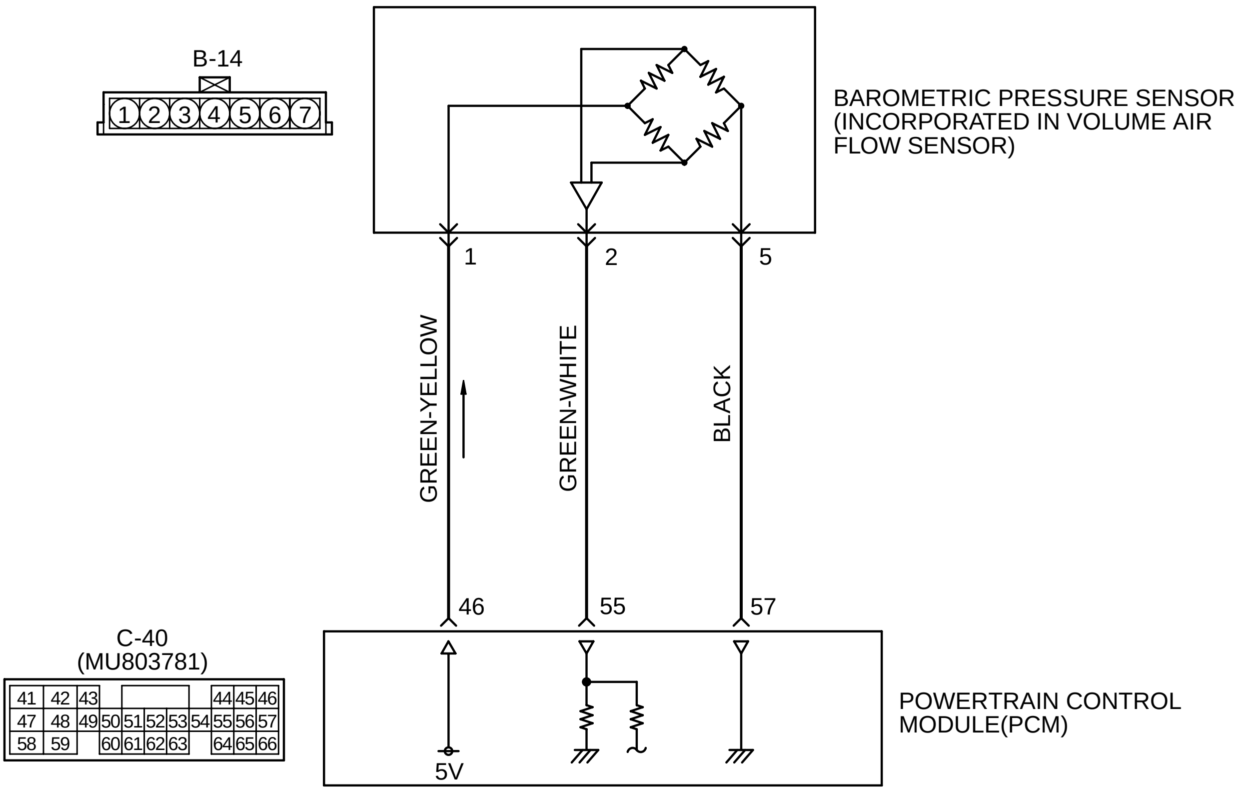
STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0103 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0107: Barometric Pressure Circuit Low Input



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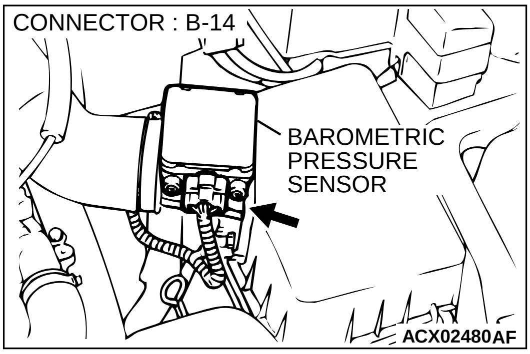
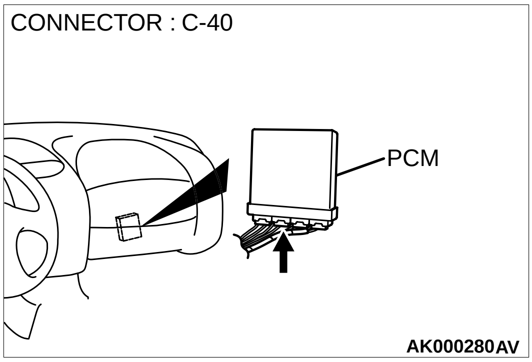




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the PCM (terminal 46). The ground terminal (terminal 5) is grounded with PCM (terminal 57).
- A voltage that is proportional to the atmospheric pressure is sent to the PCM (terminal 55) from the barometric pressure sensor output terminal (terminal 2).

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

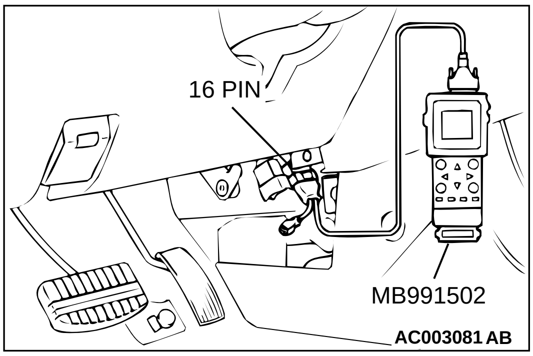
- Barometric pressure sensor output voltage has continued to be 1.95 volts or lower [corresponding to a barometric pressure of 50 kPa (7.3 psi) or lower] approximately 15,000 ft above sea level for 10 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

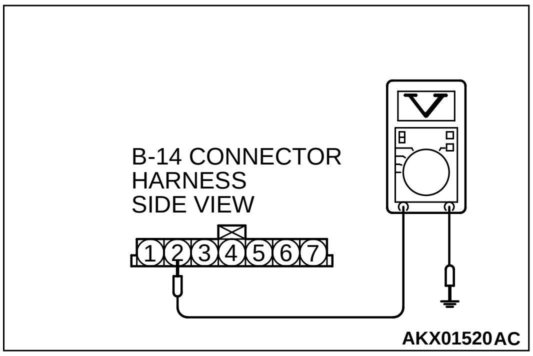
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : NO: Go to Step 2.



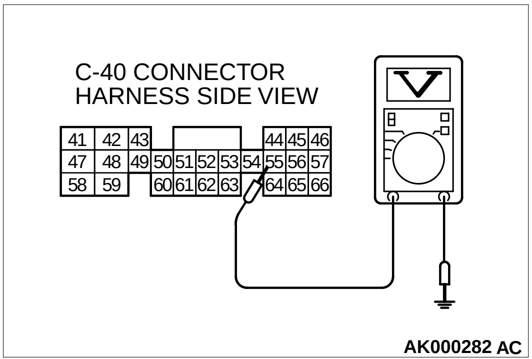
STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m(0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m(1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m(3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m(5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.



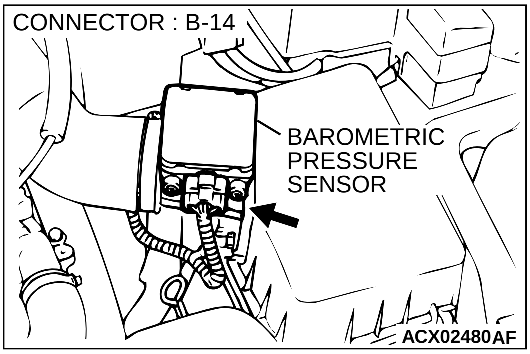
STEP 3. Check the sensor output voltage at PCM connector C-40 by backprobing.

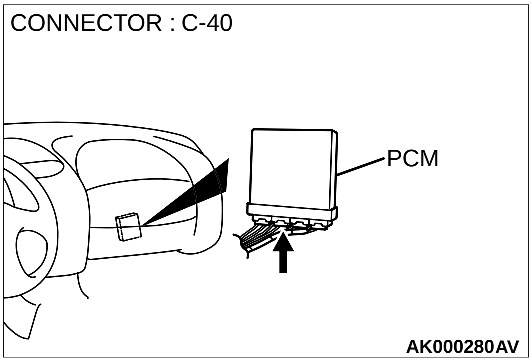
(1) Do not disconnect the connector C-40.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 55 and ground by backprobing.
- When altitude is 0 m(0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m(1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m(3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m(5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



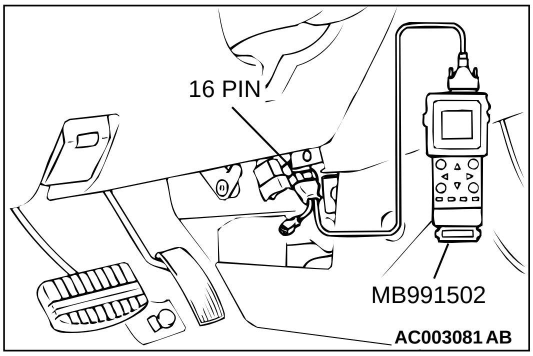


STEP 4. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.



STEP 5. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

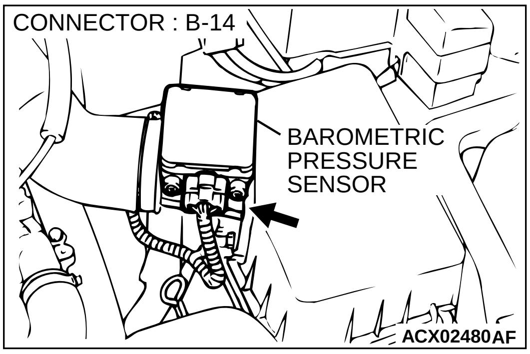
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

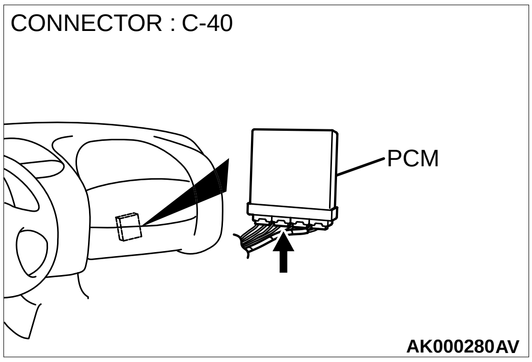
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points(P.00-8).

NO : Replace the ECM or PCM. Then go to Step 18.



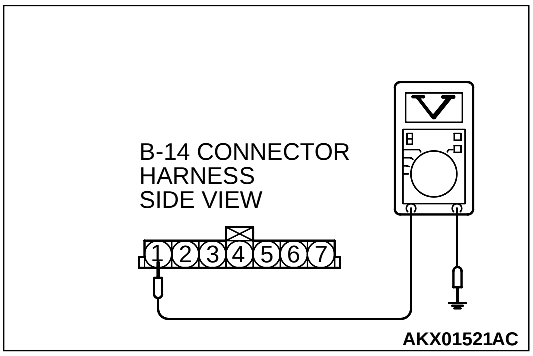


STEP 6. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-14 terminal 2 and PCM connector C-40 terminal 55 because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.



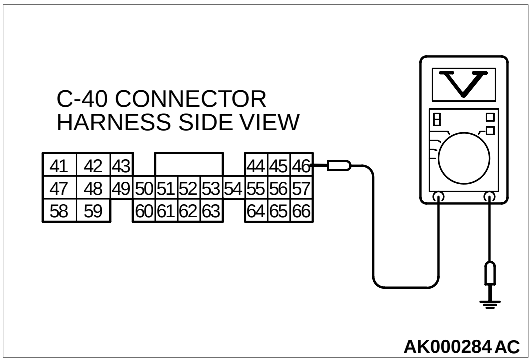
STEP 7. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
   - Voltage should be between 4.8 and 5.2 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 8.



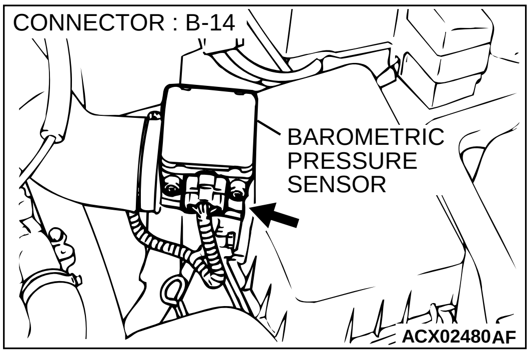
STEP 8. Check the sensor supply voltage at PCM connector C-40 by backprobing.

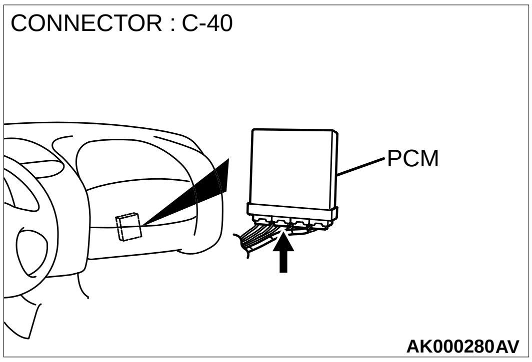
(1) Do not disconnect the connector C-40.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 46 and ground by backprobing.
   - Voltage should be between 4.8 and 5.2 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Go to Step 10.



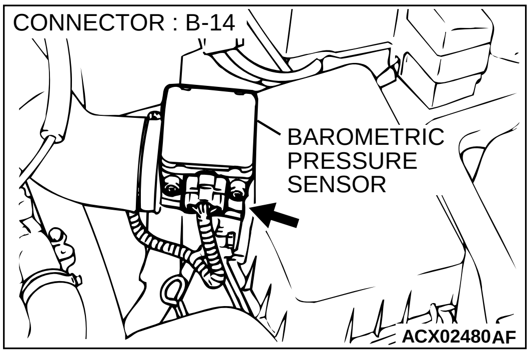


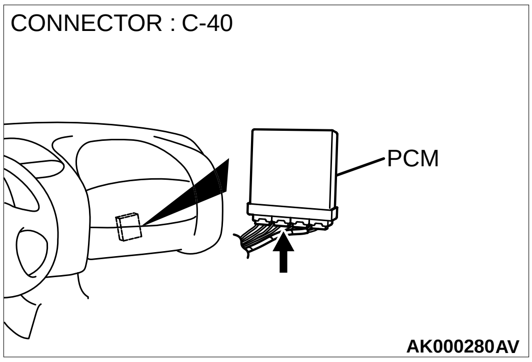
STEP 9. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-14 terminal 1 and PCM connector C-40 terminal 46 because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.



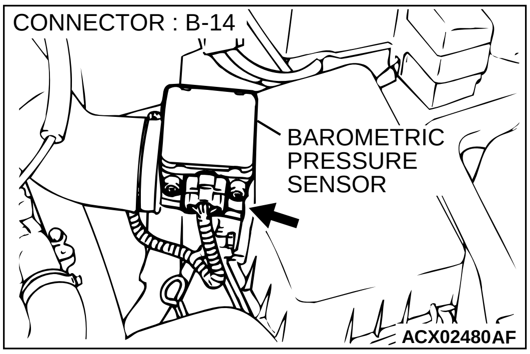


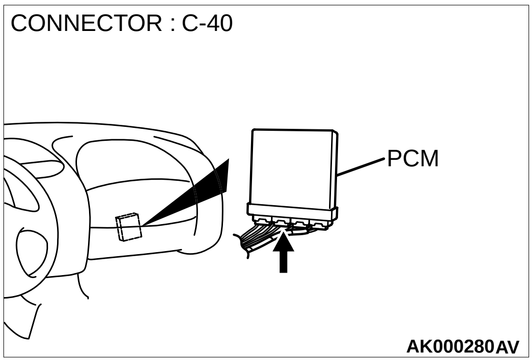
STEP 10. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.

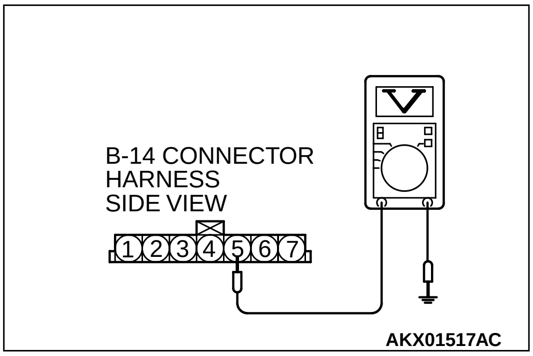




STEP 11. Check for short circuit to ground between barometric pressure sensor connector B-14 terminal 1 and PCM connector C-40 terminal 46.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 18.
NO : Repair it. Then go to Step 18.



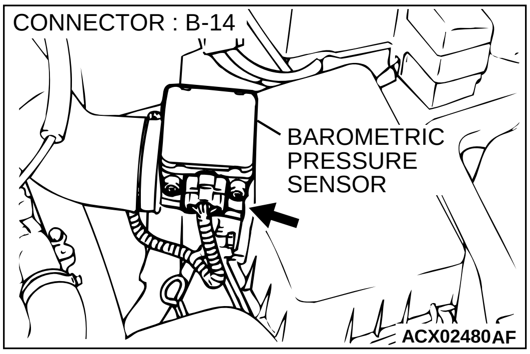
STEP 12. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

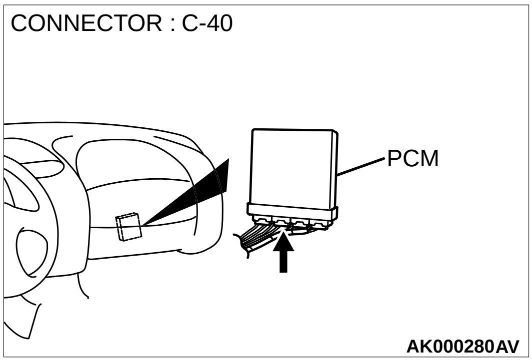
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 15.
NO : Go to Step 13.



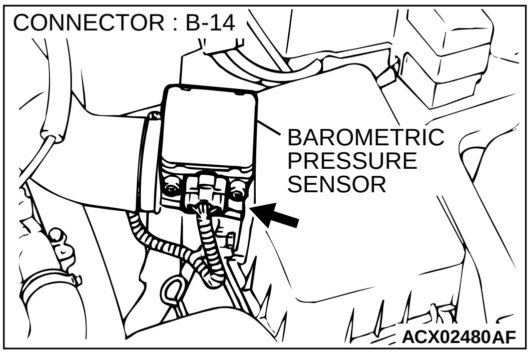


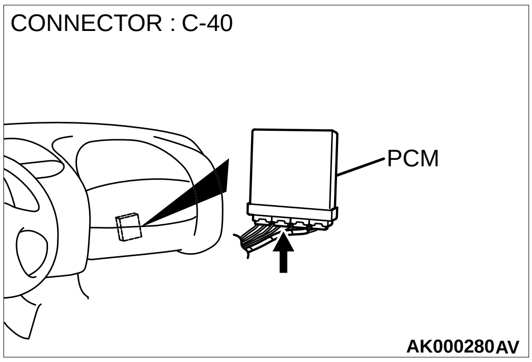
STEP 13. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.



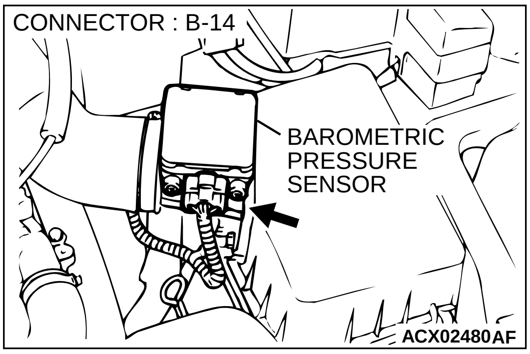


STEP 14. Check for harness damage between barometric pressure sensor connector B-14 terminal 5 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.

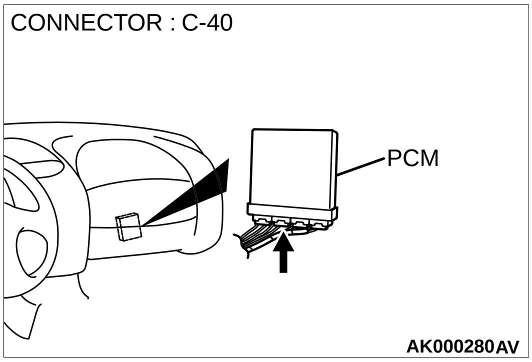


STEP 15. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.

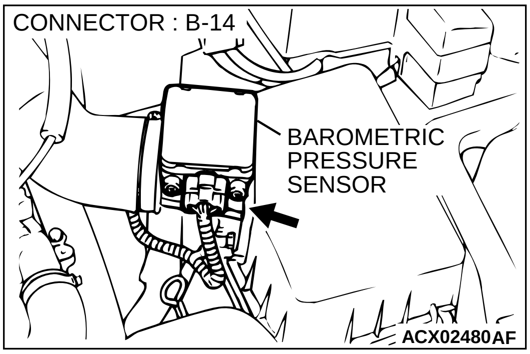


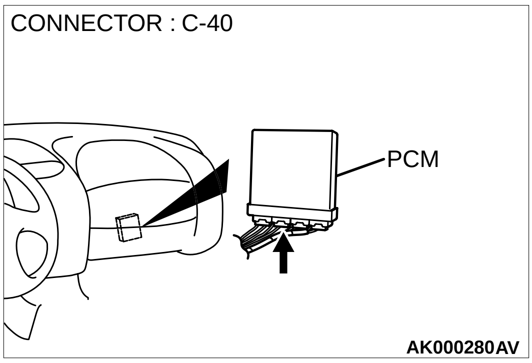
STEP 16. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 18.





STEP 17. Check for short circuit to ground and harness damage between barometric pressure sensor connector B-14 terminal 2 and PCM connector C-40 terminal 55.

Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 18.

NO : Repair it. Then go to Step 18.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

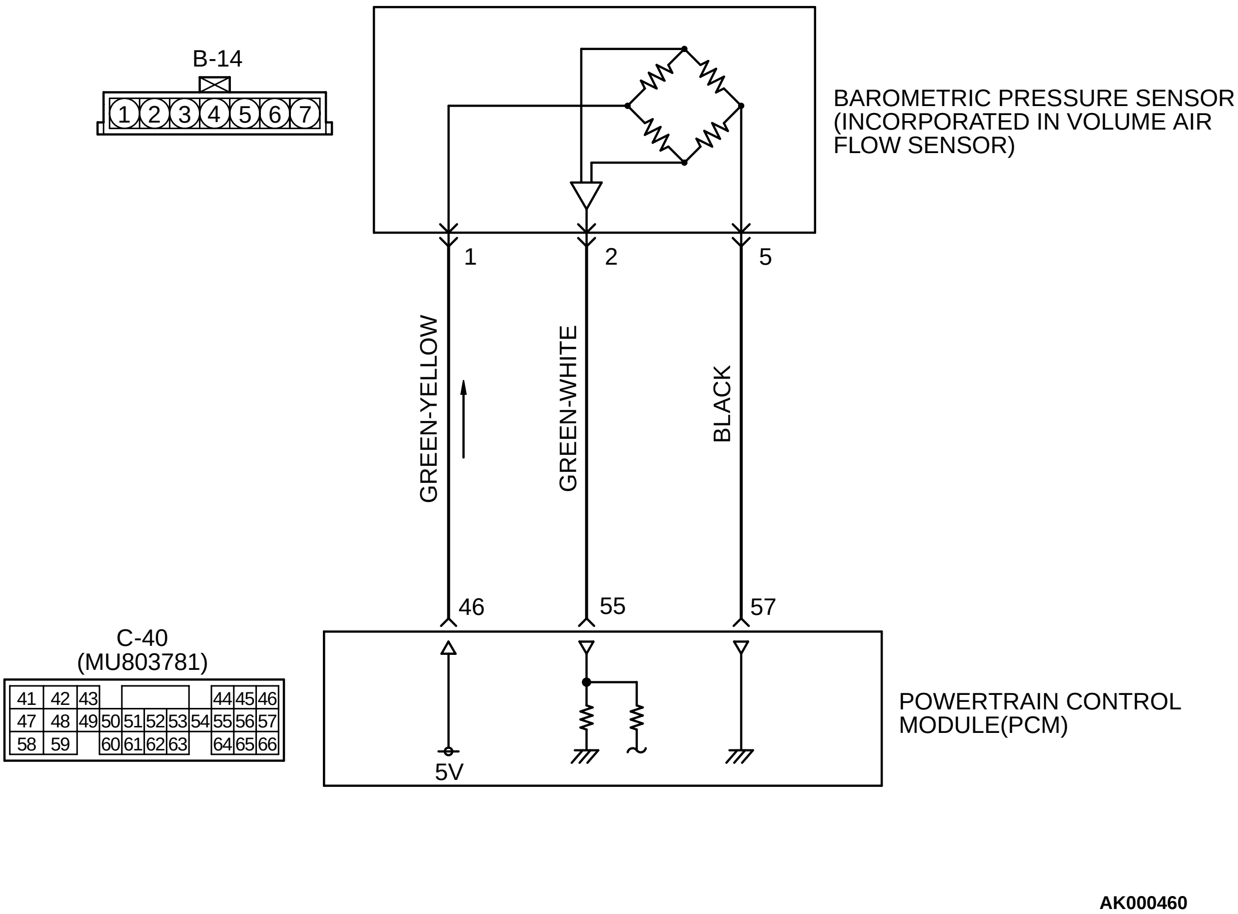
(2) Check the diagnostic trouble code (DTC).

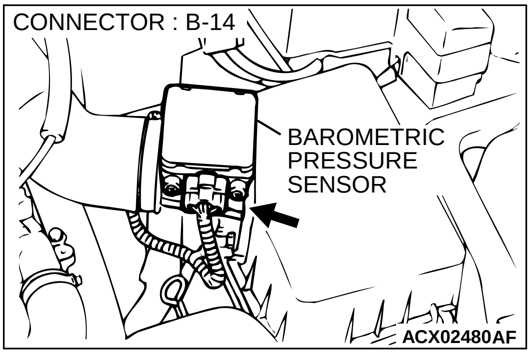
Q: Is the DTC P0107 is output?

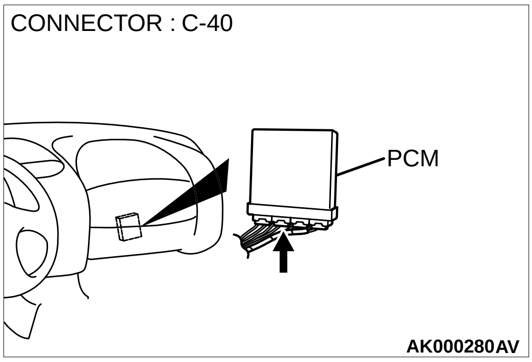
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0108: Barometric Pressure Circuit High Input







CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the PCM (terminal 46). The ground terminal (terminal 5) is grounded with PCM (terminal 57).
- A voltage that is proportional to the atmospheric pressure is sent to the PCM (terminal 55) from the barometric pressure sensor output terminal (terminal 2).

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output voltage has continued to be 4.45 volts or higher [corresponding to a barometric pressure of 114 kPa (16.5 psi) or higher] approximately 4,000 ft below sea level for 10 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

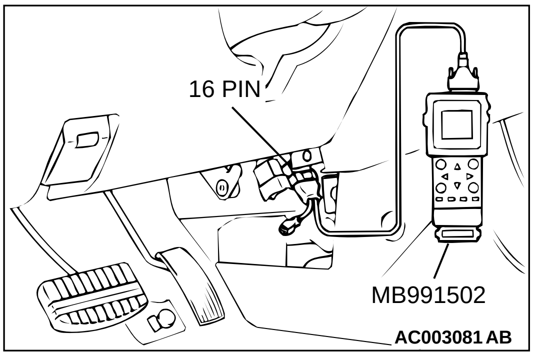
- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

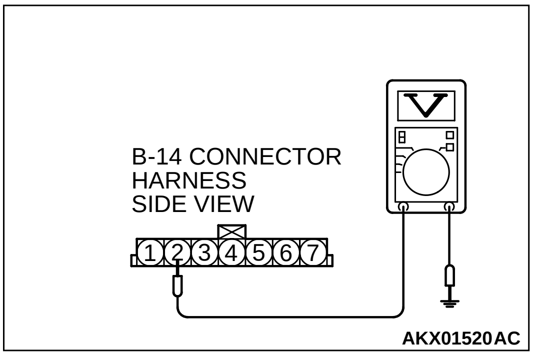
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.

STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.



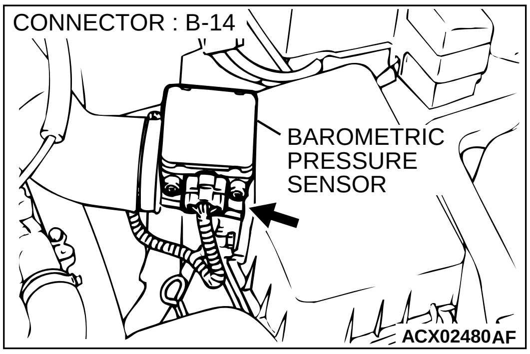
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m(0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m(1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m(3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m(5,906 feet), voltage should be 2.9 and 3.5 volts.

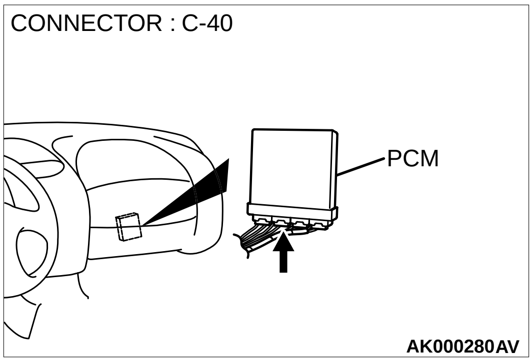
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.



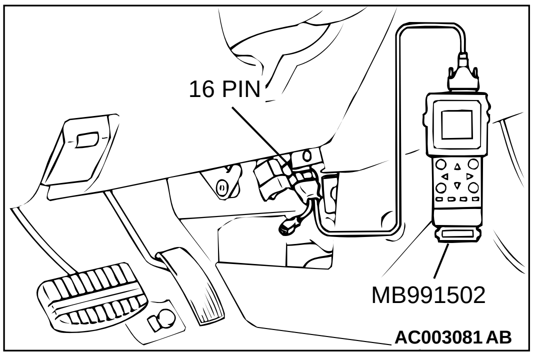


Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

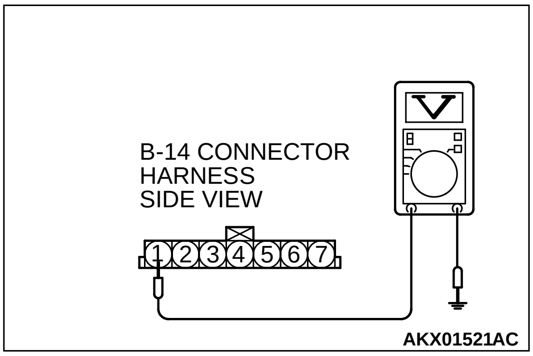
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 12.



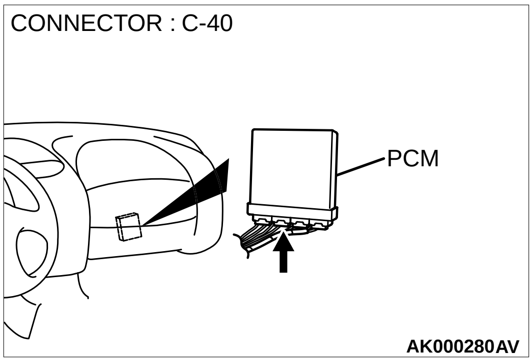
STEP 5. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

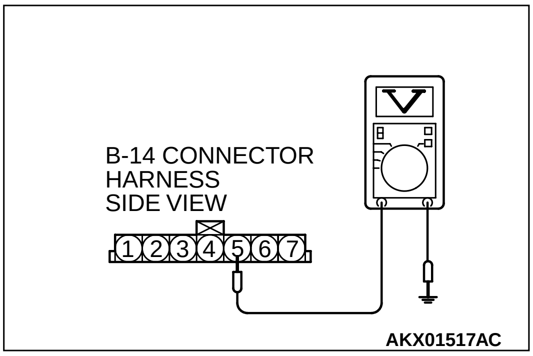
YES : Go to Step 7.
NO : Go to Step 6.



STEP 6. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



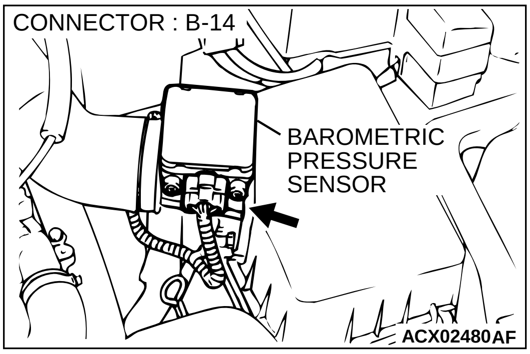
STEP 7. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

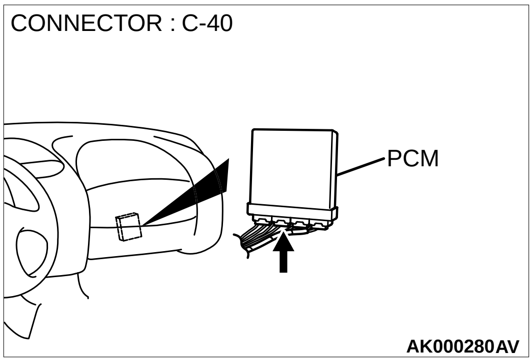
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.
NO : Go to Step 8.



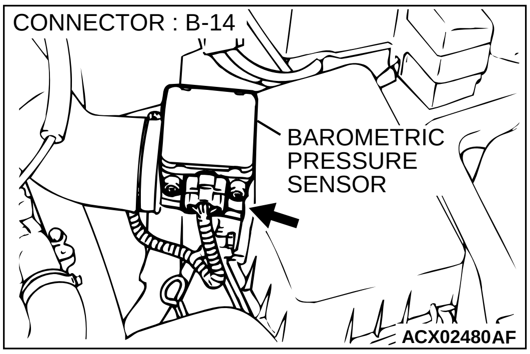


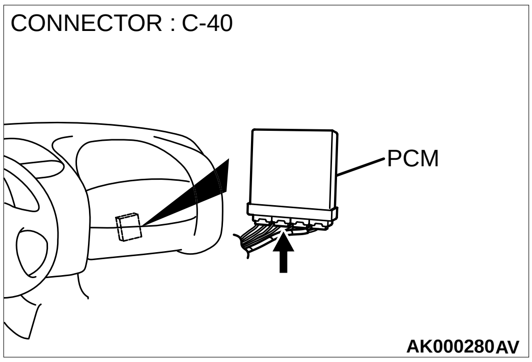
STEP 8. Check connector B-14 at the barometric pressure sensor and connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



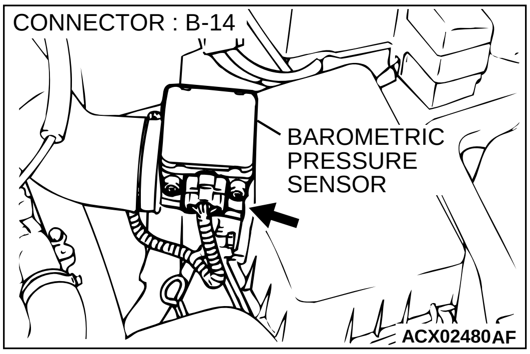


STEP 9. Check for open circuit between barometric pressure sensor connector B-14 terminal 5 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

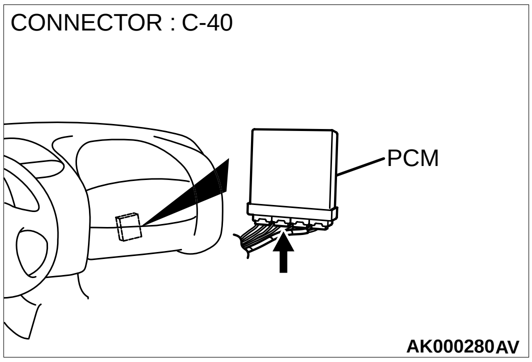


STEP 10. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



STEP 11. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

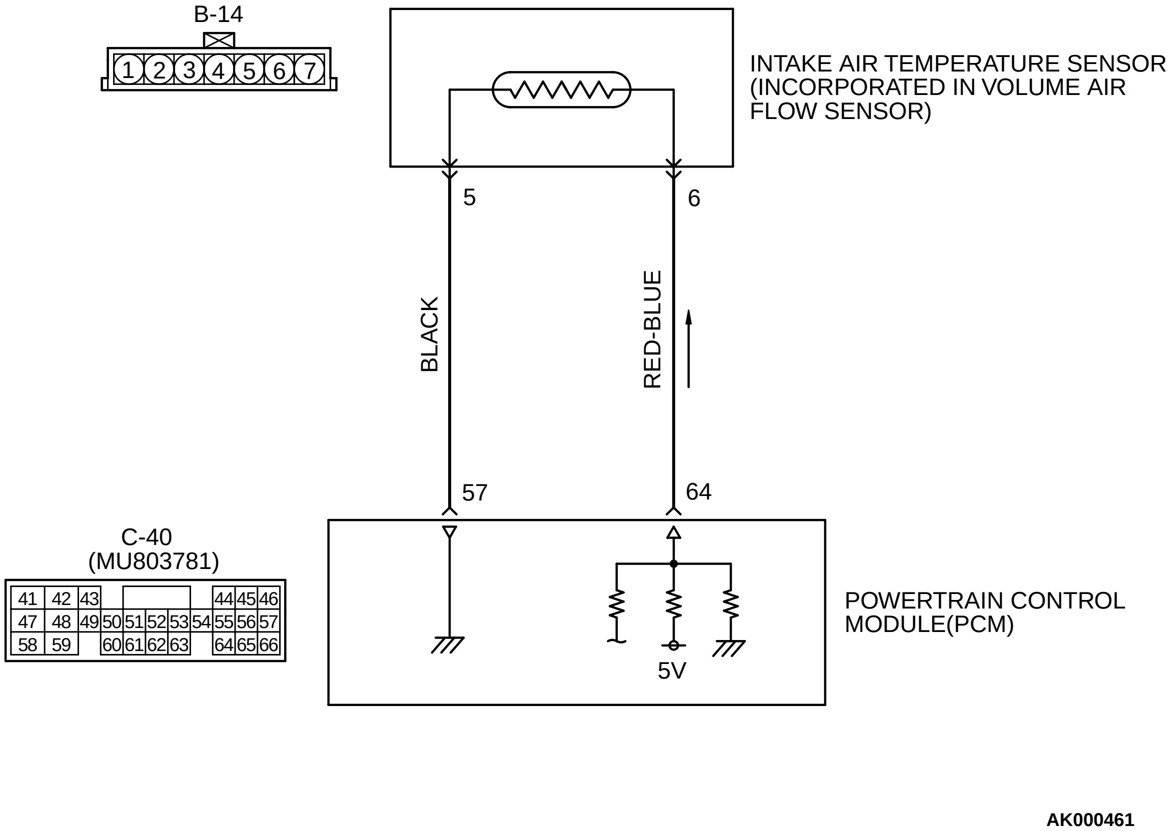
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

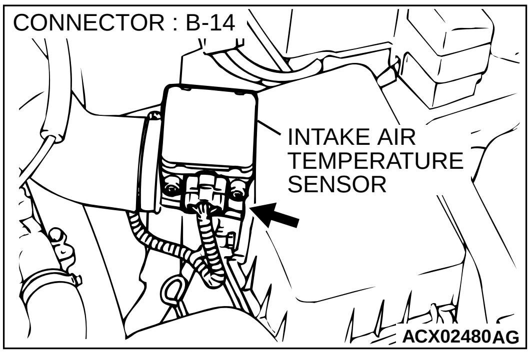
Q: Is the DTC P0108 is output?

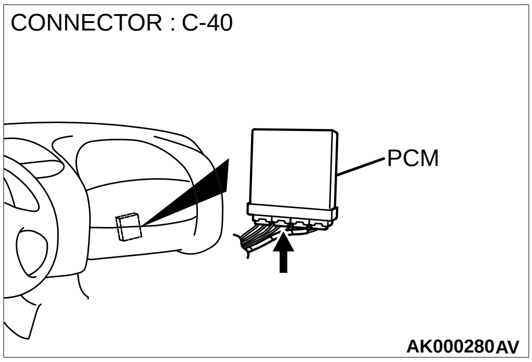
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0111: Intake air temperature Circuit Range/Performance Problem







CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the PCM (terminal 64) via the resistor in the PCM. The ground terminal (terminal 5) is grounded with PCM (terminal 57).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the engine was started.

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an air intake temperature of -45° C (-49° F) or lower] for 2 seconds.

or

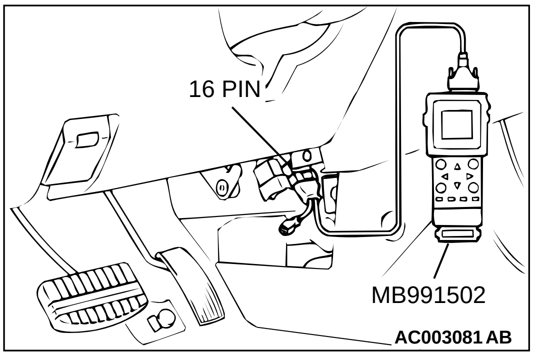
- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 125° C (257° F) or higher] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

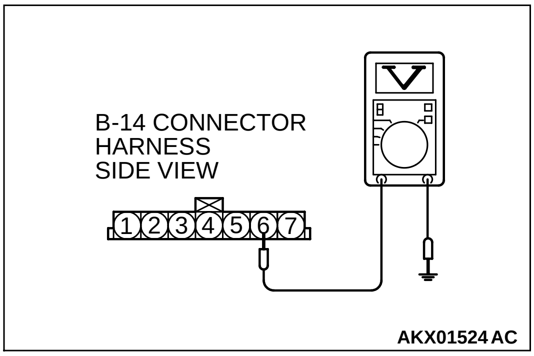
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points(P.00-8).
NO : Go to Step 2.



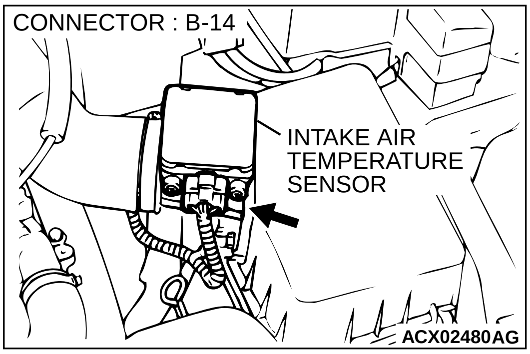
STEP 2. Check the sensor output voltage at intake air temperature sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground by backprobing.
- When intake air temperature is 0° C(32° F), voltage should be 3.2 and 3.8 volts.
- When intake air temperature is 20° C(68° F), voltage should be 2.3 and 2.9 volts.
- When intake air temperature is 40° C(104° F), voltage should be 1.5 and 2.1 volts.
- When intake air temperature is 80° C(176° F), voltage should be 0.4 and 1.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

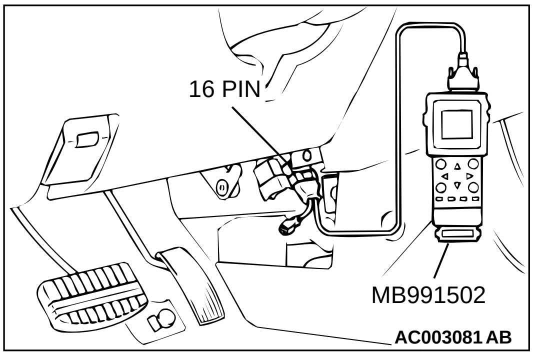
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-14 at the intake air temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.



STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

⚠ CAUTION

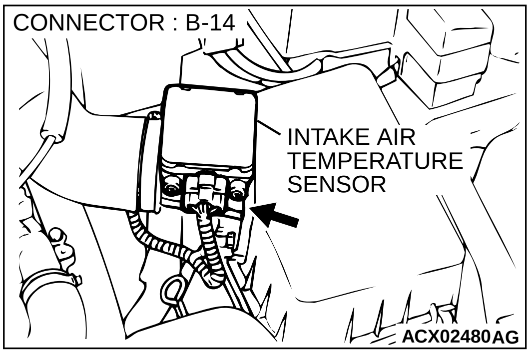
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Replace the PCM. Then go to Step 19.

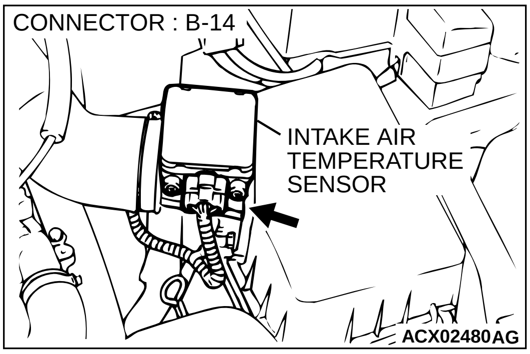


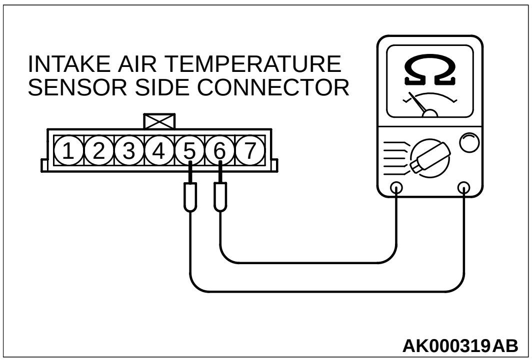
STEP 5. Check connector B-14 at intake air temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.





STEP 6. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14

(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.

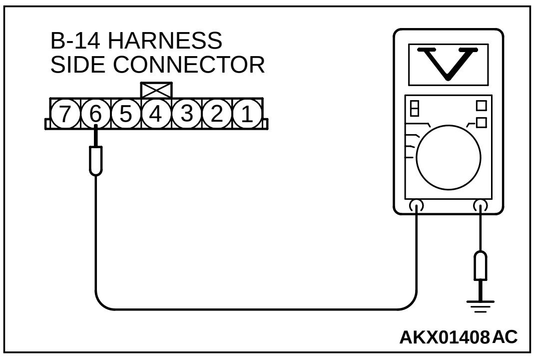
- There should be continuity. (0.30 – 1.0 kΩ)

NOTE: Check that the circuit is not open loop.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the volume air flow sensor. Then go to Step 19.



STEP 7. Check the sensor supply voltage at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 6 and ground.

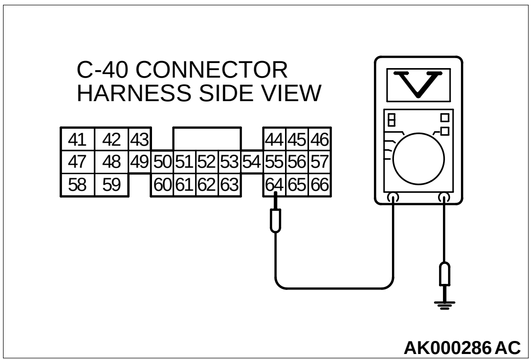
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 8.



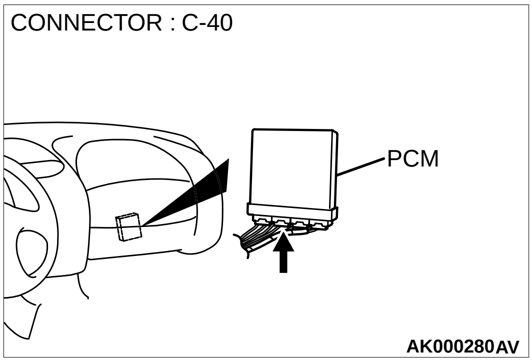
STEP 8. Check the sensor supply voltage at PCM connector C-40 by backprobing.

(1) Do not disconnect the PCM connector C-40.
(2) Disconnect the intake air temperature sensor connector B-14.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 64 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

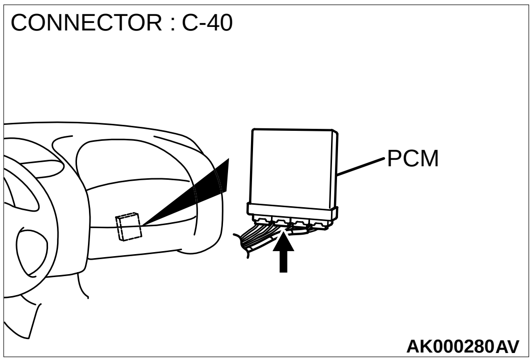
YES : Go to Step 9.
NO : Go to Step 10.



STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

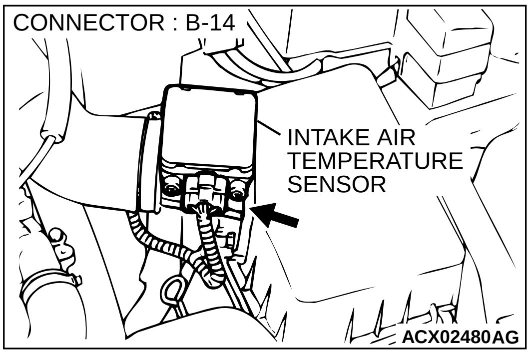
YES : Repair harness wire between intake air temperature sensor connector B-14 terminal 6 and PCM connector C-40 terminal 64 because of open circuit. Then go to Step 19.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.

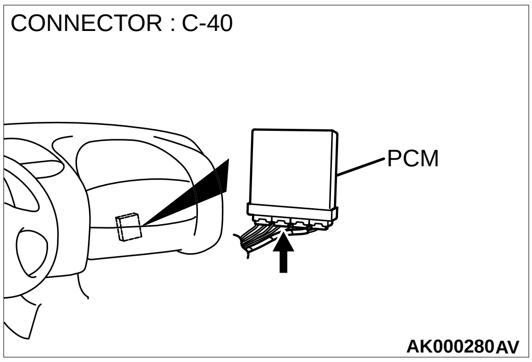


STEP 10. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.

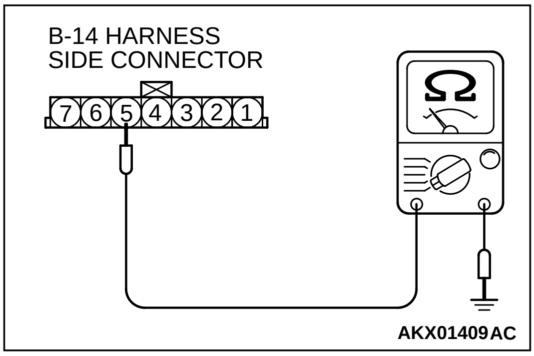




STEP 11. Check for short circuit to ground between intake air temperature sensor connector B-14 terminal 6 and PCM connector C-40 terminal 64.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 19.
NO : Repair it. Then go to Step 19.

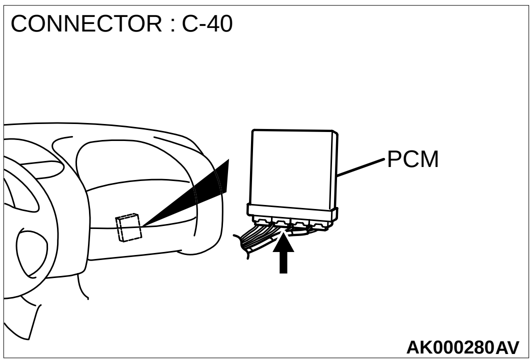


STEP 12. Check the continuity at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

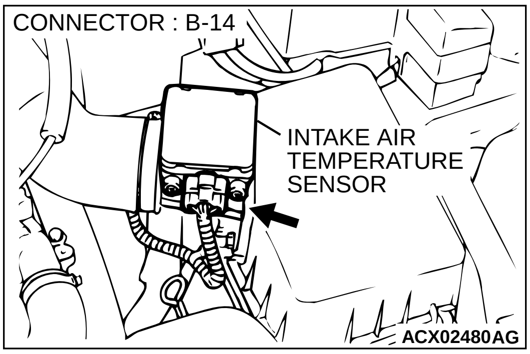
YES : Go to Step 15.
NO : Go to Step 13.

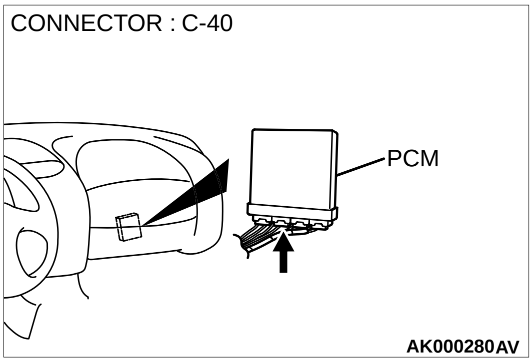


STEP 13. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.



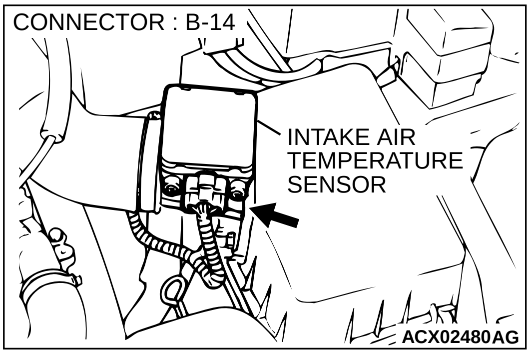


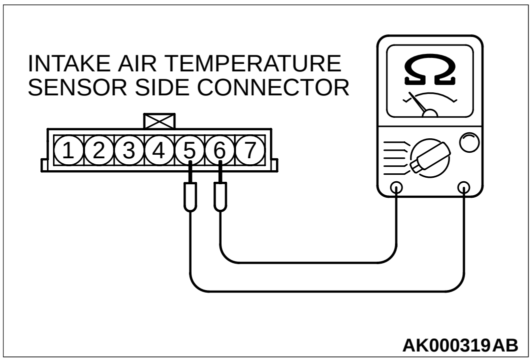
STEP 14. Check for open circuit and harness damage between intake air temperature sensor connector B-14 terminal 5 and PCM connector C-40 terminal 57.

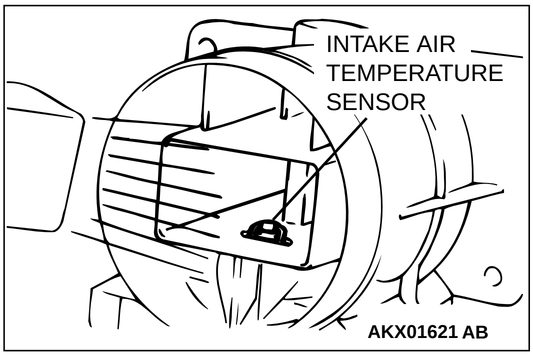
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 19.

NO : Repair it. Then go to Step 19.







STEP 15. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14

(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.

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

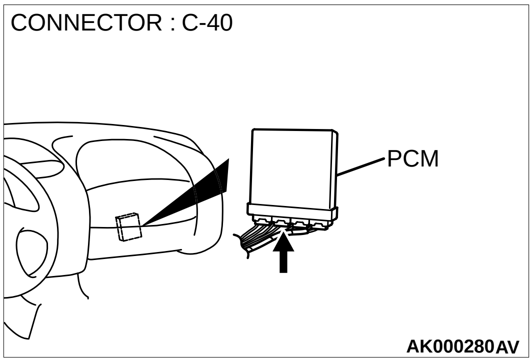
Standard value:

5.3 – 6.7 kΩ [at 0° C (32° F)]
2.3 – 3.0 kΩ [at 20° C (68° F)]
1.0 – 1.5 kΩ [at 40° C (104° F)]
0.30 – 0.42 kΩ [at 80° C (176° F)]

Q: Is the resistance at the standard value?

YES : Go to Step 16.

NO : Replace the volume air flow sensor. Then go to Step 19.

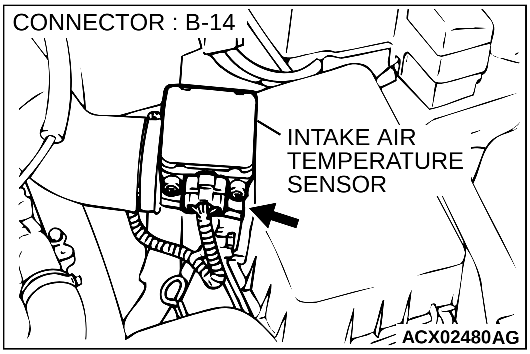


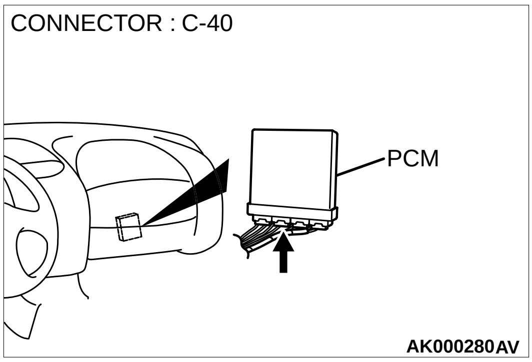
STEP 16. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 19.



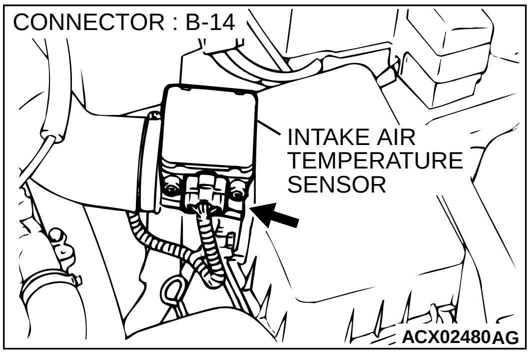


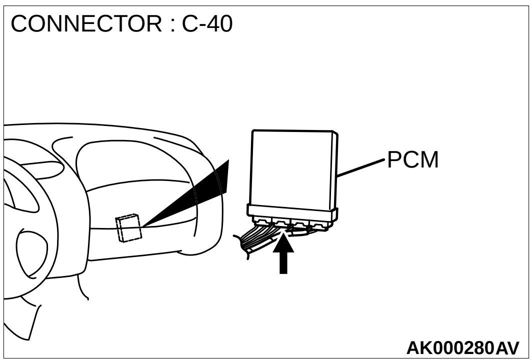
STEP 17. Check for harness damage between intake air temperature sensor connector B-14 terminal 5 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 19.





STEP 18. Check for harness damage between intake air temperature sensor connector B-14 terminal 6 and PCM connector C-40 terminal 64.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 19.

NO : Repair it. Then go to Step 19.

STEP 19. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

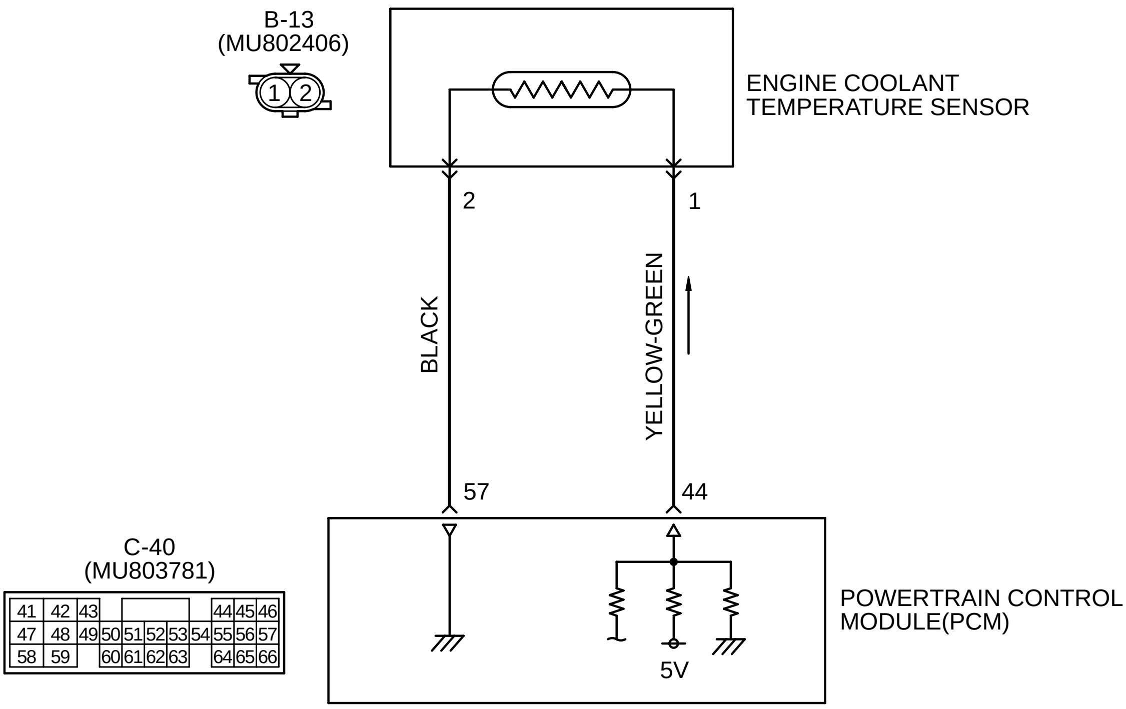
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0111 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0115: Engine Coolant Temperature Circuit High Input



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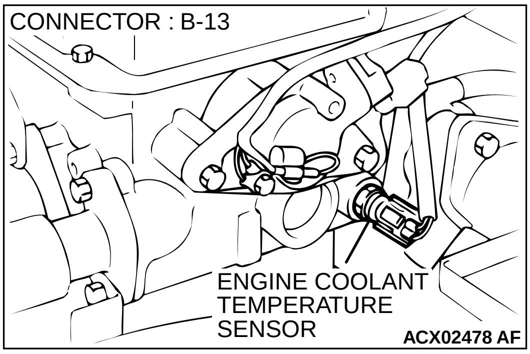
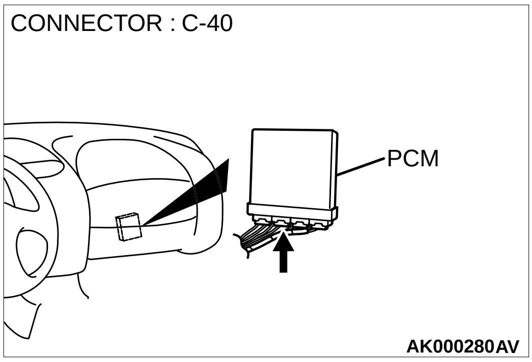




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the PCM (terminal 44) via the resistor in the PCM. The ground terminal (terminal 2) is grounded with PCM (terminal 57).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature was 7° C (44.6° F) or more immediately before the engine was stopped at the last drive.
- Engine coolant temperature was 7° C (44.6° F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1° C (33.8° F) after five minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60° C (140° F) or more.
  2. Volume air flow sensor output frequency is 70 Hz or less.
  3. During fuel shut-off operation.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

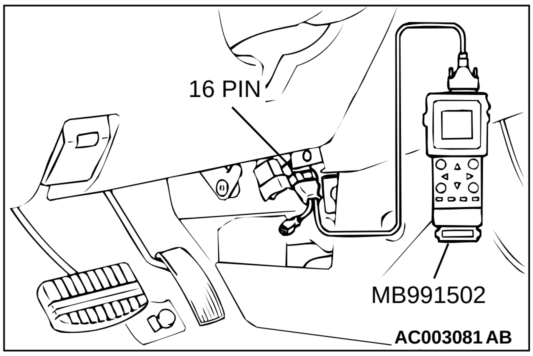
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

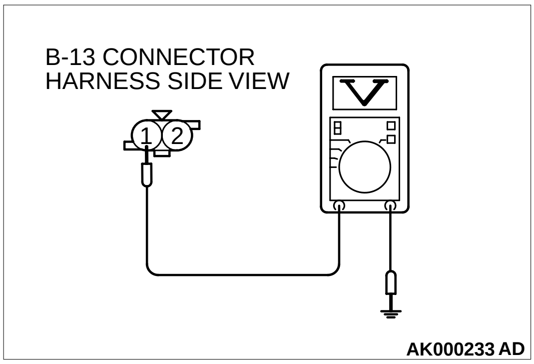
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.

STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-13 by backprobing.



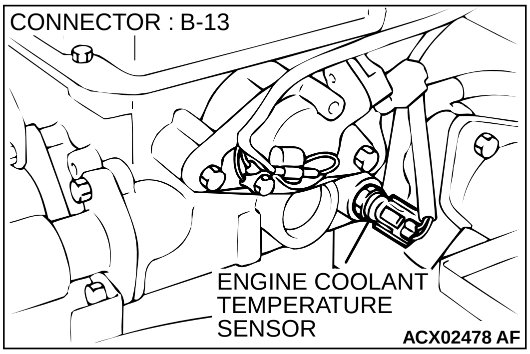
(1) Do not disconnect the connector B-13.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is 0° C(32° F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20° C(68° F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40° C(104° F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 80° C(176° F), voltage should be 0.3 and 0.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 5.

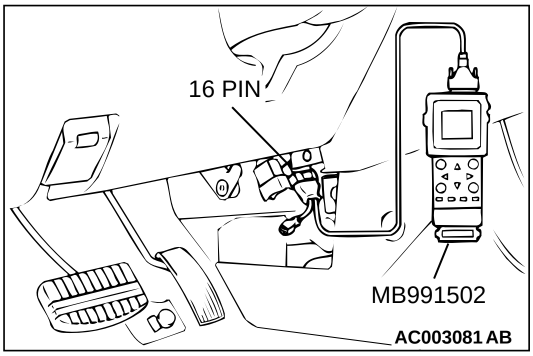
STEP 3. Check connector B-13 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.

STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

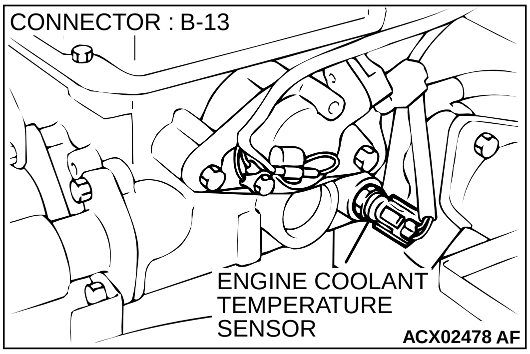
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Replace the PCM. Then go to Step 14.

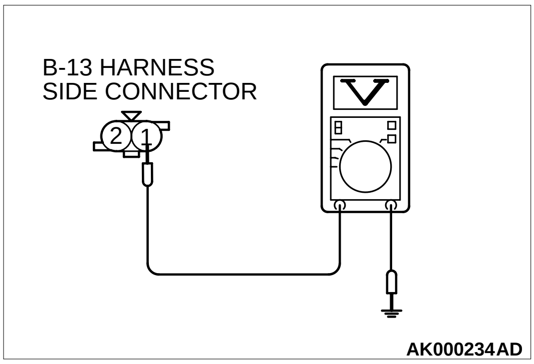
STEP 5. Check connector B-13 at engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.

STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-13.

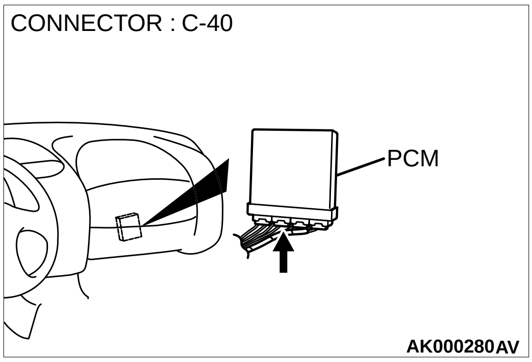


(1) Disconnect the connector B-13 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

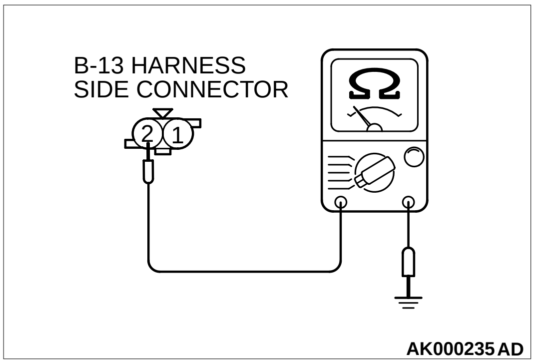


STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-13.

(1) Disconnect the connector B-13 and measure at the harness side.

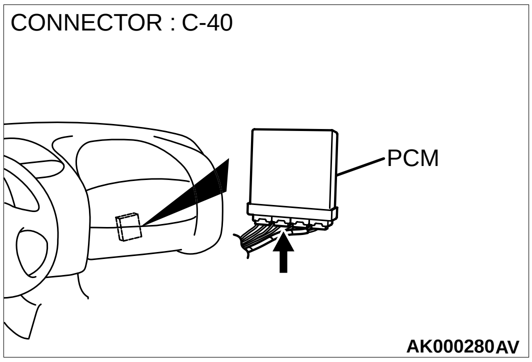
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

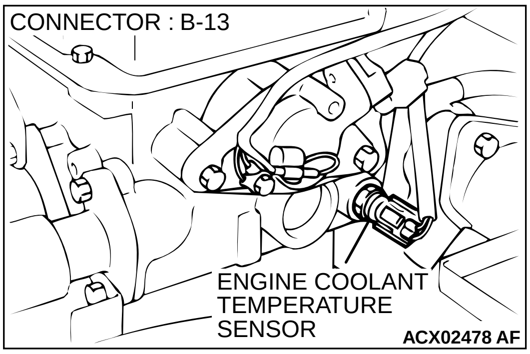


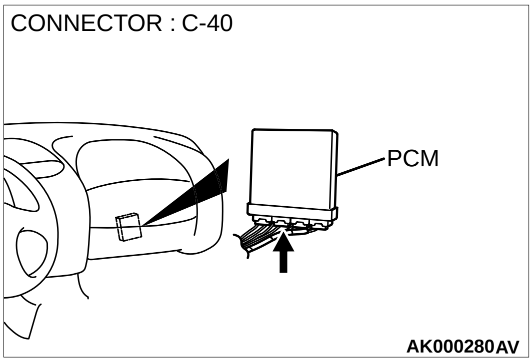
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



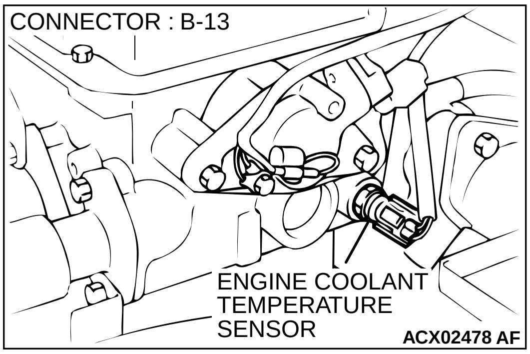


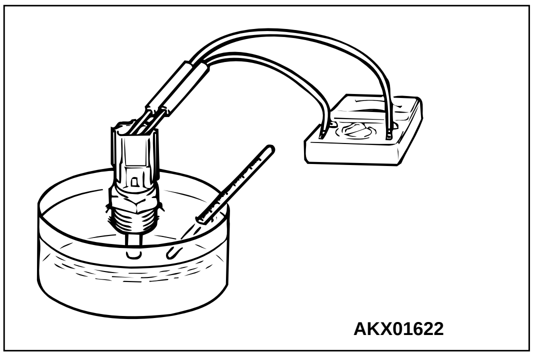
STEP 10. Check for harness damage between engine coolant temperature sensor connector B-13 terminal 2 and PCM connector C-40 terminal 57.

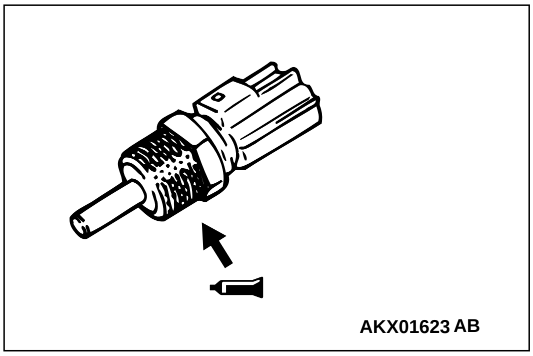
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.







STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-13

(2) Remove the engine coolant temperature sensor.

(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:

5.3 – 6.7 kΩ [at 0° C (32° F)]
2.3 – 3.0 kΩ [at 20° C (68° F)]
1.0 – 1.5 kΩ [at 40° C (104° F)]
0.30 – 0.42 kΩ [at 80° C (176° F)]

(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

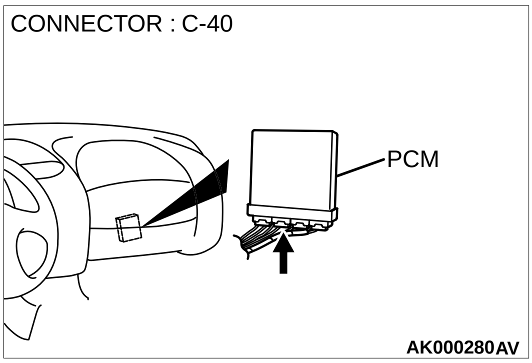
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N· m(22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Go to Step 12.

NO : Replace the engine coolant temperature sensor. Then go to Step 14.

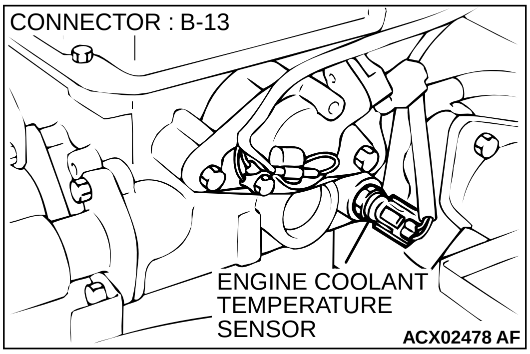


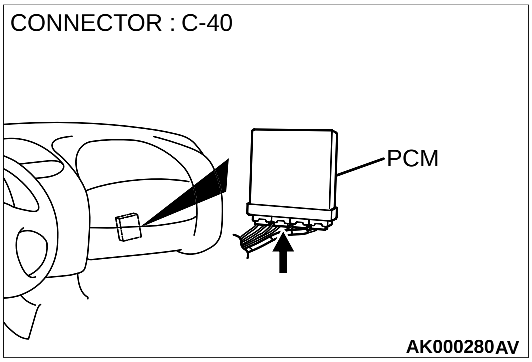
STEP 12. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.





STEP 13. Check for harness damage between engine coolant temperature sensor connector B-13 terminal 1 and PCM connector C-40 terminal 44.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

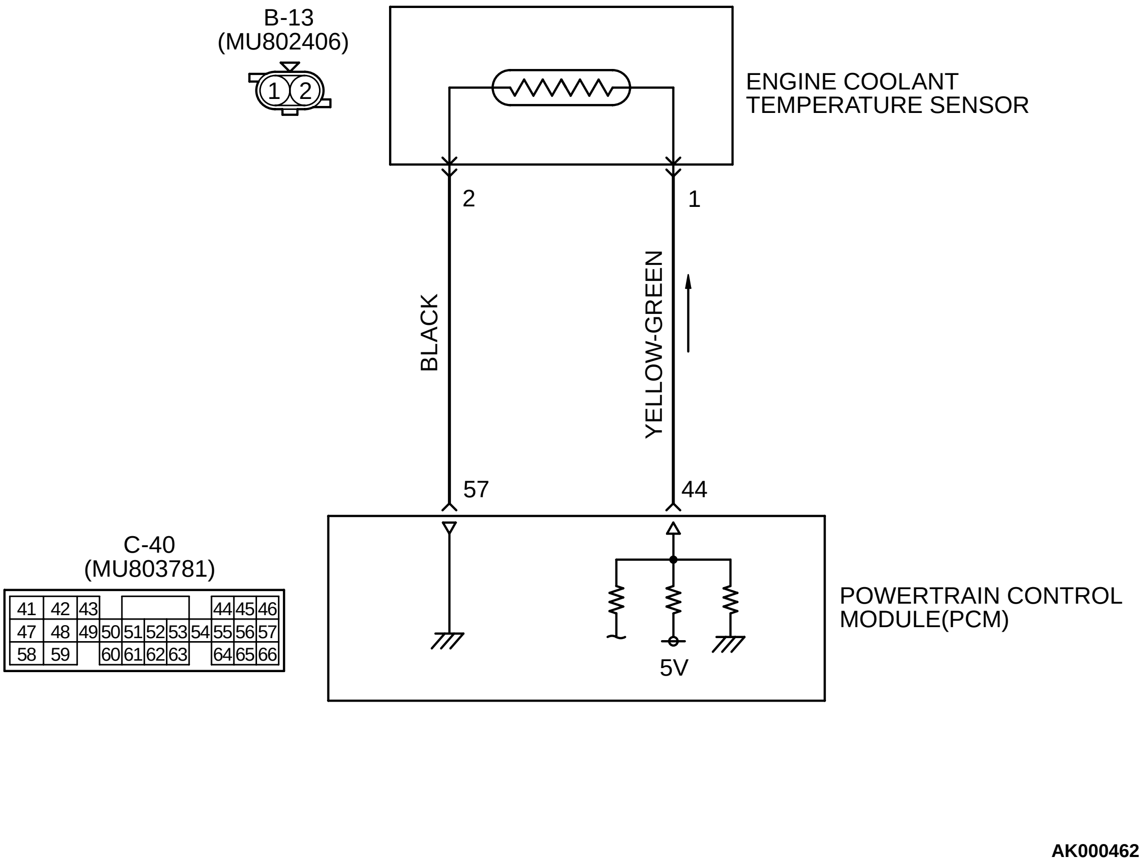
STEP 14. Test the OBD-II drive cycle.

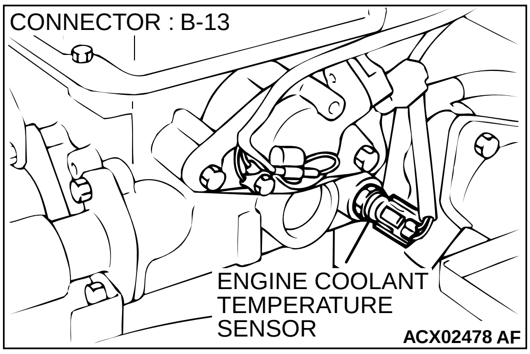
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

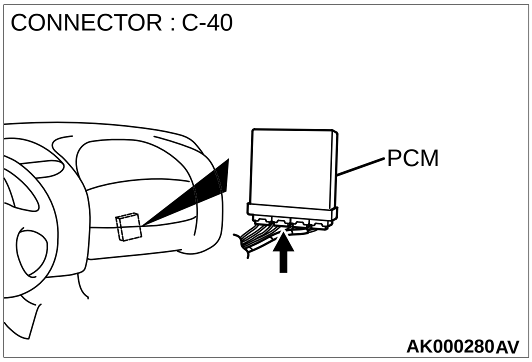
Q: Is the DTC P0115 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem







CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the PCM (terminal 44) via the resistor in the PCM. The ground terminal (terminal 2) is grounded with PCM (terminal 57).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to a coolant temperature of -45° C (-49° F) or lower] for 2 seconds.

or

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower [corresponding to a coolant temperature of 140° C (284° F) or higher] for 2 seconds.

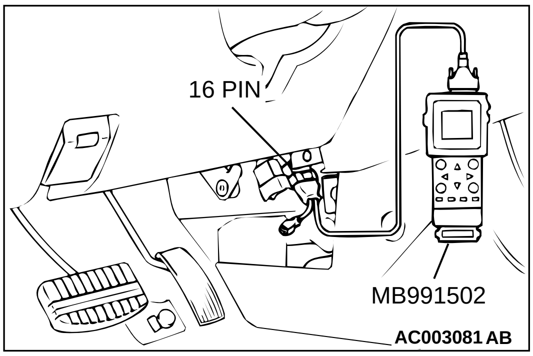
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

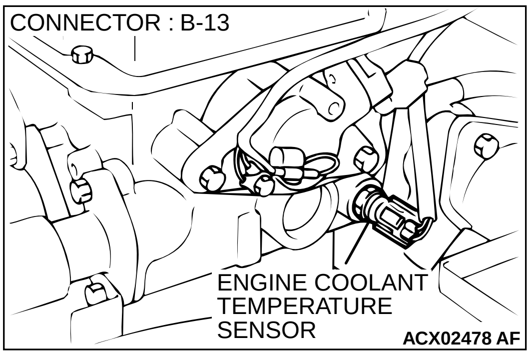
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

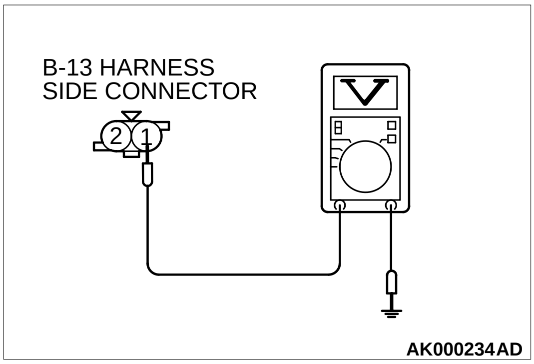
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



STEP 2. Check connector B-13 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.

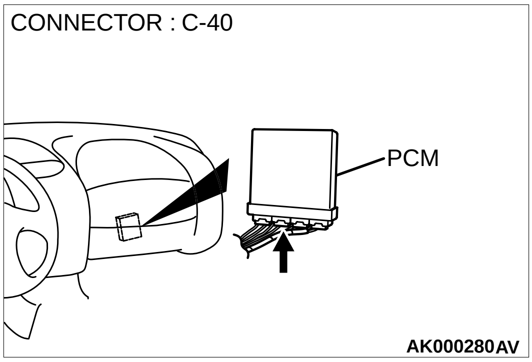


STEP 3. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-13.

(1) Disconnect the connector B-13 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
  - Voltage should be between 4.5 and 4.9 volts
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

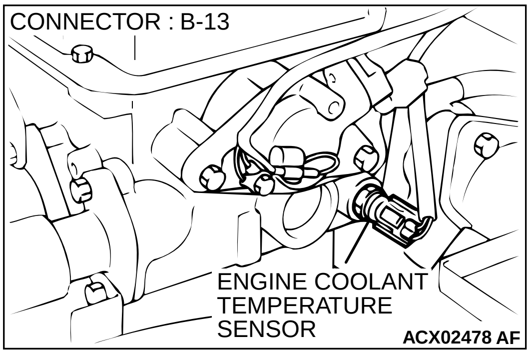
YES : Go to Step 6.
NO : Go to Step 4.

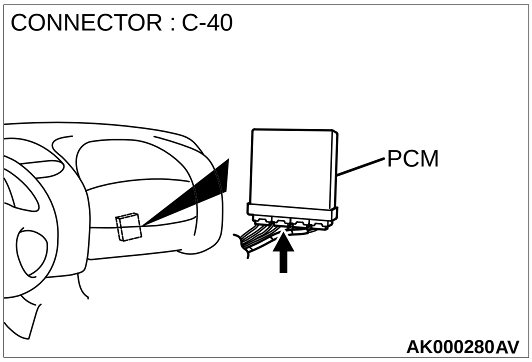


STEP 4. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.

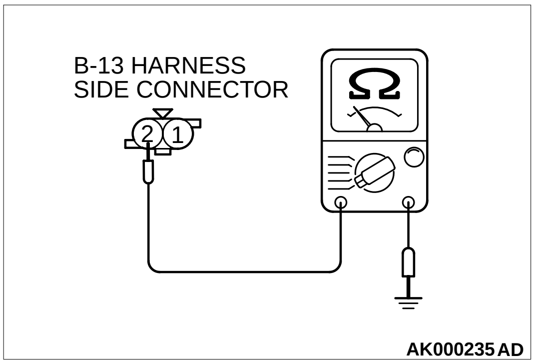




STEP 5. Check for open circuit between engine coolant temperature sensor connector B-13 terminal 1 and PCM connector C-40 terminal 44.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 11.
NO : Repair it. Then go to Step 11.



STEP 6. Check the continuity at engine coolant temperature sensor harness side connector B-13.

(1) Disconnect the connector B-13 and measure at the harness side.

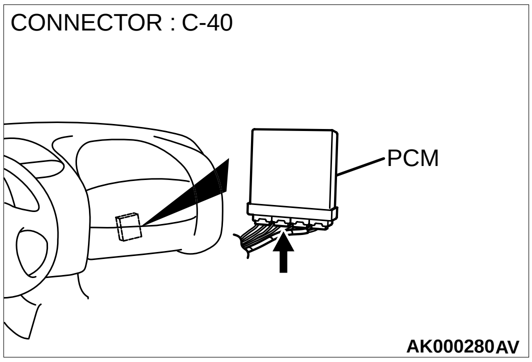
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Go to Step 7.

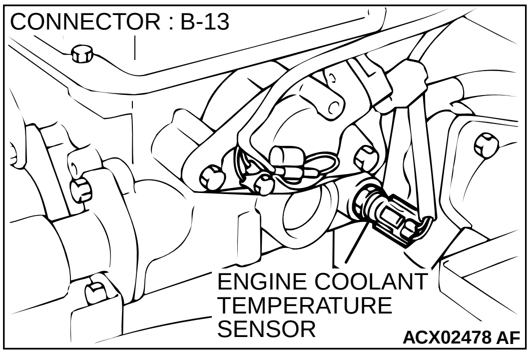


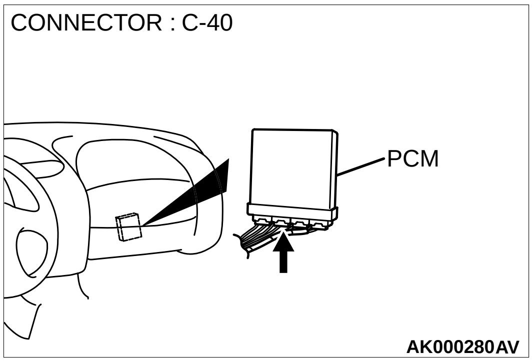
STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.



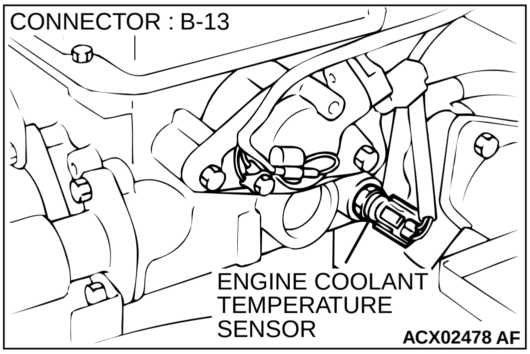


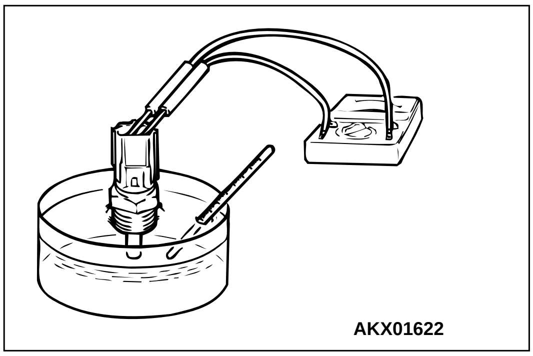
STEP 8. Check for open circuit between engine coolant temperature sensor connector B-13 terminal 2 and PCM connector C-40 terminal 57.

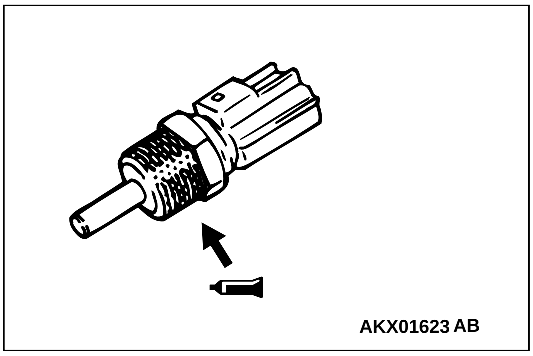
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.







STEP 9. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-13.
(2) Remove the engine coolant temperature sensor.
(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

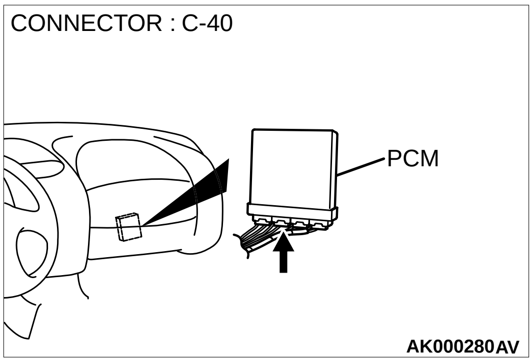
Standard value:
5.3 – 6.7 kΩ [at 0C° (32° F)]
2.3 – 3.0 kΩ [at 20C° (68° F)]
1.0 – 1.5 kΩ [at 40C° (104° F)]
0.30 – 0.42 kΩ [at 80C° (176° F)]

(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N· m(22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Go to Step 10.
NO : Replace the engine coolant temperature sensor. Then go to Step 11.



STEP 10. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

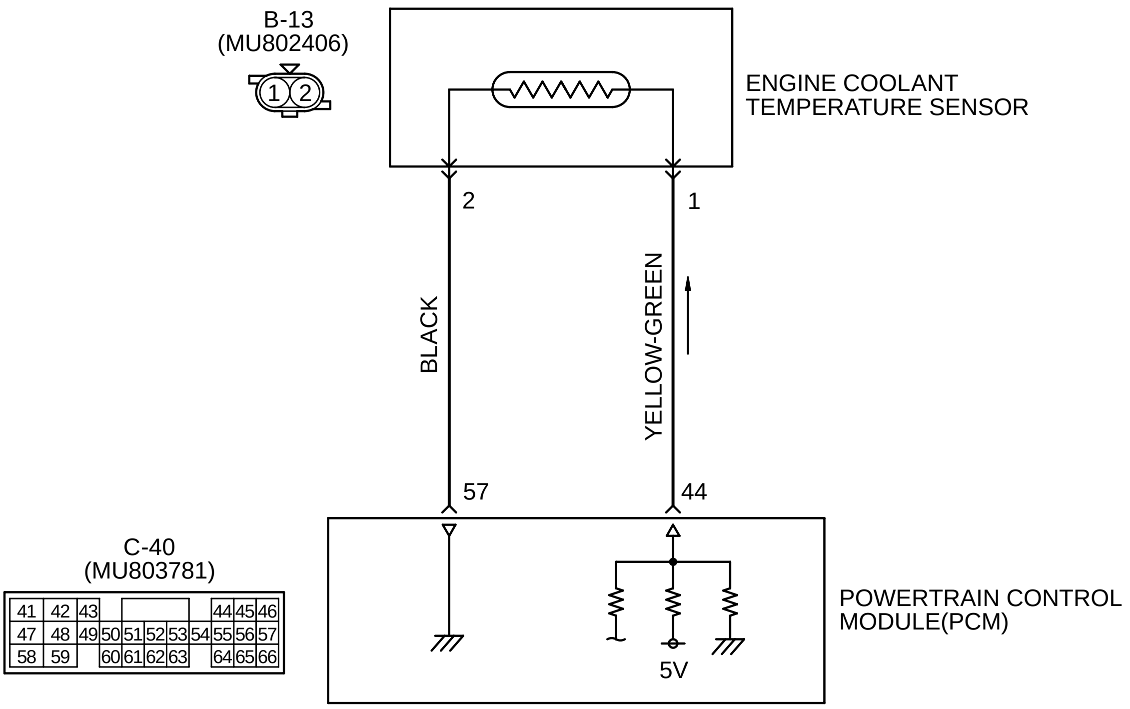
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0116 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input



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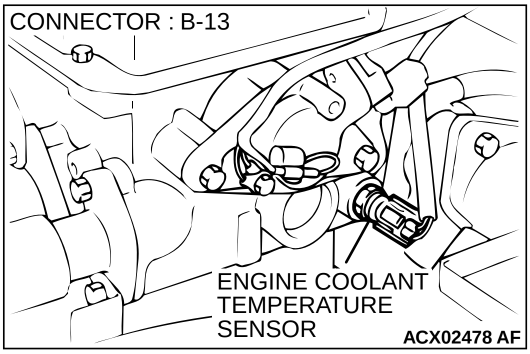
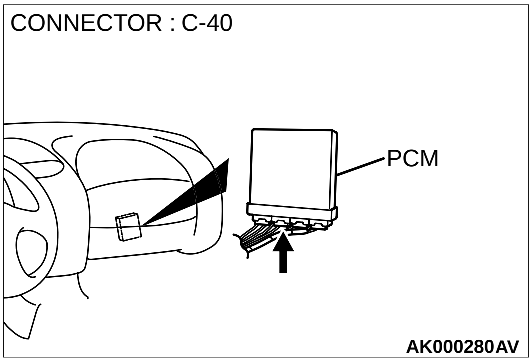




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the PCM (terminal 44) via the resistor in the PCM. The ground terminal (terminal 2) is grounded with PCM (terminal 57).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Engine coolant temperature sensor output voltage increased from a value lower than 1.6 volts to a value higher than 1.6 volts [coolant temperature decreases from a higher than 40° C (104° F) temperature to a lower than 40° C (104° F) temperature].
- Then the engine coolant temperature sensor output voltage has continued to be 1.6 volts or higher for five minutes.

Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7° C (44.6° F) after starting sequence was completed.
- However, time is not counted when volume air flow sensor average output frequency is 70Hz or less, or fuel is shut off.

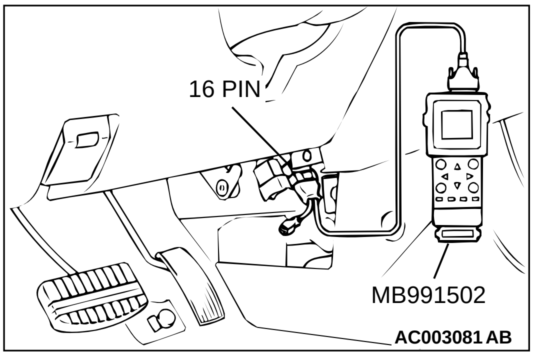
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

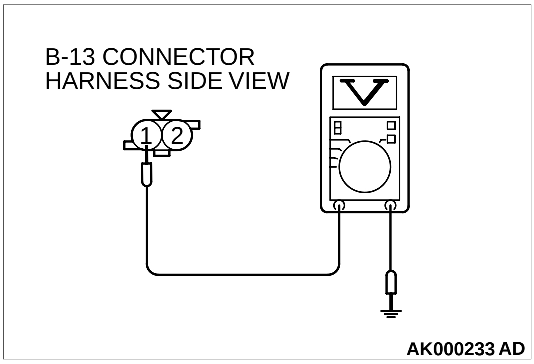
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



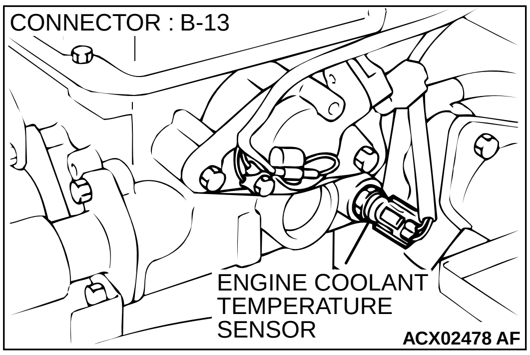
STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-13 by backprobing.

(1) Do not disconnect the connector B-13.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is 0° C(32° F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20° C(68° F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40° C(104° F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 80° C(176° F), voltage should be 0.3 and 0.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

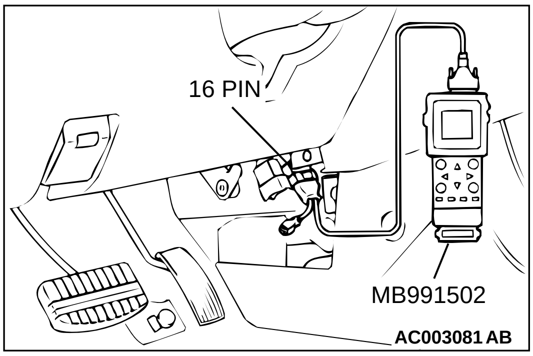
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-13 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

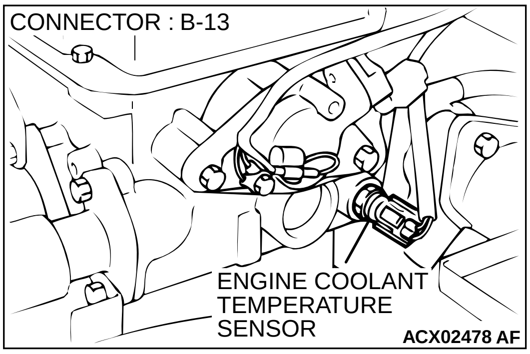
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

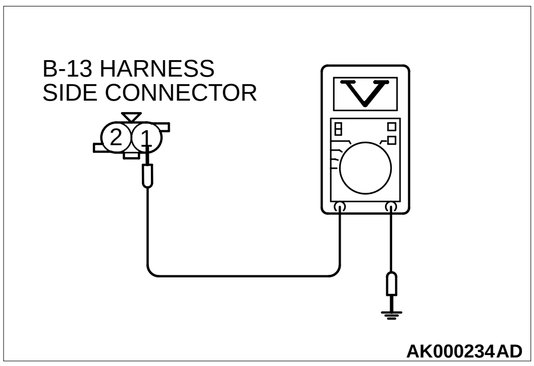
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Replace the PCM. Then go to Step 14.



STEP 5. Check connector B-13 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



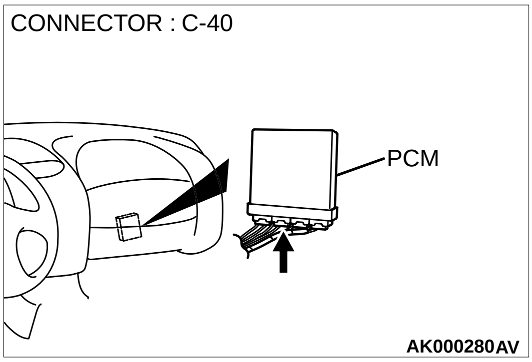
STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-13.

(1) Disconnect the connector B-13 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

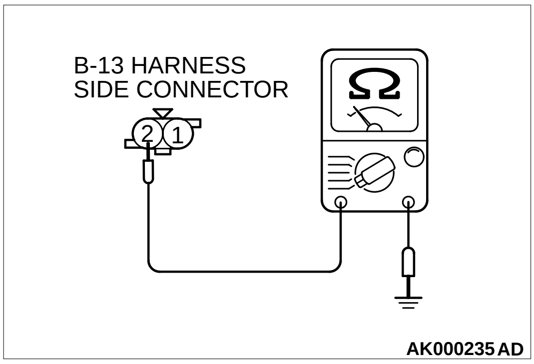


STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-13.

(1) Disconnect the connector B-13 and measure at the harness side.

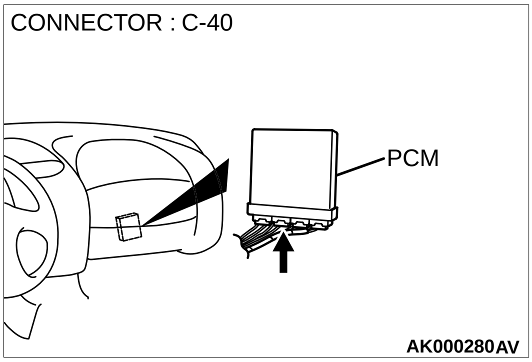
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

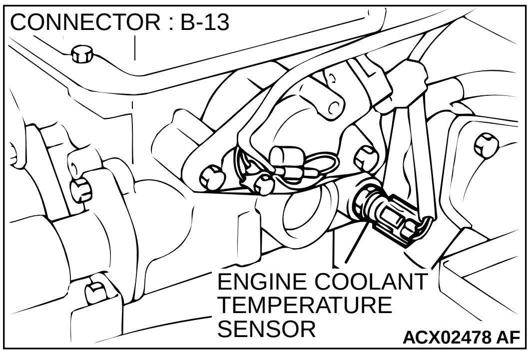


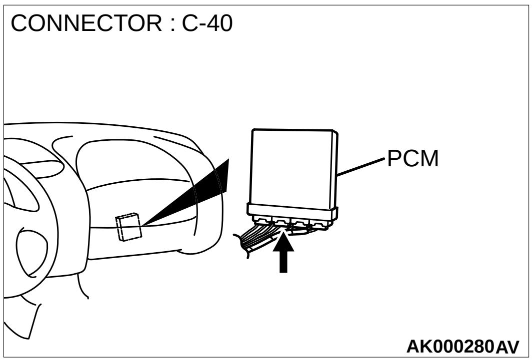
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



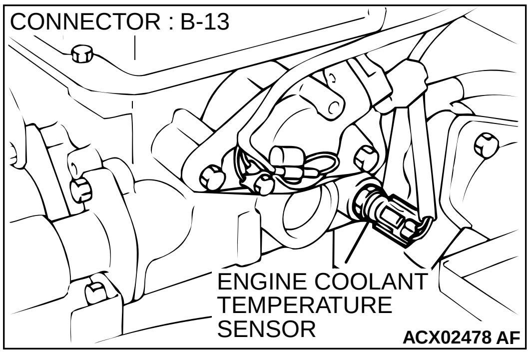


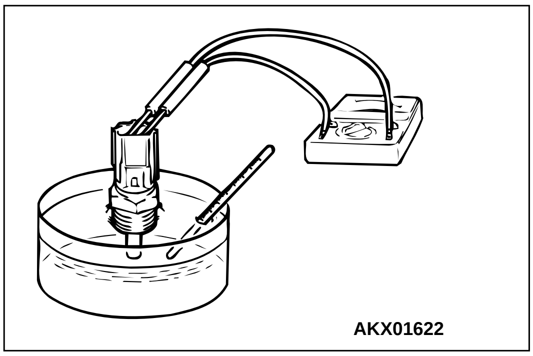
STEP 10. Check for harness damage between engine coolant temperature sensor connector B-13 terminal 2 and PCM connector C-40 terminal 57.

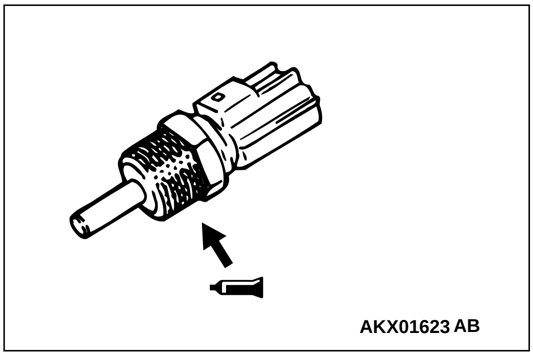
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.







STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-13

(2) Remove the engine coolant temperature sensor.

(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:

5.3 – 6.7 kΩ [at 0° C (32° F)]
2.3 – 3.0 kΩ [at 20° C (68° F)]
1.0 – 1.5 kΩ [at 40° C (104° F)]
0.30 – 0.42 kΩ [at 80° C (176° F)]

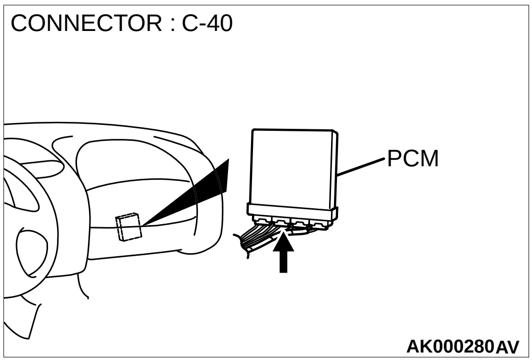
(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m(22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

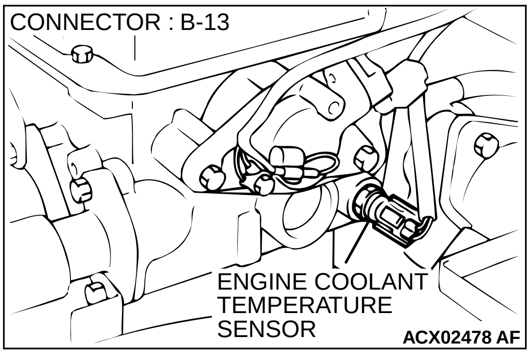
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

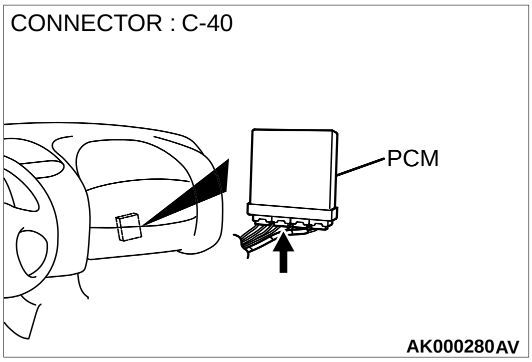


STEP 12. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.





STEP 13. Check for harness damage between engine coolant temperature sensor connector B-13 terminal 1 and PCM connector C-40 terminal 44.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

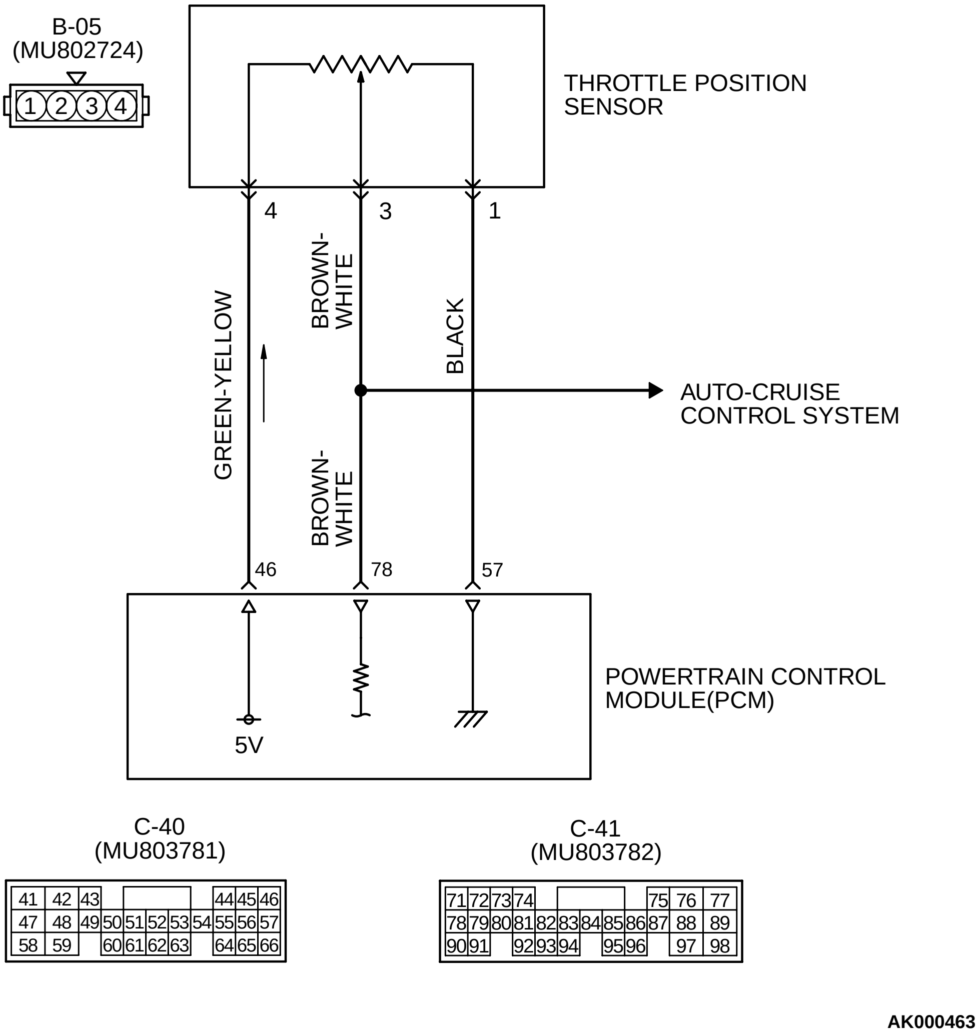
STEP 14. Test the OBD-II drive cycle.

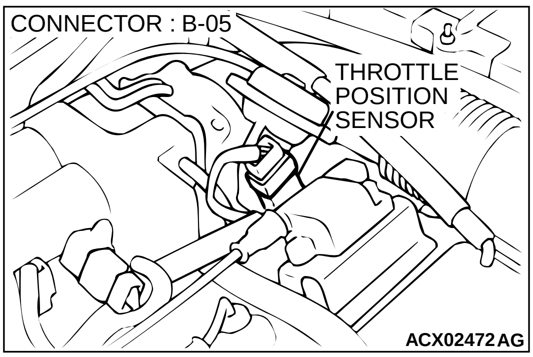
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

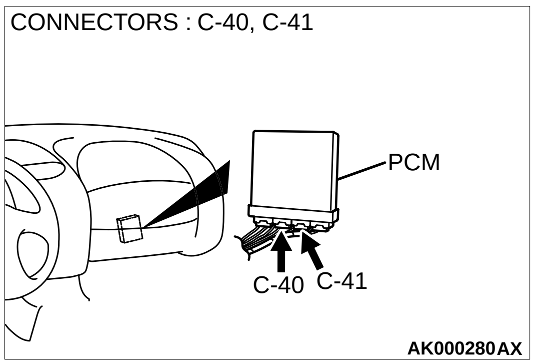
Q: Is the DTC P0117 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0121: Throttle Position Circuit Range/Performance Problem







CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the PCM (terminal 46).
  The ground terminal (terminal 1) is grounded with PCM (terminal 57).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- The sensor output voltage remains 2 volts or more for two seconds when engine speed is 1,000 r/min or less, and volumetric efficiency is 60% or less.

or

- TPS output voltage has continued to be 0.2 volt or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

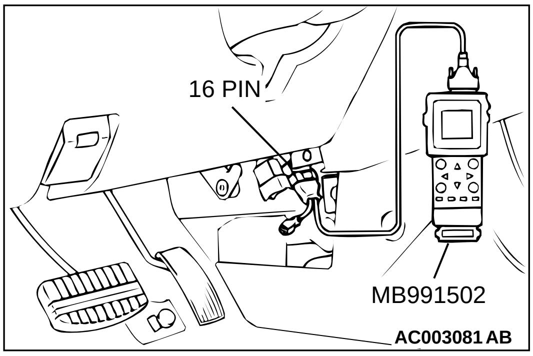
- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

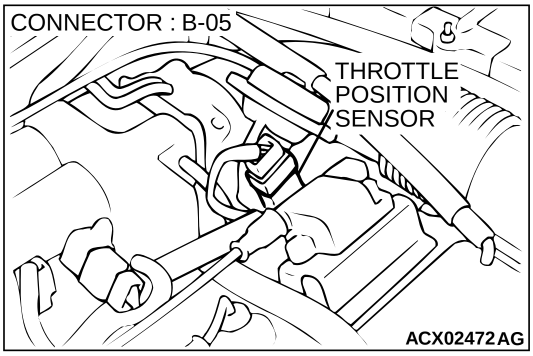
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Go to Step 2.

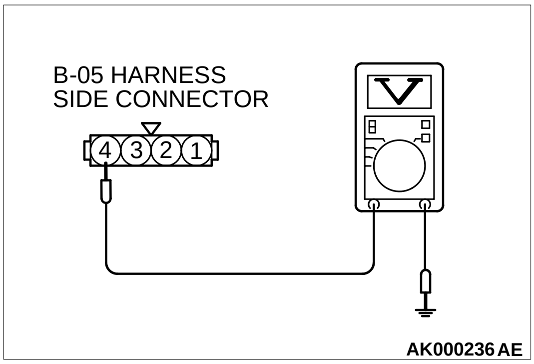
STEP 2. Check connector B-05 at throttle position sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.



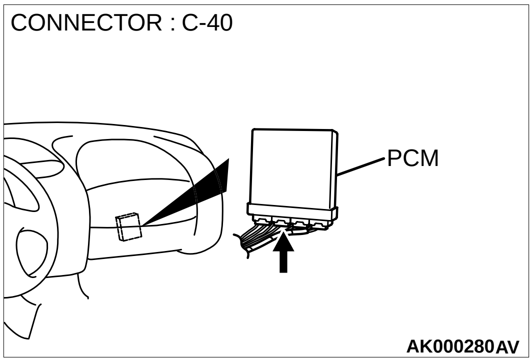
STEP 3. Check the sensor supply voltage at throttle position sensor harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

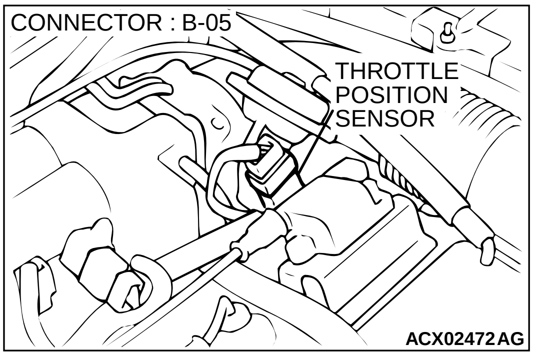
YES : Go to Step 6.
NO : Go to Step 4.

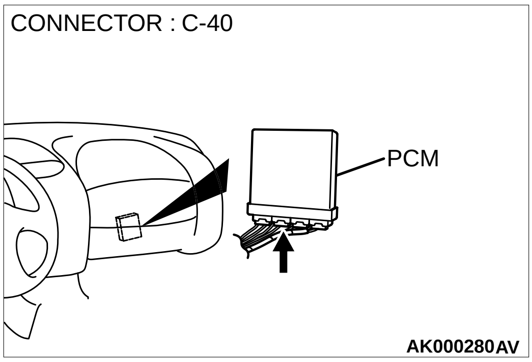


STEP 4. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.

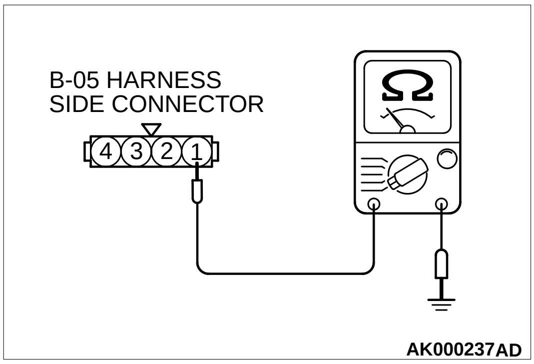




STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-05 terminal 4 and PCM connector C-40 terminal 46.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

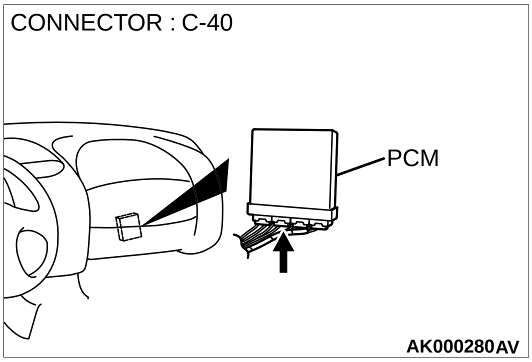


STEP 6. Check the continuity at throttle position sensor harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Measure the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

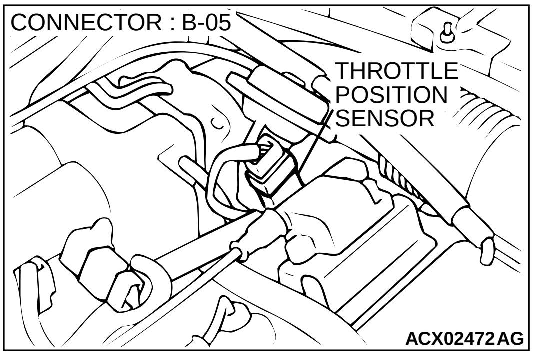
YES : Go to Step 9.
NO : Go to Step 7.

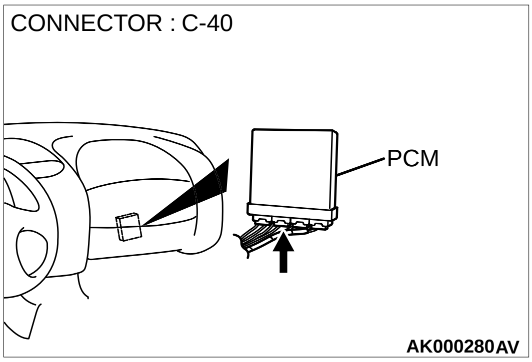


STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.

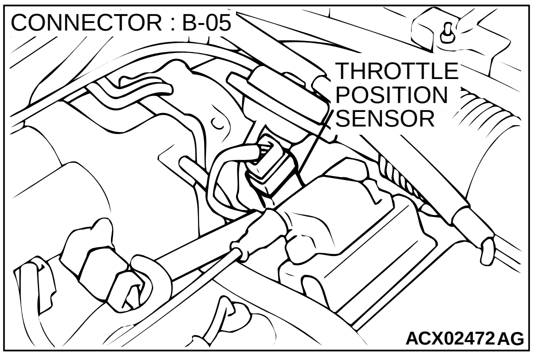


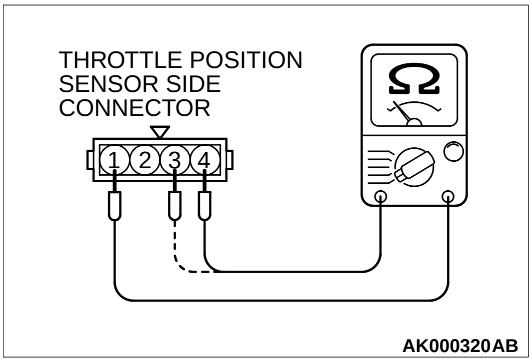


STEP 8. Check for open circuit and harness damage between throttle position sensor connector B-05 terminal 1 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.





STEP 9. Check the throttle position sensor.

(1) Disconnect the connector B-05.

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

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

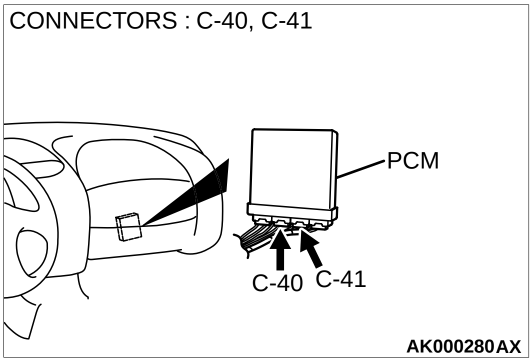
(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 10.

NO : Replace the throttle position sensor.(Refer to P.13A-452, Throttle Body.) Then go to Step 14.

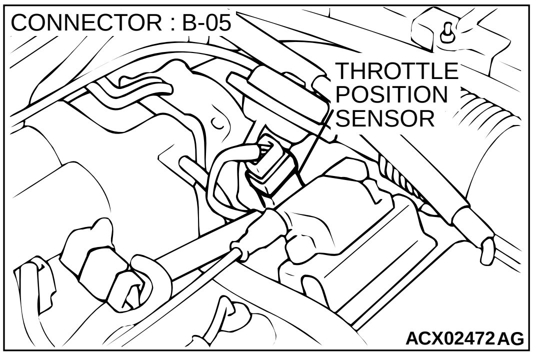


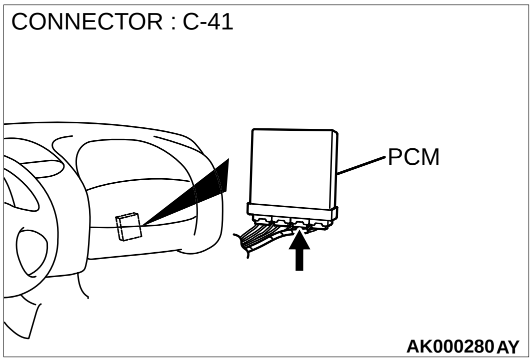
STEP 10. Check connector C-40, C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 14.





STEP 11. Check for open circuit and short circuit to ground between throttle position sensor connector B-05 terminal 3 and PCM connector C-41 terminal 78.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

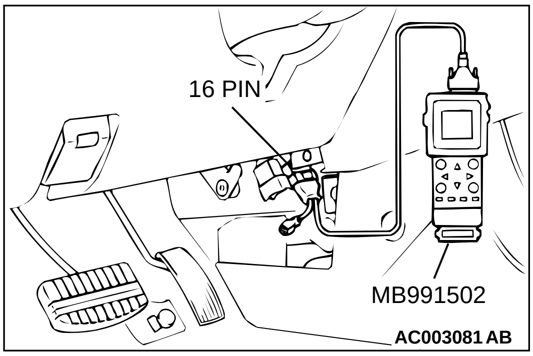
STEP 12. Check for short circuit to ground between throttle position sensor connector and auto-cruise control-ECU.

Refer to GROUP 17, Auto Cruise Control System-Diagnostic Trouble Code Chart (P.17-10).

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.



STEP 13. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

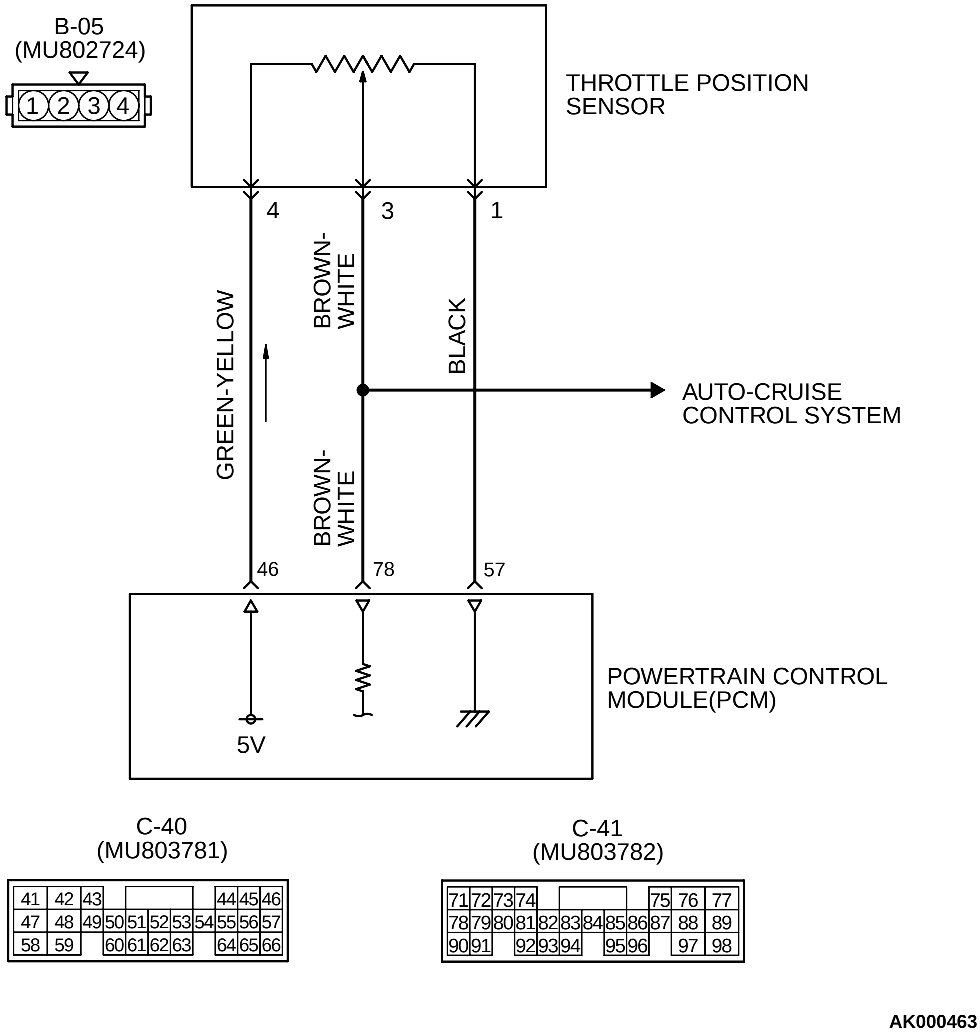
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

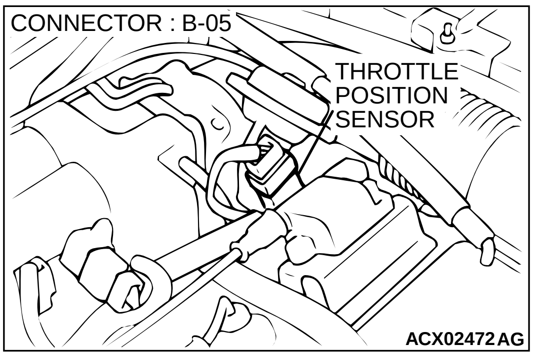
Q: Is the DTC P0121 is output?

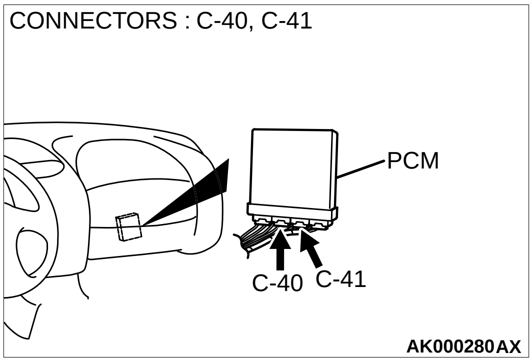
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0122: Throttle Position Circuit Low Input







CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the PCM (terminal 46). The ground terminal (terminal 1) is grounded with PCM (terminal 57).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the staring sequence was completed.
- Engine speed is higher than 2,000 r/min.
- Volumetric efficiency is higher than 60 percent.

Judgement Criteria

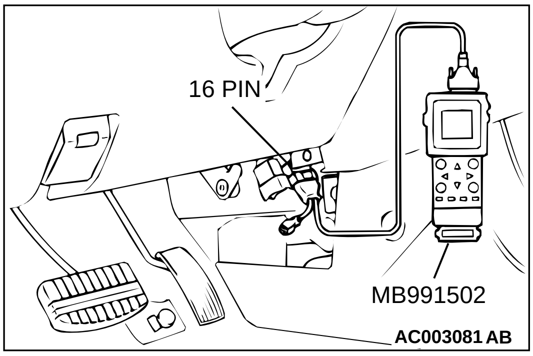
- TPS output voltage has continued to be 0.8 volt or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

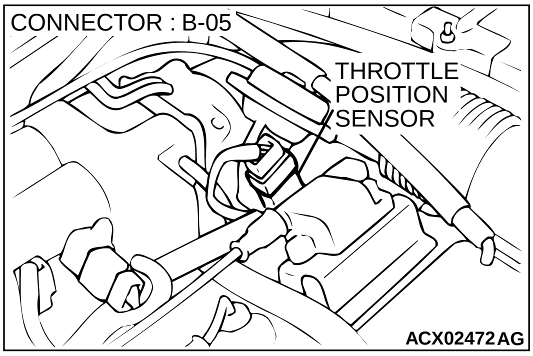
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

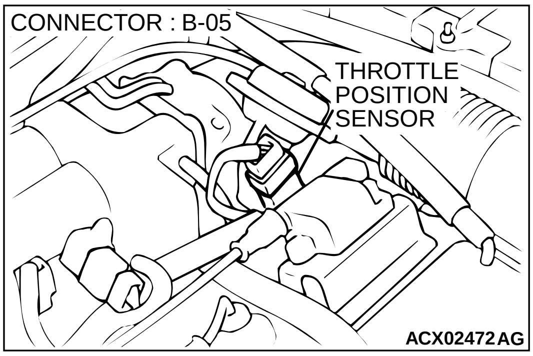
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.

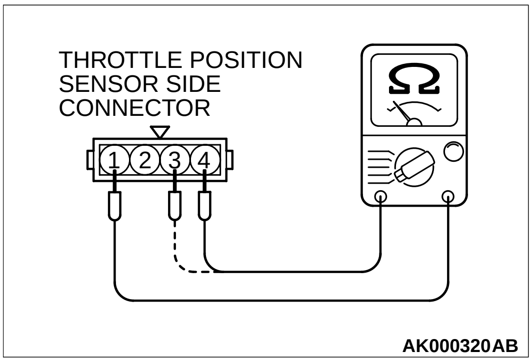


STEP 2. Check connector B-05 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 9.





STEP3. Check the throttle position sensor.

(1) Disconnect the connector B-05.
(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.
(4) Move the throttle valve from the idle position to the full-open position.
- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

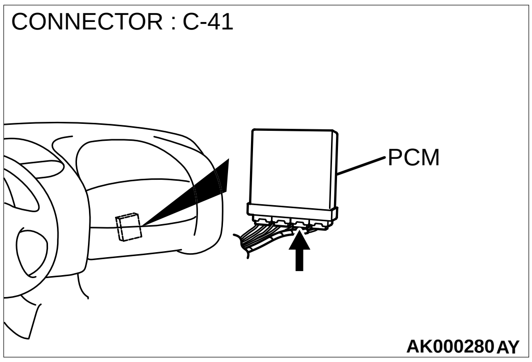
YES : Go to Step 4.
NO : Replace the throttle position sensor.(Refer to P.13A-452, Throttle Body.) Then go to Step 9.

STEP 4. Check the maladjusted throttle position sensor.

Refer to, Throttle Position Sensor Adjustment(P.13A-437).

Q: Is the output voltage normal?

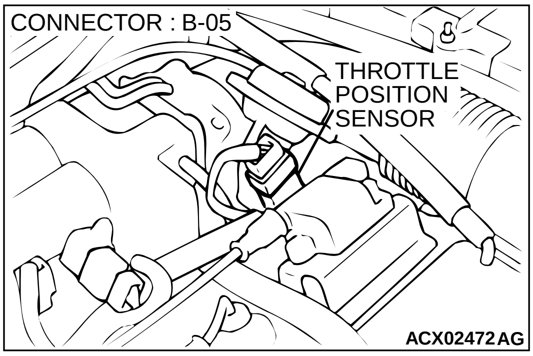
YES : Go to Step 5.
NO : Adjust it. Then go to Step 9.

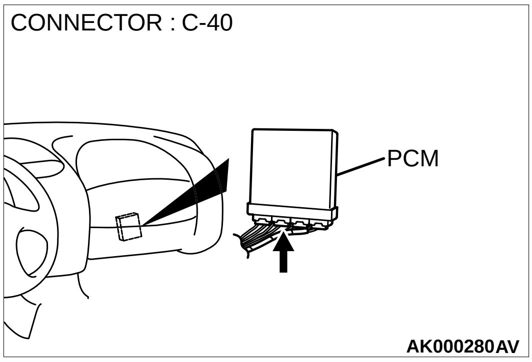


STEP 5. Check connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 9.



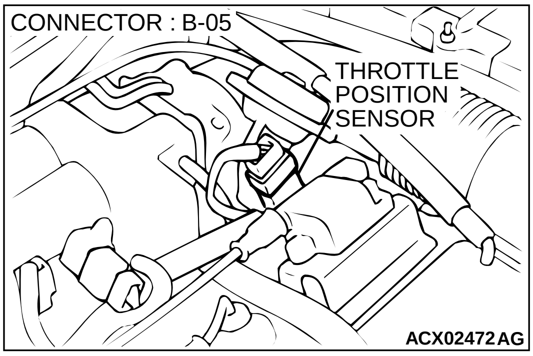


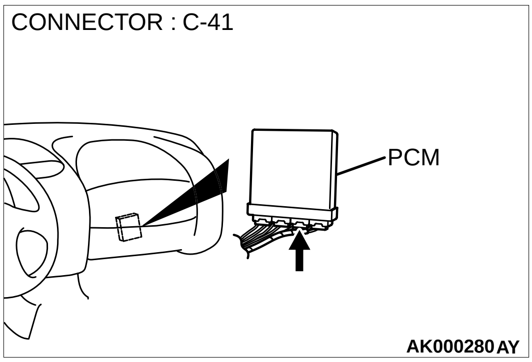
STEP 6. Check for harness damage between throttle position sensor connector B-05 terminal 4 and PCM connector C-40 terminal 46.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 9.



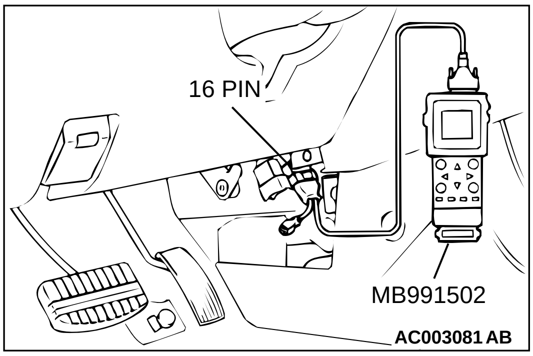


STEP 7. Check for harness damage between throttle position sensor connector B-05 terminal 3 and PCM connector C-41 terminal 78.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 9.



STEP 8. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

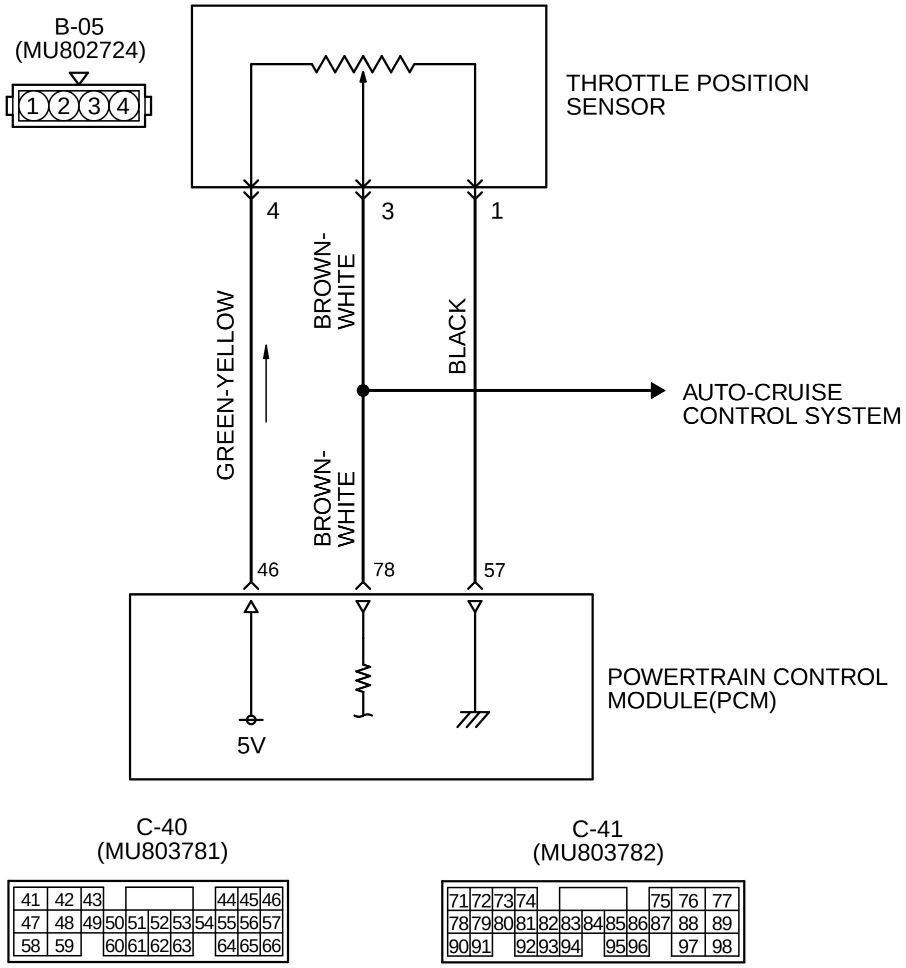
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

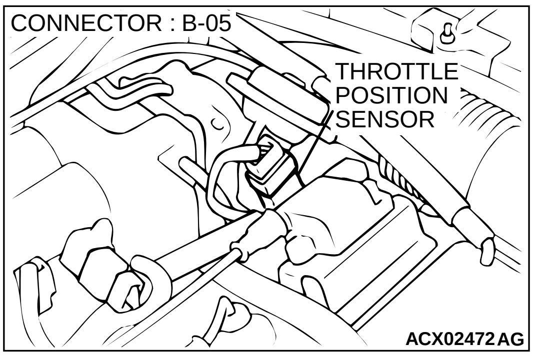
Q: Is the DTC P0122 is output?

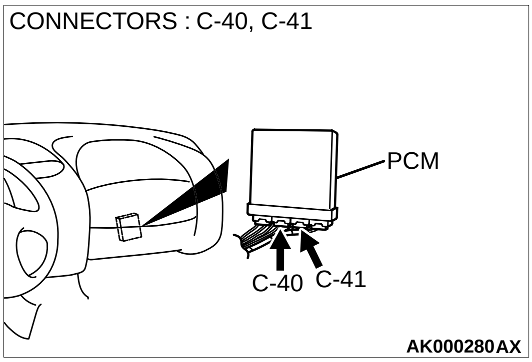
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0123: Throttle Position Circuit High Input







CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the PCM (terminal 46).
  The ground terminal (terminal 1) is grounded with PCM (terminal 57).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the staring sequence was completed.
- Engine speed is lower than 3,000 r/min.
- Volumetric efficiency is lower than 30 percent.

Judgement Criteria

- TPS output voltage has continued to be 4.6 volts or higher for 2 seconds.

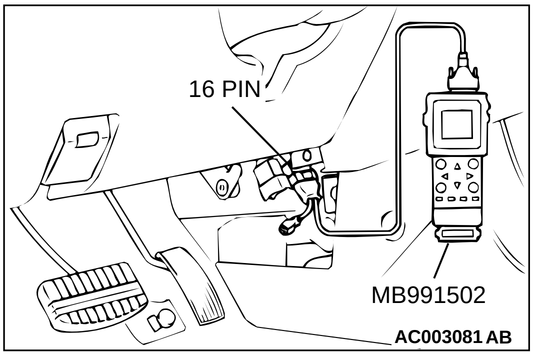
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

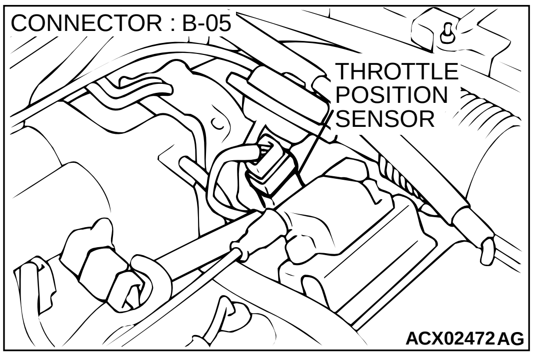
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

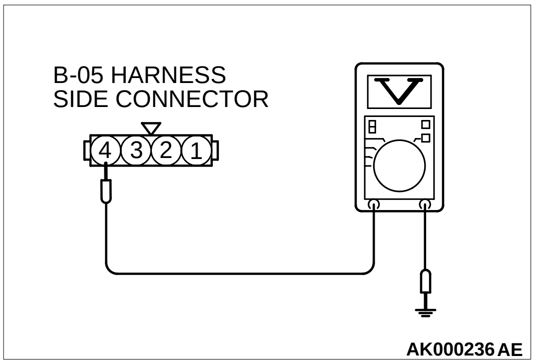
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



STEP 2. Check connector B-05 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.



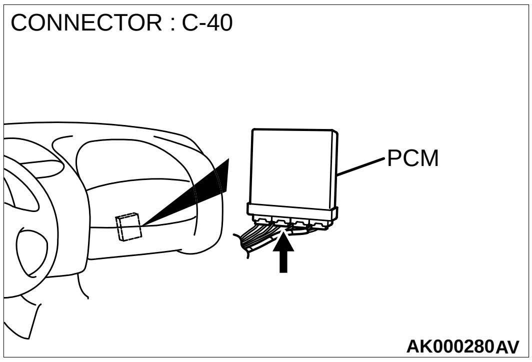
STEP 3. Check the sensor supply voltage at throttle position sensor harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

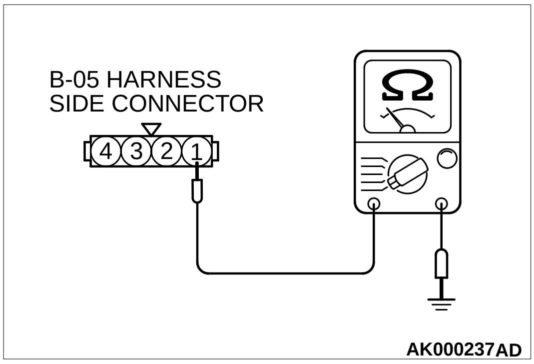
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.

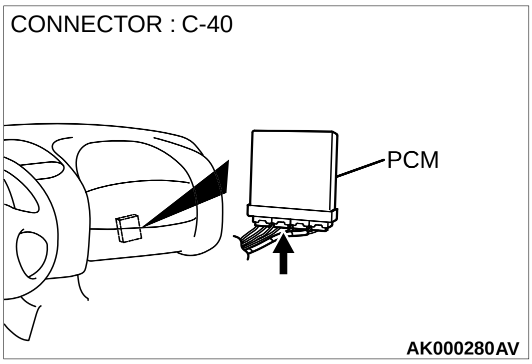


STEP 5. Check the continuity at throttle position sensor harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Measure the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

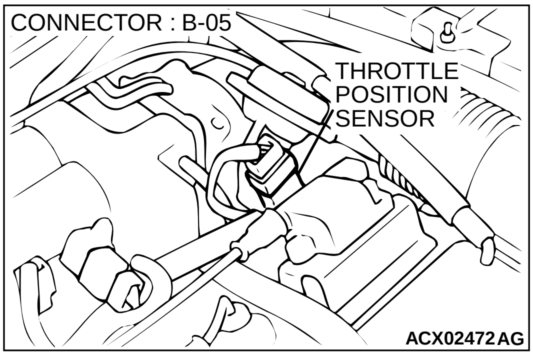
YES : Go to Step 8.
NO : Go to Step 6.

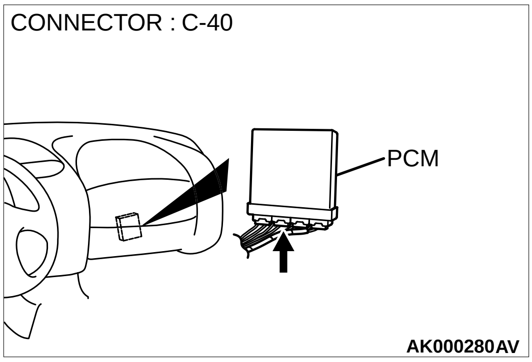


STEP 6. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.



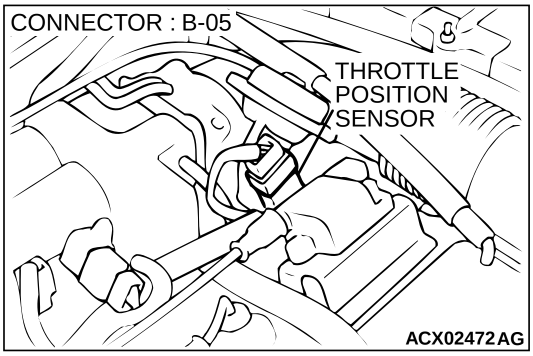


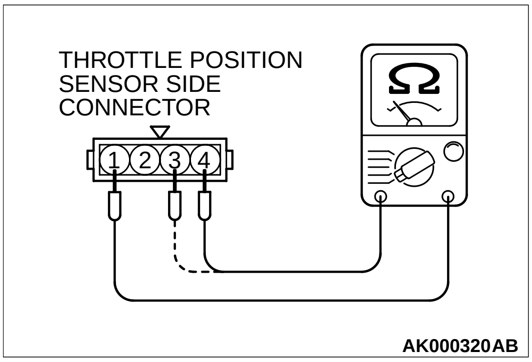
STEP 7. Check for open circuit and harness damage between throttle position sensor connector B-05 terminal 1 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.





STEP 8. Check the throttle position sensor.

(1) Disconnect the connector B-05.

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

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

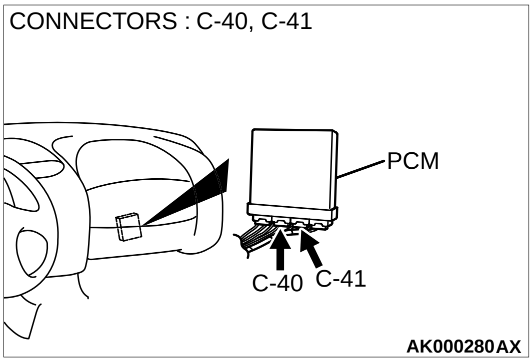
(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 9.

NO : Replace the throttle position sensor.(Refer to P.13A-452, Throttle Body.) Then go to Step 11.

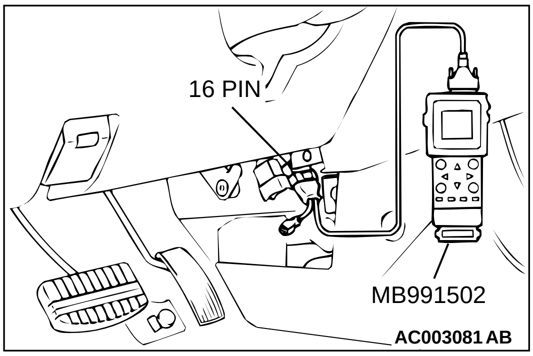


STEP 9. Check connector C-40, C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.



STEP 10. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0123 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0128: Coolant Thermostat Malfunction

TECHNICAL DESCRIPTION

- The PCM checks the time for the engine coolant temperature to reach the judgment temperature.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is between -10° C (14° F) and 82° C (180° F) when the engine is started.

- The engine coolant temperature – intake air temperature is 5° C (48° F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 2° C (36° F) or less.
- The volume air flow sensors output frequency is in the low frequency (50-100Hz or less) state for 400 seconds or less.

Judgment Criteria

- The time for the engine coolant temperature to rise to 82° C (180° F) takes longer than the specified time *.

*: Approximately 11 to 23 minutes when the engine coolant temperature at start is 20° C (68° F) or more.
Approximately 12 to 60 minutes when the engine coolant temperature at start is 20° C (68° F) or less.

- Only one monitor during one drive cycle.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- The thermostat is faulty
- PCM failed.

DIAGNOSIS

STEP 1. Check the cooling system.

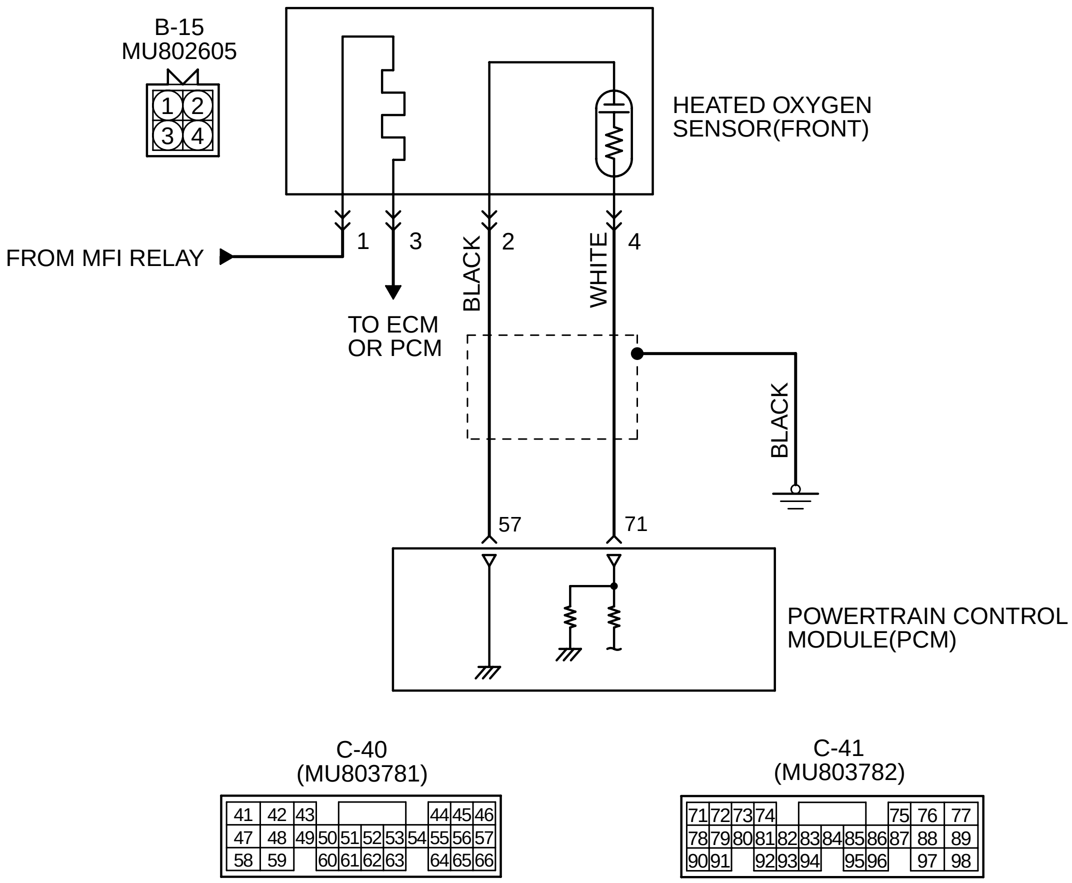
Refer to GROUP 14, Engine Cooling Diagnosis (P.14-2).

Q: Is the cooling system normal?

YES : Replace the PCM. Then check that the DTC P0128 does not reset.

NO : Repair it. Then check that the DTC P0128 does not reset.

DTC P0130: O_2 Sensor Circuit Malfunction (sensor 1)



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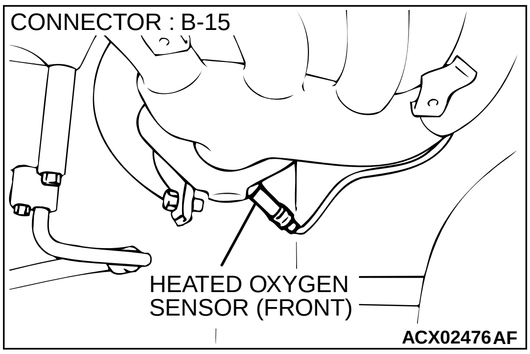

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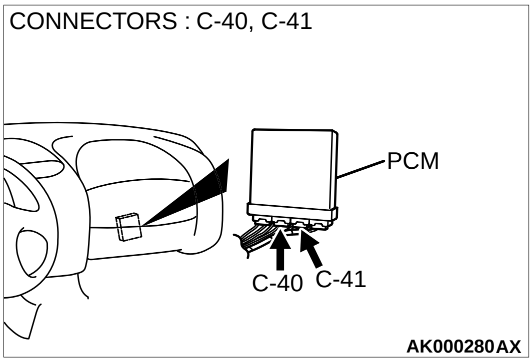


AK000280AX

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal 71) from the output terminal (terminal 4) of the heated oxygen sensor (front).
- Terminal 2 of the heated oxygen sensor (front) is grounded with PCM (terminal 57).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.

- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the PCM also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower for three minutes or more after the starting sequence was completed.
- Engine coolant temperature is higher than 82° C (180° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (front) output line via a resistor.

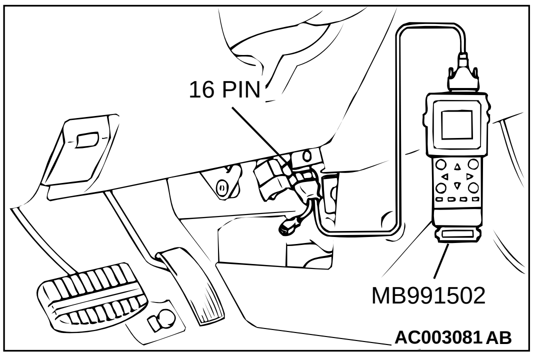
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)
MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

⚠ CAUTION

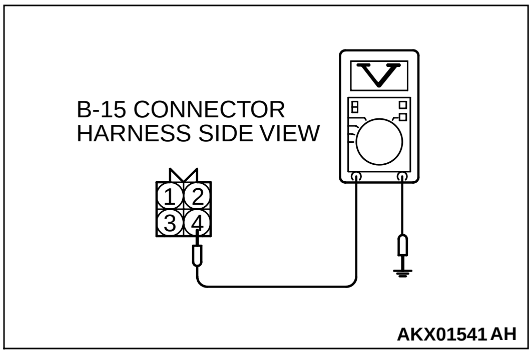
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



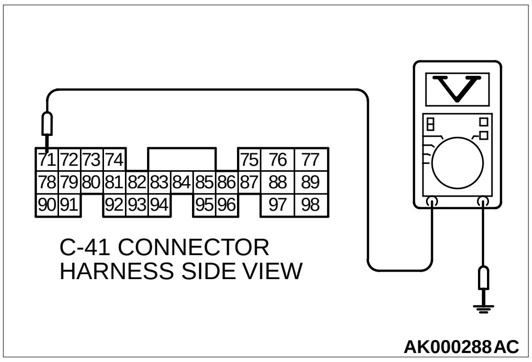
STEP 2. Check the sensor output voltage at heated oxygen sensor (front) connector B-15 by backprobing.

(1) Do not disconnect the connector B-15.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.



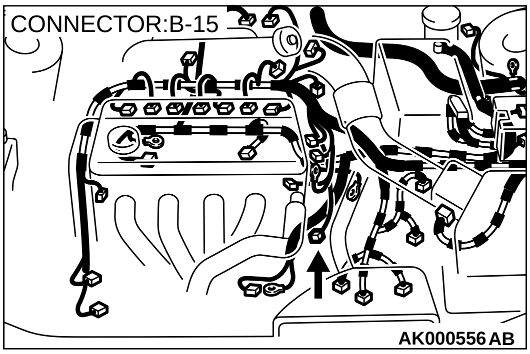
STEP 3. Check the sensor output voltage at PCM connector C-41 by backprobing.

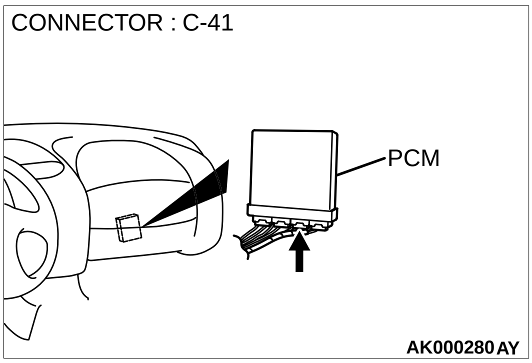
(1) Do not disconnect the connector C-41.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 71 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



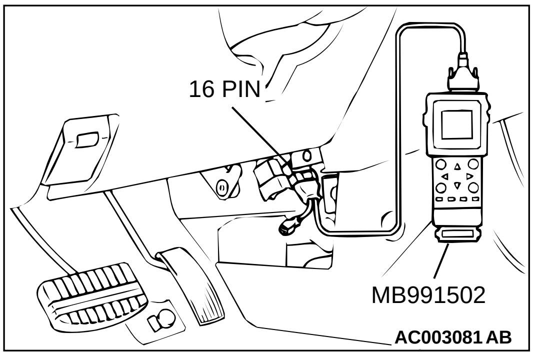


STEP 4. Check connector B-15 at heated oxygen sensor (front) and connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.

STEP 5. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

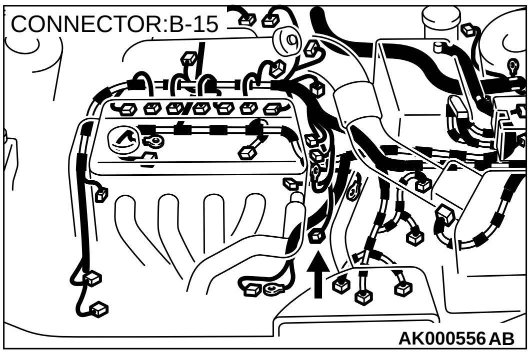
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

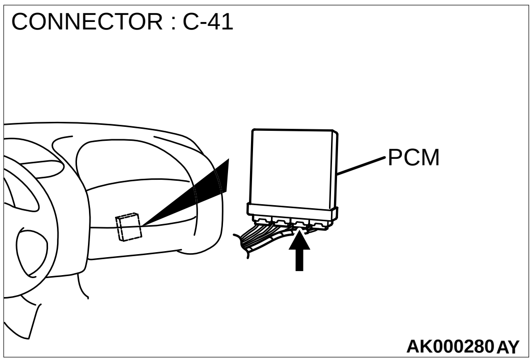
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Replace the PCM. Then go to Step 15.

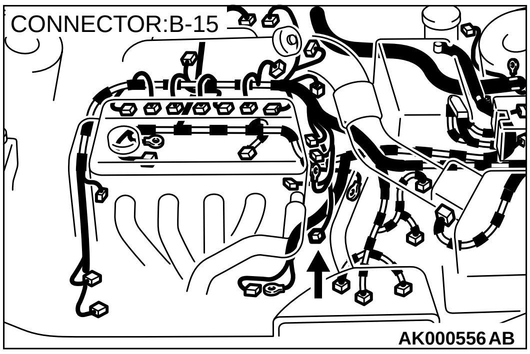
STEP 6. Check connector B-15 at heated oxygen sensor (front) and connector C-41 at PCM for damage.





Q: Is the connector in good condition?

YES : Repair harness wire between heated oxygen sensor (front) connector B-15 terminal 4 and PCM connector C-41 terminal 71 because of open circuit or harness damage. Then go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.

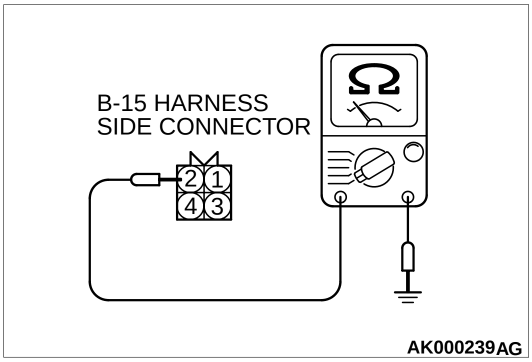


STEP 7. Check connector B-15 at heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.



STEP 8. Check the continuity at heated oxygen sensor (front) harness side connector B-15.

(1) Disconnect the connector B-15 and measure at the harness side.

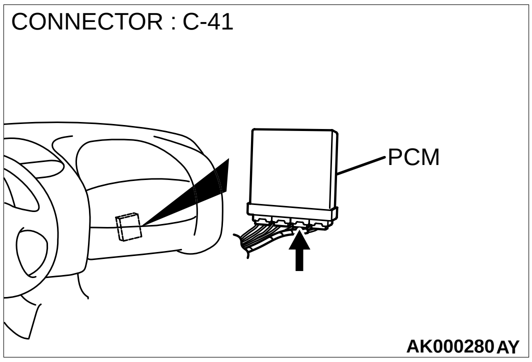
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

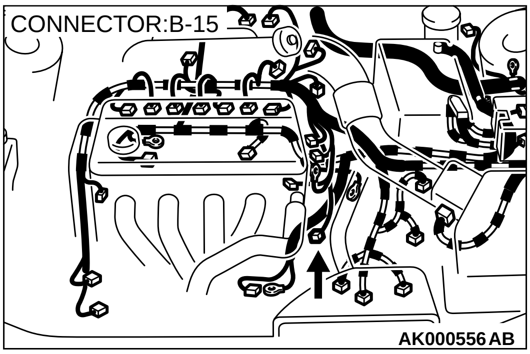


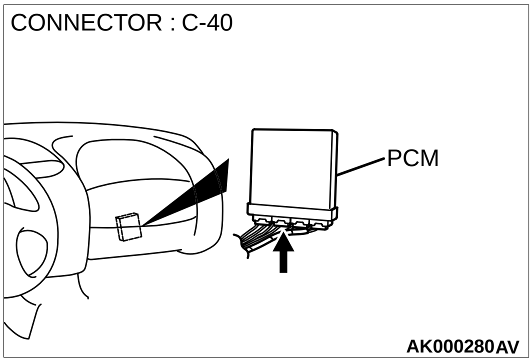
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.



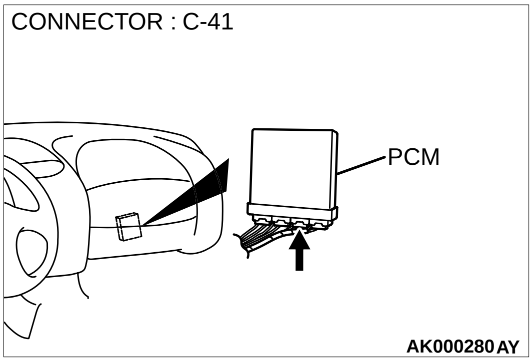


STEP 10. Check for open circuit and harness damage between heated oxygen sensor (front) connector B-15 terminal 2 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.

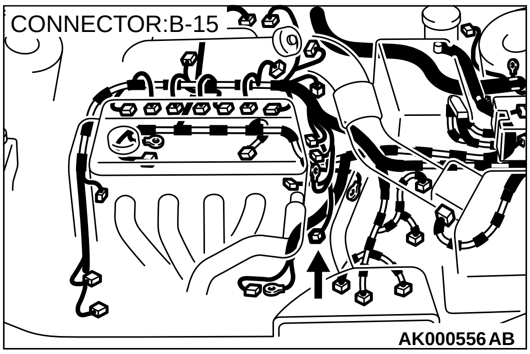


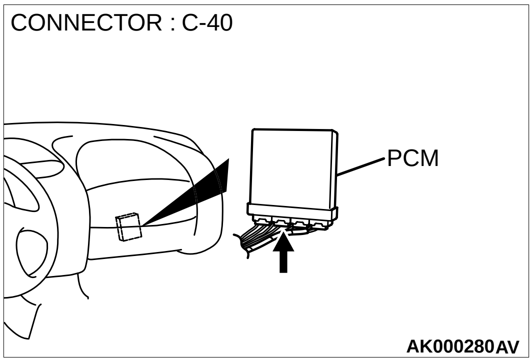
STEP 11. Check connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.

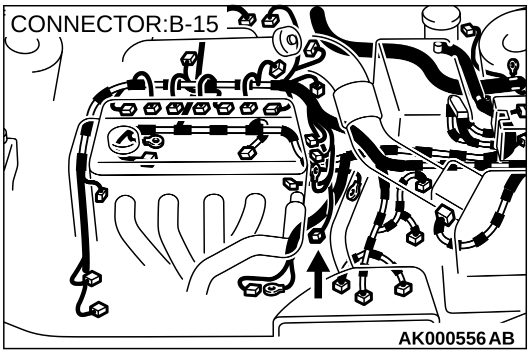


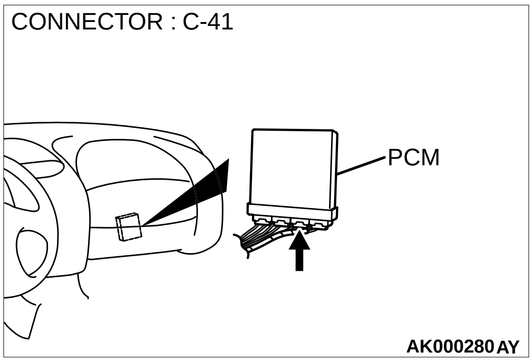


STEP 12. Check for harness damage between heated oxygen sensor (front) connector B-15 terminal 2 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 15.

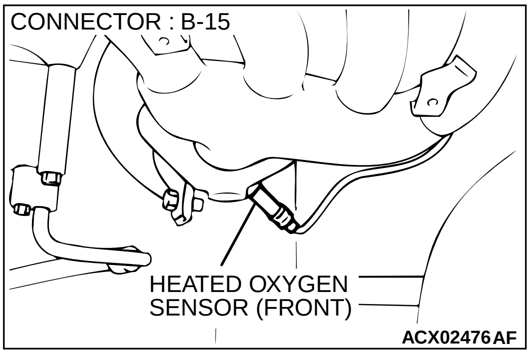


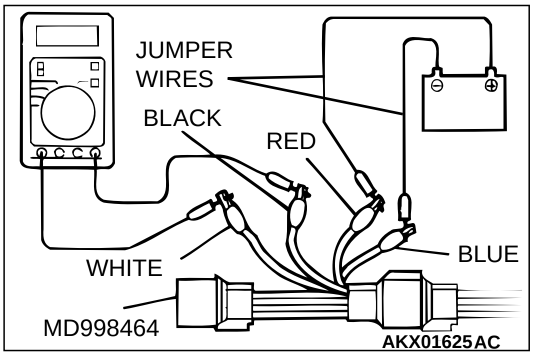


STEP 13. Check for short circuit to ground and harness damage between heated oxygen sensor (front) connector B-15 terminal 4 and PCM connector C-41 terminal 71.

Q: Is the harness wire in good condition?

YES : Go to Step 14.
NO : Repair it. Then go to Step 15.





STEP 14. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-15 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80° C (176° F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the PCM. Then go to Step 15.

NO : Replace the heated oxygen sensor (front). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor and Procedure 6 – Other Monitor(P.13A-5).

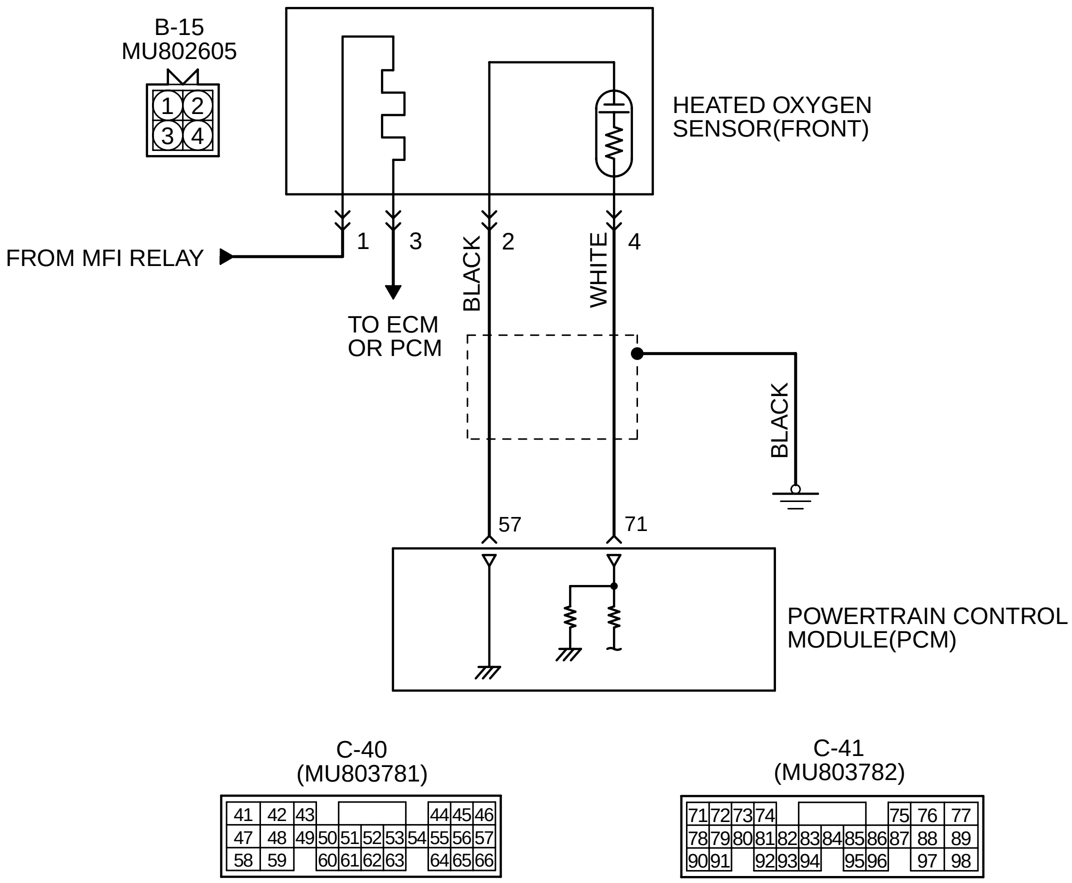
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0130 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0133: O_2 Sensor Circuit Slow Response (sensor 1)



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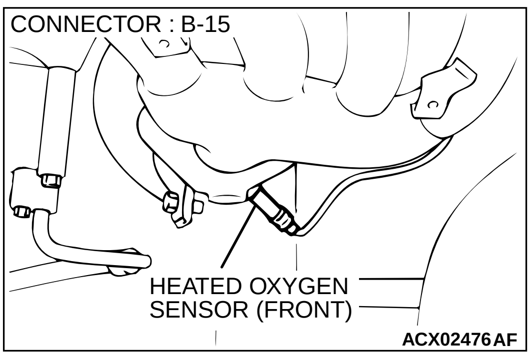
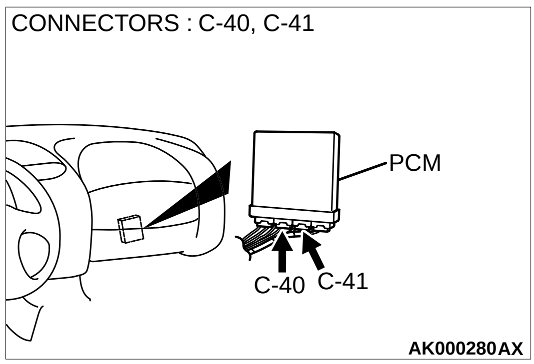




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal 71) from the output terminal (terminal 4) of the right bank heated oxygen sensor (front).
- Terminal 2 of the right bank heated oxygen sensor (front) is grounded with PCM (terminal 57).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the PCM also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 50° C (176° F).
- Engine speed is at between 1,200 and 3,000 r/min.
- Volumetric efficiency is at between 25 and 60 percent.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Under the closed loop air/fuel control.
- PCM dose not judge to be idling state.

Judgment Criteria

- The heated oxygen sensor (front) sends "lean" and "rich" signals alternately eight times (Response time 1.1 or equivalent) or less for 10 seconds.
- Only one monitor during one drive cycle

NOTE: If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is short, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.

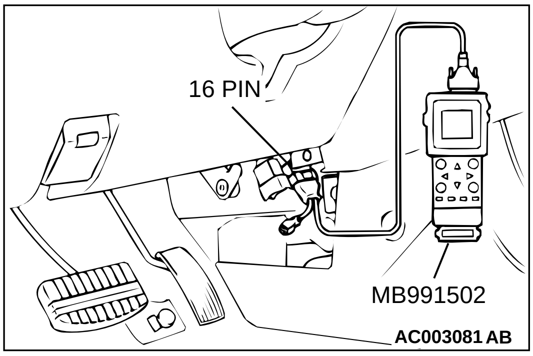
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
(4) Warm up the engine, 2500r/min.
- Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points(P.00-8).
NO : Replace the heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0133 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0134: O_2 Sensor Circuit No Activity Detected (sensor 1)

O_2 Sensor Circuit No Activity Detected (sensor 1)

- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit (P.13A-105).
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit (P.13A-154).

CIRCUIT OPERATION

- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit (P.13A-105).
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit (P.13A-154).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the PCM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the PCM also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Thirty seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 81° C (178° F).
- Engine speed is higher than 1200r/min.
- Volumetric efficiency is higher than 30 percent.
- Under the closed loop air/fuel control.
- Monitoring time: 30seconds.

Judgment Criteria

- Multi port fuel injection system does not enter the closed loop control within about 30 seconds of meeting all criteria above.
- Only one monitor during one drive cycle.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools

MD998464: Test Harness

STEP 1. Check the exhaust leaks.

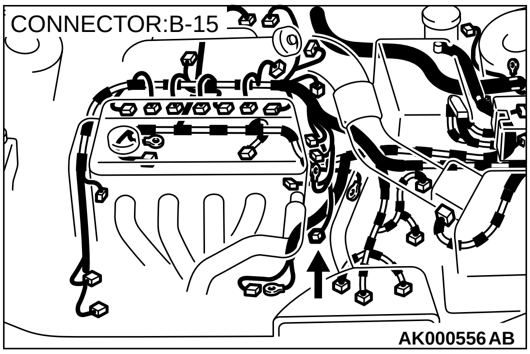
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 11.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 11.

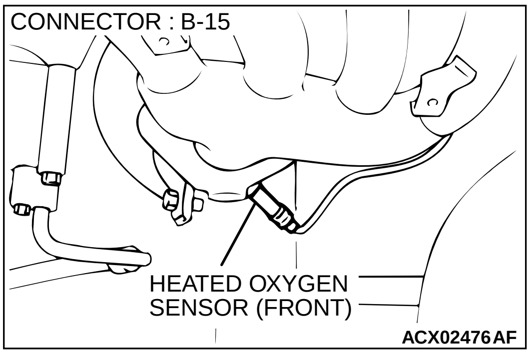


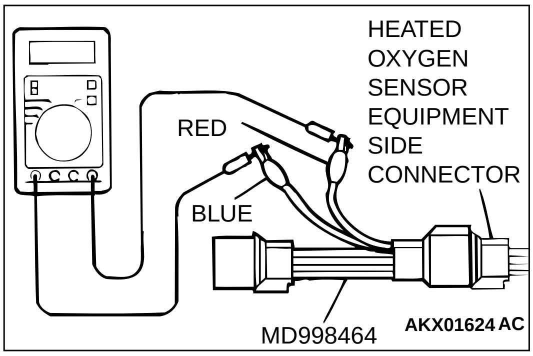
STEP 3. Check connector B-15 at the heated oxygen sensor (front) for damage.

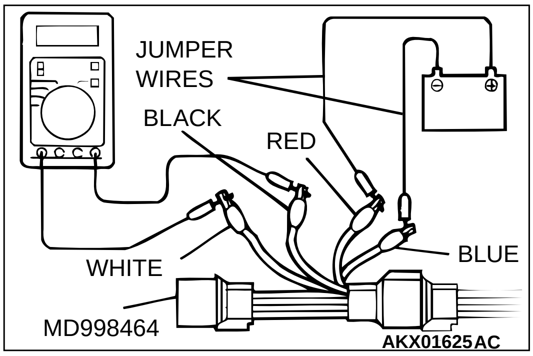
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.







STEP 4. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-15 and connect test harness special tool, MD998464 to the connector on the heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80° C (176° F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

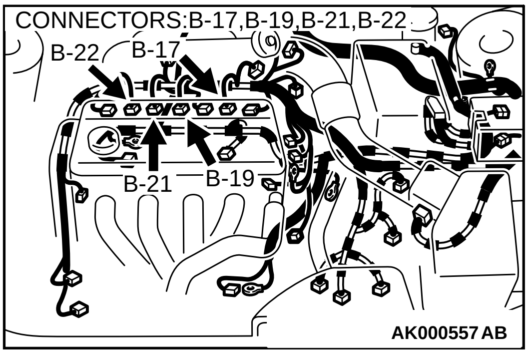
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Go to Step 5.

NO : Replace the heated oxygen sensor (front). Then go to Step 11.

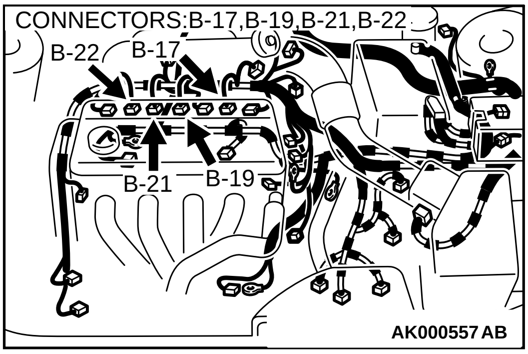


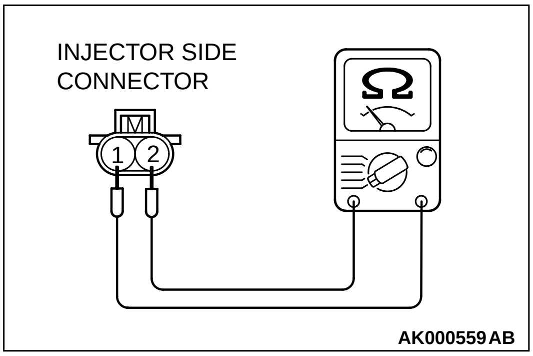
STEP 5. Check connector B-17, B-19, B-21, B-22 at injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.





STEP 6. Check the injector.

(1) Disconnect each injector connector.

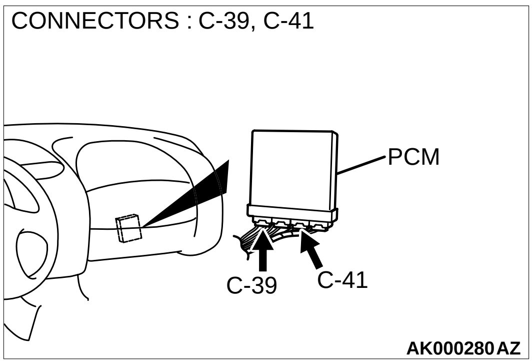
(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 7.

NO : Replace the injector. Then go to Step 11.



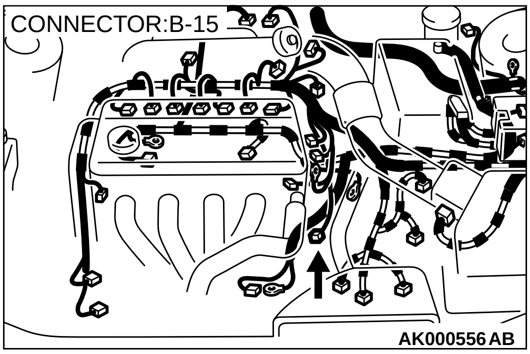
STEP 7. Check connector C-39, C-41 at PCM for damage.

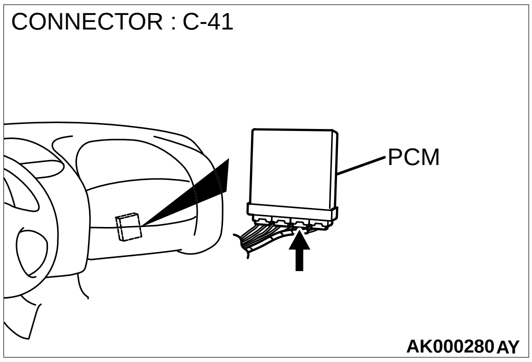
Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 11.

STEP 8. Check for harness damage between heated oxygen sensor (front) connector B-15 terminal 4 and PCM connector C-41 terminal 71.

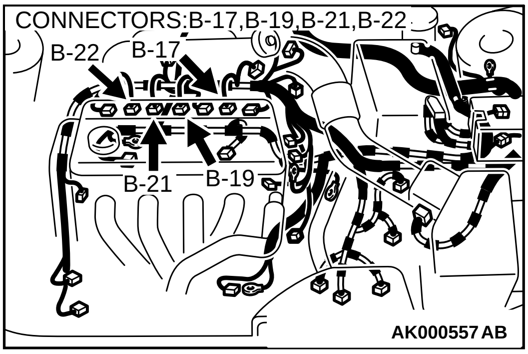


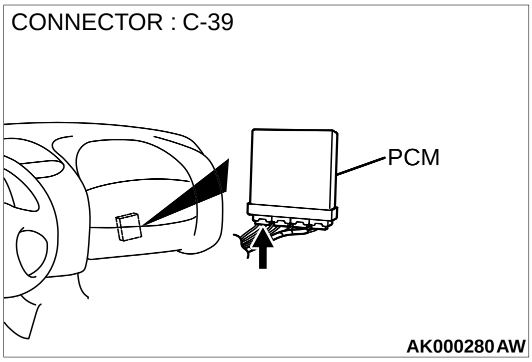


Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 11.

STEP 9. Check for harness damage between injector connector and PCM connector.





a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 11.

STEP 10. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Replace the PCM. Then go to Step 11.
NO : Repair it. Then go to Step 11.

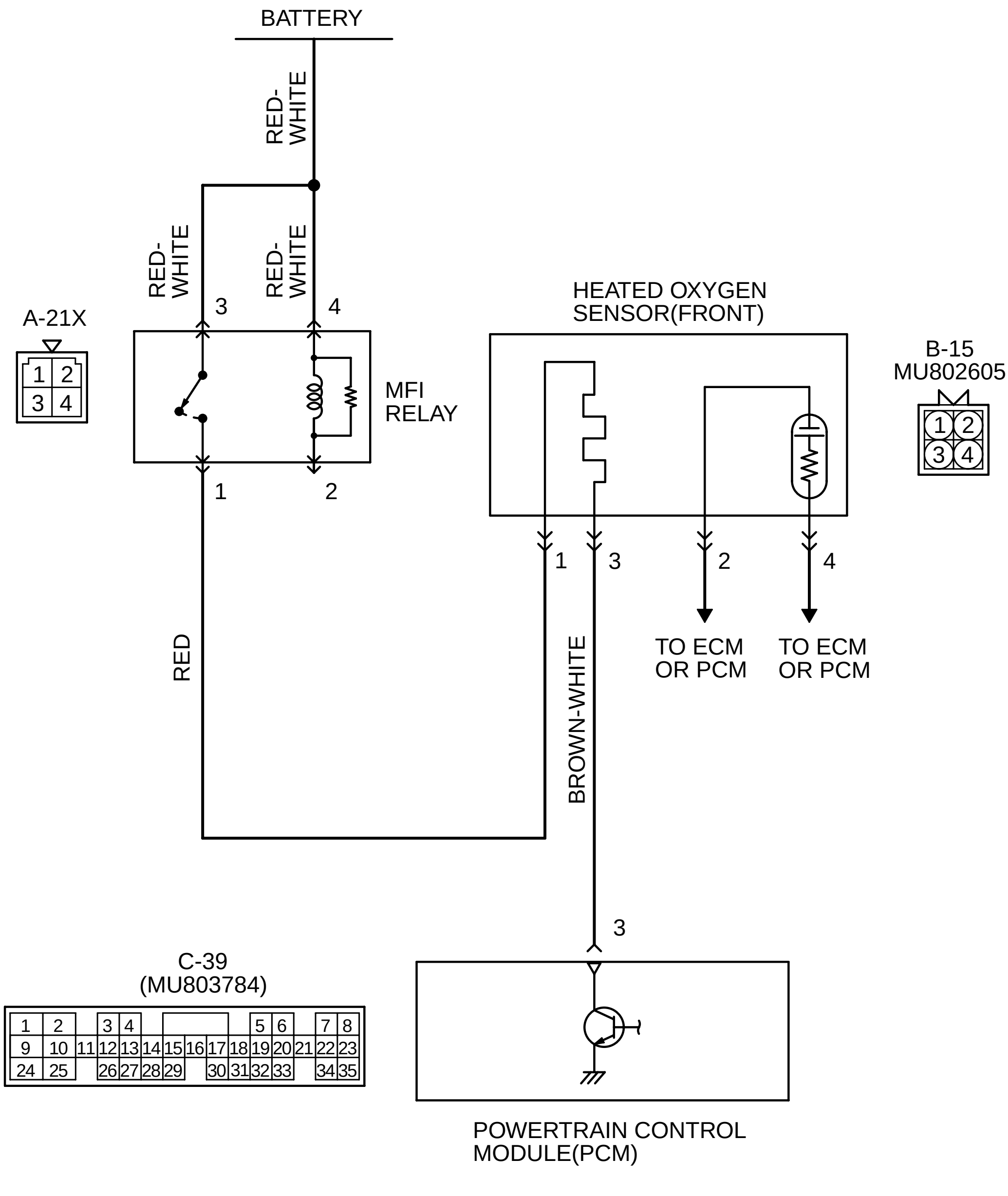
STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0134 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0135: O_2 Sensor Heater Circuit Malfunction (sensor 1)



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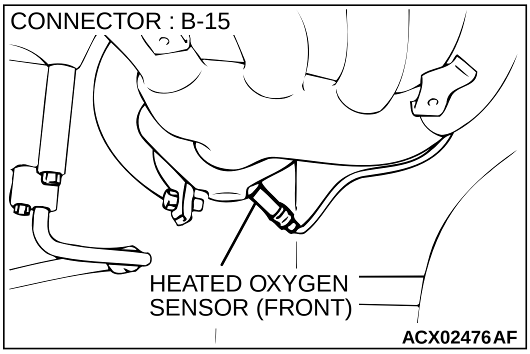
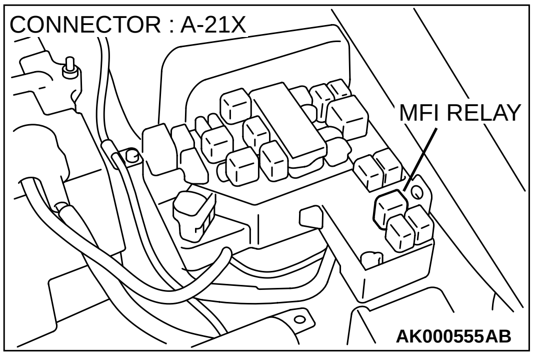
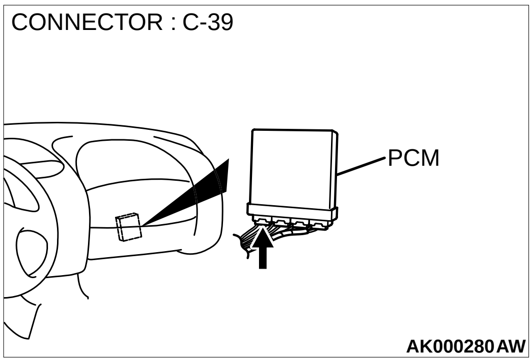






CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 1) to the heated oxygen sensor (front) heater.
- The PCM (terminal 3) controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF."

TECHNICAL DESCRIPTION

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 20° C (68° F).
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

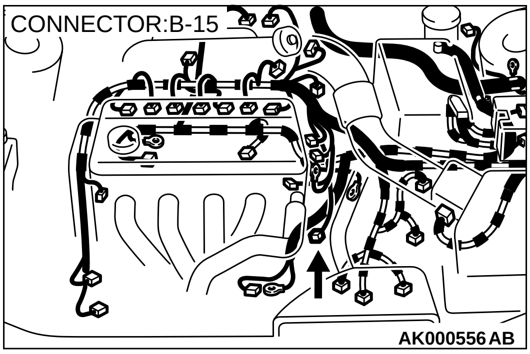
- Heater current of the heated oxygen sensor (front) heater has continued to be lower than 0.2 ampere or higher than 3.5 ampere for 6 seconds.
- One monitor during one drive cycle

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (front) heater circuit.
- Open circuit in heated oxygen sensor (front) heater.
- PCM failed.

DIAGNOSIS

Required Special Tools
MD998464: Test Harness

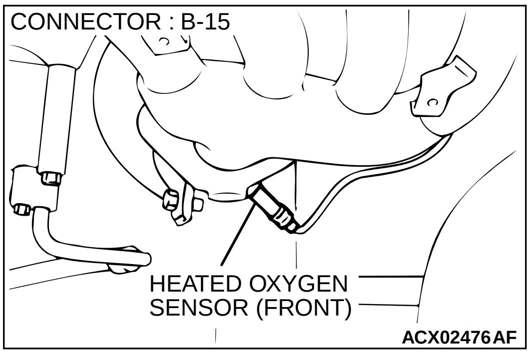


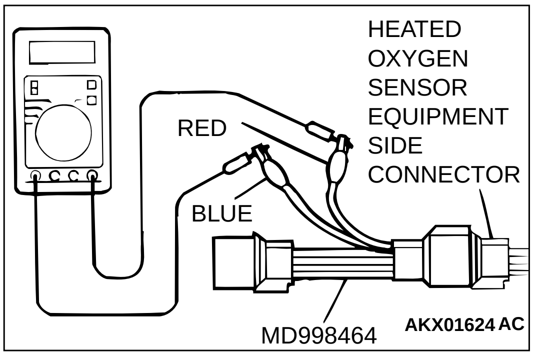
STEP 1. Check connector B-15 at the heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.





STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector B-15 and connect test harness special tool, MD998464, to the connector on the heated oxygen (front) sensor side.

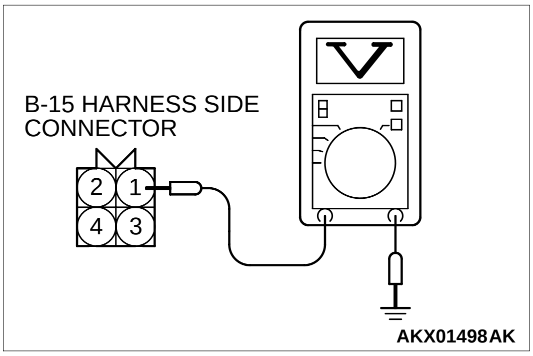
(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

Standard value: 4.5 – 8.0 ohm [at 20° C (68° F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (front). Then go to Step 12.



STEP 3. Check the power supply voltage at heated oxygen sensor (front) harness side connector B-15.

(1) Disconnect the connector B-15 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

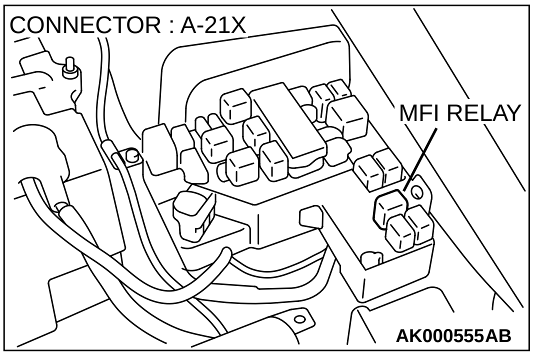
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.

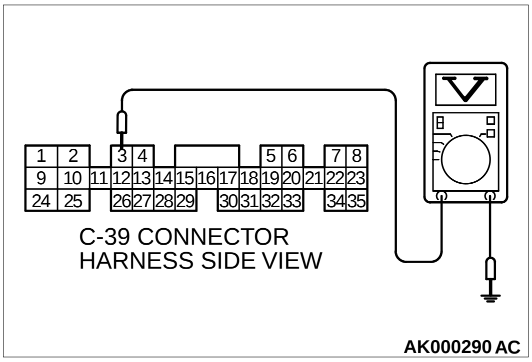


STEP 4. Check connector A-21X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and heated oxygen sensor (front) connector B-15 terminal 1 because of open circuit or short circuit to ground Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.



STEP 5. Check the power supply voltage at PCM connector C-39 by backprobing.

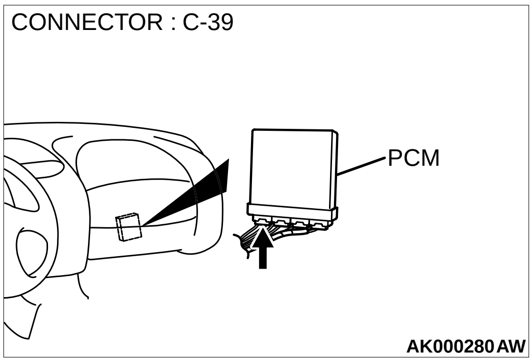
(1) Do not disconnect the connector C-39.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 6.



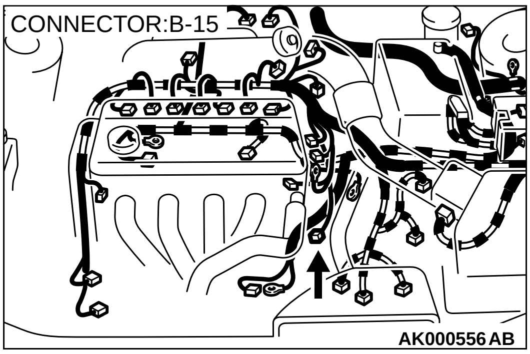
STEP 6. Check connector C-39 at PCM for damage.

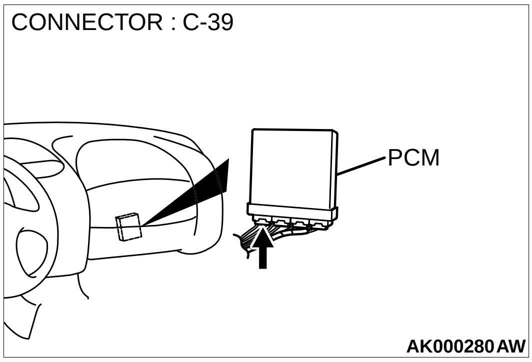
Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (front) connector B-15 terminal 3 and PCM connector C-39 terminal 3.



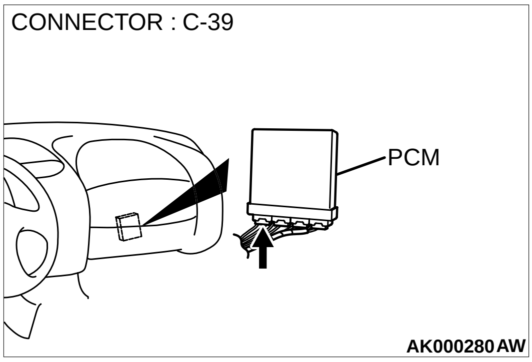


Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

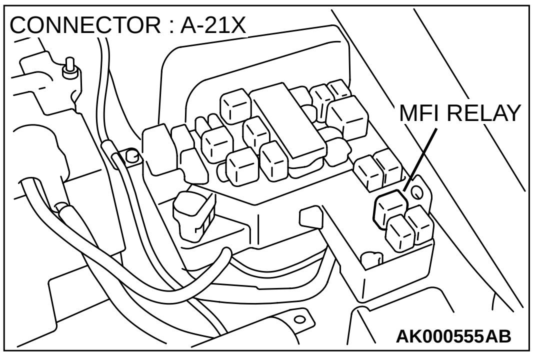
STEP 8. Check connector C-39 at PCM for damage.

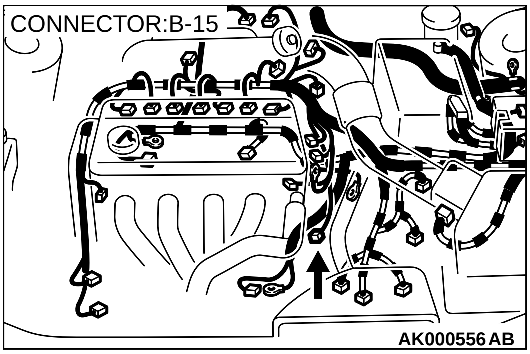


Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.

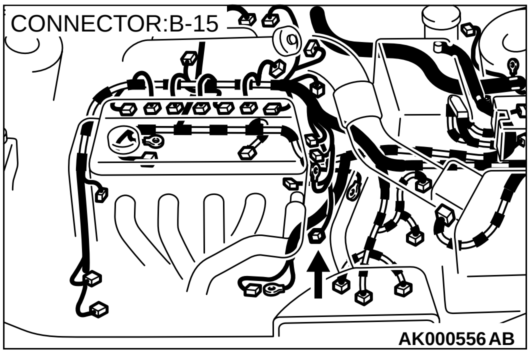


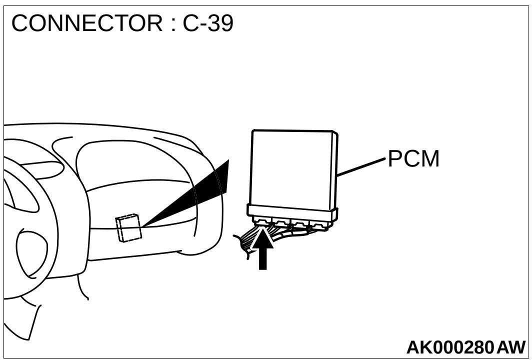


STEP 9. Check for harness damage between MFI relay connector A-21X terminal 1 and heated oxygen sensor (front) connector B-15 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between heated oxygen sensor (front) connector B-15 terminal 3 and PCM connector C-39 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Replace the PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points(P.00-8).

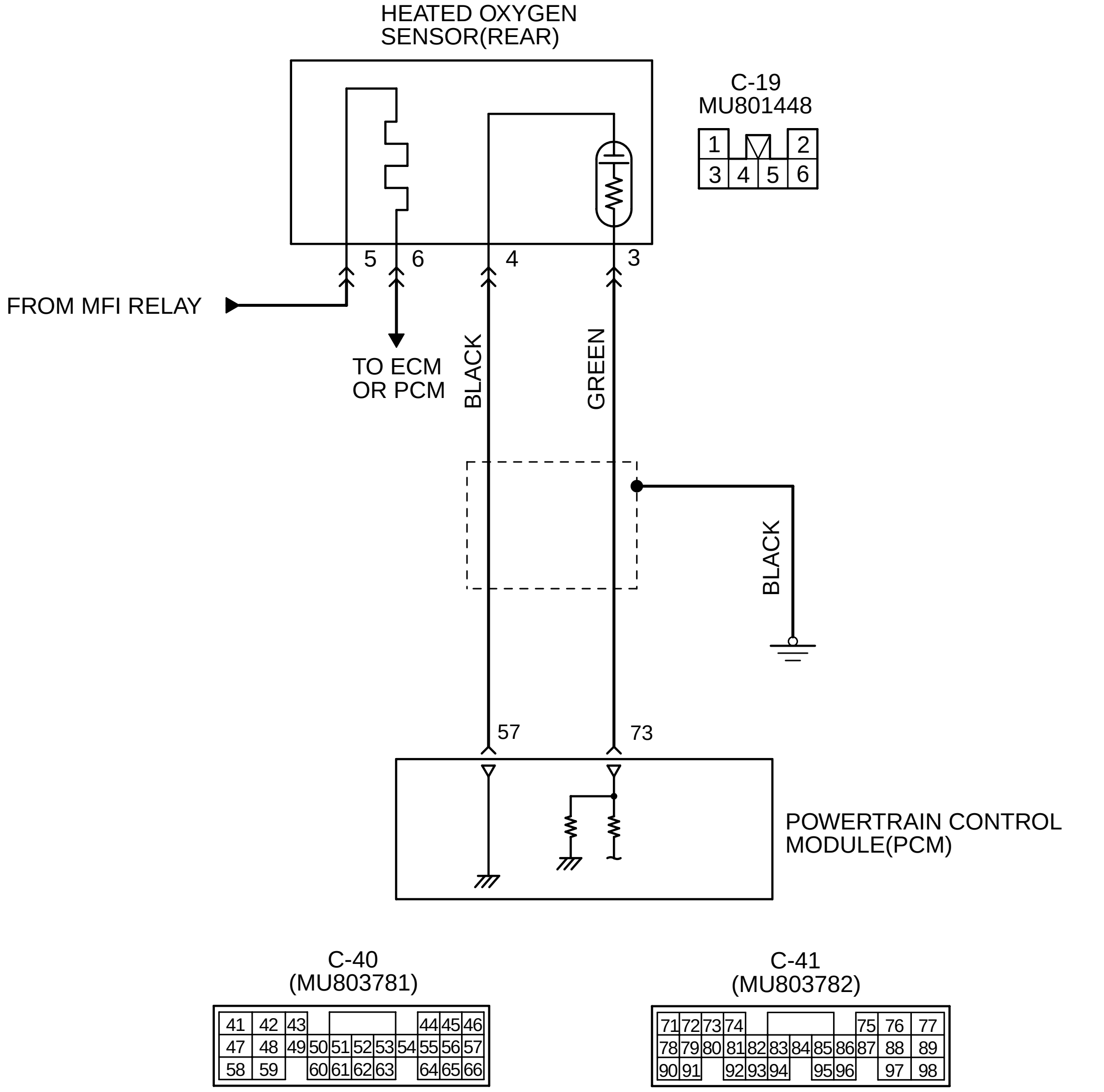
STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0136: O_2 Sensor Circuit Malfunction (sensor 2)



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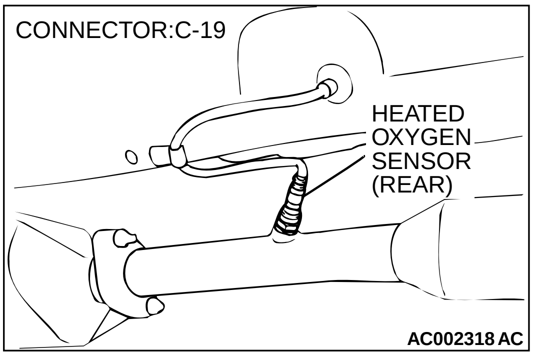
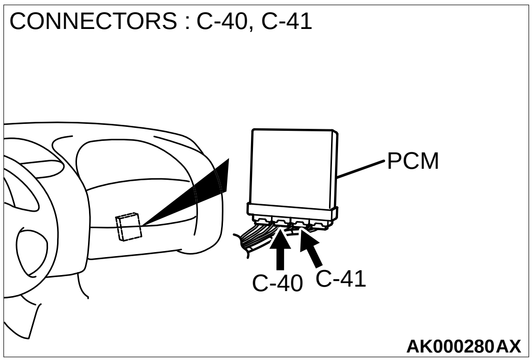




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal 73) from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with PCM (terminal 57).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The PCM checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower for three minutes or more after the starting sequence was completed.
- Engine coolant temperature is higher than 82° C (180° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (rear) output line via a resistor.
- Only one monitor during one drive cycle

Check Conditions

- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower for three minutes or more after the starting sequence was completed.
- Engine coolant temperature is higher than 82° C (180° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 88 Hz or more.
- At least twenty seconds have passed since fuel shut off control was canceled.
- The heated oxygen sensor (front) outputs 0.5 volts or more.
- Monitoring time: 10 seconds

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- Only one monitor during one drive cycle

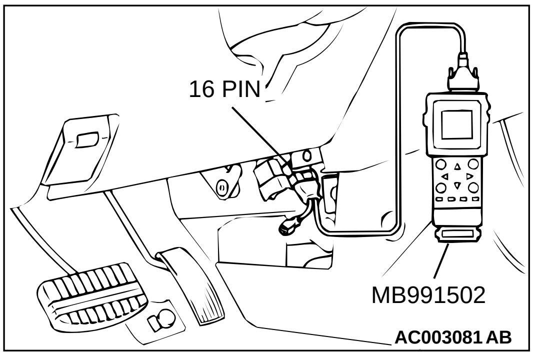
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Open circuit in heated oxygen sensor (rear) output line.
- Open circuit in heated oxygen sensor (rear) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)
MB991658: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

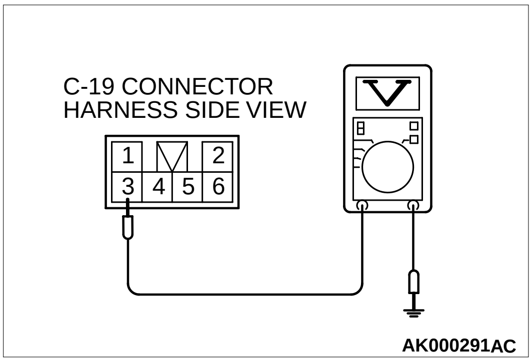
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



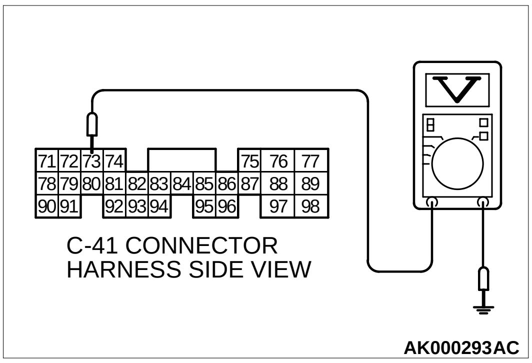
STEP 2. Check the sensor output voltage at heated oxygen sensor (rear) connector C-19 by backprobing.

(1) Do not disconnect the connector C-19.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 3 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.



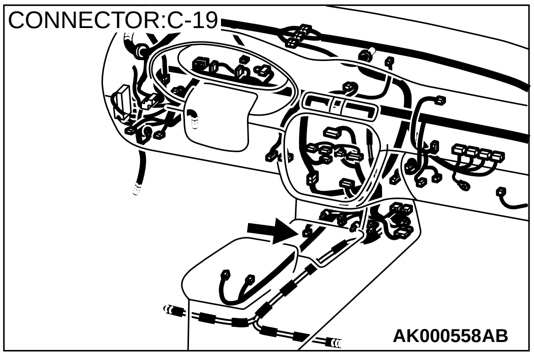
STEP 3. Check the sensor output voltage at PCM connector C-41 by backprobing.

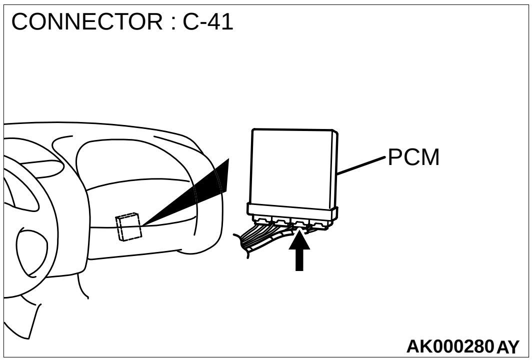
(1) Do not disconnect the connector C-41.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 73 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



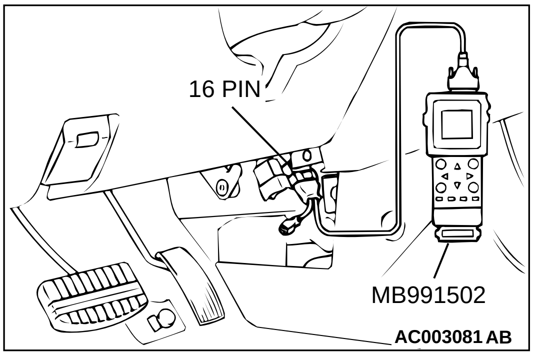


STEP 4. Check connector C-19 at heated oxygen sensor (rear) and connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.



STEP 5. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

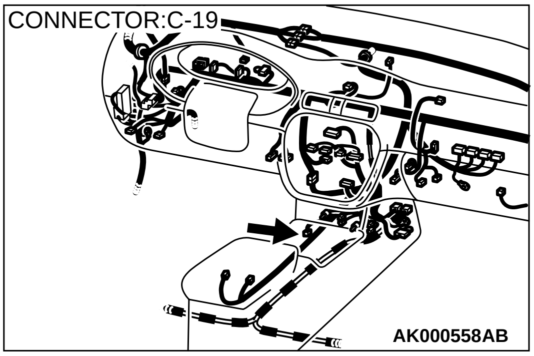
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

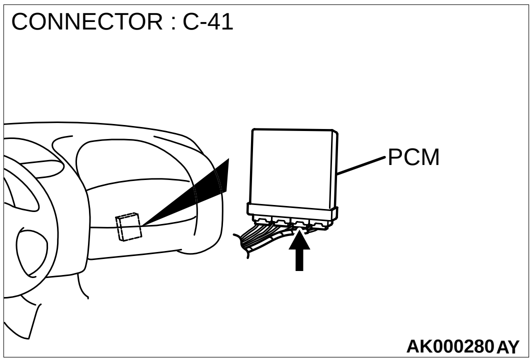
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 15.



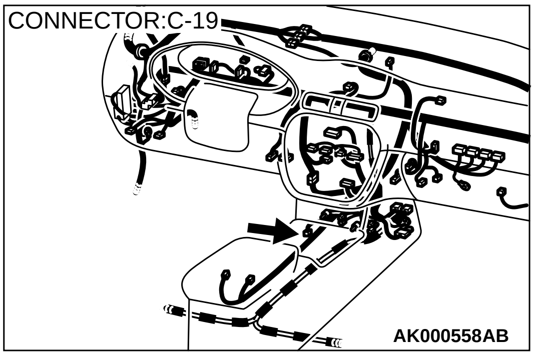


STEP 6. Check connector C-19 at heated oxygen sensor (rear) and connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between heated oxygen sensor (rear) connector C-19 terminal 3 and PCM connector C-41 terminal 73 because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.

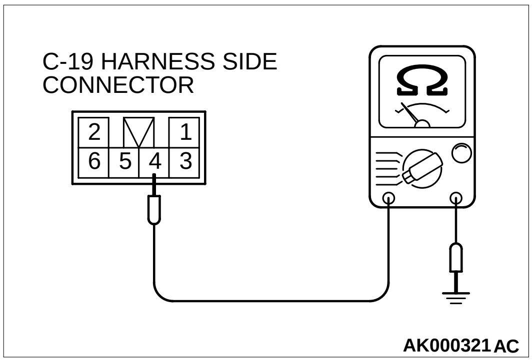


STEP 7. Check connector C-19 at heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.



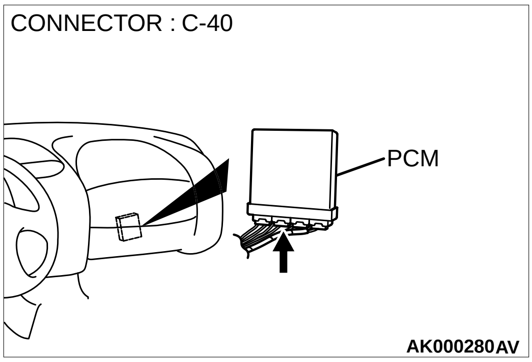
STEP 8. Check the continuity at heated oxygen sensor (rear) harness side connector C-19.

(1) Disconnect the connector C-19 and measure at the harness side.
(2) Check for the continuity between terminal 4 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

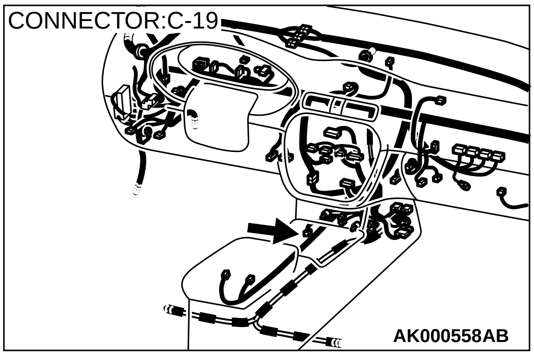


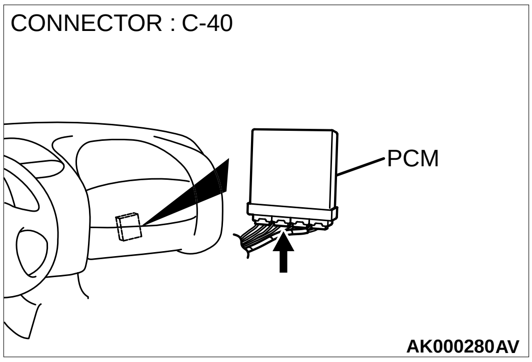
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.



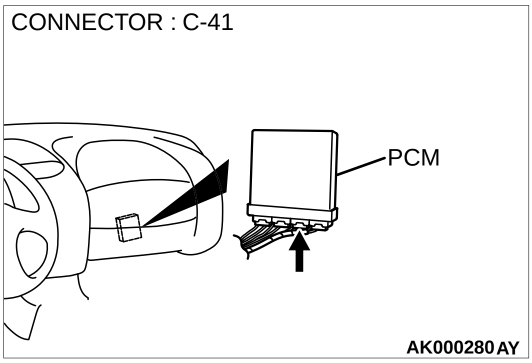


STEP 10. Check for open circuit and harness damage between heated oxygen sensor (rear) connector C-19 terminal 4 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.

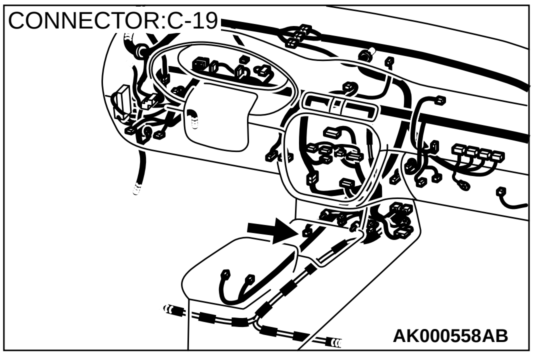


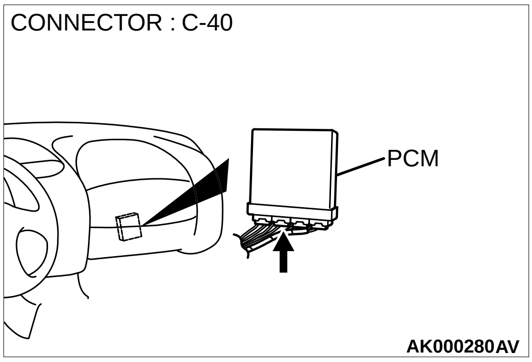
STEP 11. Check connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 15.

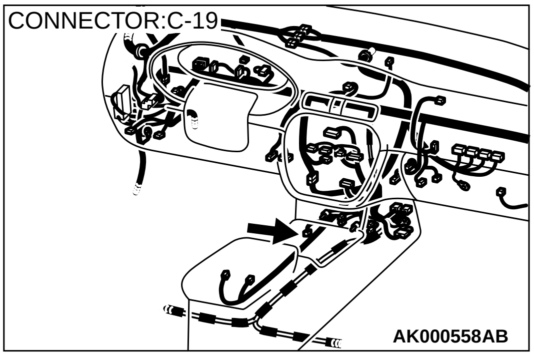


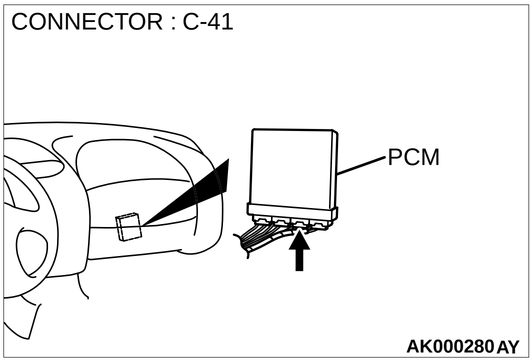


STEP 12. Check for harness damage between heated oxygen sensor (rear) connector C-19 terminal 4 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 15.

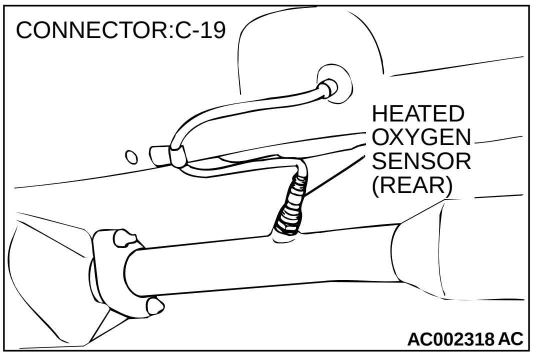


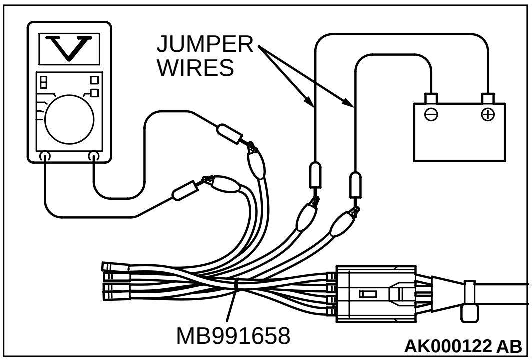


STEP 13. Check for short circuit to ground and harness damage between heated oxygen sensor (rear) connector C-19 terminal 3 and PCM connector C-41 terminal 73.

Q: Is the harness wire in good condition?

YES : Go to Step 14.
NO : Repair it. Then go to Step 15.





STEP 14. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector C-19 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80° C (176° F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 5 to the positive battery terminal and terminal 6 to the negative battery terminal.

(4) Connect a digital volt meter between terminal 3 and terminal 4.

(5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the PCM. Then go to Step 15.

NO : Replace the heated oxygen sensor (rear). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor and Procedure 6 – Other Monitor(P.13A-5).

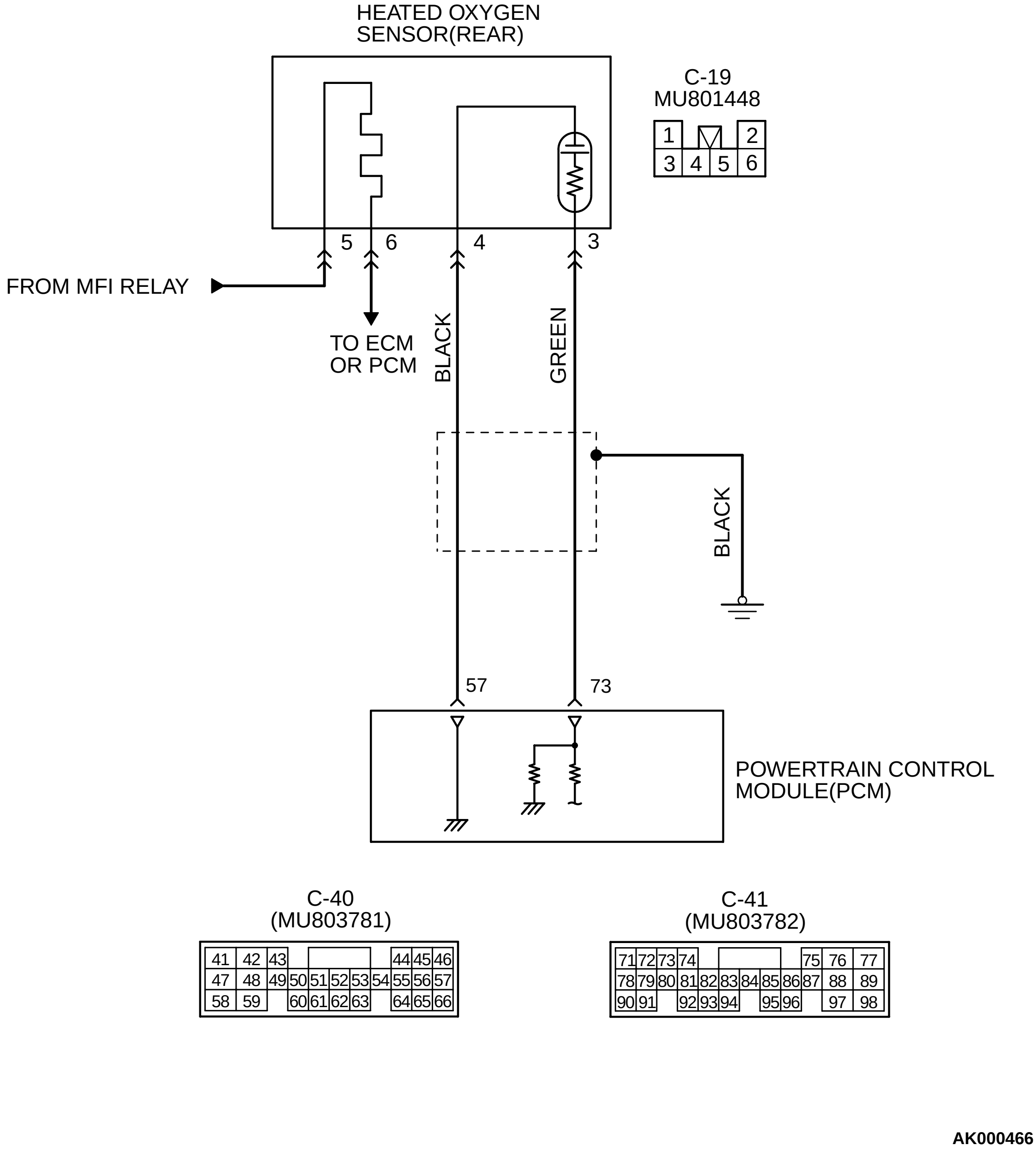
(2) Check the diagnostic trouble code (DTC).

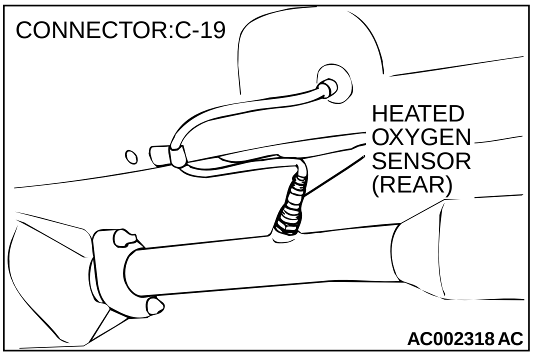
Q: Is the DTC P0136 is output?

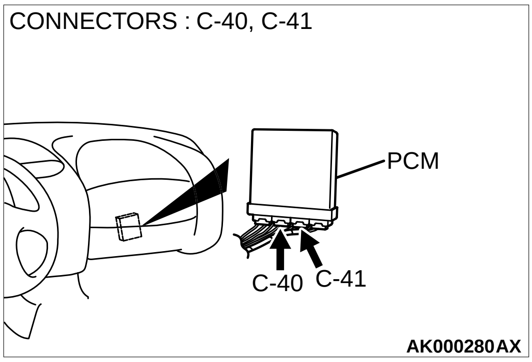
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: O_2 Sensor Circuit Slow Response (sensor 2)







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal 73) from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with PCM (terminal 57).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The PCM checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 82° C (180° F).
- Barometric pressure is higher than 76 kPa (11 psi).
- The heated oxygen sensor (front) is active.

Judgement Criteria

- The heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.4 volts or more, and during the shut off, it takes one second or more for the heated oxygen sensor (rear) output voltage to fall from 0.4 to 0.15 volts.

or

- The heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.15 volts or more, and during the shut off, it takes three seconds or more for the heated oxygen sensor (rear) output voltage to fall below 0.15 volts.

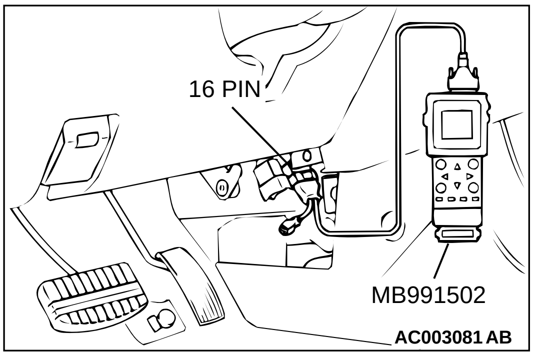
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Open circuit in heated oxygen sensor (rear) output line.
- Open circuit in heated oxygen sensor (rear) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
- After increasing the output voltage 0.15 volts or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.15 volts or less within 3 seconds.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

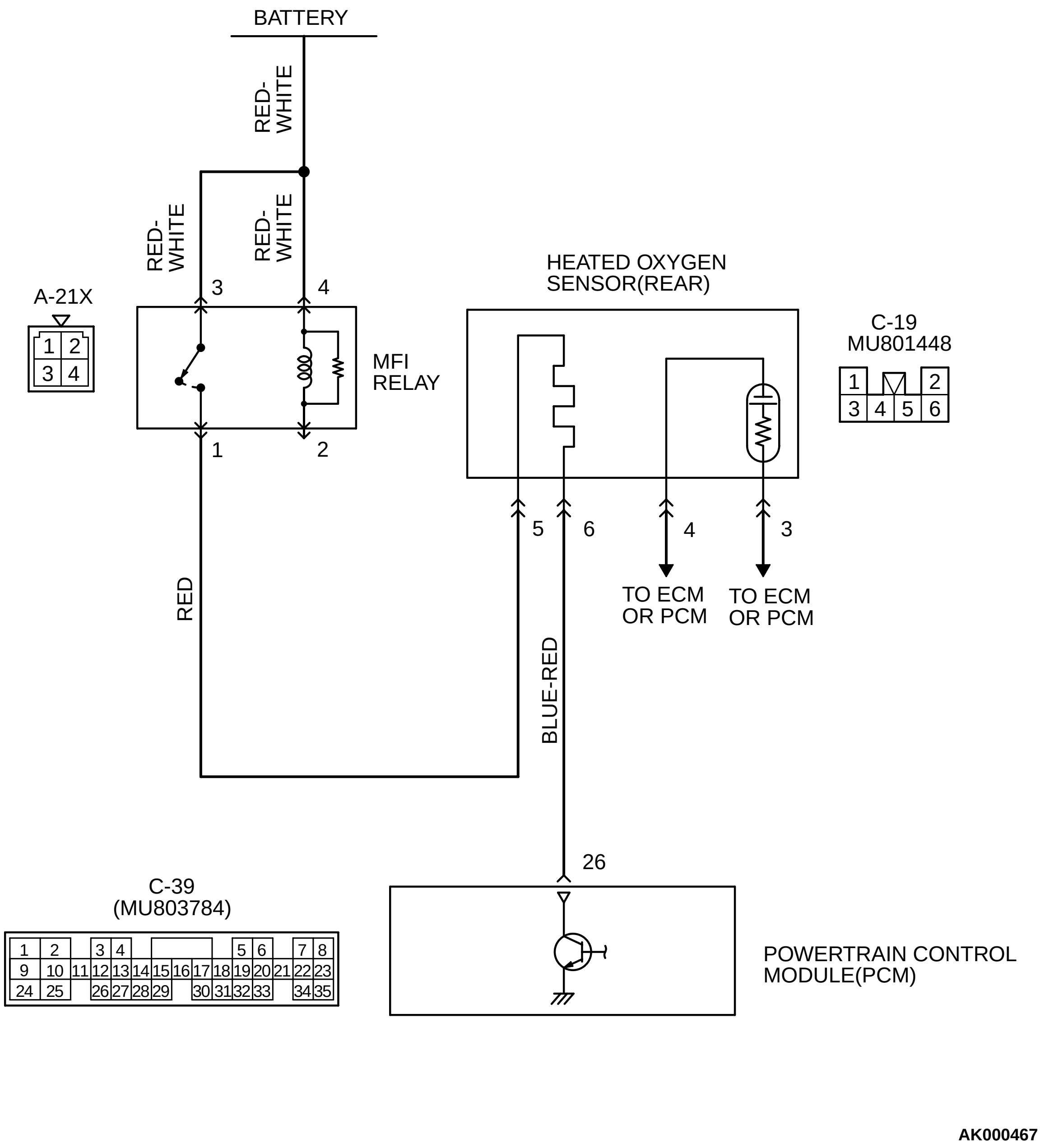
STEP 2. Test the OBD-II drive cycle.

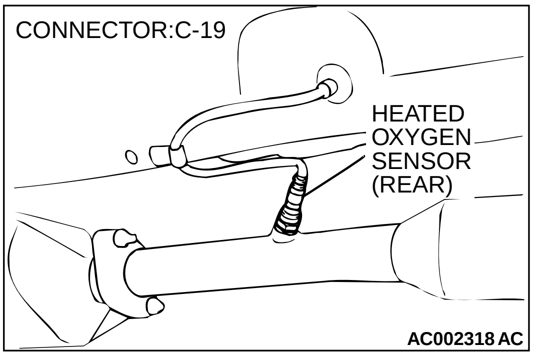
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

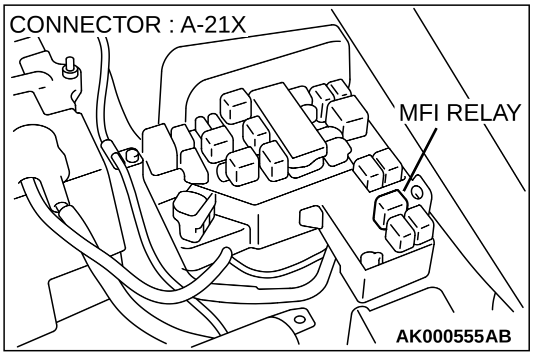
Q: Is the DTC P0139 is output?

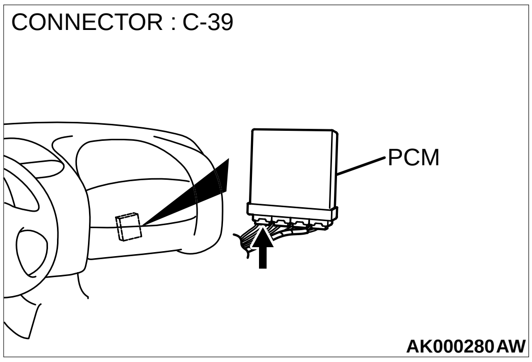
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0141: O_2 Sensor Heater Circuit Malfunction (sensor 2)









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 1) to the heated oxygen sensor (rear) heater.
- The PCM (terminal 26) controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

BACKGROUND

- The PCM checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 20° C (68° F).
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the heated oxygen sensor (rear) heater has continued to be lower than 0.2 ampere or higher than 3.5 ampere for 6 seconds.
- Only one monitor during one drive cycle

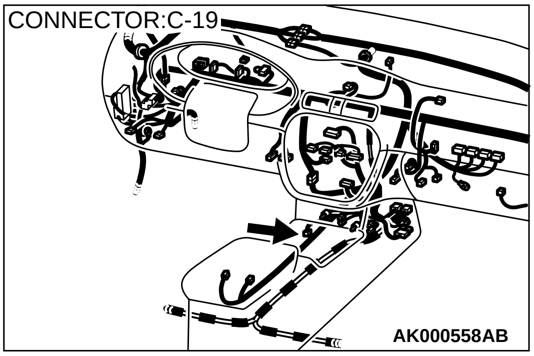
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (rear) heater circuit.
- Open circuit in heated oxygen sensor (rear) heater.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991658: Test Harness

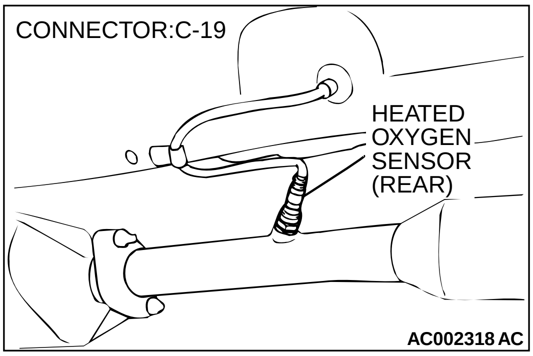


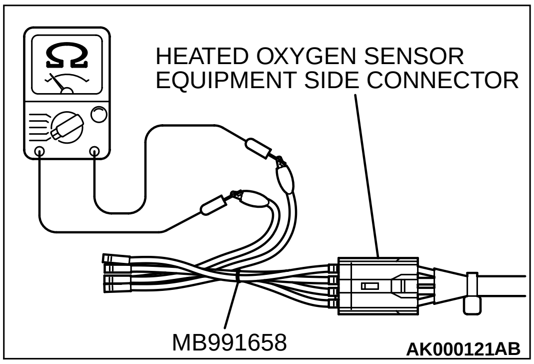
STEP 1. Check connector C-19 at the heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.





STEP 2. Check the heated oxygen sensor (rear).

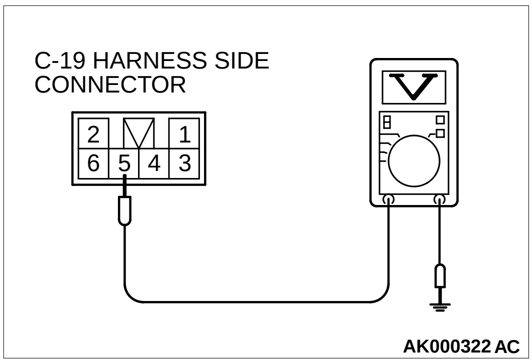
(1) Disconnect heated oxygen sensor (rear) connector C-19 and connect test harness special tool, MB991658, to the connector on the heated oxygen (rear) sensor side.
(2) Measure the resistance between heated oxygen sensor connector terminal 5 and terminal 6.

Standard value: 11 – 18 ohm [at 20° C (68° F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (rear). Then go to Step 12.



STEP 3. Check the power supply voltage at heated oxygen sensor (rear) harness side connector C-19.

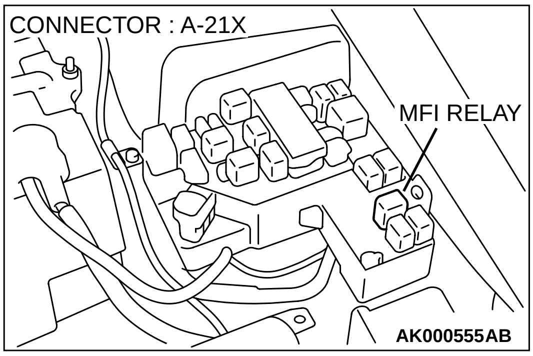
(1) Disconnect the connector C-19 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.

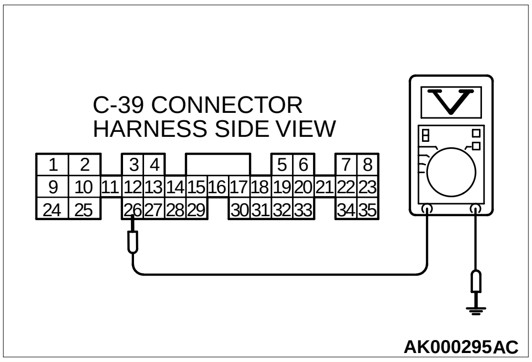


STEP 4. Check harness connector A-21X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and heated oxygen sensor (rear) connector C-19 terminal 5 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.



STEP 5. Check the power supply voltage at PCM connector C-39 by backprobing.

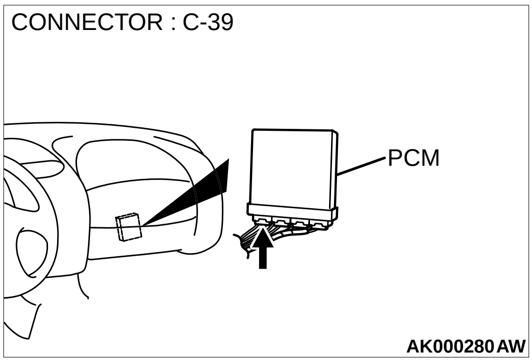
(1) Do not disconnect the connector C-39.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 26 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 6.

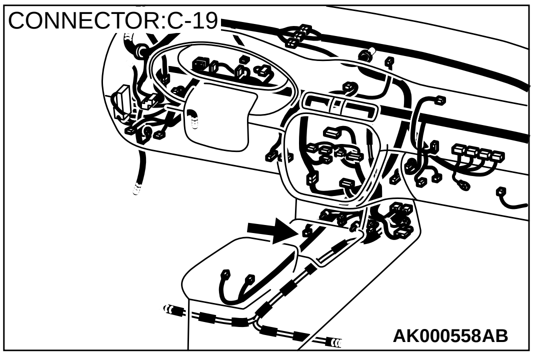


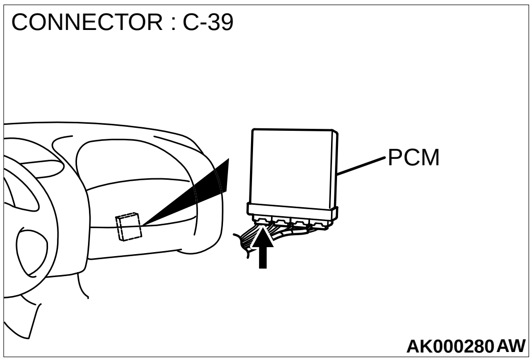
STEP 6. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.



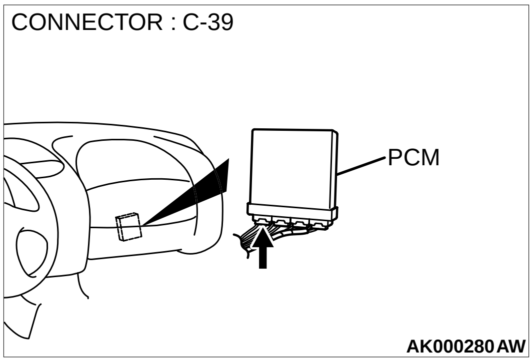


STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (rear) connector C-19 terminal 6 and PCM connector C-39 terminal 26.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

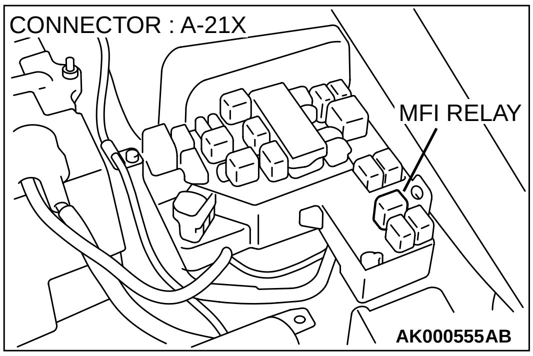


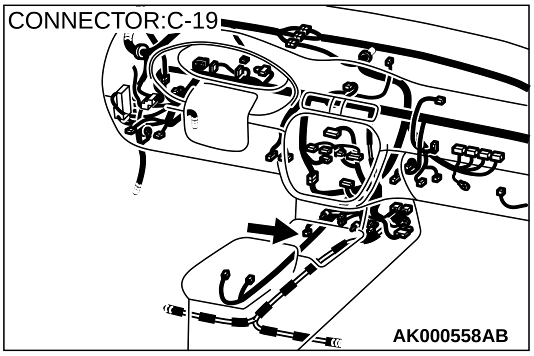
STEP 8. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 12.

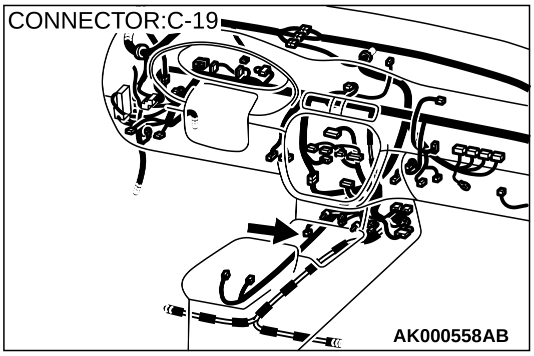


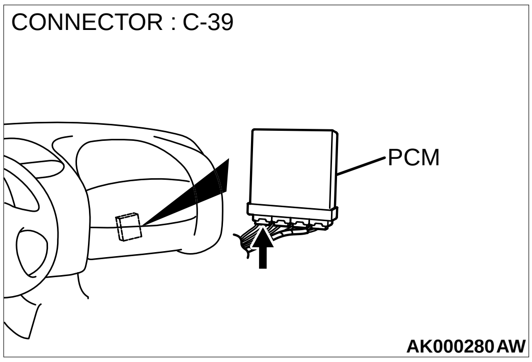


STEP 9. Check for harness damage between MFI relay connector A-21X terminal 1 and heated oxygen sensor (rear) connector C-19 terminal 5.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between heated oxygen sensor (rear) connector C-19 terminal 6 and PCM connector C-39 terminal 26.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Replace the PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0171: System too Lean

Fuel Trim Circuit

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

CIRCUIT OPERATION

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is lower than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be higher than +10.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is lower than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be higher than +15.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100° C (212° F) when the engine is started.

- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be higher than +20.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be higher than +25.0 for 2 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- The heated oxygen sensor (front) is active.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be higher than +25.0 for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure
- Air drawn in from gaps in gasket, seals, etc.
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

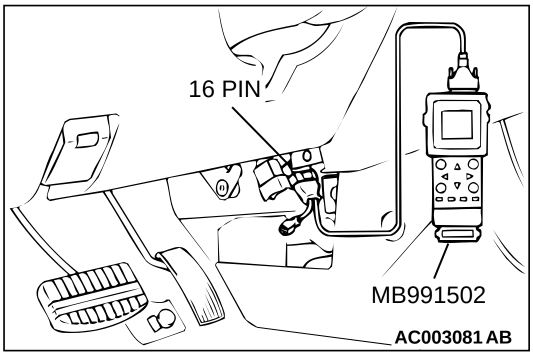
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 14.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 14.



STEP 3. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

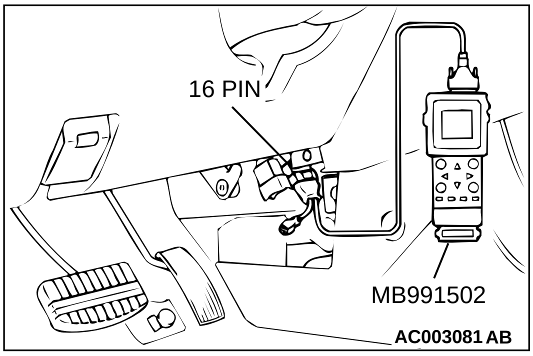
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 96° C(176° F to 205° F).
- When idling, between 25 and 51 Hz (between 2.5 and 5.0 g/s).
- When 2,500 r/min, between 80 and 120 Hz (between 8.5 and 12.7 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem(P.13A-26), DTC P0102 – Volume Air Flow Circuit Low Input(P.13A-32), DTC P0103 Volume Air Flow Circuit High Input(P.13A-35).



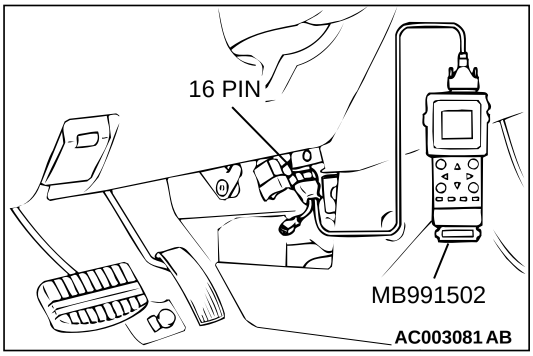
STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem(P.13A-57).



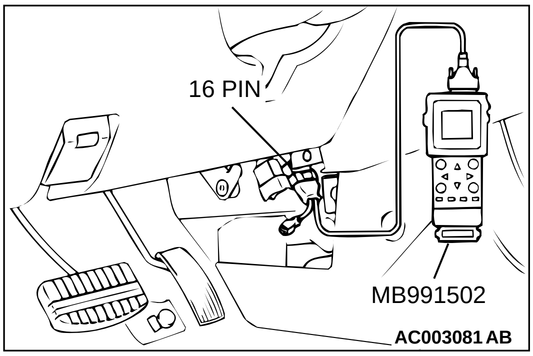
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to, DTC P0115 – Engine Coolant Temperature Circuit High Input(P.13A-66), DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem(P.13A-74), DTC P0117 – Engine Coolant Temperature Circuit Low Input(P.13A-79).



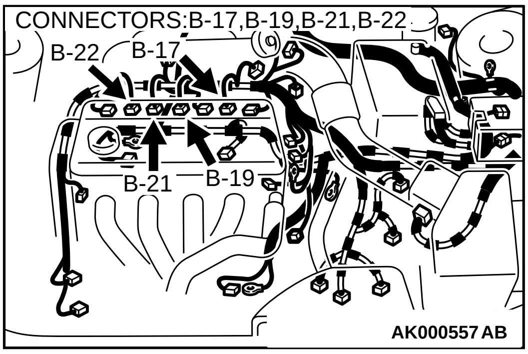
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

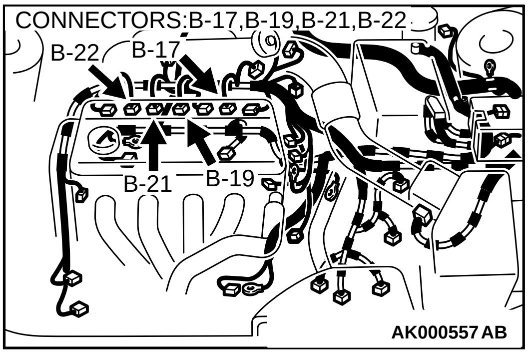
YES : Go to Step 7.
NO : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input(P.13A-41), DTC P0108 – Barometric Pressure Circuit High Input(P.13A-50).

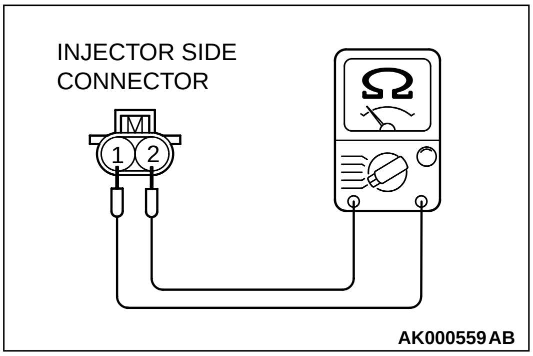


STEP 7. Check connector B-17, B-19, B-21, B-22 at injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.





STEP 8. Check the injector.

(1) Disconnect each injector connector.

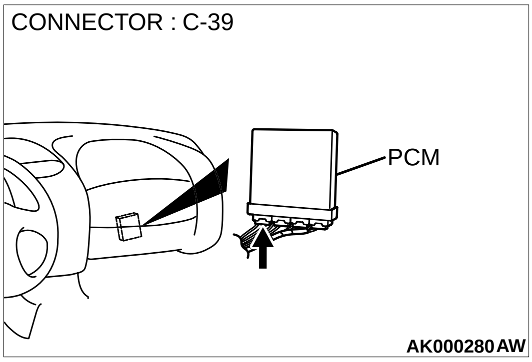
(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 9.

NO : Replace the injector. Then go to Step 14.

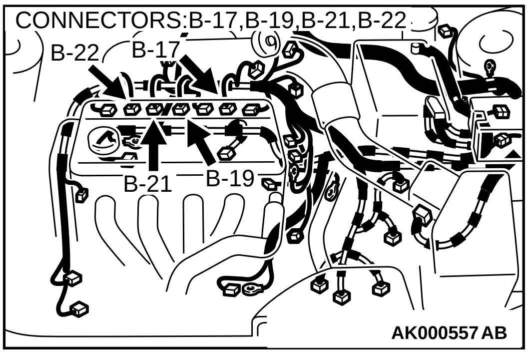


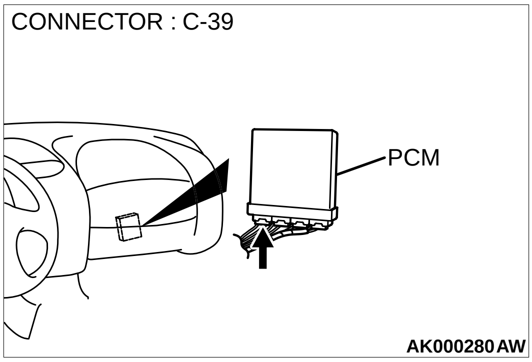
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.





STEP 10. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

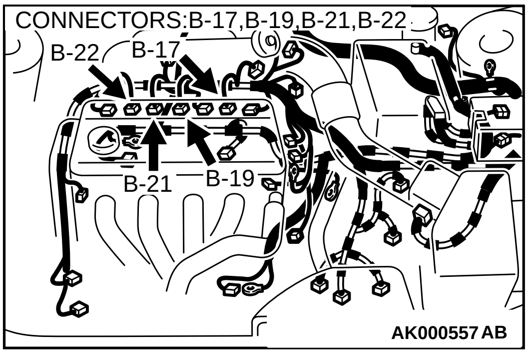
Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair or replace it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Go to Step 13.
NO : Replace the fuel. Then go to Step 14.



STEP 13. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor(P.13A-5).
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?

YES : Replace the PCM. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0172: System too Rich

Fuel Trim Circuit

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

CIRCUIT OPERATION

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is lower than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be lower than -12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be lower than -10.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is lower than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be lower than -12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be lower than -15.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be lower than -12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be lower than -10.0 for 2 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.

- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76kPa (11 psi).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be lower than -12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be lower than -15.0 for 2 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- The heated oxygen sensor (front) is active.

Judgment Criteria

- Long-term fuel trim has continued to be lower than -12.5 for 2 seconds.

or

- Short-term fuel trim has continued to be lower than -25.0 for 2 seconds.

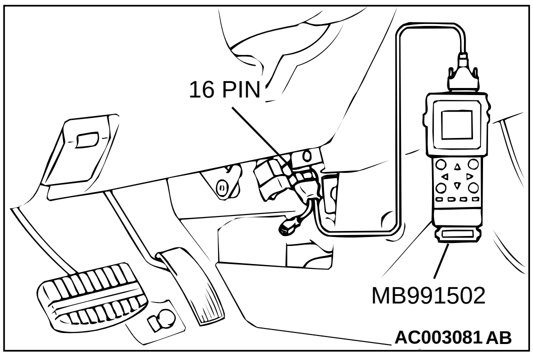
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

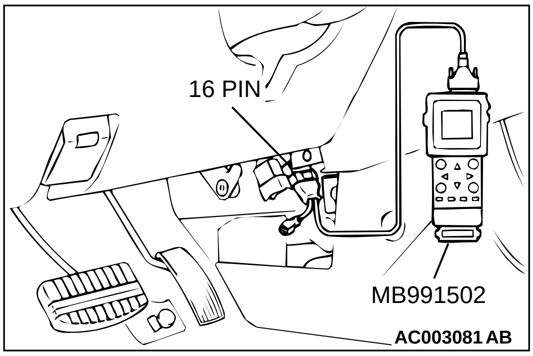
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 96° C(176° F to 205° F).
   - When idling, between 25 and 51 Hz (between 2.5 and 5.0 g/s).
   - When 2,500 r/min, between 80 and 120 Hz (between 8.5 and 12.7 g/s).
(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem(P.13A-26), DTC P0102 – Volume Air Flow Circuit Low Input(P.13A-32), DTC P0103 - Volume Air Flow Circuit High Input(P.13A-35).



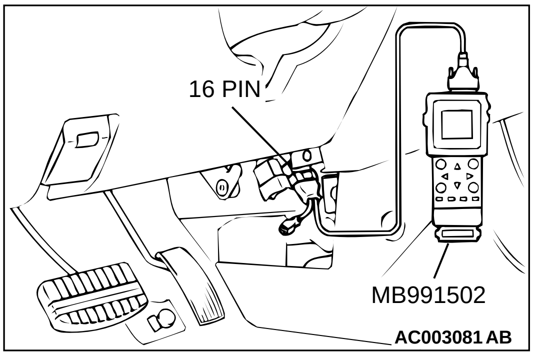
STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem(P.13A-57).



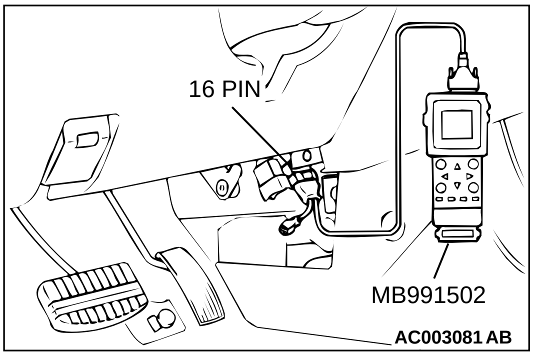
STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0115 – Engine Coolant Temperature Circuit High Input(P.13A-66), DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem(P.13A-74), DTC P0117 – Engine Coolant Temperature Circuit Low Input(P.13A-79).



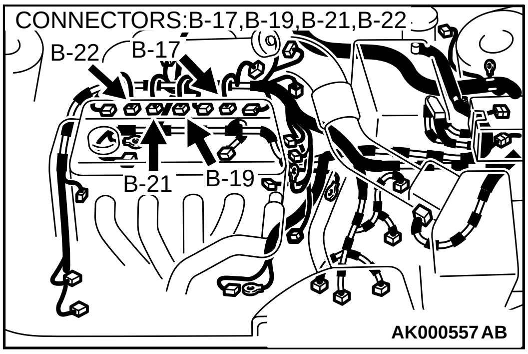
STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

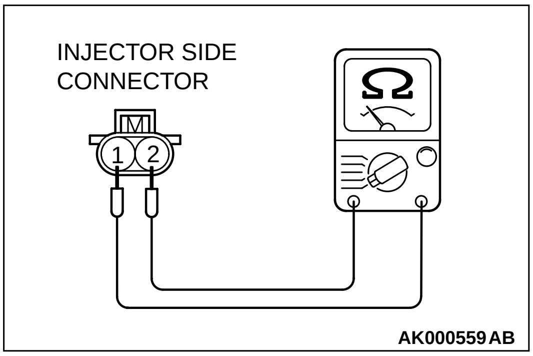
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m(0 foot), 101 kPa.
- When altitude is 600 m(1,969 feet), 95 kPa.
- When altitude is 1,200 m(3,937 feet), 88 kPa.
- When altitude is 1,800 m(5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input(P.13A-41), DTC P0108 – Barometric Pressure Circuit High Input(P.13A-50).





STEP 5. Check the injector.

(1) Disconnect each injector connector.

(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 6.

NO : Replace the injector. Then go to Step 8.

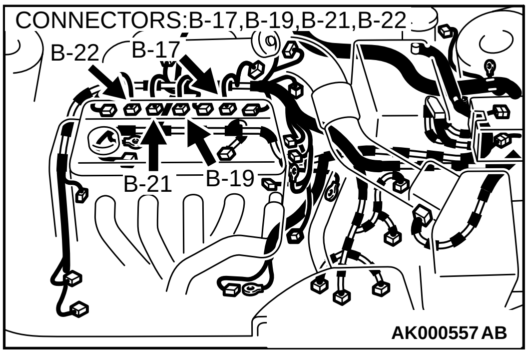
STEP 6. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Go to Step 7.

NO : Repair or replace it. Then go to Step 8.



STEP 7. Replace the injector.

(1) Replace the injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor(P.13A-5).

(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0172 is output?

YES : Replace the PCM. Then go to Step 8.

NO : The inspection is complete.

STEP 8. Test the OBD- II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor(P.13A-5).

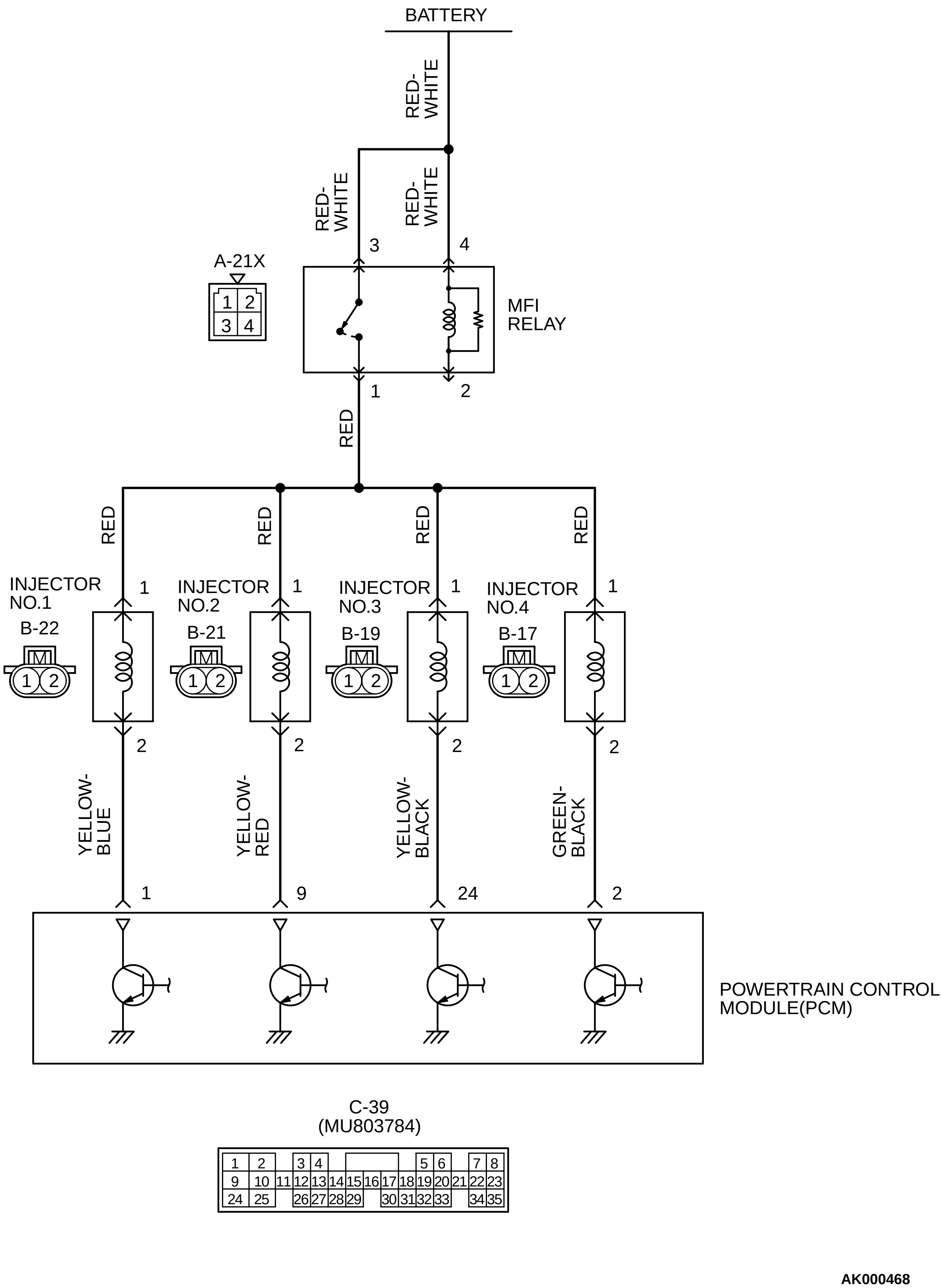
(2) Check the diagnostic trouble code (DTC).

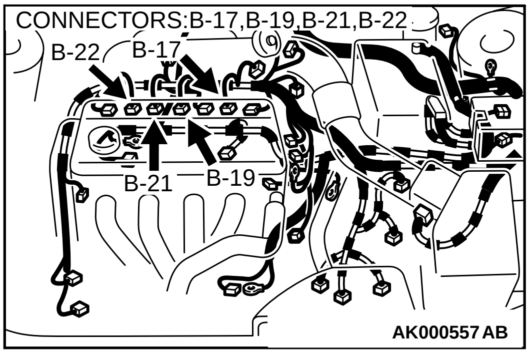
Q: Is the DTC P0172 is output?

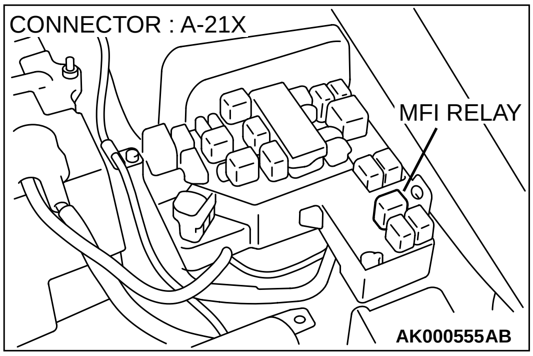
YES : Retry the troubleshooting.

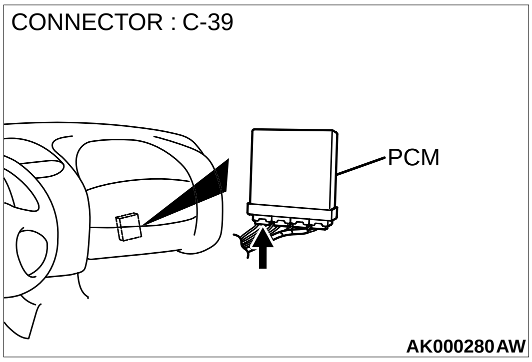
NO : The inspection is complete.

DTC P0201: Injector Circuit Malfunction – Cylinder 1, DTC P0202: Injector Circuit Malfunction – Cylinder 2, DTC P0203: Injector Circuit Malfunction – Cylinder 3, DTC P0204: Injector Circuit Malfunction - Cylinder 4


BATTERY
RED-WHITE
RED-WHITE
RED-WHITE
3
4
A-21X
1 2
3 4
MFI RELAY
1
2
RED
RED
RED
RED
RED
INJECTOR NO.1
B-22
INJECTOR NO.2
B-21
INJECTOR NO.3
B-19
INJECTOR NO.4
B-17
M
1 2
YELLOW-BLUE
YELLOW-RED
YELLOW-BLACK
GREEN-BLACK
1
9
24
2
POWERTRAIN CONTROL MODULE(PCM)
C-39
(MU803784)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35
AK000468







CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal 1).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF."

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The PCM checks this surge voltage.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

Judgment Criteria

- Injector coil surge voltage (battery positive voltage + 2 volts) has not been detected for two seconds.

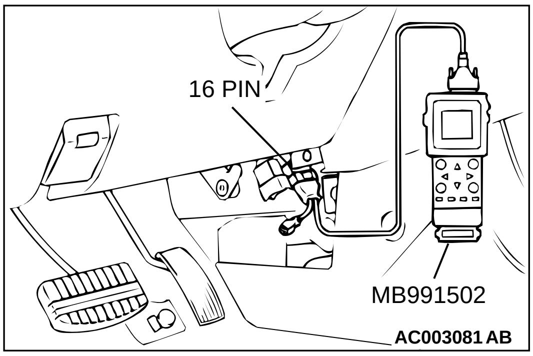
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)
MB991348: Test Harness



STEP 1. Using scan tool MB991502, check actuator test item 01, 02, 03, 04: Injectors.

⚠ CAUTION

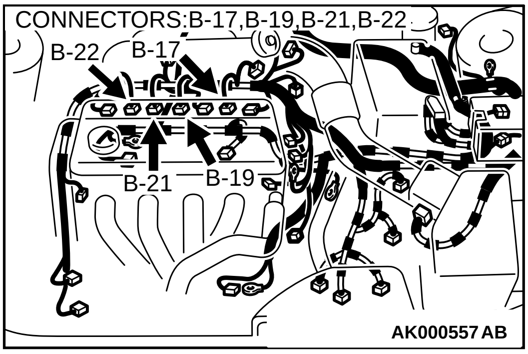
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the actuator testing mode for item 01, 02, 03, 04 Injectors.
(4) Warm up the engine to normal operating temperature: 80° C to 96° C(176° F to 205° F).
- Does the idle state worsen when the injector is cut off.

(Does idling become unstable or does the engine stall)
(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.

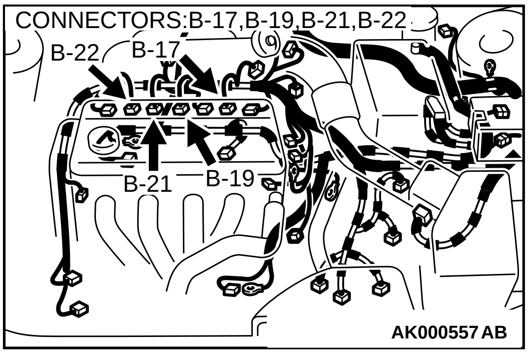


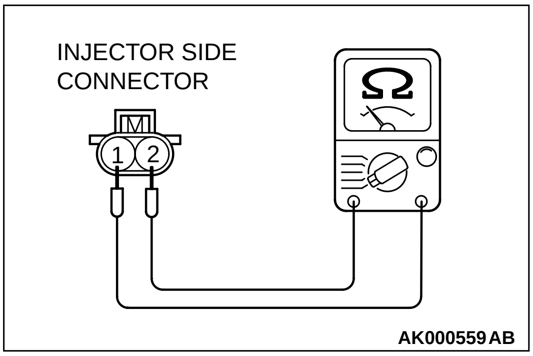
STEP 2. Check the connector at injector for damage.

a. Check the connector B-22 when checking No.1 cylinder.
b. Check the connector B-21 when checking No.2 cylinder.
c. Check the connector B-19 when checking No.3 cylinder.
d. Check the connector B-17 when checking No.4 cylinder.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 10.





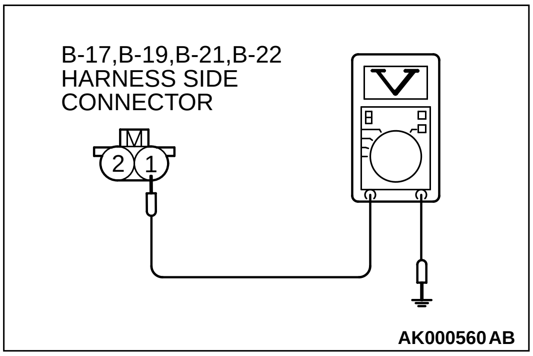
STEP 3. Check the injector.

(1) Disconnect the injector connector B-22 <No.1 cylinder> or B-21 <No.2 cylinder> or B-19 <No.3 cylinder> or B-17 <No.4 cylinder>.
(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 4.
NO : Replace the injector. Then go to Step 10.

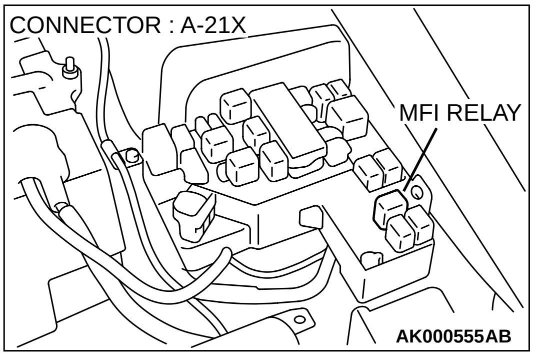


STEP 4. Check the power supply voltage at injector connector.

(1) Disconnect connector B-22 <No.1 cylinder> or B-21 <No.2 cylinder> or B-19 <No.3 cylinder> or B-17 <No.4 cylinder> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 5.



STEP 5. Check connector A-21X at MFI relay for damage.

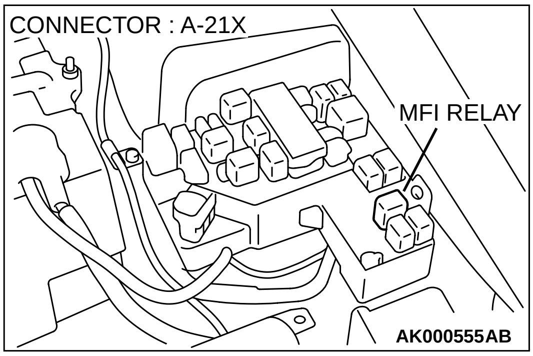
Q: Is the connector in good condition?

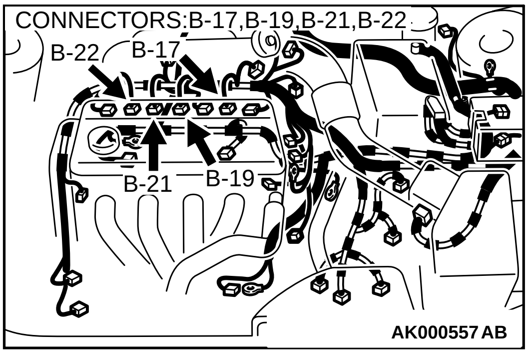
YES : Repair harness wire between MFI relay connector and injector connector because of open circuit or short circuit to ground.

a. Repair harness wire between MFI relay connector A-21X terminal 1 and injector connector B-22 terminal 1 when checking No.1 cylinder.
b. Repair harness wire between MFI relay connector A-21X terminal 1 and injector connector B-21 terminal 1 when checking No.2 cylinder.
c. Repair harness wire between MFI relay connector A-21X terminal 1 and injector connector B-19 terminal 1 when checking No.3 cylinder.
d. Repair harness wire between MFI relay connector A-21X terminal 1 and injector connector B-17 terminal 1 when checking No.4 cylinder.

Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 10.





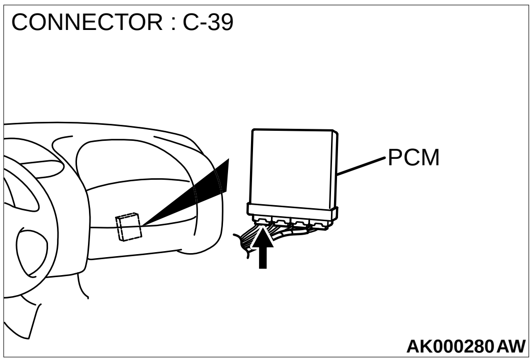
STEP 6. Check for harness damage between MFI relay connector and injector connector.

a. Check the harness wire between MFI relay connector A-21X terminal 1 and injector connector B-22 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between MFI relay connector A-21X terminal 1 and injector connector B-21 terminal 1 when checking No.2 cylinder.
c. Check the harness wire between MFI relay connector A-21X terminal 1 and injector connector B-19 terminal 1 when checking No.3 cylinder.
d. Check the harness wire between MFI relay connector A-21X terminal 1 and injector connector B-17 terminal 1 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

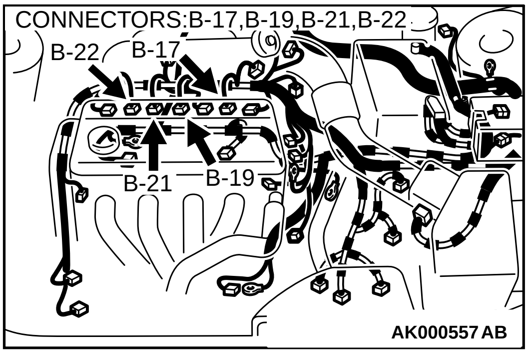


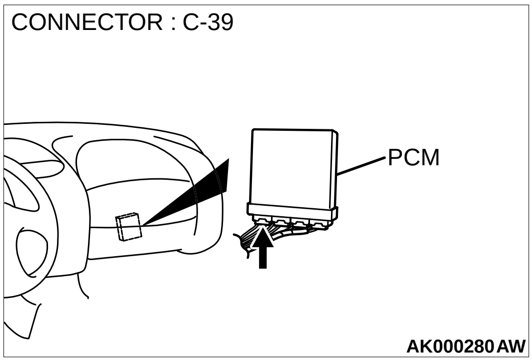
STEP 7. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 10.





STEP 8. Check for open circuit and short circuit to ground and harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.

b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.

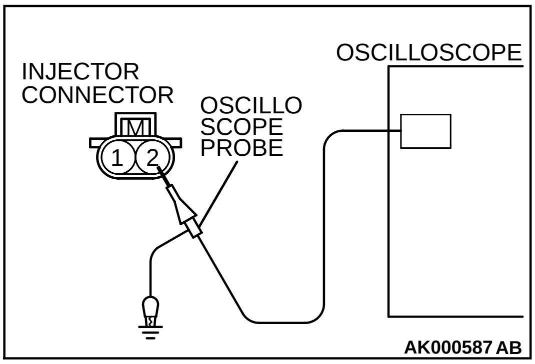
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.

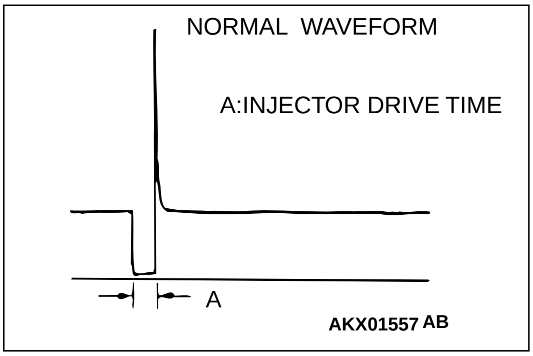
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 10.





STEP 9. Using the oscilloscope, check the injector.

(1) Disconnect the injector connector B-22 <No.1 cylinder> or B-21 <No.2 cylinder> or B-19 <No.3 cylinder> or B-17 <No.4 cylinder> and connect the test harness special tool (MB991348) in between. (All terminals should be connected)

(2) Connect the oscilloscope probe to the injector side connector terminal 2.

NOTE: When measuring with the PCM side connector, connect an oscilloscope probe to the each of the following terminals.

- *PCM terminal 1 when checking No.1 cylinder.*
- *PCM terminal 9 when checking No.2 cylinder.*
- *PCM terminal 24 when checking No.3 cylinder.*
- *PCM terminal 2 when checking No.4 cylinder*

(3) Start the engine and run at idle.

(4) Measure the waveform.

- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Replace the PCM. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0201, P0202, P0203, P0204 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0300: Random Misfire Detected

Random Misfire Circuit

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

CIRCUIT OPERATION

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than -10° C (14° F).
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Adaptive learning is complete for the vane which generates a crankshaft position signal.

- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- Vehicle speed is 2.5km (1.6mph) or more.
- The throttle deviation is -0.059V/10ms to +0.059V/10ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred in 4 or more of the last 200 revolutions [when the catalyst temperature is higher than 950° C (1742° F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

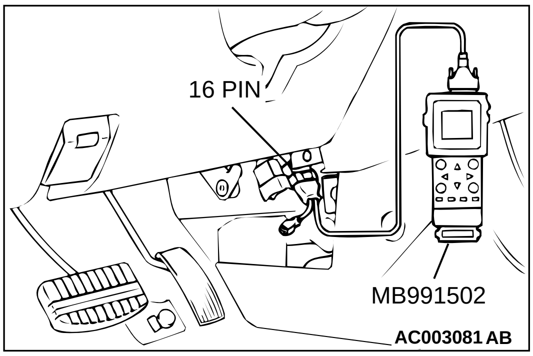
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

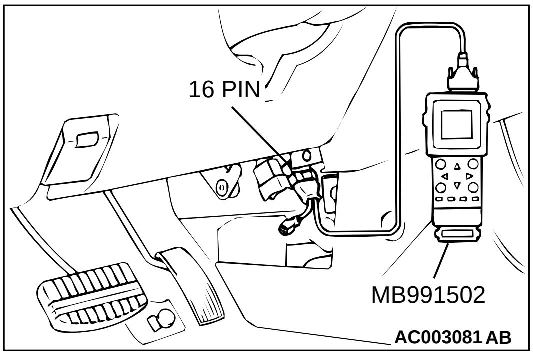
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
- The pulse width should be constant.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit Malfunction(P.13A-170).

STEP 2. Using scan tool MB991502, check data list item 81: Long - Term Fuel Compensation (trim).

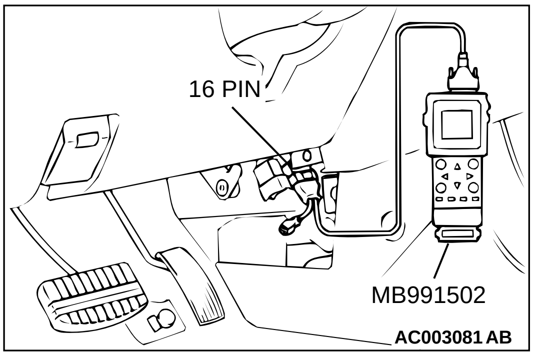


(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 81, Long – Term Fuel Compensation (trim).
- The fuel trim should be between -12.5 and +12.5 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to, DTC P0171 – System too Lean(P.13A-144), DTC P0172 – System too Rich(P.13A-150).



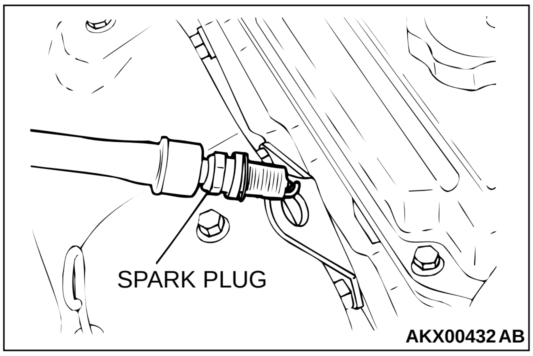
STEP 3. Using scan tool MB991502, check data list item 82: Short - Term Fuel Compensation (trim).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 82, Short – Term Fuel Compensation (trim).
- The fuel trim should be between -25 and +16.8 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 – System too Lean(P.13A-144), DTC P0172 – System too Rich(P.13A-150).

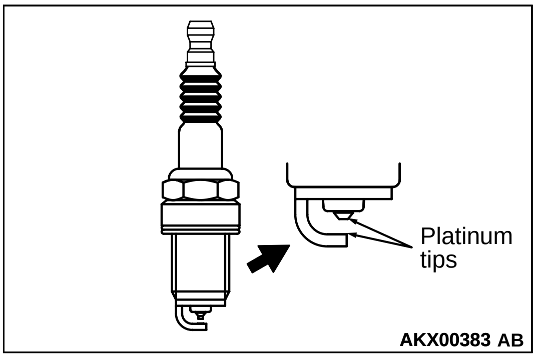


STEP 4. Check the ignition coil spark

(1) Check each ignition coil spark.
(2) Remove the spark plug and connect to the spark plug cable.
(3) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 7.
NO : Go to Step 5.



STEP 5. Check the spark plugs.

⚠ CAUTION

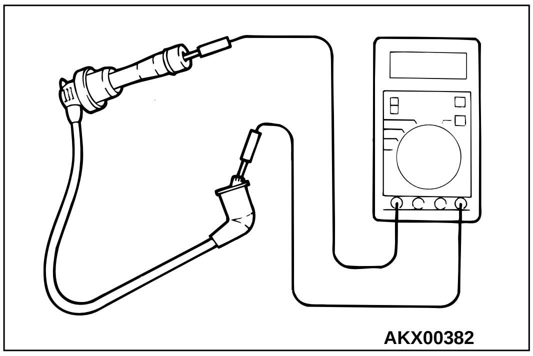
Do not attempt to adjust the gap of the platinum plug. Cleaning of the platinum plug may result in damage to the platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

(1) Check the plug gap and replace if the limit is exceeded.

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)
Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 6.
NO : Replace the faulty spark plug. Then go to Step 13.



STEP 6. Check the spark plug cable.

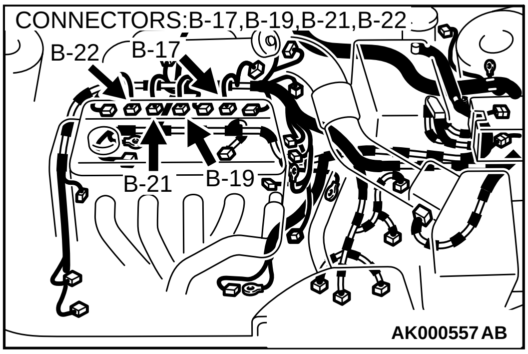
(1) Check the cap and coating for cracks.
(2) Measure the resistance.

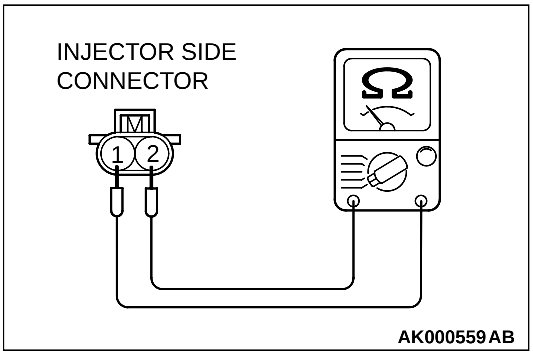
Limit: maximum 22 kΩ

Q: Is the resistance normal?

YES : Refer to, INSPECTION PROCEDURE 32 – Ignition Circuit System(P.13A-396).

NO : Replace the faulty spark plug cable. Then go to Step 13.





STEP 7. Check the injector.

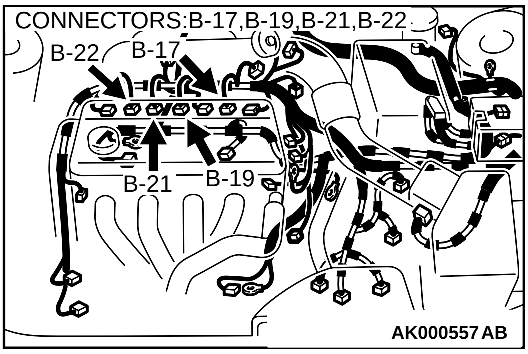
(1) Disconnect the injector connector.
(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 8.

NO : Replace the faulty injector. Then go to Step 13.

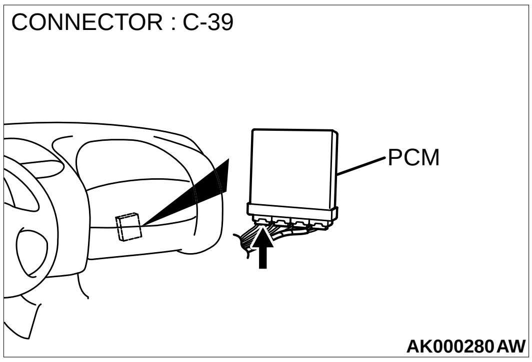


STEP 8. Check connector B-17, B-19, B-21, B-22 at injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty injector. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.

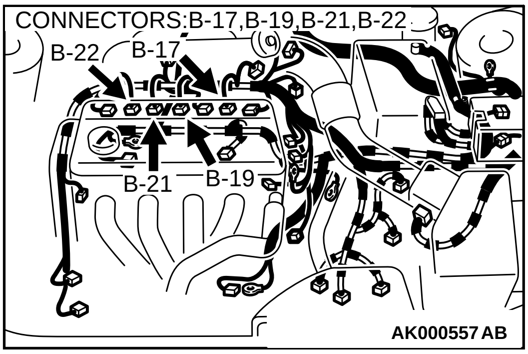


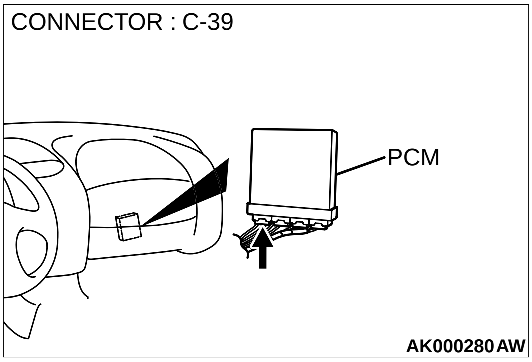
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 13.





STEP 10. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 13.

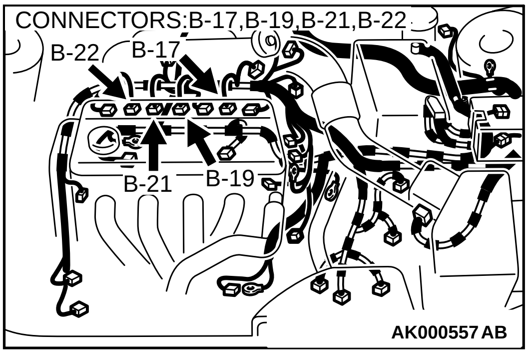
STEP 11. Check the following items.

(1) Check the following items, and repair or replace the defective component.
  a. Check for skipped timing belt teeth.
  b. Check compression.
  c. EGR valve failed.

Q: Are there any abnormalities?

YES : Go to Step 12.

NO : Repair or replace it. Then go to Step 13.



STEP 12. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Replace the PCM. Then go to Step 13.
NO : The inspection is complete.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected

Misfire Detected Circuit

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

CIRCUIT OPERATION

- Refer to, P0201_P0204 Injector Circuit (P.13A-154).

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The PCM checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than -10° C (14° F).
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is at between 76kPa (11psi) and 106kPa (15psi).
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/ deceleration and A/C compressor switching.
- Vehicle speed is 2.5km/h (1.6mph) or more.
- The throttle deviation is -0.059V/10ms to +0.059V/10ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred in 4 or more of the last 200 revolutions [when the catalyst temperature is higher than 950° C (1,742° F)].

or

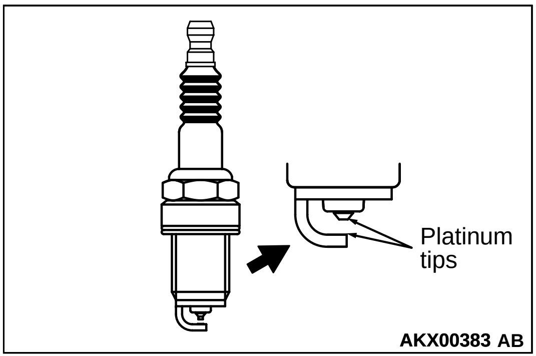
- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- Injector failed.
- PCM failed.

DIAGNOSIS

STEP 1. Check the spark plugs.



⚠ CAUTION

Do not attempt to adjust the gap of the platinum plug. Cleaning of the platinum plug may result in damage to the platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

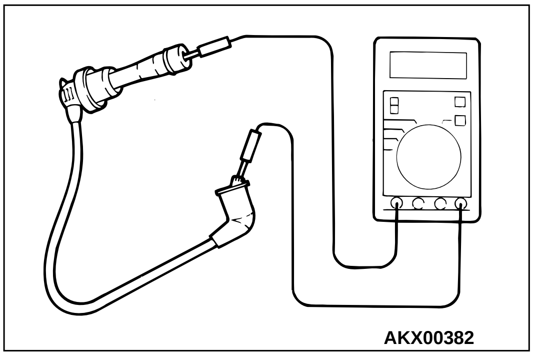
(1) For the right bank cylinder, remove the intake manifold.
(2) Check the plug gap and replace if the limit is exceeded.

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)
Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 2.
NO : Replace the spark plug. Then go to Step 9.

STEP 2. Check the spark plug cable.

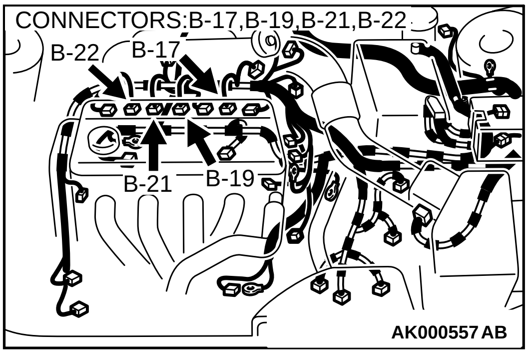


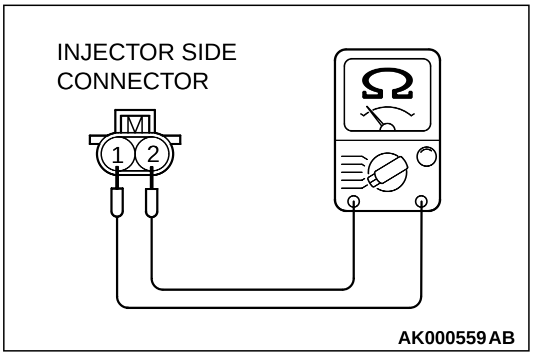
(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 22 kΩ

Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the spark plug cable. Then go to Step 9.





STEP 3. Check the injector.

(1) Disconnect the injector connector B-22 <No.1 cylinder>, B-21 <No.2 cylinder>, B-19 <No.3 cylinder>, B-17 <No.4 cylinder>.

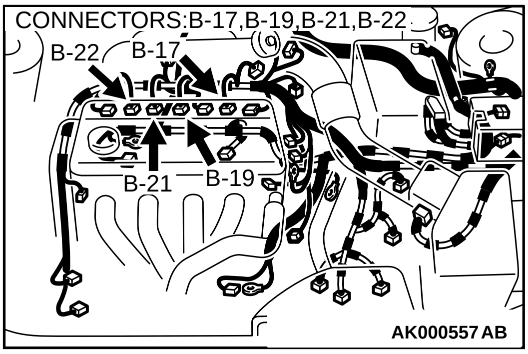
(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20° C (68° F)]

Q: Is the resistance standard value?

YES : Go to Step 4.

NO : Replace the injector. Then go to Step 9.



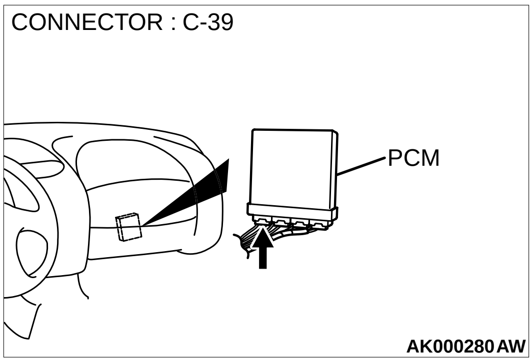
STEP 4. Check connector at injector for damage.

a. Check the connector B-22 when checking No.1 cylinder.
b. Check the connector B-21 when checking No.2 cylinder.
c. Check the connector B-19 when checking No.3 cylinder.
d. Check the connector B-17 when checking No.4 cylinder.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace the injector. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 9.

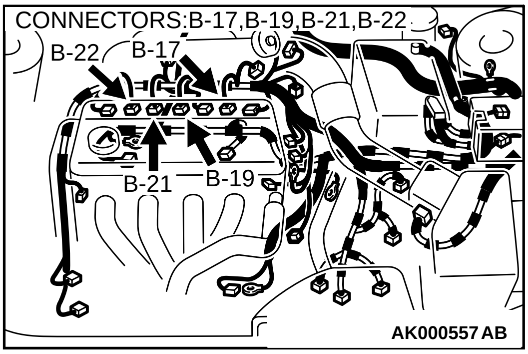


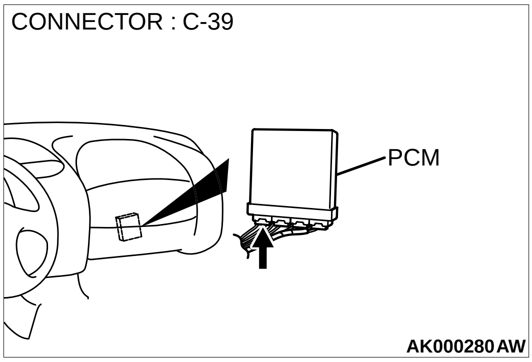
STEP 5. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 9.





STEP 6. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

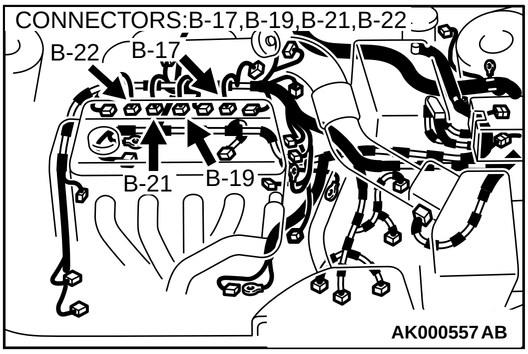
YES : Go to Step 7.
NO : Repair it. Then go to Step 9.

STEP 7. Check the compression.

Refer to GROUP 11A, On-Vehicle Service-Compression Pressure Check(P.11A-8).

Q: Are there any abnormalities?

YES : Go to Step 8.
NO : Repair or replace it. Then go to Step 9.



STEP 8. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0301, P0302, P0303, P0304 is output?

YES : Replace the PCM. Then go to Step 9.
NO : The inspection is complete.

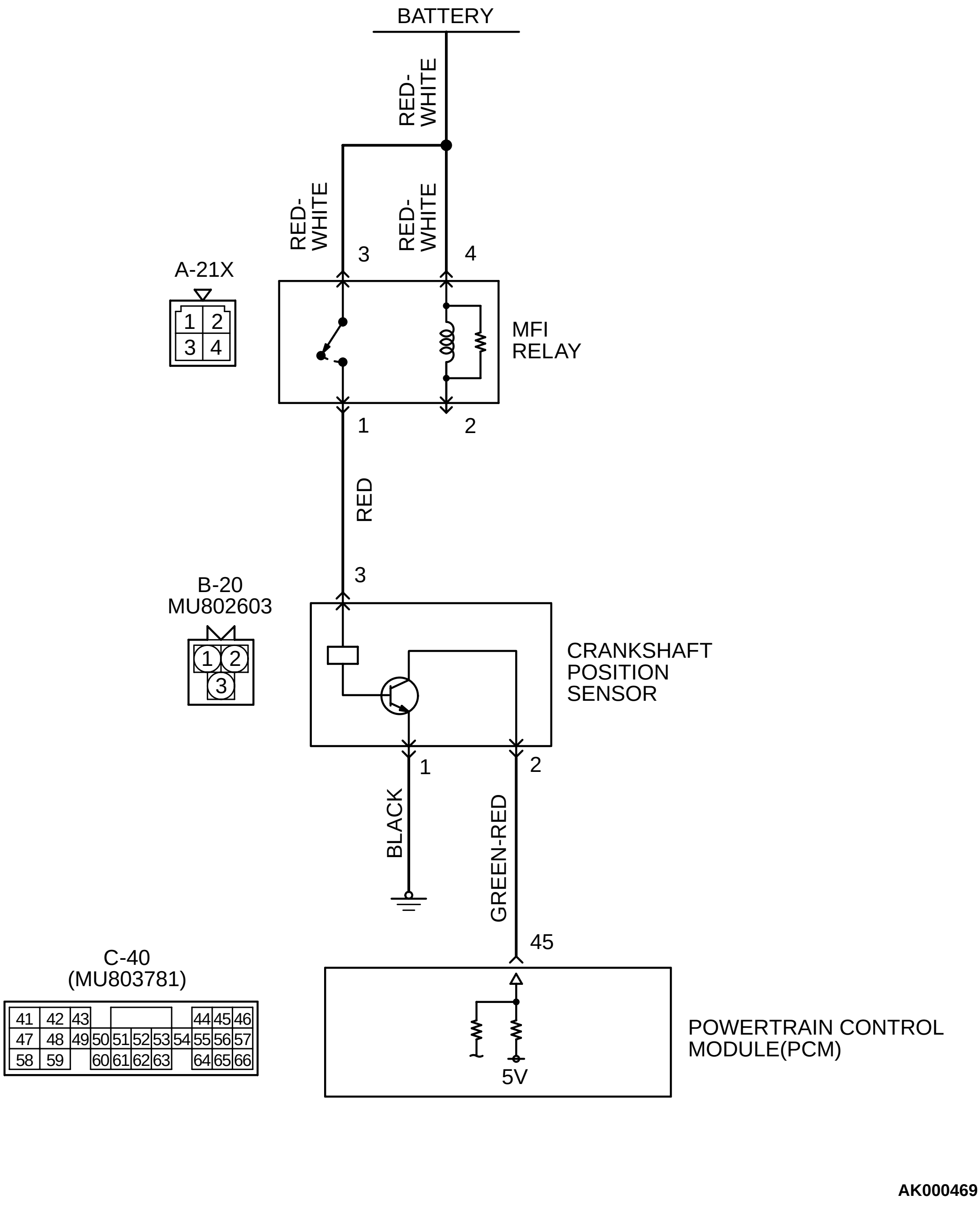
STEP 9. Test the OBD-II drive cycle.

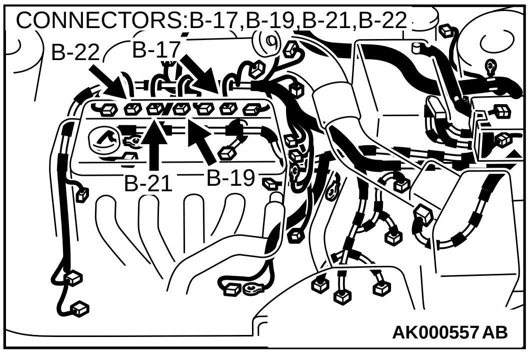
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

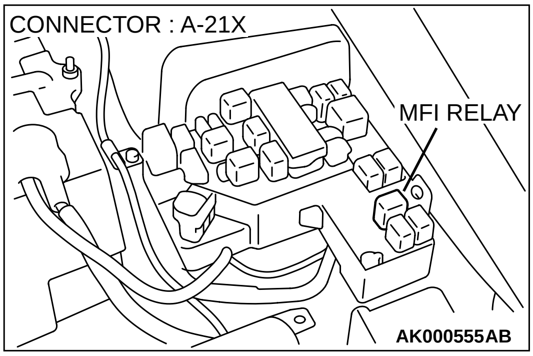
Q: Is the DTC P0301, P0302, P0303, P0304 is output?

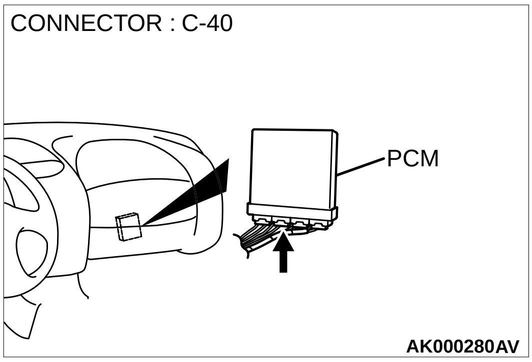
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit Malfunction









CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal 1), and the ground is provided on the vehicle body.
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal 2) from the PCM (terminal 45). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the PCM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.

Judgment Criteria

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions, Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

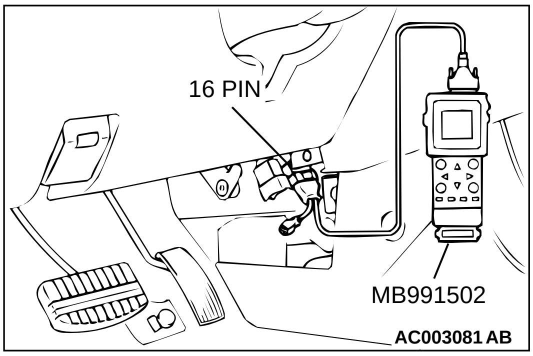
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

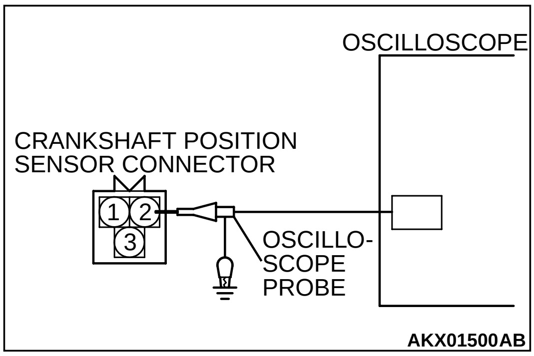
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

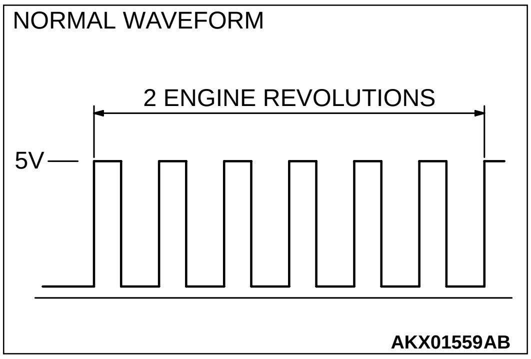
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.





STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Do not disconnect the crankshaft position sensor connector B-20.
(2) Connect the oscilloscope probe to terminal 2 of the crankshaft position sensor by backprobing.

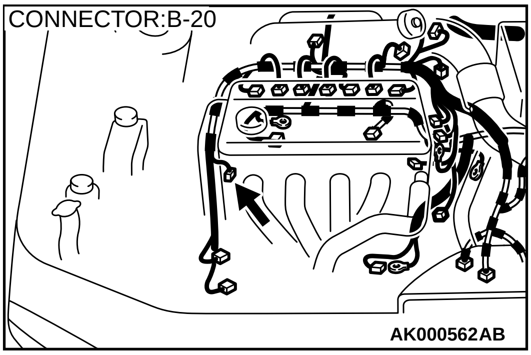
NOTE: Connect the oscilloscope probe to terminal 45 by backprobing when measuring with the PCM connector.

(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the waveform normal?

YES : Go to Step 3.
NO : Go to Step 5.

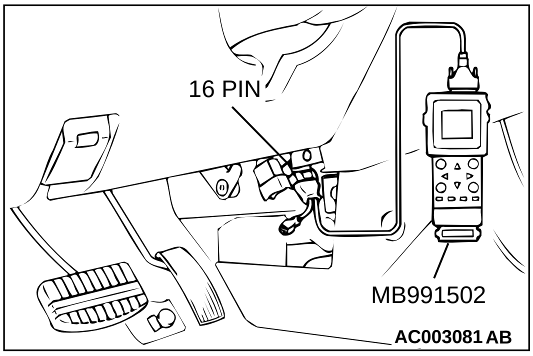


STEP 3. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.



STEP 4. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

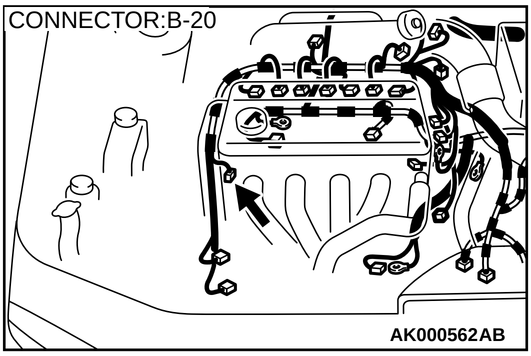
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points (P.00-8).

NO : Replace the PCM. Then go to Step 20.

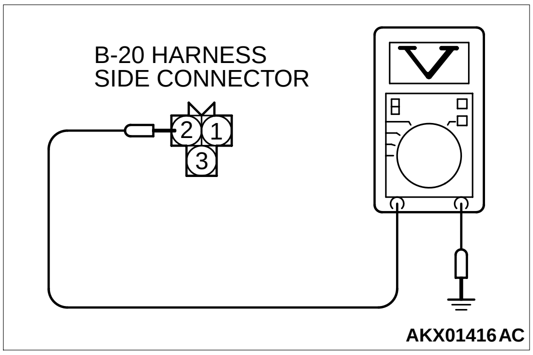


STEP 5. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.



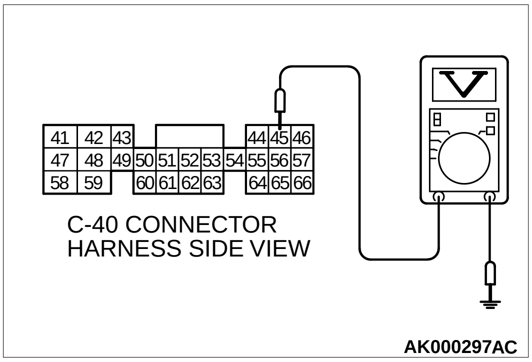
STEP 6. Check the sensor supply voltage at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.8 and 5.2 volts

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.
NO : Go to Step 7.



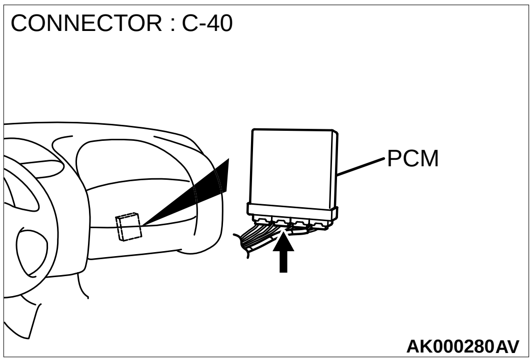
STEP 7. Check the sensor supply voltage at PCM connector C-40 by backprobing

(1) Do not disconnect the PCM connector C-40.
(2) Disconnect the crankshaft position sensor connector B-20.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 45 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

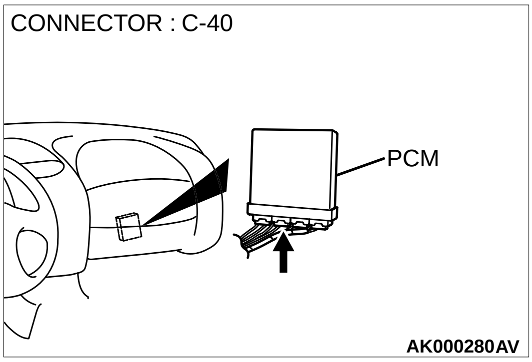
YES : Go to Step 8.
NO : Go to Step 9.



STEP 8. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

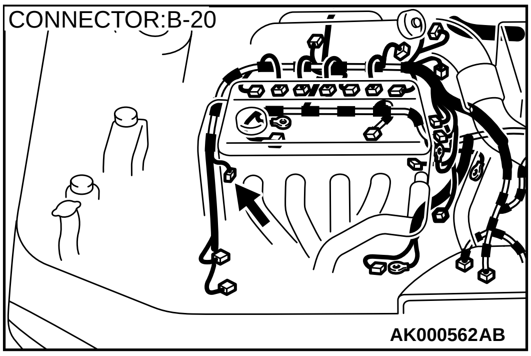
YES : Repair it because of open circuit between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-40 terminal 45. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.

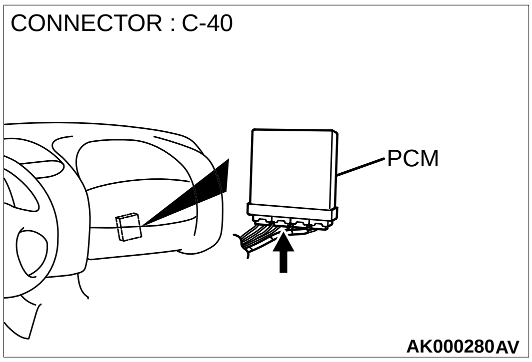


STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.

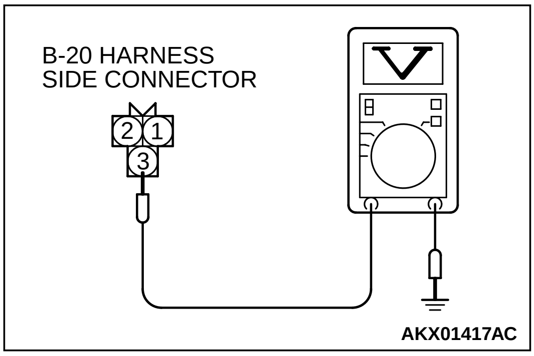




STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-40 terminal 45.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 20.
NO : Repair it. Then go to Step 20.



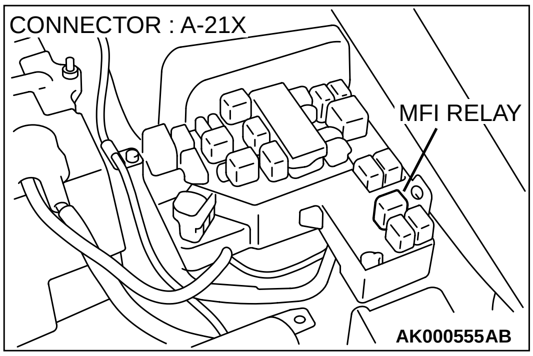
STEP 11. Check the power supply voltage at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

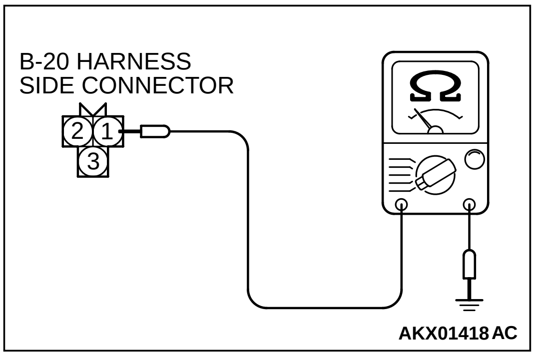
YES : Go to Step 13.
NO : Go to Step 12.



STEP 12. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and crankshaft position sensor connector B-20 terminal 3 because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.



STEP 13. Check the continuity at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.

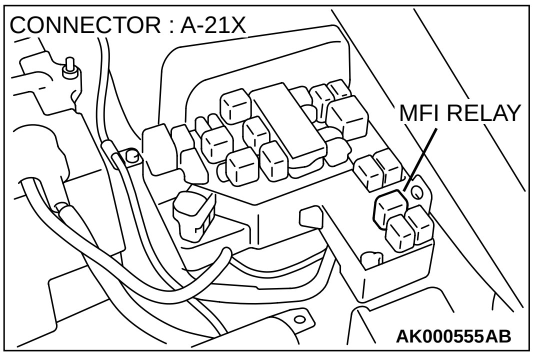
(2) Check for the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 14.

NO : Repair harness wire between crankshaft position sensor connector B-20 terminal 1 and ground because of open circuit or harness damage. Then go to Step 20.

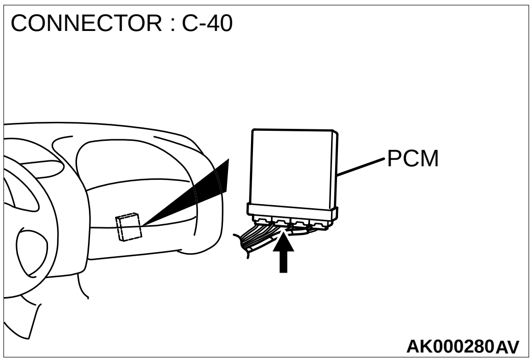


STEP 14. Check connector A-21X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.

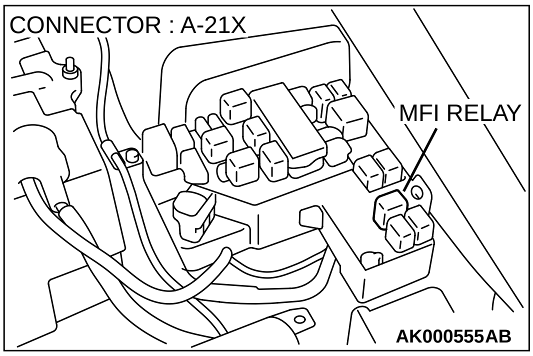


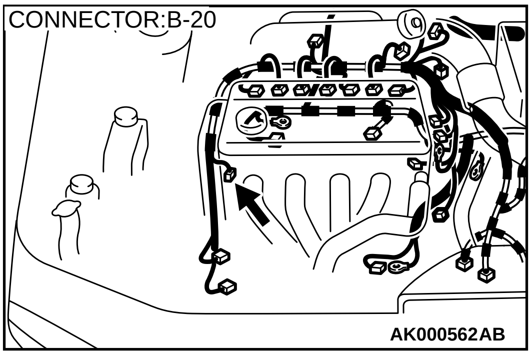
STEP 15. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 20.



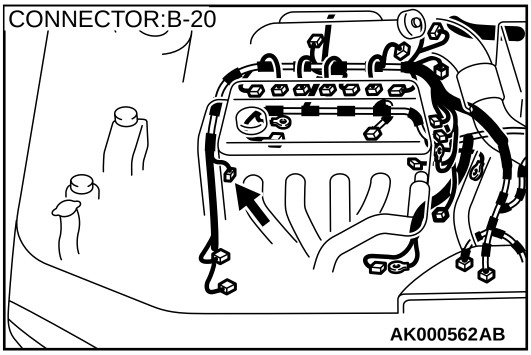


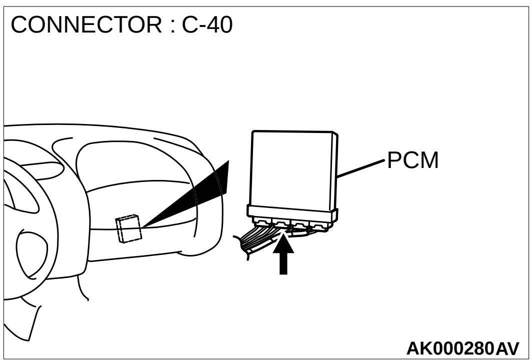
STEP 16. Check for harness damage between MFI relay connector A-21X terminal 1 and crankshaft position sensor connector B-20 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to Step 20.



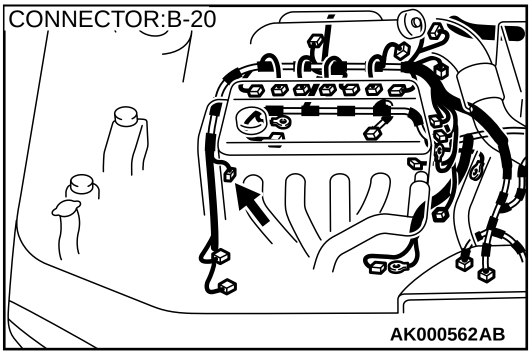


STEP 17. Check for harness damage between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-40 terminal 45.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.



STEP 18. Check for harness damage between crankshaft position sensor connector B-20 terminal 1 and ground.

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.

STEP 19. Check the crankshaft position sensor vane.

Q: Is the vane in a good condition?

YES : Replace the crankshaft position sensor. Then go to Step 20.
NO : Repair it. Then go to Step 20.

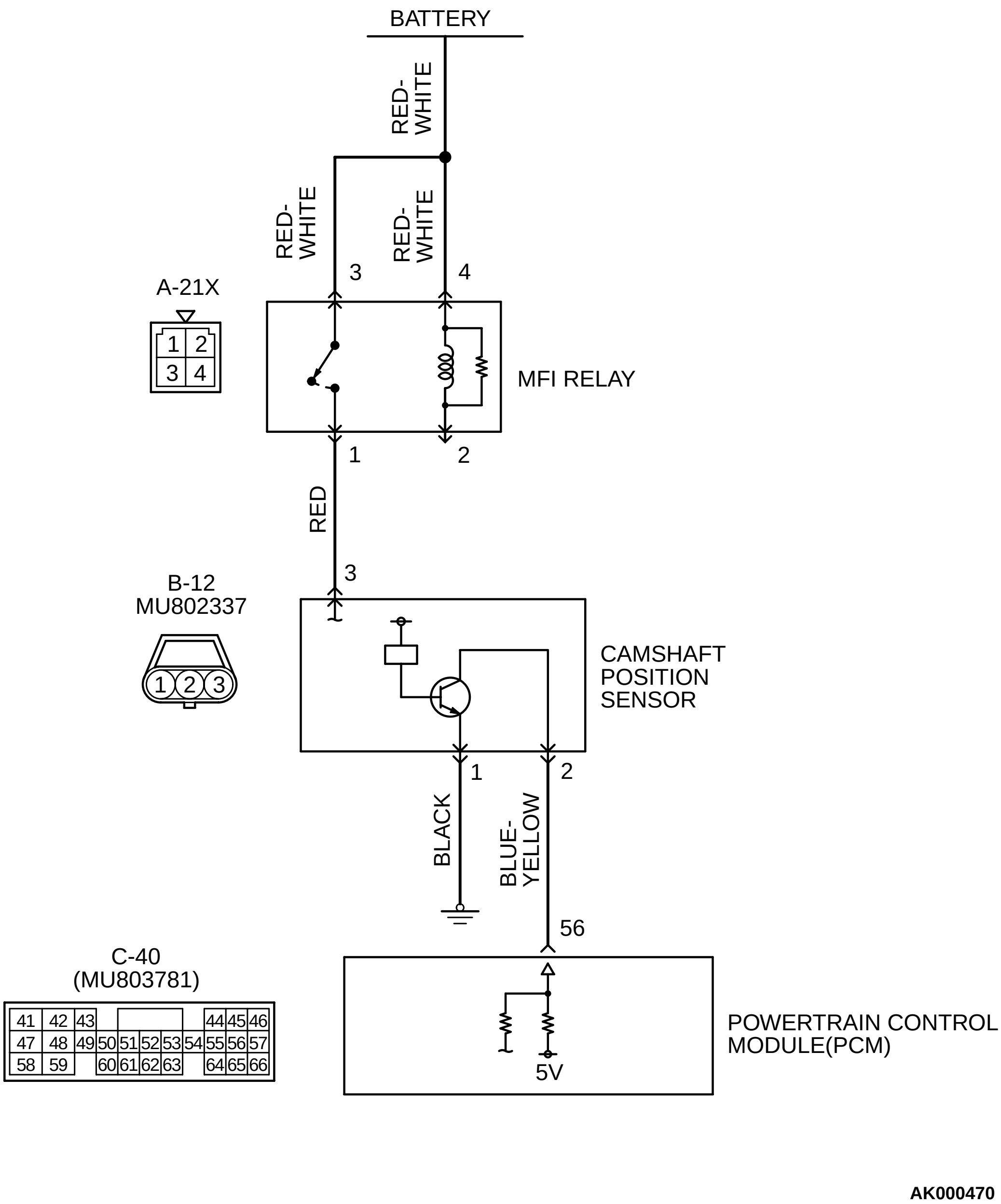
STEP 20. Test the OBD-II drive cycle.

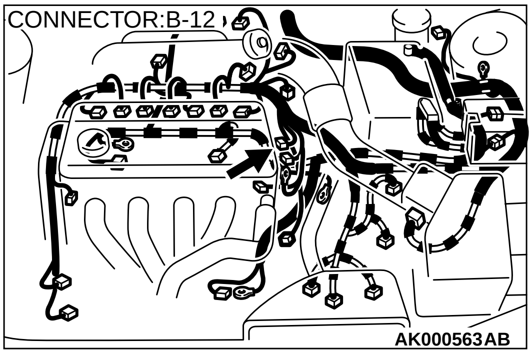
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

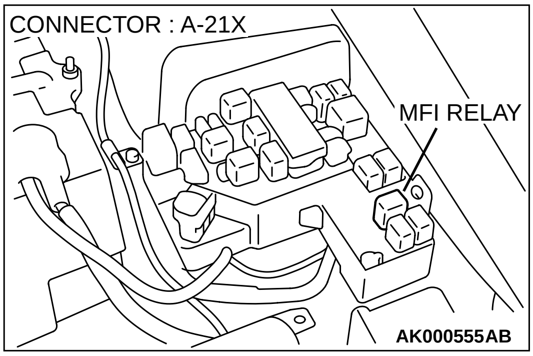
Q: Is the DTC P0335 is output?

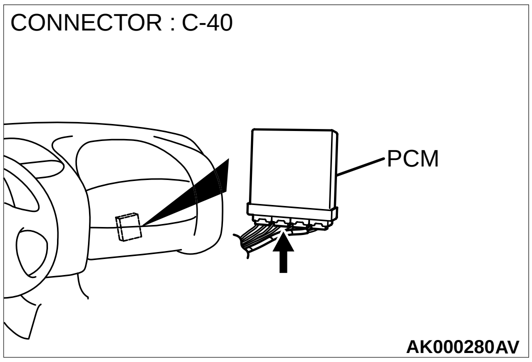
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0340: Camshaft Position Sensor Circuit Malfunction









CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal 1). Ground is provided through terminal 1 to chassis ground.
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal 2) from the PCM (terminal 56). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the PCM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

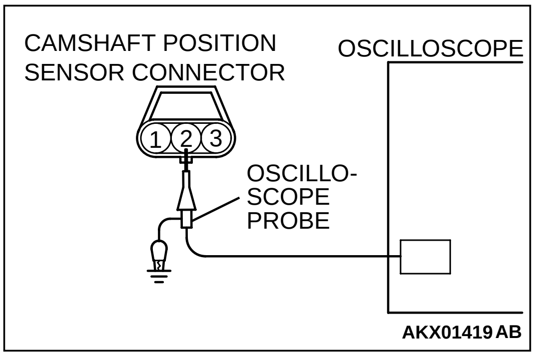
- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

STEP 1. Using the oscilloscope, check the camshaft position sensor.

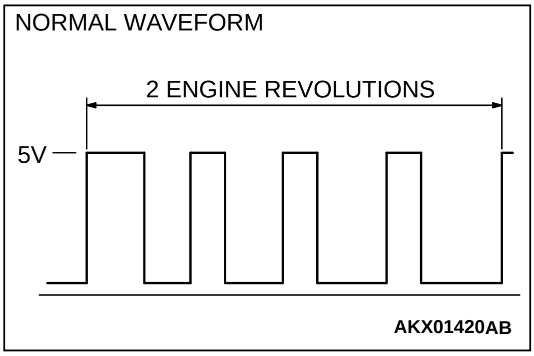


(1) Disconnect the camshaft position sensor connector B-12, and connect test harness special tool (MB991348) in between. (All terminals should be connected.)
(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal 2.

NOTE: When measuring with the PCM side connector, connect an oscilloscope probe to terminal 56.

(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

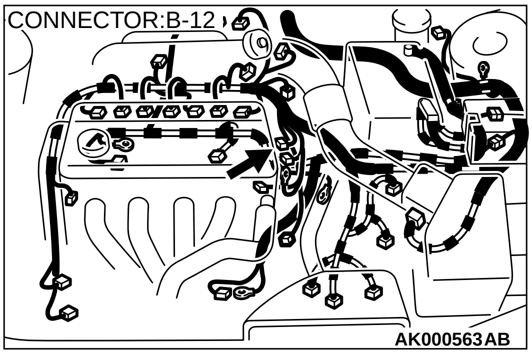
(5) Turn the ignition switch to the "LOCK"(OFF) position.



Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check connector B-12 at camshaft position sensor for damage.



Q: Is the connector in good condition?

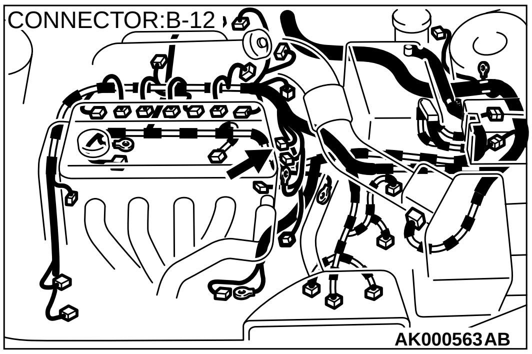
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Replace the PCM. Then go to Step 18.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points (P.00-8).

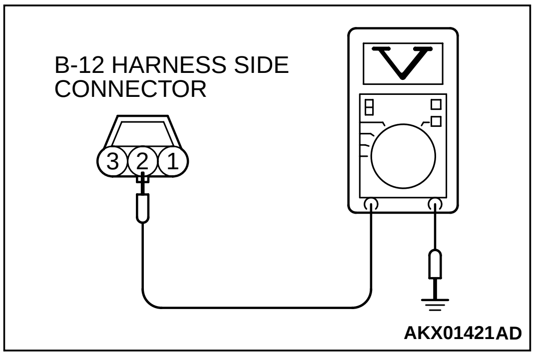


STEP 4. Check connector B-12 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.



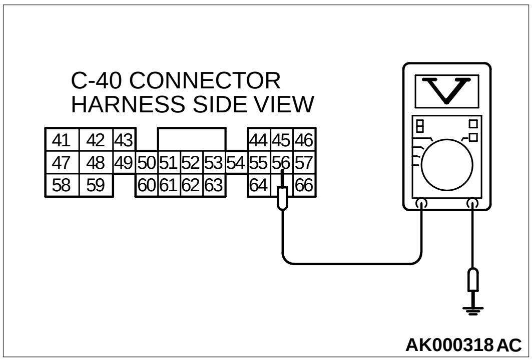
STEP 5. Check the sensor supply voltage at camshaft position sensor connector B-12.

(1) Disconnect the connector B-12 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.8 and 5.2 volts
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 6.



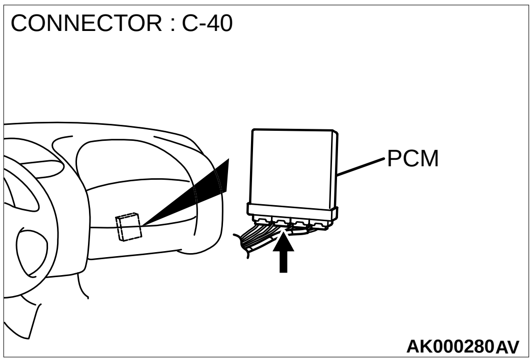
STEP 6. Check the sensor supply voltage at PCM connector C-40 by backprobing

(1) Do not disconnect the PCM connector C-40.
(2) Disconnect the camshaft position sensor connector B-12.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 56 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.
(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 8.

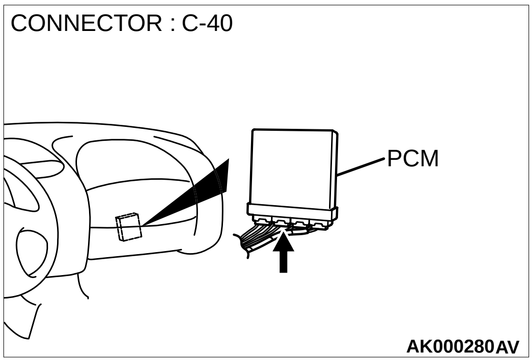


STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-12 terminal 2 and PCM connector C-40 terminal 56 because of open circuit. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.

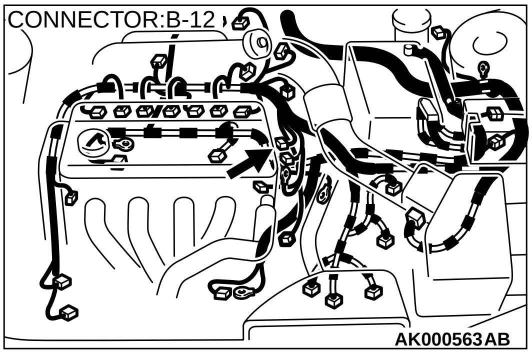


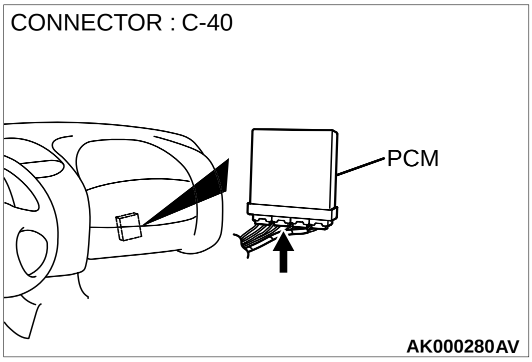
STEP 8. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.



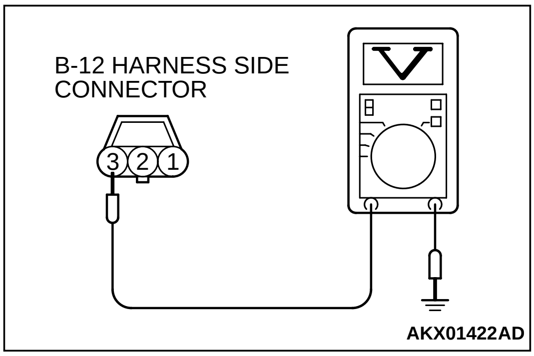


STEP 9. Check for short circuit to ground between camshaft position sensor connector B-12 terminal 2 and PCM connector C-40 terminal 56.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.



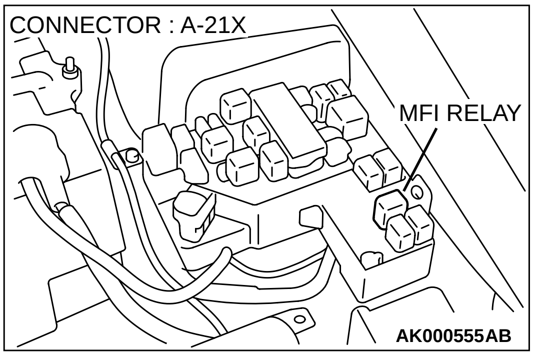
STEP 10. Check the power supply voltage at camshaft position sensor connector B-12.

(1) Disconnect the connector B-12 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

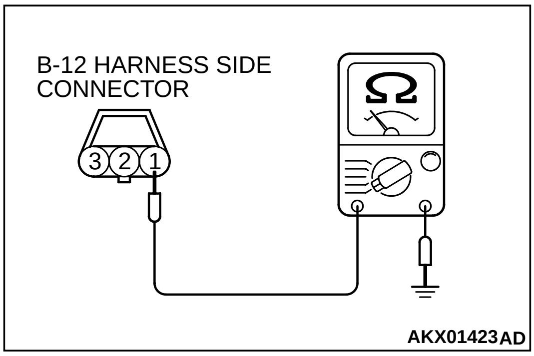
YES : Go to Step 12.
NO : Go to Step 11.



STEP 11. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and camshaft position sensor connector B-12 terminal 3 because of open circuit or short circuit to ground. Then go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.

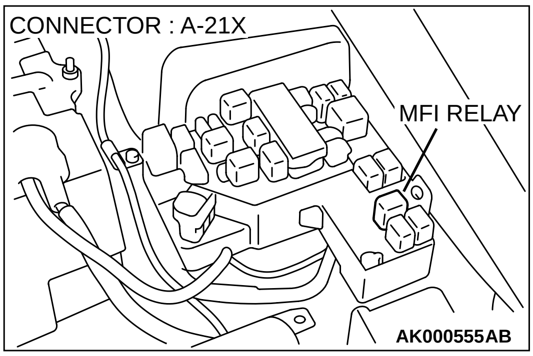


STEP 12. Check the continuity at camshaft position sensor connector B-12.

(1) Disconnect the connector B-12 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

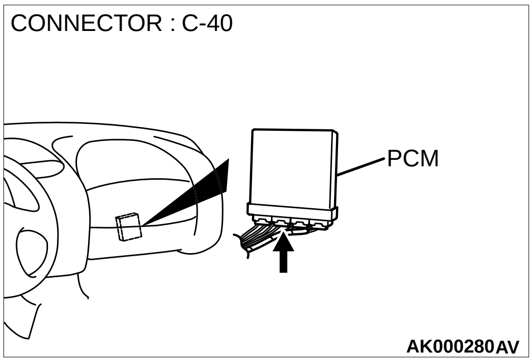
YES : Go to Step 13.
NO : Repair harness wire between camshaft position sensor connector B-12 terminal 1 and ground because of open circuit or harness damage. Then go to Step 18.



STEP 13. Check connector A-21X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 18.

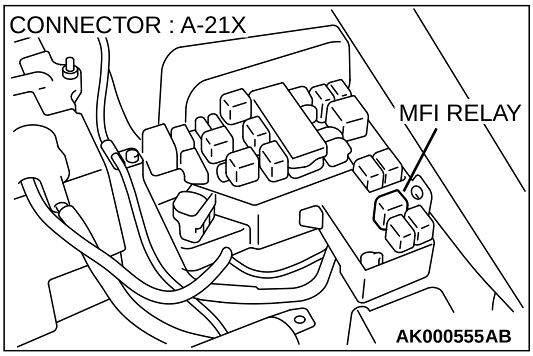


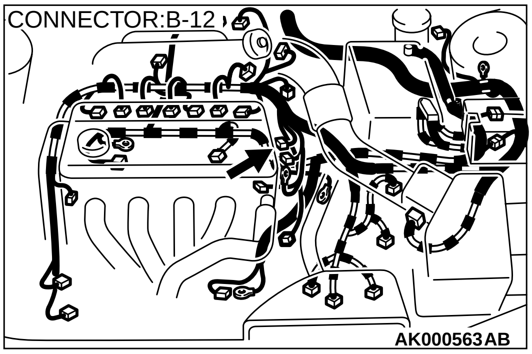
STEP 14. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then go to Step 19.



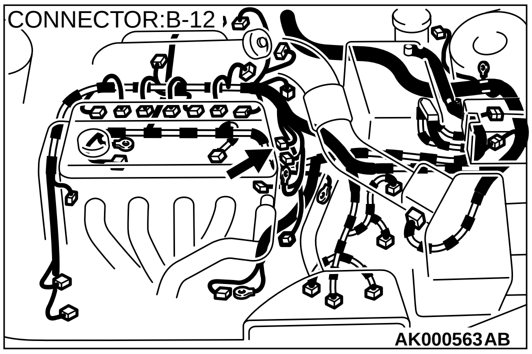


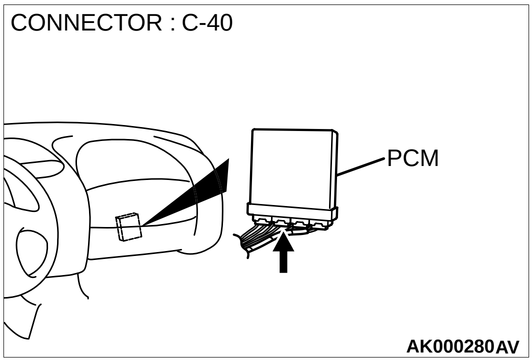
STEP 15. Check for harness damage between MFI relay connector A-21X terminal 1 and camshaft position sensor connector B-12 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it. Then go to Step 18.





STEP 16. Check for harness damage between camshaft position sensor connector B-12 terminal 2 and PCM connector C-40 terminal 56.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to Step 18.

STEP 17. Check the camshaft position sensor vane.

Q: Is the vane in a good condition?

YES : Replace the camshaft position sensor. Then go to Step 18.

NO : Repair it. Then go to Step 18.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR solenoid switches from "OFF" to "ON" while the engine is running, EGR gas flows.
- The PCM checks how the EGR gas flow signal changes.

DTC SET CONDITIONS

Check Conditions

- At least twenty seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 82° C (180° F).
- Engine speed is at between 940 and 2,000 r/min.
- Intake air temperature is higher than 5° C (41° F).

- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 30 km/h (18.7 mph) or more.
- At least ninety seconds have passed since manifold differential pressure sensor output voltage fluctuated 1.5 volts or more.
- The throttle valve is closed.
- Volumetric efficiency is lower than 20 percent.
- Monitoring time: 2 seconds.

Judgement Criteria

- The intake manifold pressure fluctuations are minimal. When the EGR solenoid is turned ON.
- Three monitors during one drive cycle

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve does not open.
- EGR control vacuum is too low.
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- Manifold differential pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

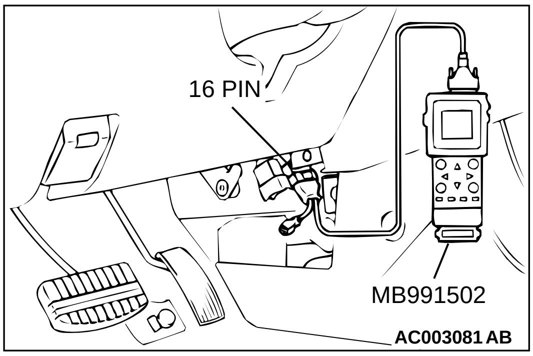
STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System - EGR System Check (P.17-91).

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 3.

STEP 2. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 96° C(176° F to 205° F).
- Should be between 62 – 76 kPa at engine idling.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to, DTC P1400 – Manifold Differential Pressure Sensor Circuit Malfunction(P.13A-299).

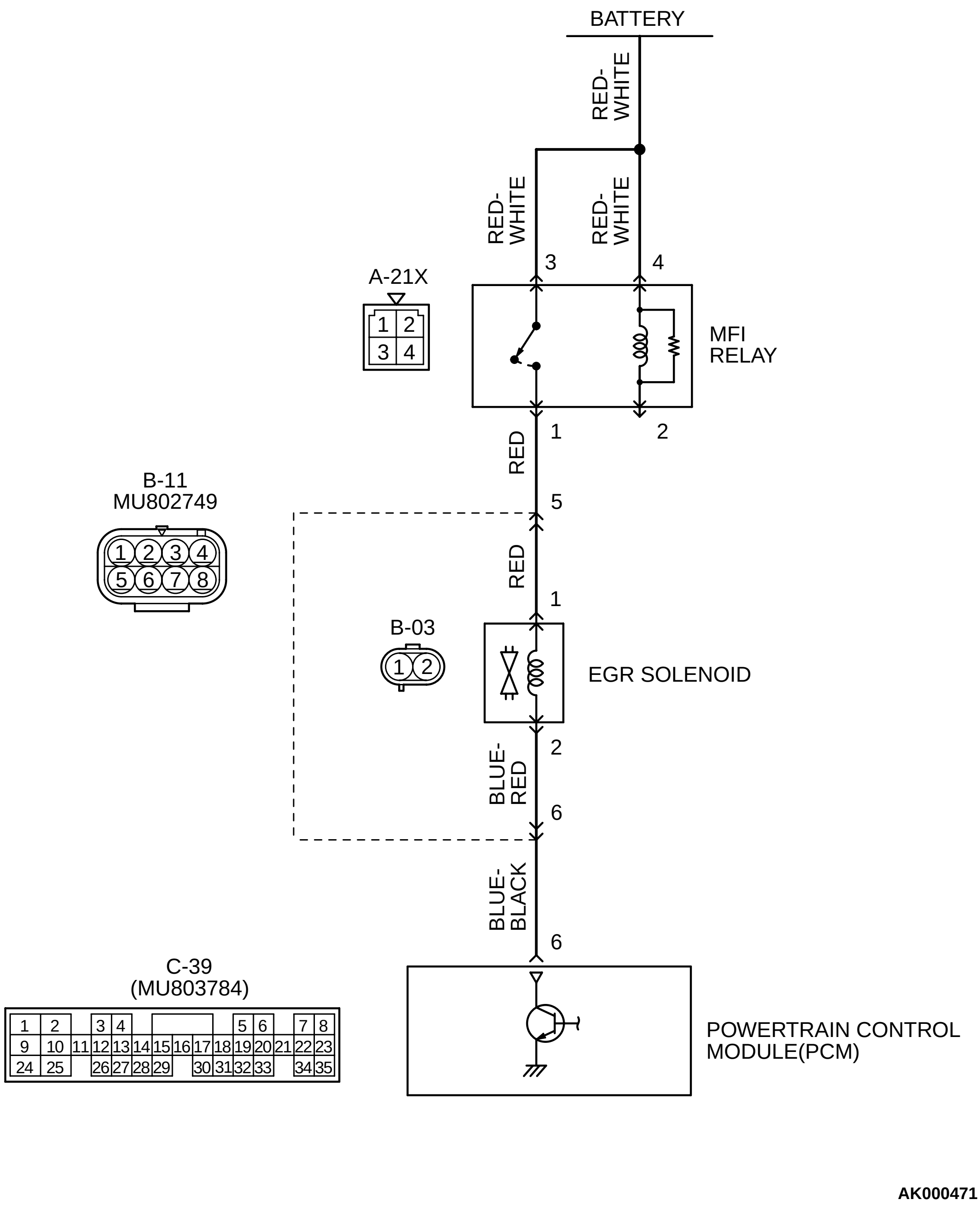
STEP 3. Test the OBD-II drive cycle.

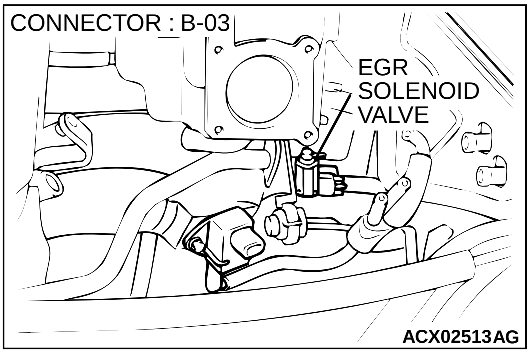
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

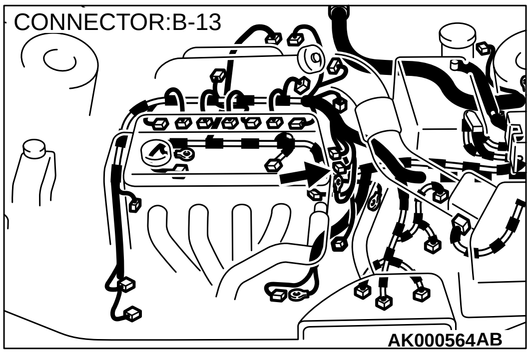
Q: Is the DTC P0401 is output?

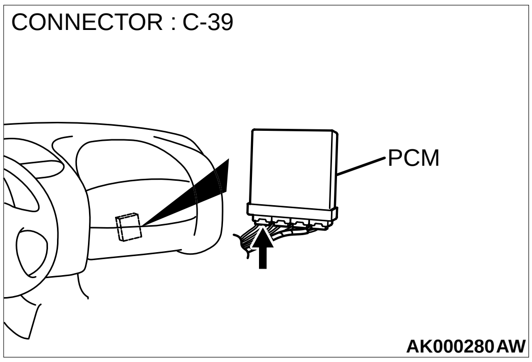
YES : Retry the troubleshooting.
NO : The inspection is complete.

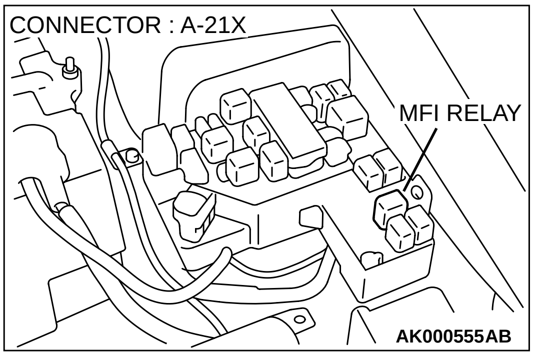
DTC P0403: Exhaust Gas Recirculation Solenoid Malfunction











TECHNICAL DESCRIPTION

- The EGR solenoid power is supplied from the MFI relay (terminal 1).
- The PCM controls the EGR solenoid ground by turning the power transistor in the PCM "ON" and "OFF."

BACKGROUND

- The PCM checks current flows in the EGR solenoid drive circuit when the EGR solenoid is "ON" and "OFF."

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 10 volts.

Judgment Criteria

- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected when the EGR solenoid is turned from "ON" to "OFF."
- Only one monitor during one drive cycle

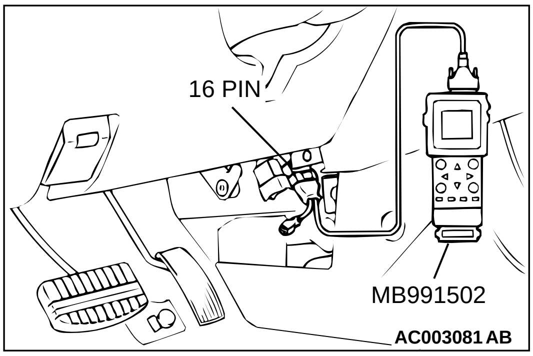
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 10: EGR solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

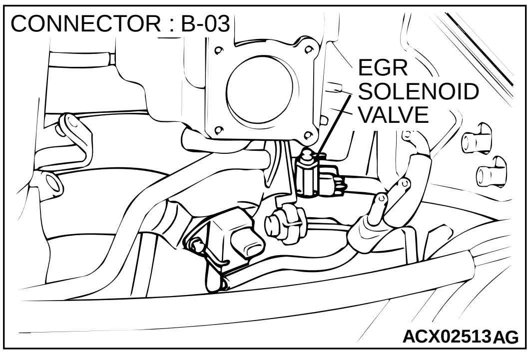
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 10, EGR solenoid.
- An operation sound should be heard and vibration should be felt when the EGR solenoid is operated.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Go to Step 2.

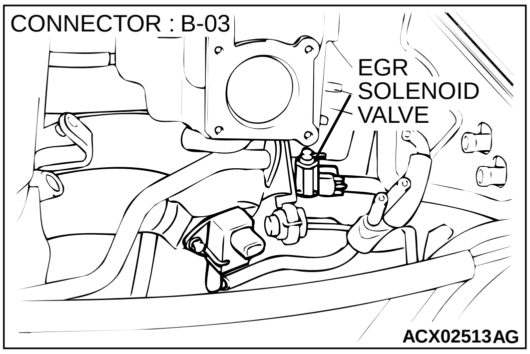


STEP 2. Check connector B-03 at the EGR solenoid for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

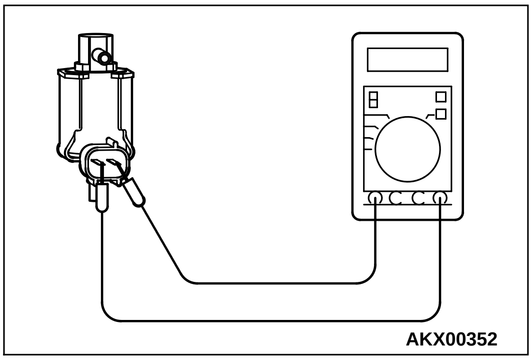
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



STEP 3 Check the EGR solenoid.

(1) Disconnect the EGR solenoid connector B-03.
(2) Measure the resistance between EGR solenoid side connector terminal 1 and 2.

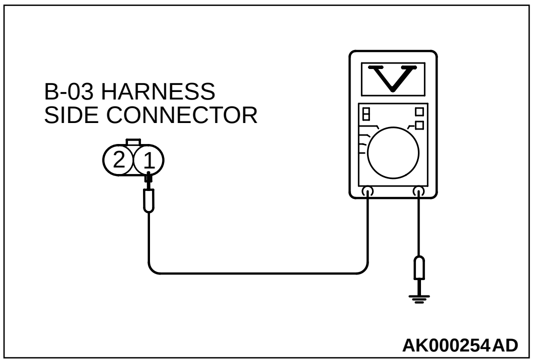
Standard value: 29 – 35Ω [at 20° C (68° F)]



Q: Is the resistance at the standard value?

YES : Go to Step 4.
NO : Replace the EGR solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at EGR solenoid harness side connector B-03.

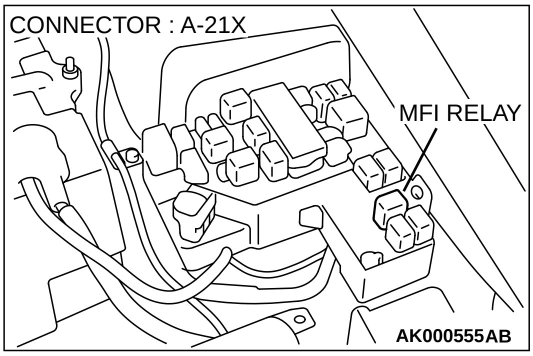


(1) Disconnect the connector B-03 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

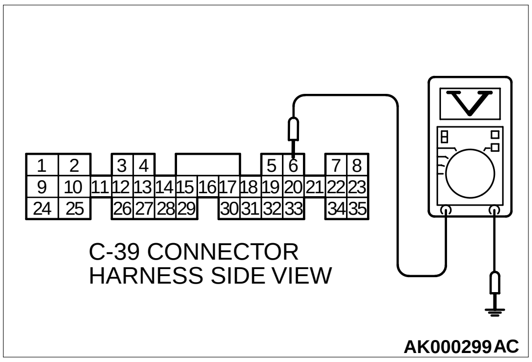
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check connector A-21X at MFI relay for damage.



Q: Is the connector in good condition?

YES : Check connector B-11 at intermediate connector for damage, and repair or replace as required. to GROUP 00E, Harness Connector Inspection(P.00E-2). If intermediate connectors is in good condition, repair harness wire between MFI relay connector A-21X terminal 1 and EGR solenoid connector B-03 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



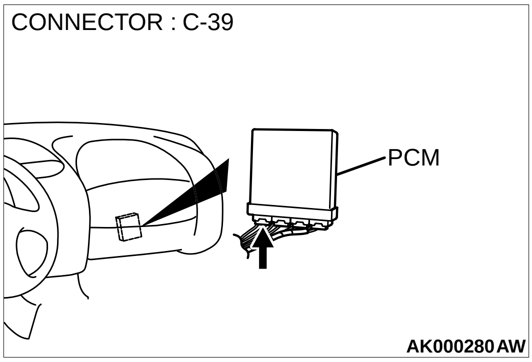
STEP 6. Check the power supply voltage at PCM connector C-39 by backprobing

(1) Do not disconnect the connector C-39.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

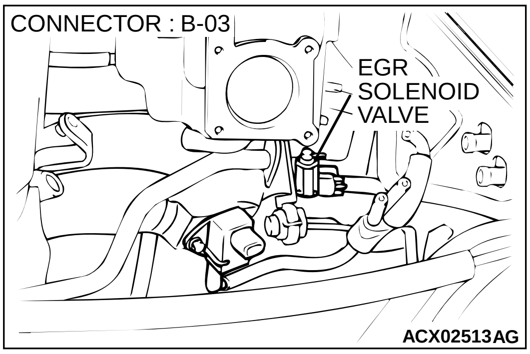
YES : Go to Step 9.
NO : Go to Step 7.

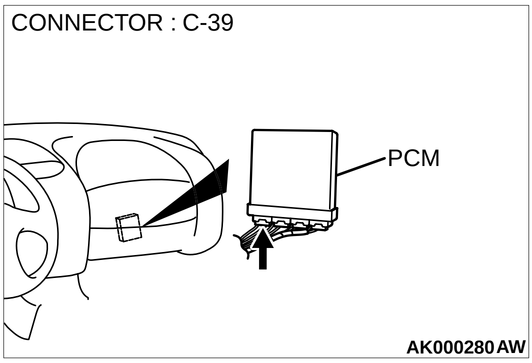


STEP 7. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



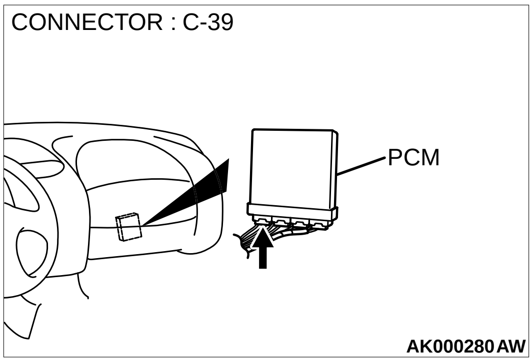


STEP 8. Check for open circuit and short circuit to ground between EGR solenoid connector B-03 terminal 2 and PCM connector C-39 terminal 6.

NOTE: Check harness after checking intermediate connector B-11.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection(P.00E-2).Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

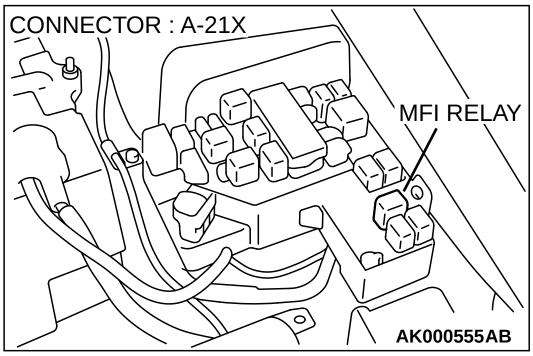


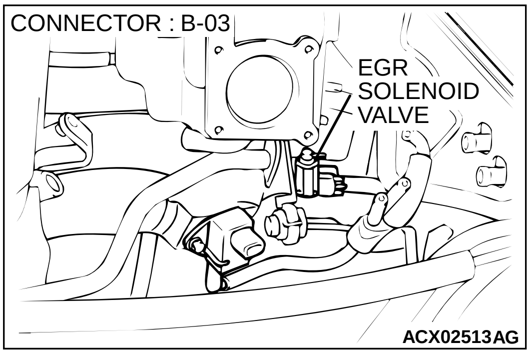
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.





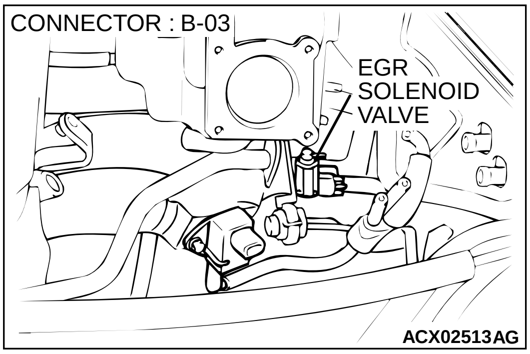
STEP 10. Check for harness damage between MFI relay connector A-21X terminal 1 and EGR solenoid connector B-03 terminal 1.

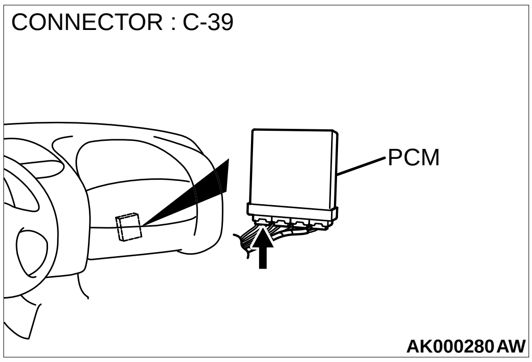
NOTE: Check harness after checking intermediate connector B-11.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection(P.00E-2).Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between EGR solenoid connector B-03 terminal 2 and PCM connector C-39 terminal 6.

NOTE: Check harness after checking intermediate connector B-11.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection(P.00E-2).Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other MonitorP.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0403 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor.That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Volume air flow sensor output frequency is between 63 and 169 Hz.
- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76 kPa (11 psi).
- The throttle valve is open.
- Under the closed loop air / fuel ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- Monitoring time: 70 seconds.

Judgment Criteria

- The heated oxygen sensor (rear) signal and heated oxygen sensor (front) signal are similar.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- PCM failed.

DIAGNOSIS

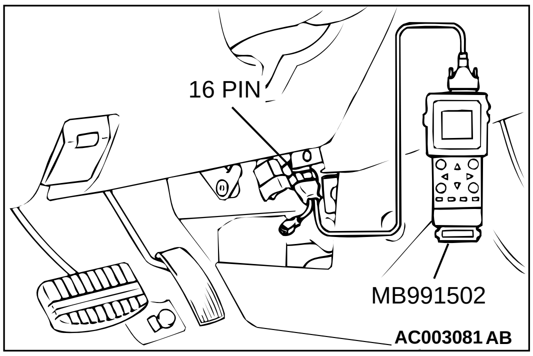
Required Special Tools
MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.

STEP 2. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

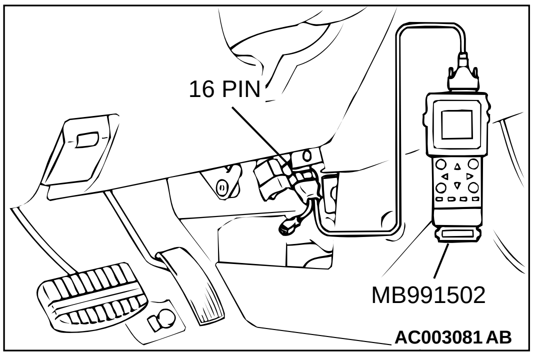
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0136 – O_2 Sensor Circuit Malfunction (sensor 2)(P.13A-127), DTC P0139 – O_2 Sensor Circuit Slow Response (sensor 2)(P.13A-135).

STEP 3. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

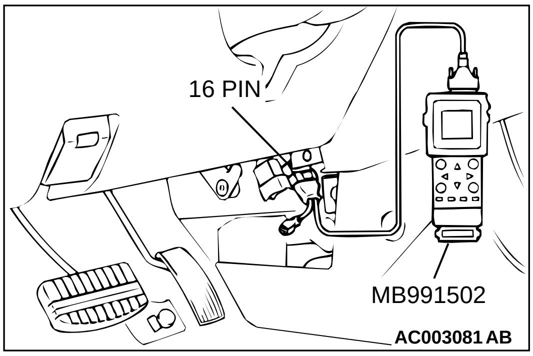


(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0130 – O_2 Sensor Circuit Malfunction (sensor 1)(P.13A-105), DTC P0133 – O_2 Sensor Circuit Slow Response (sensor 1)(P.13A-113).



STEP 4. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the right bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the PCM. Then go to Step 7.
NO : The inspection is complete.

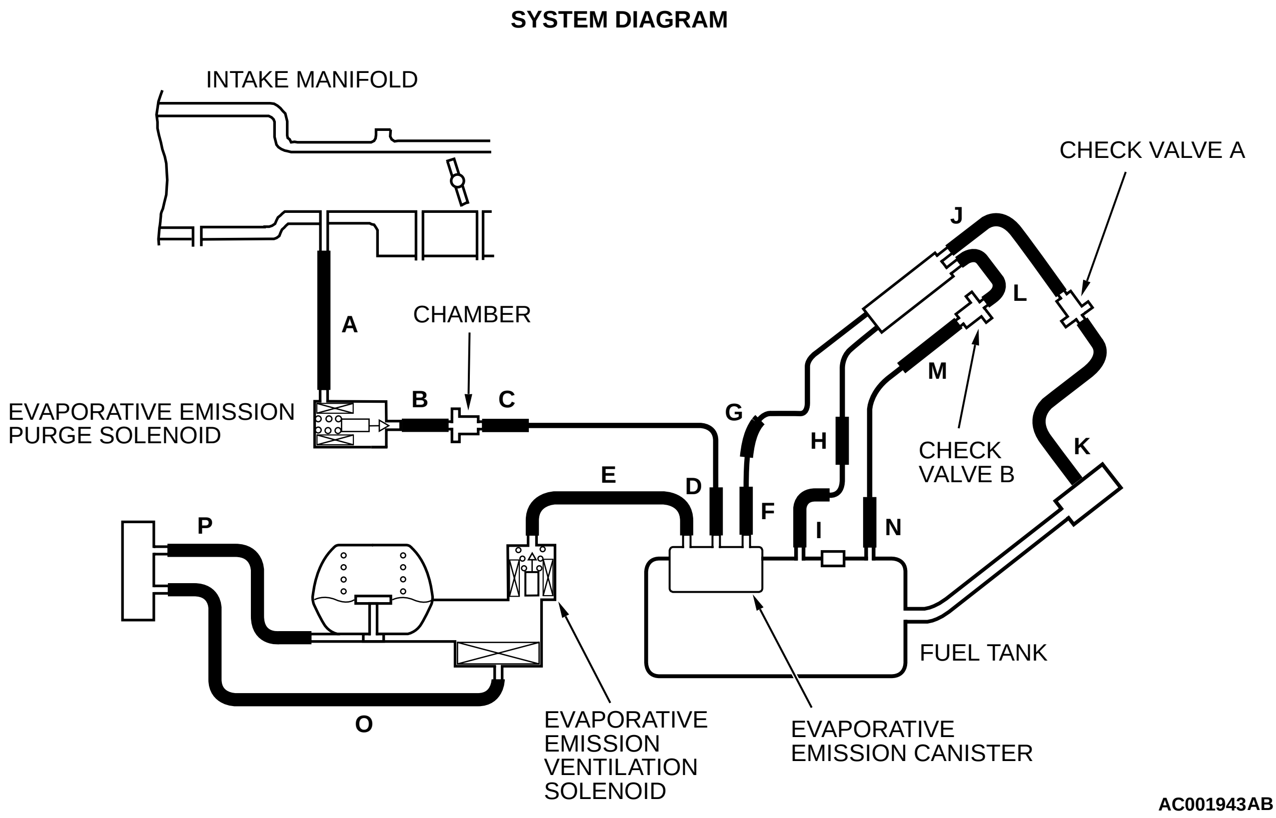
STEP 7. Test the OBD-II drive cycle.

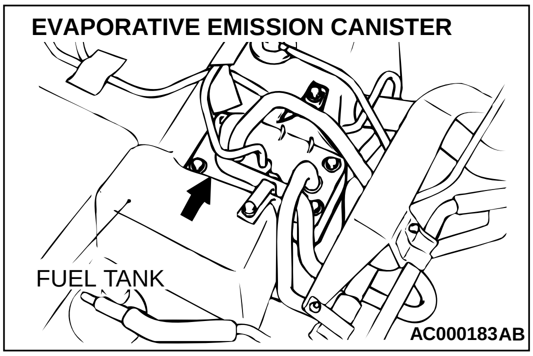
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

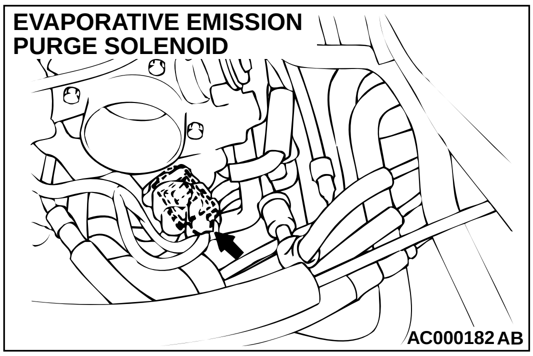
Q: Is the DTC P0421 is output?

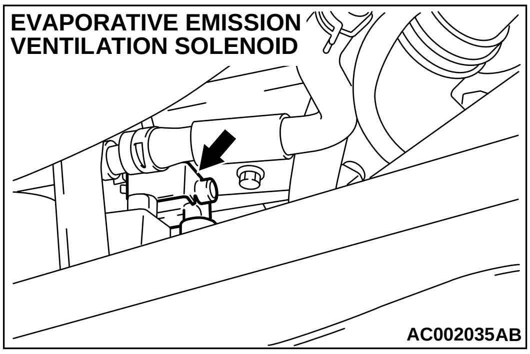
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0442: Evaporative Emission Control System Leak Detected









TECHNICAL DESCRIPTION

- To judge if there is leak in the fuel system, PCM measure the change of the pressure inside the fuel tank.
- The PCM turns on the evaporative emission ventilation solenoid to shot off the evaporative emission canister outlet port.

- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi.)
- The PCM determines if there is leak in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions

A. At Start up

- Intake air temperature is 30°C (86°F) or less when the engine is started.
- The engine coolant temperature 30°C (86°F) or less when the engine is started.

B. For Test to Run

- With in 16 minutes after the engine is started.
- Engine coolant temperature is higher than 60°C (140°F.)
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF"
- Barometric pressure is above 76 kPa (11 psi.)
- Volumetric efficiency is between 20 and 80 percent.
- Vehicle speed is 30 km/h (18.7 mph) or more.

C. For Test to Stop

- Intake air temperature is less than 5°C (41°F.)
- The engine coolant temperature higher than 60°C (140°F.)
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises within 451 Pa (0.065 psi.)
- The pressure fluctuation width is less than 647 Pa (0.094 psi.)
- Fuel tank differential pressure sensor output voltage is 1 to 4 V.

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 785 Pa (0.114 psi) in 20 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (75 –125 seconds.)

TROUBLESHOOTING HINTS

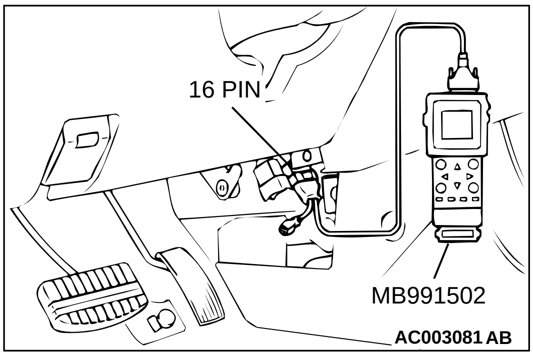
The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission ventilation solenoid failed.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS



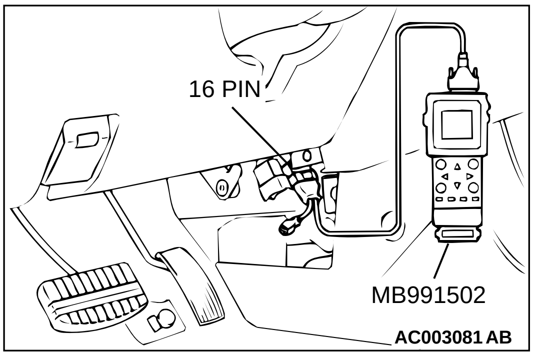
Required Special Tool:

MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa.) If not, set scan tool MB991502 by selecting the "Syatem Setup" at the main menu.



STEP 1. Evaporative Emission System Monitor Test using scan tool MB991502.

⚠ CAUTION

With this monitor, the PCM automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "P."

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using the scan tool MB991502.
(3) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(4) Start the engine.
(5) Select "System Test," and press the "YES" key.
(6) Select "Evap Leak Mon," and press the "YES" key.
(7) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-438. and adjust to the standard value.

(8) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."

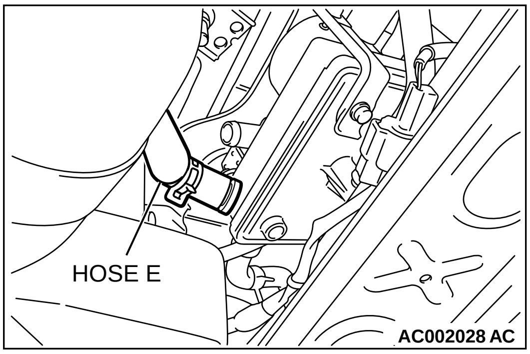
Q: What is displayed on the scan tool MB991507?

"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

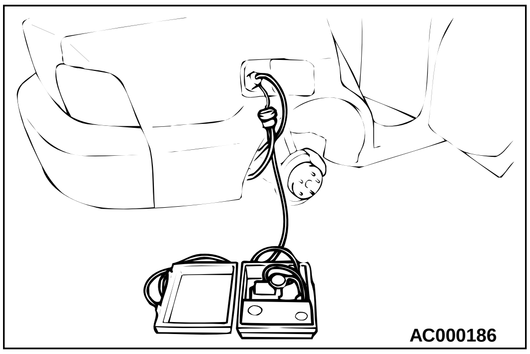
"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range.) Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.

STEP 2. Pressure test for evaporator line from hose B to hose N.



(1) Remove the module bracket mounting bolts, and disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.



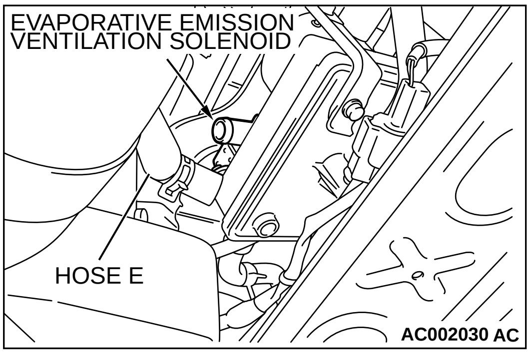
(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

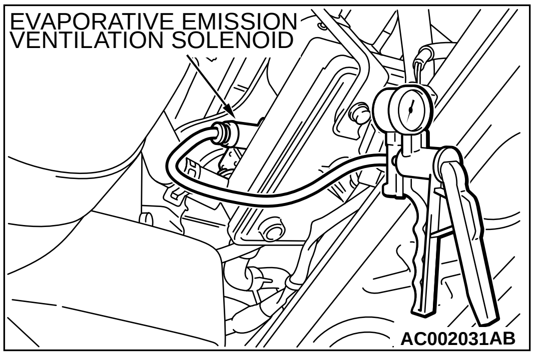
Q: Are there any leaks in the evaporator line?

YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the evaporative emission ventilation solenoid valve using the scan tool MB991502. (Actuator test item 29)



(1) Turn the ignition switch to the "ON" position, and disconnect the hose E from the evaporative emission ventilation solenoid side.



(2) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(3) Drive the evaporative emission ventilation solenoid with the scan tool MB991502 actuator test, and confirm that the vacuum does not fluctuate when the vacuum is applied with the hand vacuum pump.

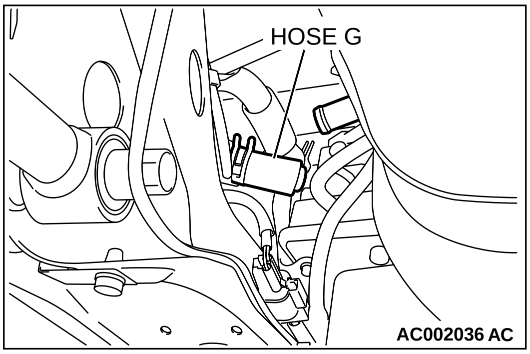
Q: Does the vacuum pump gauge indicate the atmosheric pressure when the evaporative emission purge solenoid is activated?

The evaporative emission purge solenoid valve operates normally, and the vacuum pump gauge reading returns to the atmospheric pressure : Go to Step 1.

The evaporative emission purge solenoid valve operates normally, but the vacuum pump gauge does not indicate the atmospheric pressure : Replace the evaporative emission purge solenoid. Then go to Step 1.

The evaporative emission purge solenoid valve does not operate normally : Refer to P.13A-214, evaporative emission purge solenoid trouble code DTC P0446.

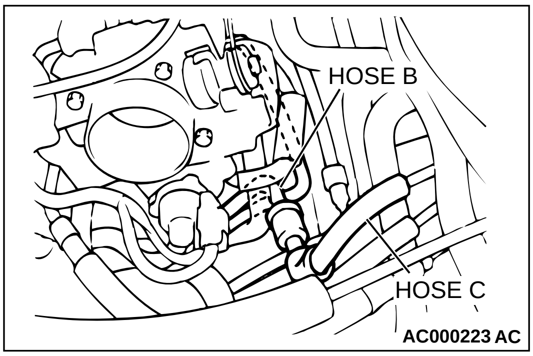
STEP 4. Pressure test for evaporator line from hose G to hose N.



(1) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Are there any leaks in the evaporator line?

YES : Go to Step 9.
NO : Go to Step 5.



STEP 5. Check for leaks in the evaporator line hose B and hose C.

(1) Remove the battery.
(2) Remove the air intake hose. (Refer to GROUP 15, Air CleanerP.15-4.)
(3) The leakage test with a hand vacuum pump on each hose from hose B and hose C.

Q: Can the leaks be pinpointed?

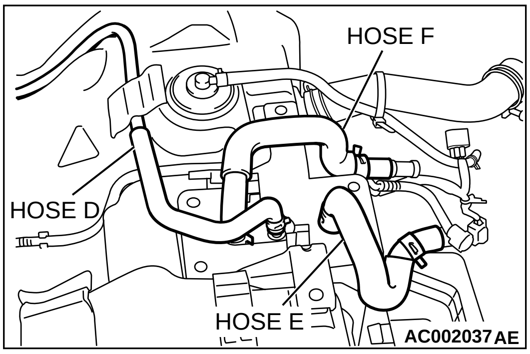
YES : Replace the hose. Then go to Step 1.
NO : Go to Step 6.

STEP 6. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Does the vacuum reading fluctuate?

YES : Replace the chamber, then go to Step 1.
NO : Go to Step 7.

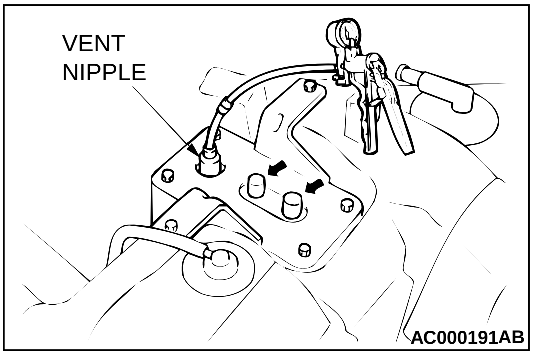


STEP 7. Check for leaks in the evaporator line from hose D to hose F.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The leakage test with a hand vacuum pump on each hose from hose D to hose F.

Q: Can the leaks be pinpointed?

YES : Replace that hose, reinstall the filler tank. Then go to Step 1.
NO : Go to Step 8.

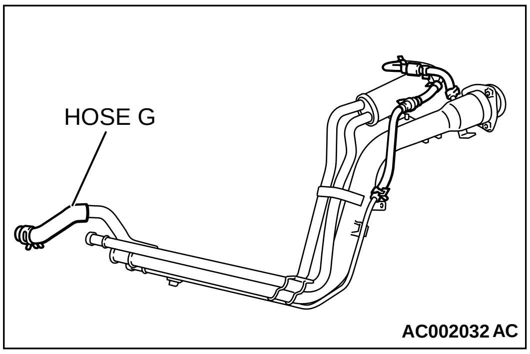


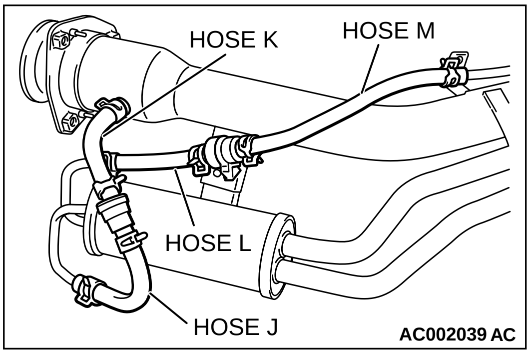
STEP 8. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Does the vacuum reading fluctuate?

YES : Replace the evaporative emission canister, reinstall the fuel tank. Then go to Step 1.
NO : Go to Step 1.



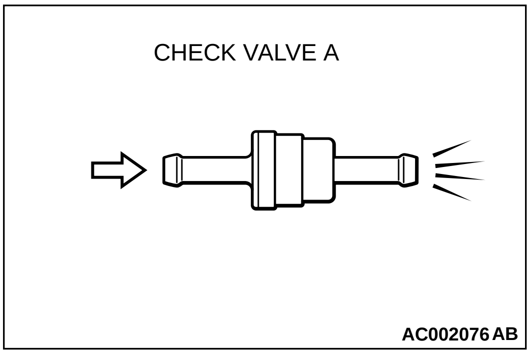


STEP 9. Check for leaks in the evaporator line hose G, J, K, L and M.

(1) Remove the fuel tank filler neck assembly. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The leakage test with a hand vacuum pump on each hose from hose G, J, K, L and M.

Q: Can the leaks be pinpointed?

YES : Replace the hose, reinstall the fuel tank filler neck assembly. Then go to Step 1.
NO : Go to Step 10.

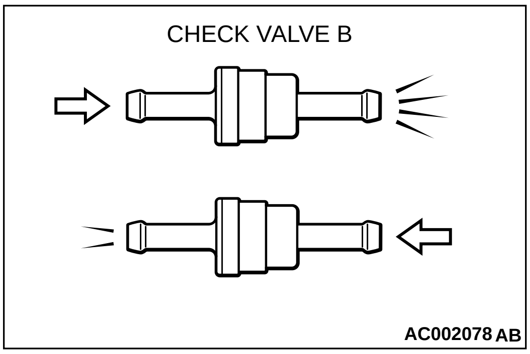


STEP 10. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, on air should leak from the check valve body.

Q: Is there any failure?

YES : Replace it, reinstall the filler neck assembly. Then go to Step 1.
NO : Go to Step 11.



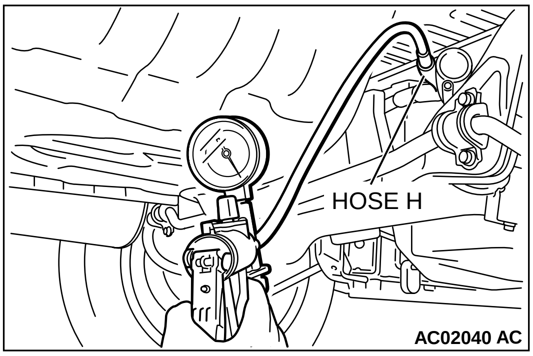
STEP 11. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, on air should leak from the check valve body.

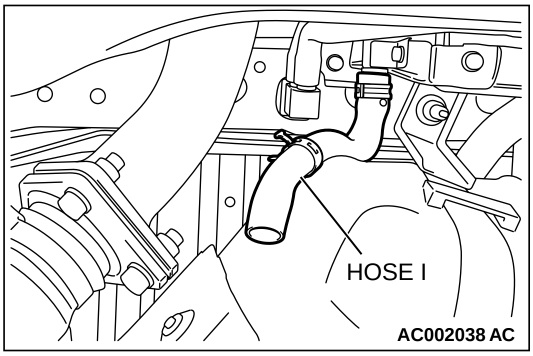
Q: Is there any failure?

YES : Replace it, reinstall the filler neck assembly and filler neck protector. Then go to Step 1.
NO : Go to Step 12.

STEP 12. Check for leaks in the evaporator line from hose H to hose I.



(1) Disconnect hose H at the liquid separator, and then connect a hand vacuum pump to the hose.

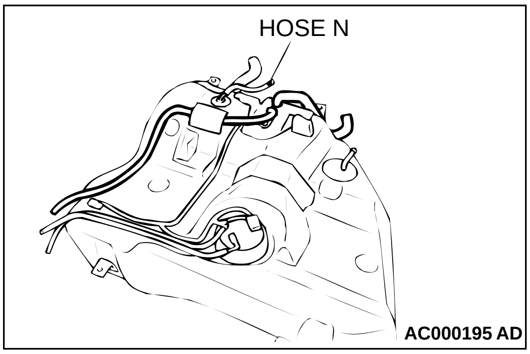


(2) Disconnect hose I at the fuel tank side, and then plug the hose.
(3) Apply vacuum by using the hand vacuum pump.

Q: Is the pressure maintained in the evaporator line?

YES : Go to Step 13.
NO : Go to Step 16.

STEP 13. Check for leaks in the evaporator line from hose N.

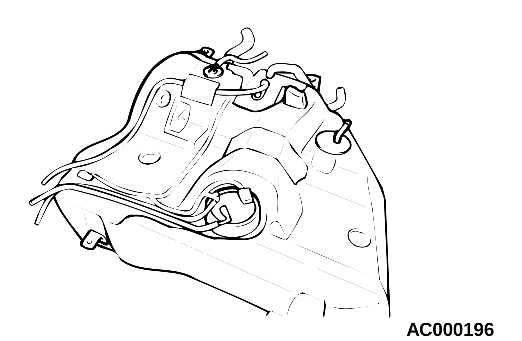


(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The leakage test with a hand vacuum pump on each hose from hose N.

Q: Can the leaks be pinpointed?

YES : Replace the hose, reinstall the fuel tank. Then go to Step 1.
NO : Go to Step 14.

STEP 14. Check for leaks in the fuel tank.



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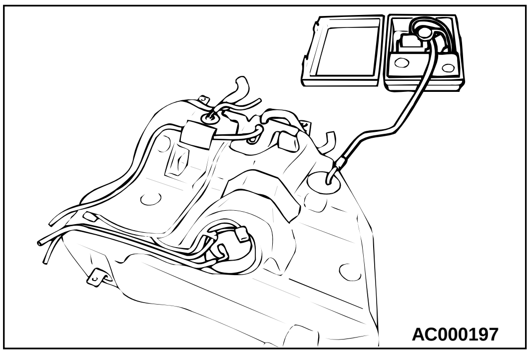
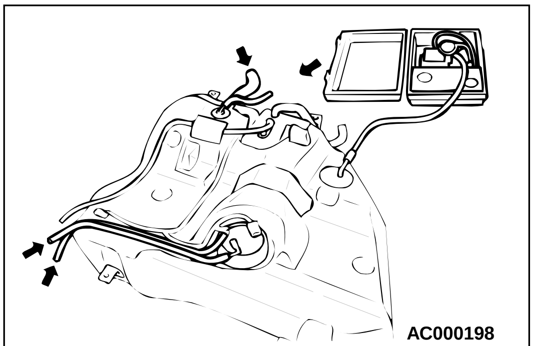
(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.



AC000197

(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.



AC000198

(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Can the leaks be pinpointed?

There is leaks at the fuel pump assembly or the inner pressure sensor installation section : Reassemble the parts, check again that there are no leaks, reinstall the fuel tank. Then go to Step 1.

There is leaks at another section : Go to Step 15.

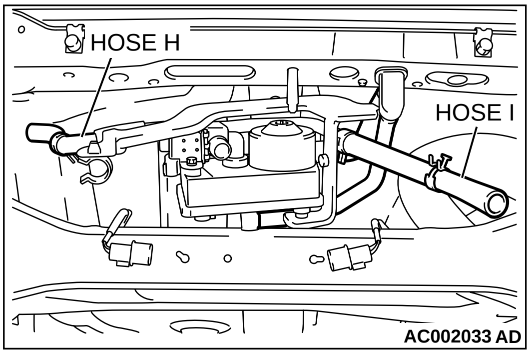
STEP 15. Visually check for cracks in the fuel tank filler neck.

(1) Visually check for cracks in the fuel tank filler neck.

Q: Can the cracks be found out?

YES : Replace the fuel tank filler neck, reinstall the fuel tank. Then go to Step 1 .

NO : Reinstall the fuel tank. Then go to Step 1.



STEP 16. Check for leaks in the evaporator line from hose H to hose I.

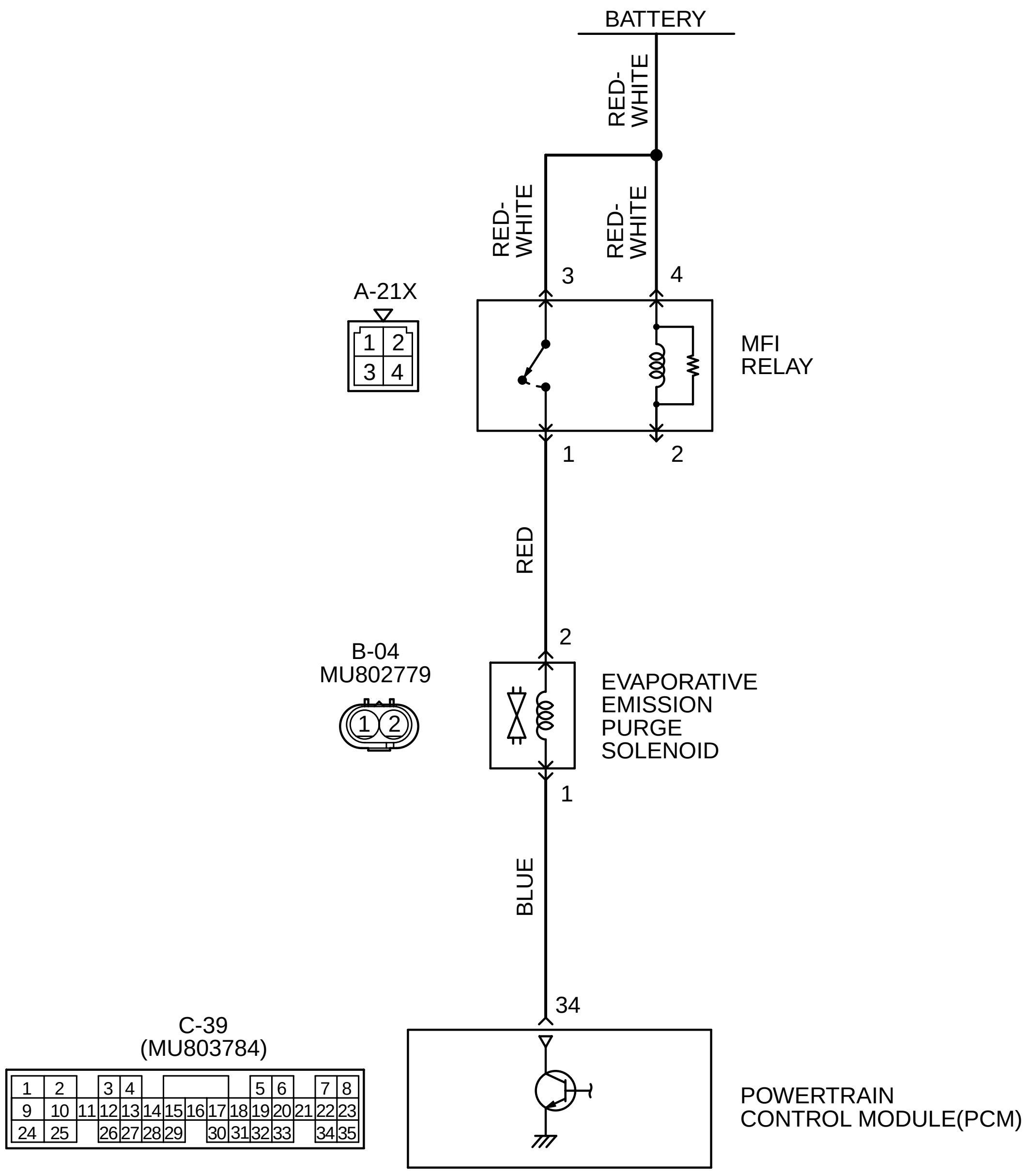
(1) The leakage test with a hand vacuum pump on each hose from hose H to hose I.

Q: Can the leaks be pinpointed?

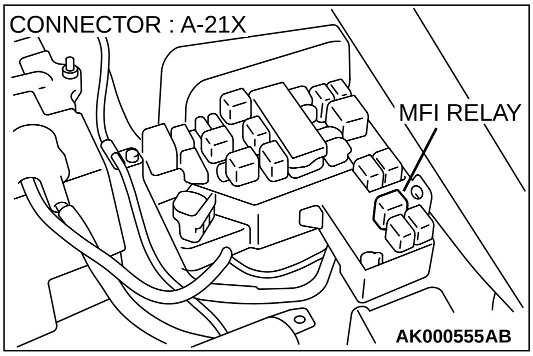
YES : Replace the hose, reinstall the fuel tank. Then go to Step 1.

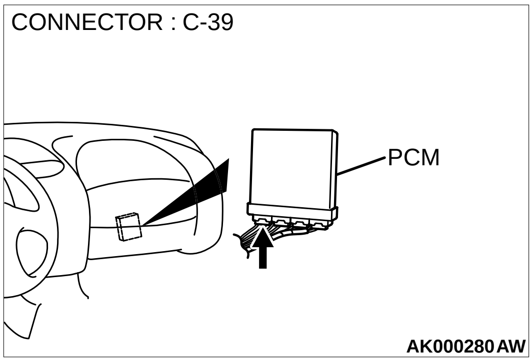
NO : Go to Step 1.

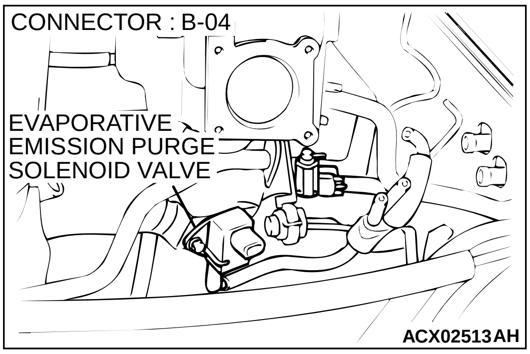
DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit Malfunction



AK000543







CIRCUIT OPERATION

- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal 1).
- The PCM controls ground evaporative emission purge solenoid by turning the power transistor in the PCM "ON" and "OFF."

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, PCM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The PCM drives the evaporative emission purge solenoid for 30 milliseconds. After the solenoid is turned off, the PCM will check if the solenoid coil produces a surge voltage of 2V or more.

DTC SET CONDITIONS

Test Conditions

- Battery positive voltage is higher than 10 V.

Judgment Criteria

- If a surge voltage of 2 V or more is not detected within 30 milliseconds after the evaporative emission purge solenoid is driven, the PCM judges that the drive circuit is open.
- Only one monitor during one drive cycle.

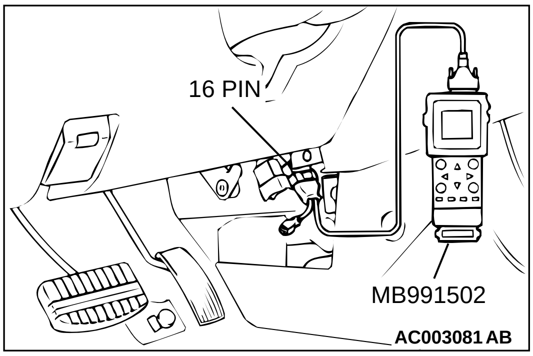
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

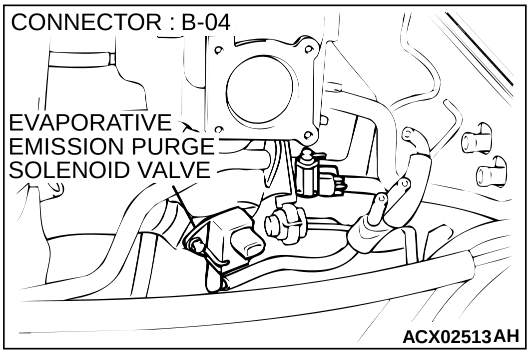
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

NO : Go to Step 2.

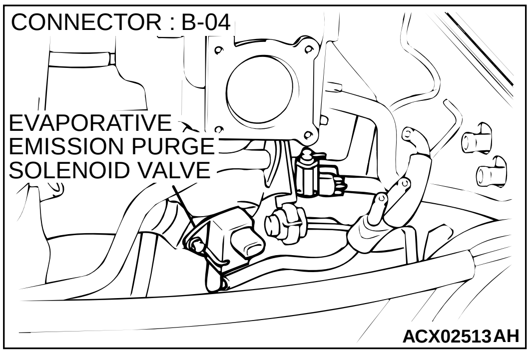


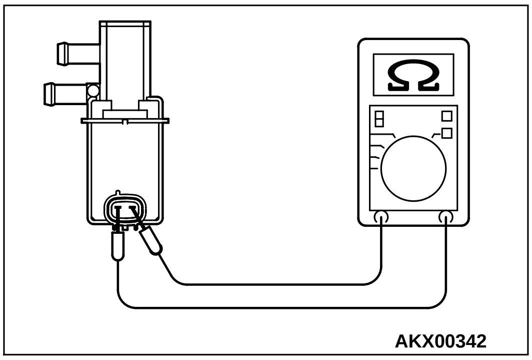
STEP 2. Check connector B-04 at the evaporative emission purge solenoid for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.





STEP 3. Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-04.

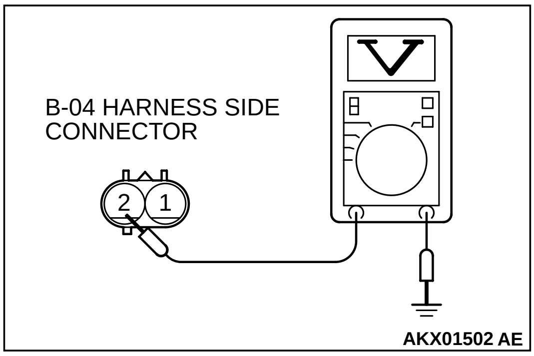
(2) Measure the resistance between evaporative emission purge solenoid side connector terminal 1 and 2.

Standard value: 30 – 34 Ω [at 20° C (68° F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the evaporative emission purge solenoid. Then go to Step 12.



STEP 4. Check the power supply voltage at evaporative emission purge solenoid harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

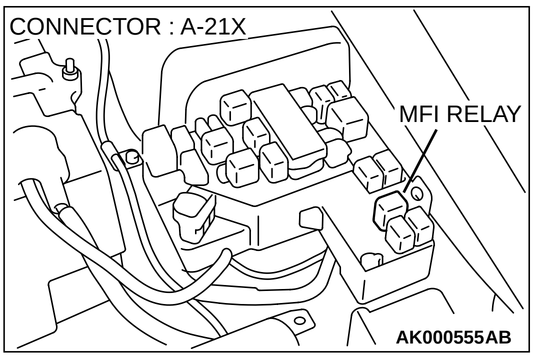
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.

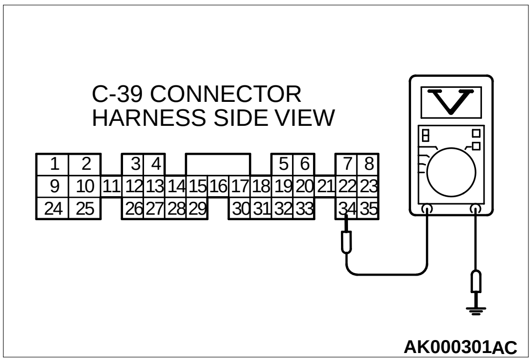


STEP 5. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and evaporative emission purge solenoid connector B-04 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



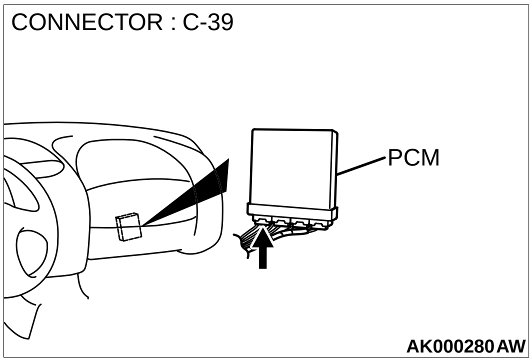
STEP 6. Check the power supply voltage at PCM connector C-39 by backprobing

(1) Do not disconnect the connector C-39.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 34 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

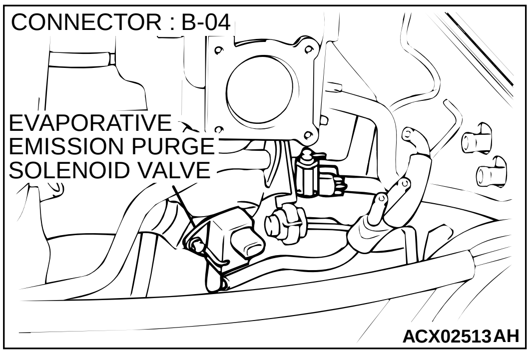
YES : Go to Step 9.
NO : Go to Step 7.

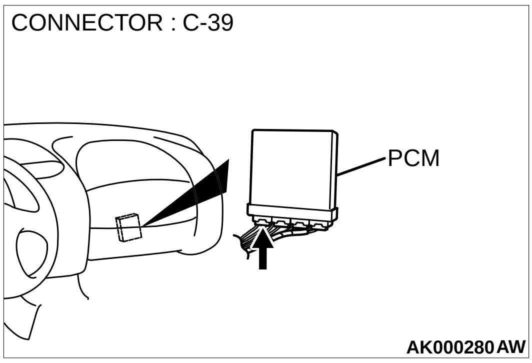


STEP 7. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

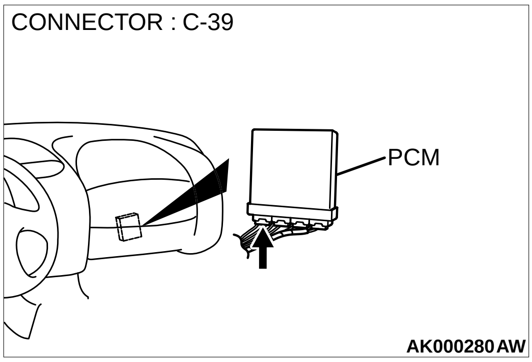




STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-04 terminal 1 and PCM connector C-39 terminal 34.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

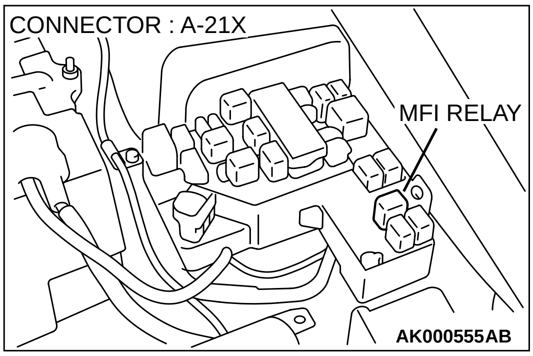


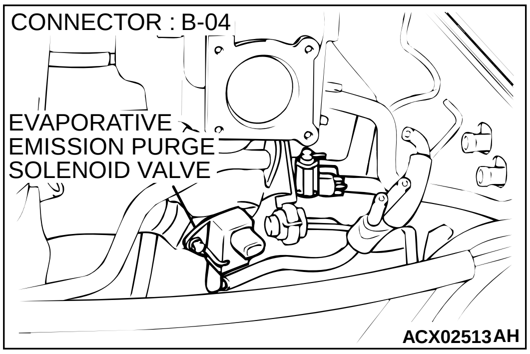
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



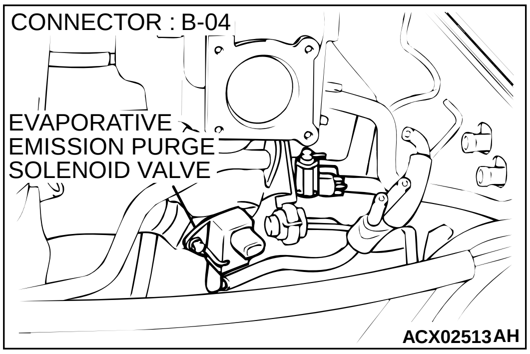


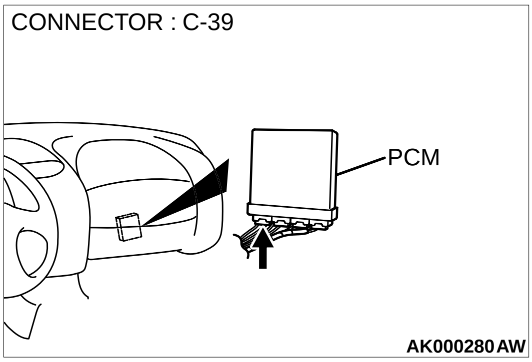
STEP 10. Check for harness damage between MFI relay connector A-21X terminal 1 and evaporative emission purge solenoid connector B-04 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-04 terminal 1 and PCM connector C-39 terminal 34.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

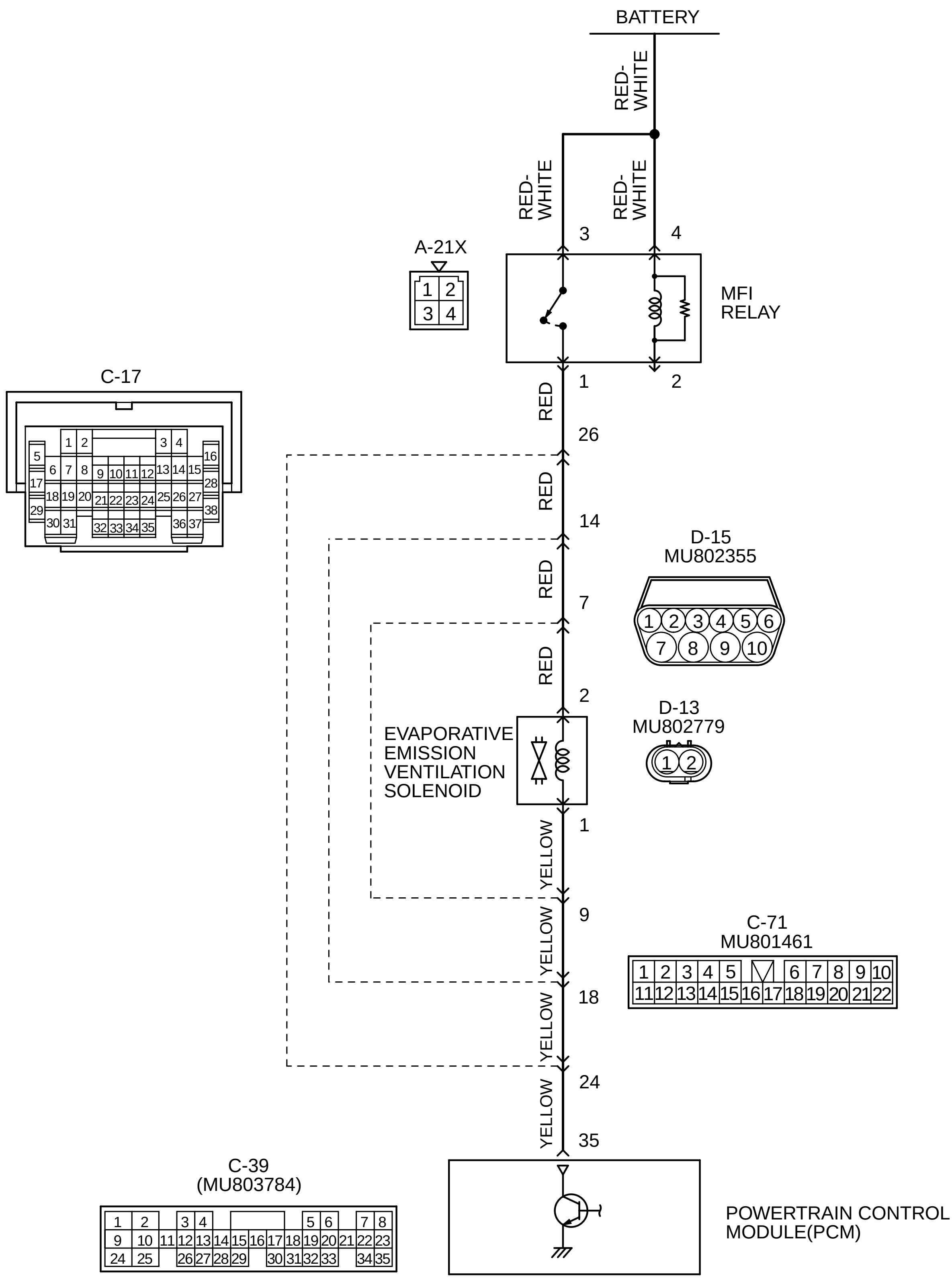
STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

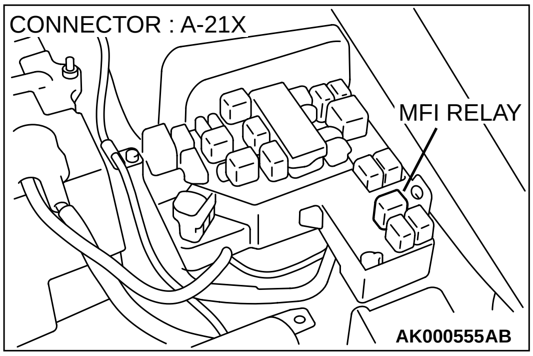
Q: Is the DTC P0443 is output?

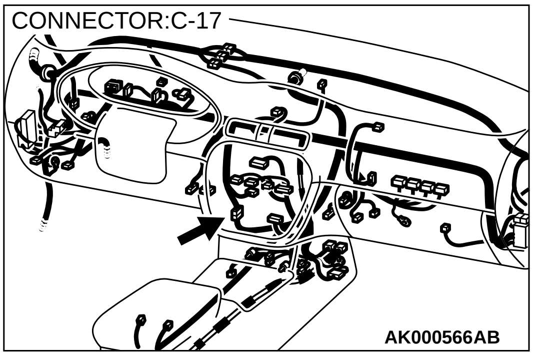
YES : Retry the troubleshooting.
NO : The inspection is complete.

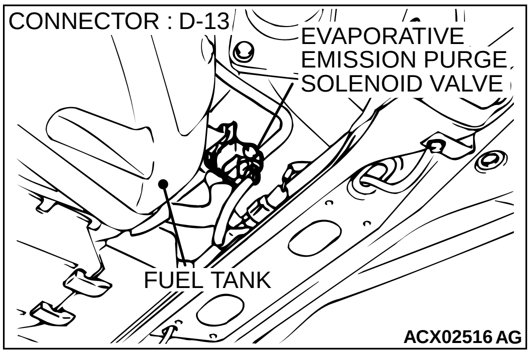
DTC P0446: Evaporative Emission Control System Vent Control Malfunction

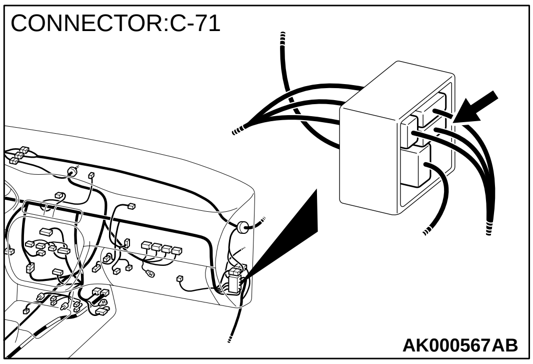


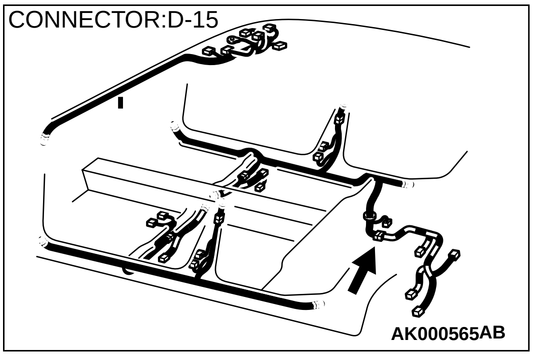
AK000544

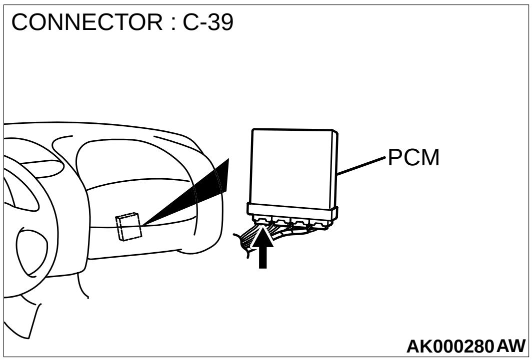












CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal 1).
- The PCM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the PCM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, PCM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The PCM drives the evaporative emission ventilation solenoid for 30 milliseconds. After the solenoid is turned off, the PCM will check if the solenoid coil produces a surge voltage of 2V or more.

DTC SET CONDITIONS

Test Conditions

- Battery positive voltage is higher than 10 V.

Judgment Criteria

- If a surge voltage of 2 V or more is not detected within 30 milliseconds after the evaporative emission ventilation solenoid is driven, the PCM judges that the drive circuit is open.
- Only one monitor during one drive cycle.

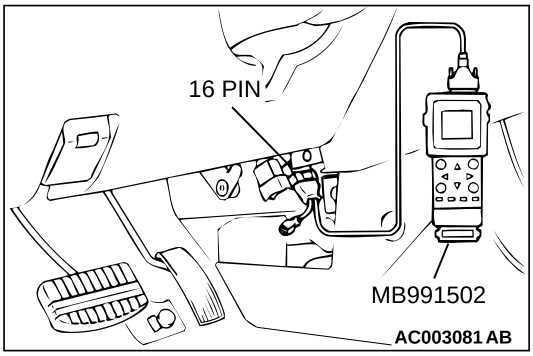
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

⚠ CAUTION

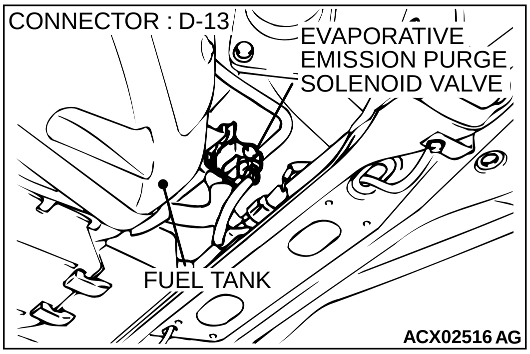
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the solenoid operating properly?

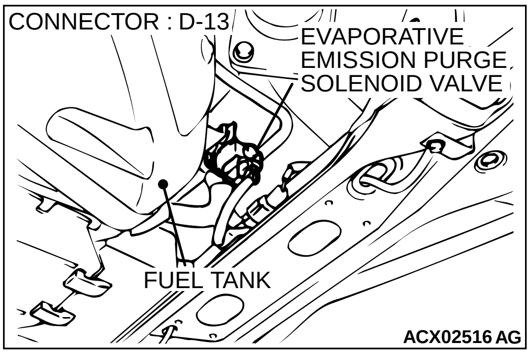
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.

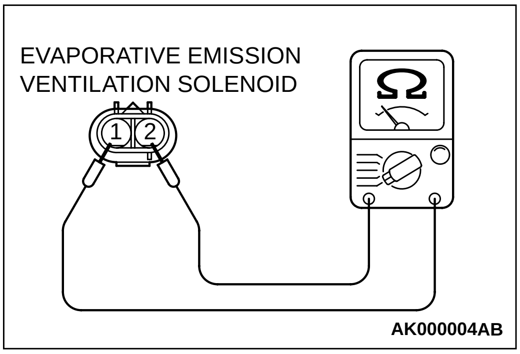


STEP 2 Check connector D-13 at the evaporative emission ventilation solenoid for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.





STEP 3 Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector D-13.

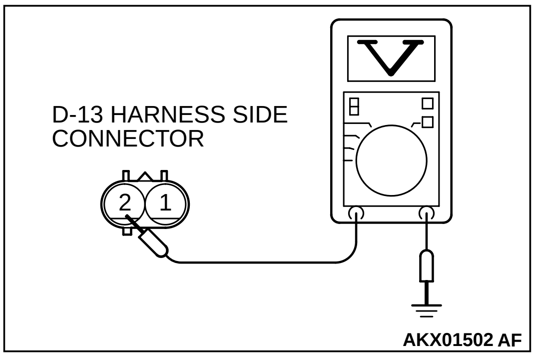
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal 1 and 2.

Standard value: 17 – 21Ω [at 20° C (68° F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the over vent valve module. Then go to Step 12.



STEP 4. Check the power supply voltage at evaporative emission ventilation solenoid harness side connector D-13.

(1) Disconnect the connector D-13 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2 and ground.

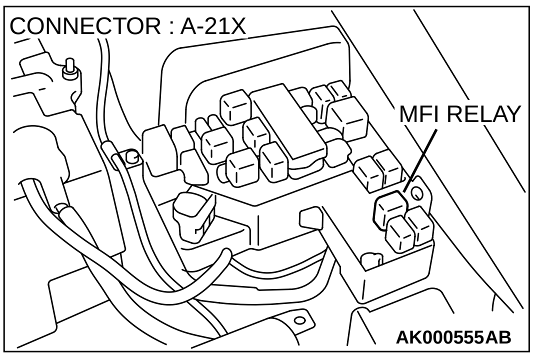
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.

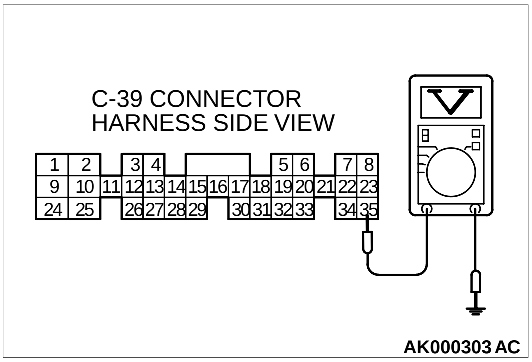


STEP 5. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Check connectors D-15, C-71 and C-17 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). If intermediate connectors are in good condition, repair harness wire between MFI relay connector A-21X terminal 1 and evaporative emission ventilation solenoid connector D-13 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



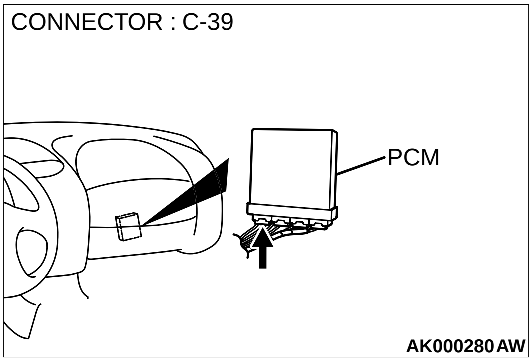
STEP 6. Check the power supply voltage at PCM connector C-39 by backprobing

(1) Do not disconnect the connector C-39.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 35 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

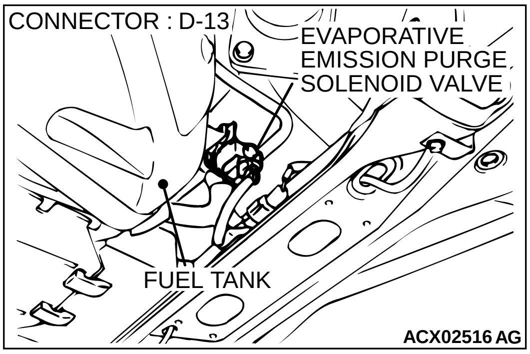
YES : Go to Step 9.
NO : Go to Step 7.

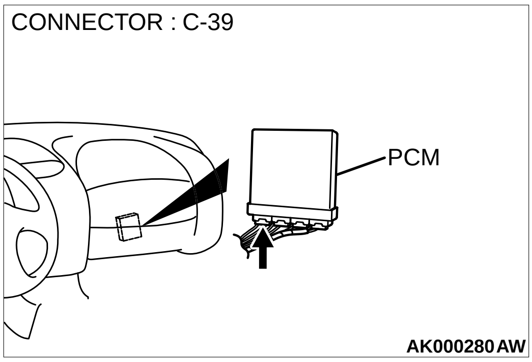


STEP 7. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



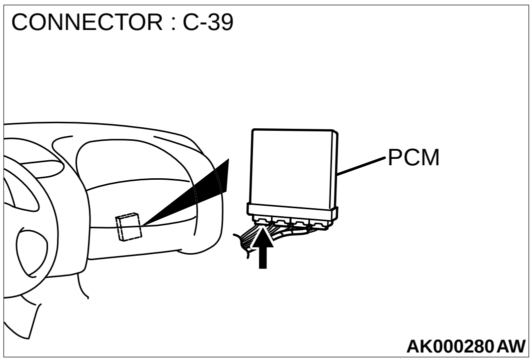


STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector D-13 terminal 1 and PCM connector C-39 terminal 35.

NOTE: Check harness after checking intermediate connectors D-15,C-71 and C-17. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

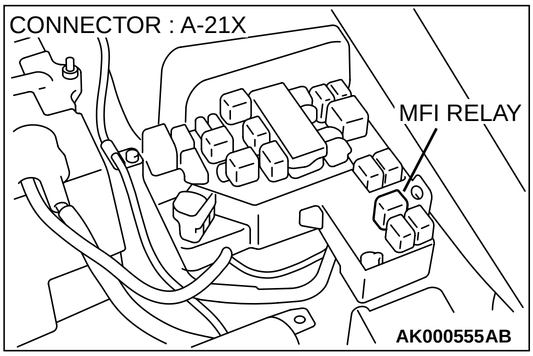


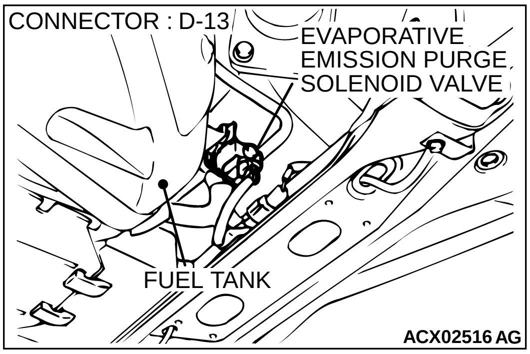
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.





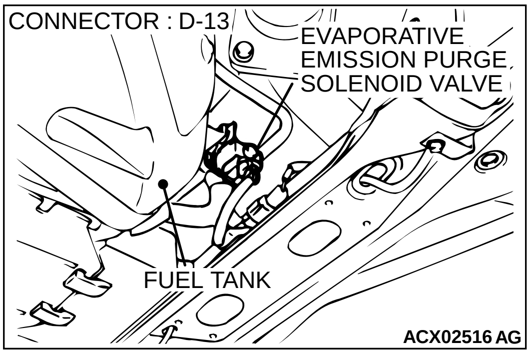
STEP 10. Check for harness damage between MFI relay connector A-21X terminal 1 and evaporative emission ventilation solenoid connector D-13 terminal 2.

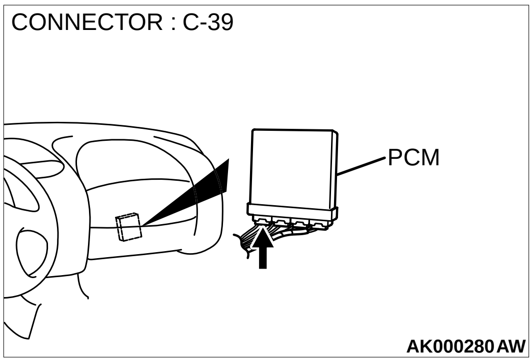
NOTE: Check harness after checking intermediate connectors D-15,C-71 and C-17. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector D-13 terminal 1 and PCM connector C-39 terminal 35.

NOTE: Check harness after checking intermediate connectors D-15,C-71 and C-17. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

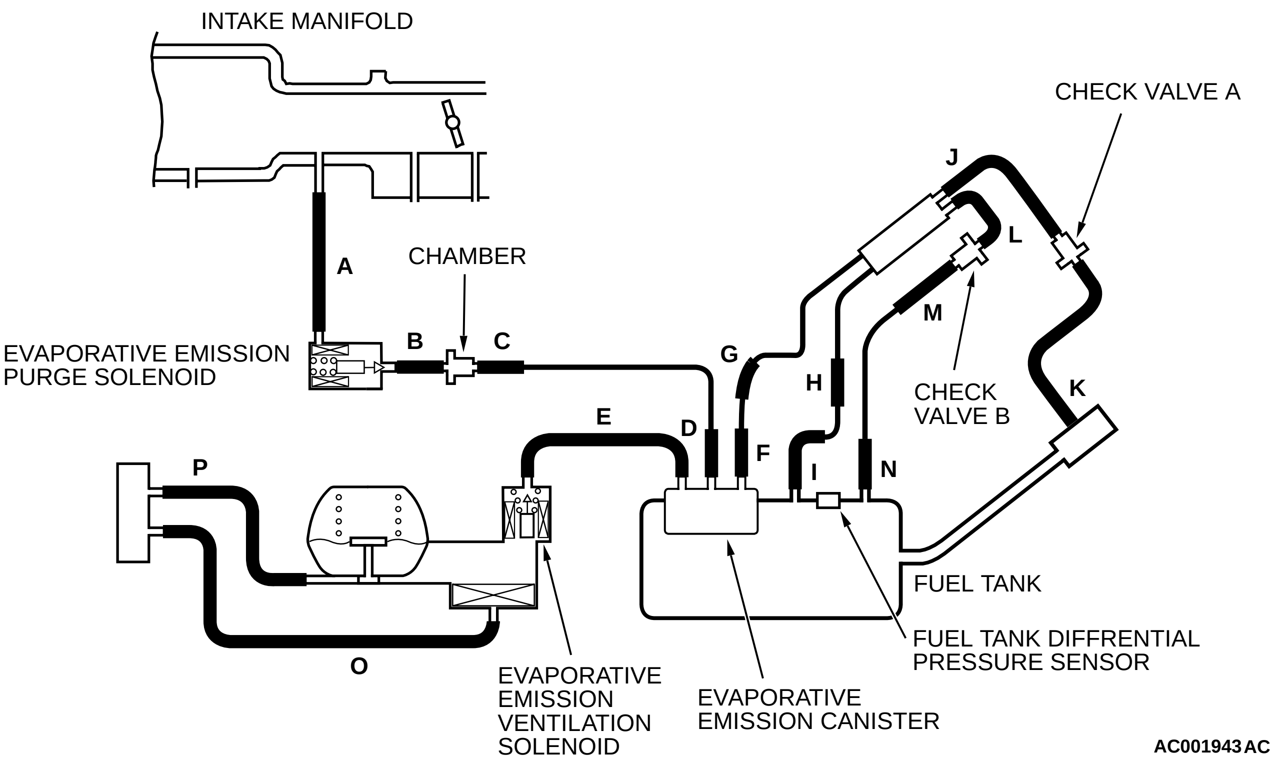
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0446 is output?

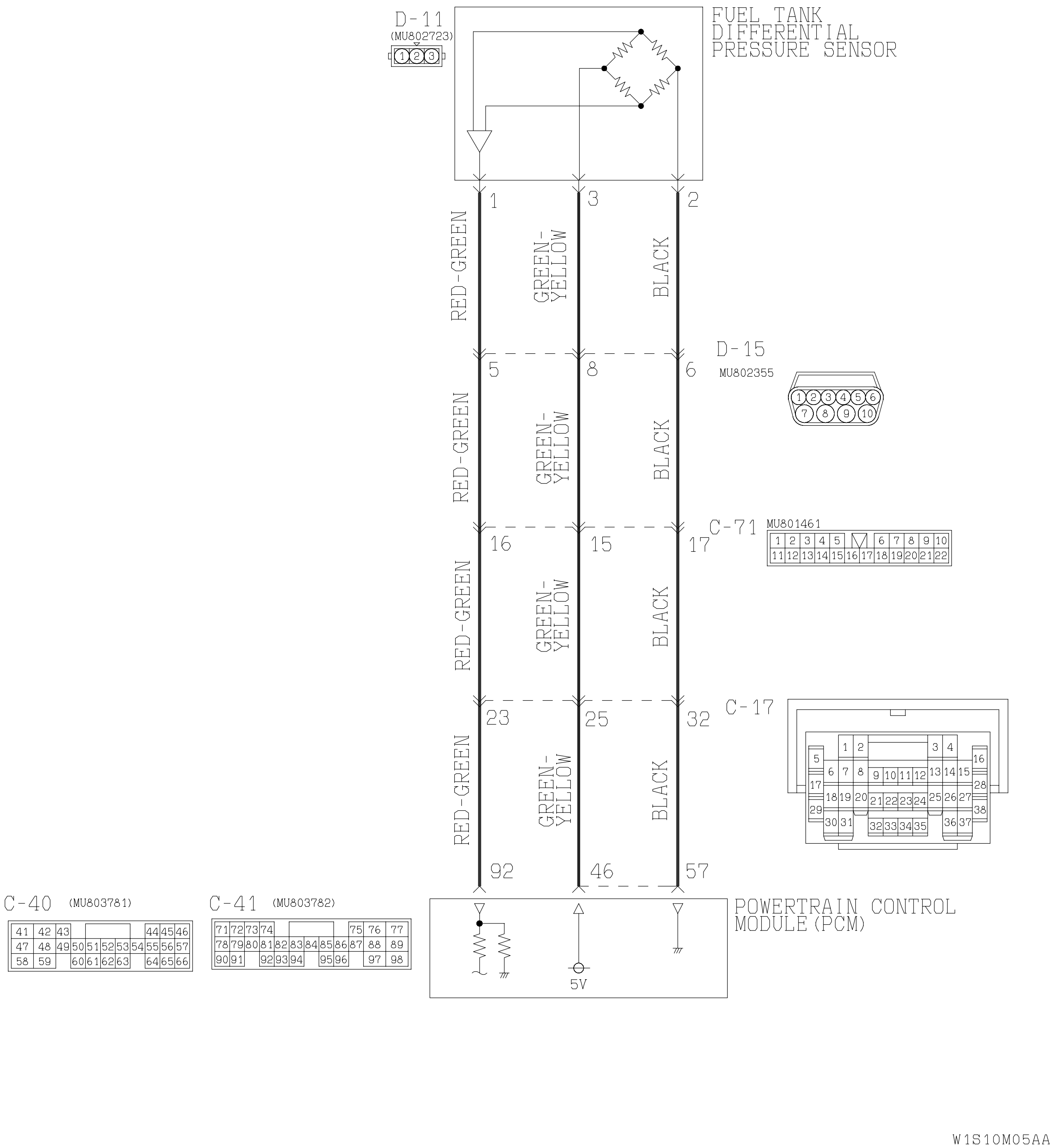
YES : Retry the troubleshooting.
NO : The inspection is complete.

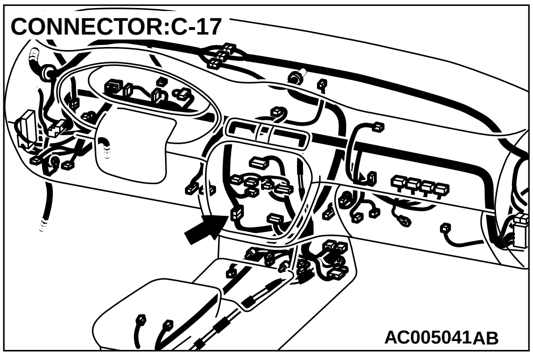
DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction

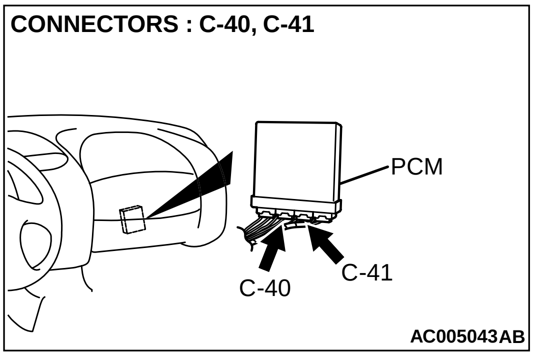
SYSTEM DIAGRAM

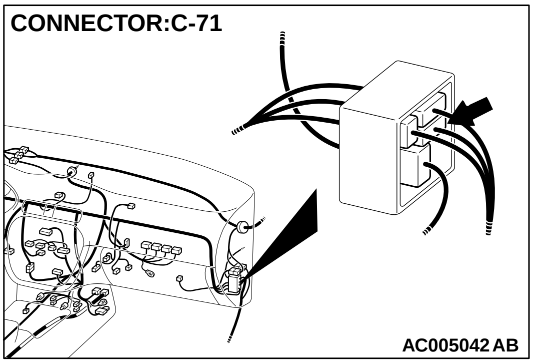


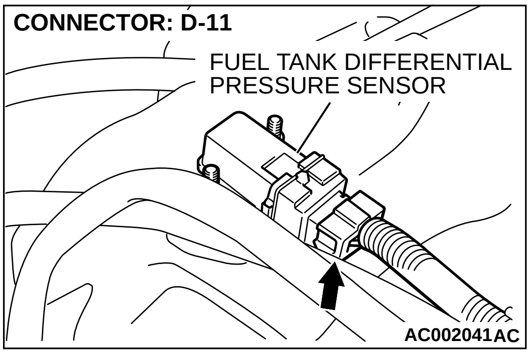
Fuel Tank Differential Pressure Sensor Circuit

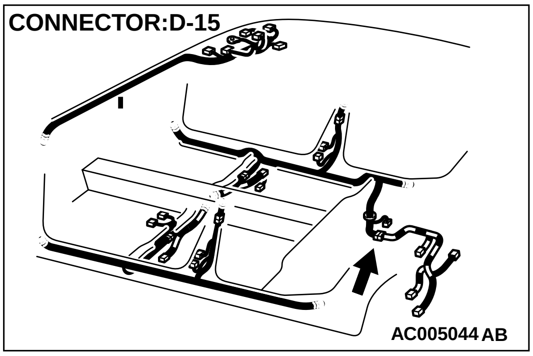












CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the PCM (terminal 46). The ground terminal (terminal 2) is grounded with the PCM (terminal 57.)
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the PCM (terminal 92.)

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the PCM monitors the fuel tank differential pressure sensor output voltage.
- There are three different sets (A, B, C) of test conditions and the judgment criteria. Based on these test conditions and judgment criteria, the PCM judges if the fuel tank differential pressure sensor output voltage is normal.

NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

DTC SET CONDITIONS

Test Conditions: Electrical noise

- Idle switch: ON
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Test Conditions: Judgment Criteria

- The PCM looks for rapid voltage changes (electrical noise) equal to 20 or more spikes of 0.2 volts or more in 25 millisecond averaged blocks.
- The PCM must see this activity during 8 consecutive idling periods from engine starting.

NOTE: Rapid voltage occurs due to fuel sloshing during refuelling. However, when the PCM sees the activity mentioned above 8 consecutive times, it judges that an electrical noise is present.

NOTE: The PCM determines that the engine is not idling if all of the following conditions are met.

- *Engine speed is higher than 2,500 r/min.*
- *Vehicle speed is 15 km/h (9.3 mph) or more.*
- *Volumetric efficiency is 55 percent or more.*

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, or loose connector.
- PCM failed.
- Blockage of evaporative emission system (causing high pressure.)

OVERVIEW OF TROUBLESHOOTING

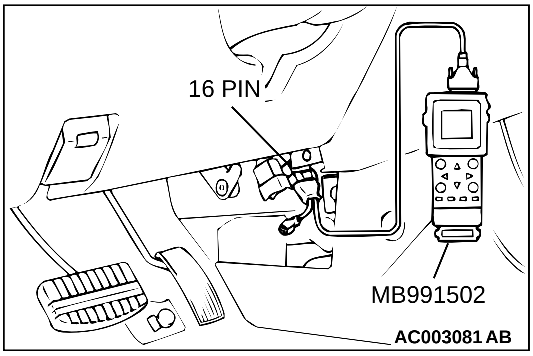
- The DTC P0450 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or PCM.
  2. Faulty fuel filler neck evaporative emission ventilation solenoid or blocked vapor line.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and the scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR73.)
  The mechanical gauge reading is used to verify the scan tool MB991502 reading.
  A comparison of the mechanical gauge to the scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

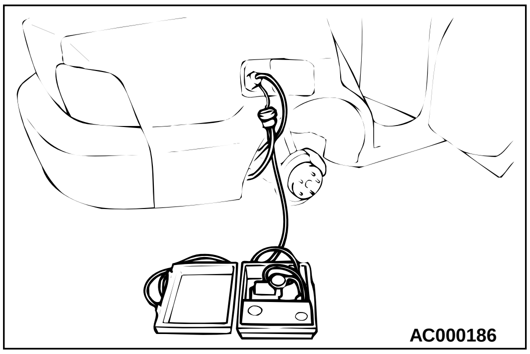
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be -1.5 to 1.5kPa.

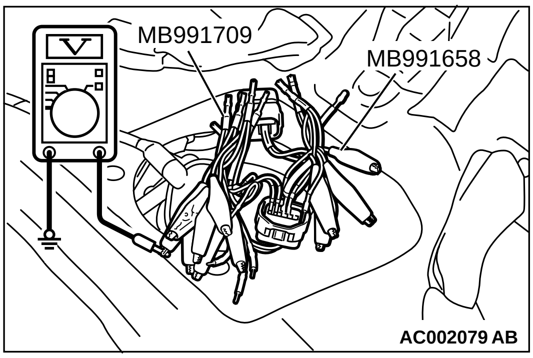


(5) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 20.
NO : Go to Step 2.

STEP 2. Check the output circuit voltage at intermediate connector D-15.



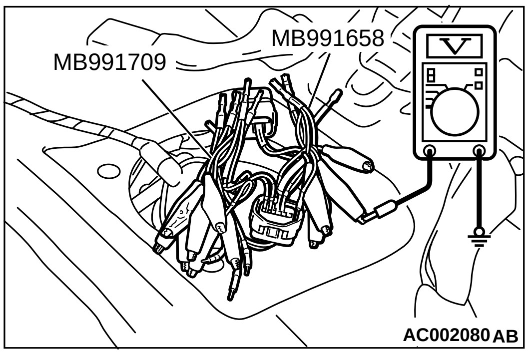
(1) Remove the rear seat cushion. (Refer to GROUP 52A, Rear SeatP.52A-20.)
(2) Remove the protector.
(3) Do not disconnect intermediate connector D-15.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 10.
NO : Go to Step 3.

STEP 3. Check the 5-volt supply circuit voltage at intermediate connector D-15.



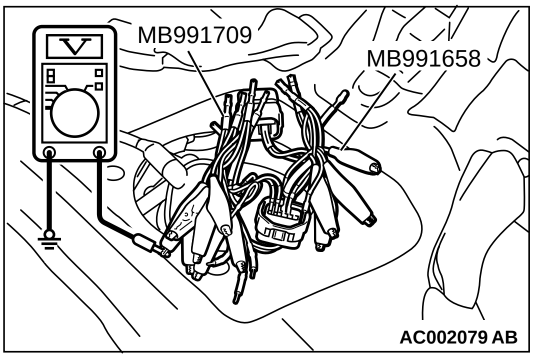
(1) Do not disconnect intermediate connector D-15.
(2) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 8 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 4.
NO : Go to Step 11.

STEP 4. Check the ground circuit voltage at intermediate connector D-15.



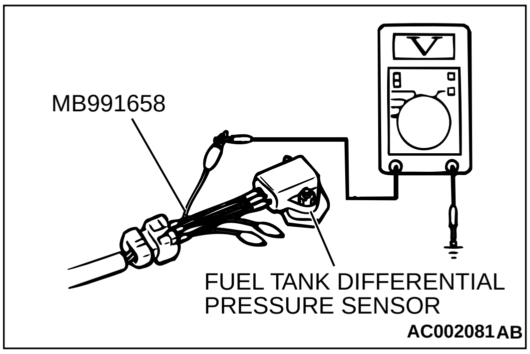
(1) Do not disconnect intermediate connector D-15.
(2) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 6 and ground by backprobing.
- Voltage should be between 0.5 volts or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 5.
NO : Go to Step 15.

STEP 5. Check the output circuit voltage at fuel tank differential pressure connector D-11.



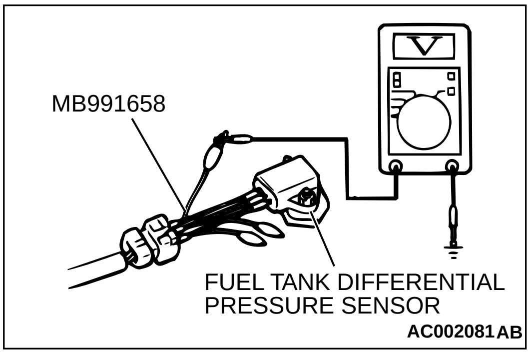
(1) Remove the center pipe.
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-11.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 17.
NO : Go to Step 6.

STEP 6. Check the 5-volt supply circuit voltage at fuel tank differential pressure sensor connector D-11.



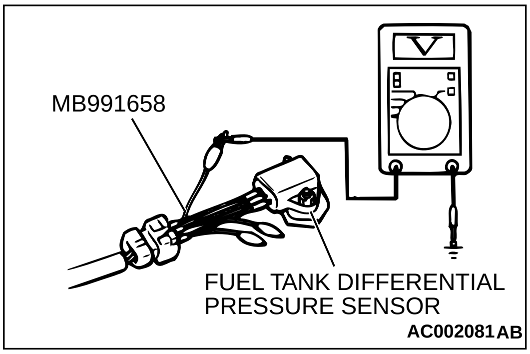
(1) Do not disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 7.
NO : Go to Step 17.

STEP 7. Check the ground circuit voltage at fuel tank differential pressure sensor connector D-11.

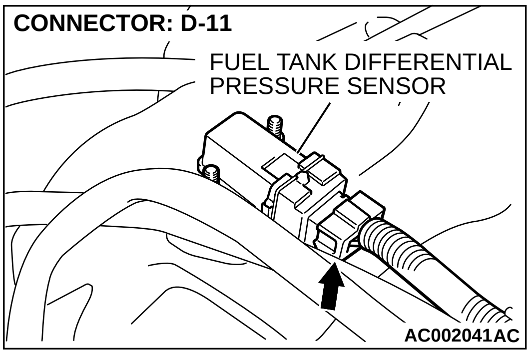


(1) Disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 2 and ground by backprobing.
- Voltage should be between 0.5 volts or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 8.
NO : Go to Step 17.



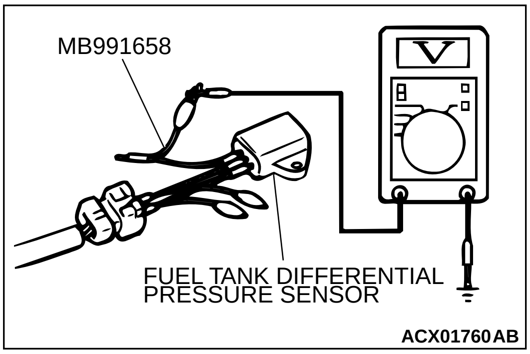
STEP 8. Check fuel tank differential pressure sensor connector D-11 for damage.

(1) Disconnect fuel tank differential pressure sensor connector D-11.

Q: Is there any failure at fuel tank differential pressure sensor connector D-11?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.



STEP 9. Check the output voltage at fuel tank differential pressure sensor connector D-11.

(1) Disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

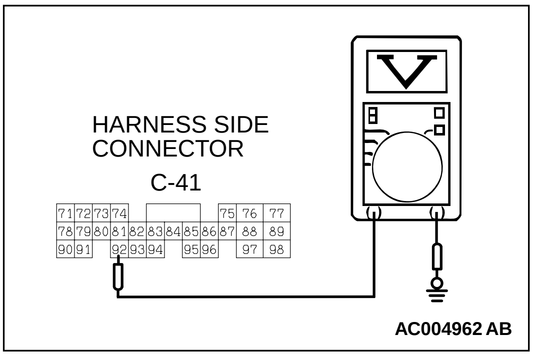
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Check connectors D-15, C-71, C-17, C-41 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-41 are in good condition, check the harness between fuel tank differential pressure sensor connector D-11 and PCM connector C-41 for short circuit to ground, then repair if necessary. Then go to Step 26.

NO : Replace the fuel tank differential pressure sensor. Then go to Step 26.

STEP 10. Check the output circuit voltage at PCM connector C-41.



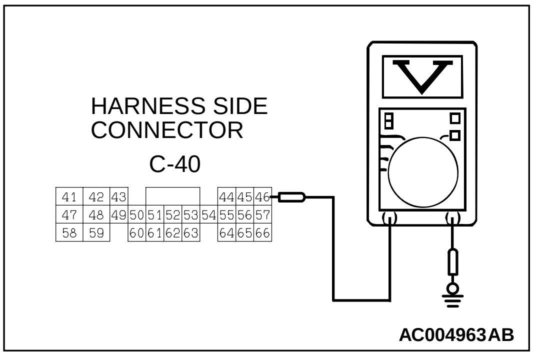
(1) Do not disconnect the PCM connector C-41.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 92 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 18.
NO : Check connectors D-15, C-71, C-17, C-41 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-41 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-41 for open circuit or damage. Then repair if necessary. Then go to Step 26 .

STEP 11. Check the 5-volt supply circuit voltage at PCM connector C-40.



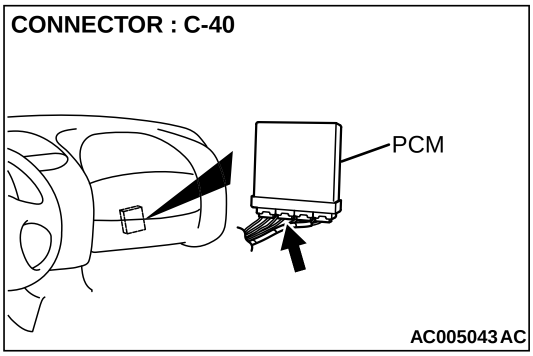
(1) Do not disconnect PCM connector C-40.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 46 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Check connectors D-15, C-71, C-17, C-40 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-40 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-40 for open circuit or damage. Then repair if necessary. Then go to Step 26 .
NO : Go to Step 12.

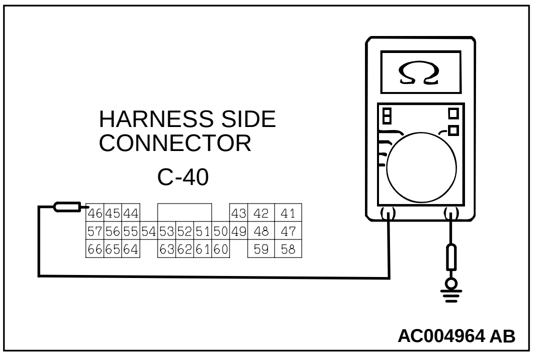
STEP 12. Check PCM connector C-40 for damage.



(1) Disconnect PCM connector C-40.

Q: Is there any failure at PCM connector C-40?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.
NO : Go to Step 13.



STEP 13. Check the sensor power supply line for short circuit to ground at PCM connector C-40.

(1) Disconnect PCM connector C-40 and measure at the harness side.

(2) Check for the continuity between terminal 46 and ground.

- There should be 2 ohms or more.

Q: Does the multi-meter reading exceed the specified value?

YES : Go to Step 26.

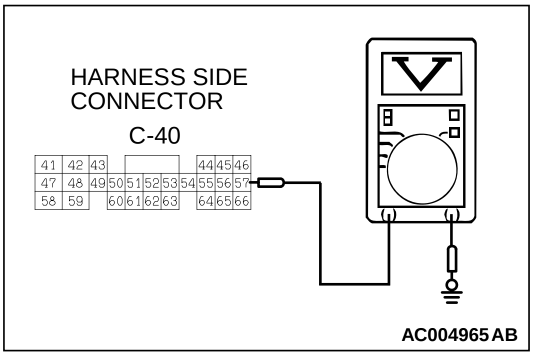
NO : Go to Step 14.

STEP 14. Check the sensor power supply lines.

(1) Check all the sensor power supply lines for damage, which flow through the harness PCM connector (terminal 46).

Q: Is there any failure in the sensor power supply lines?

When a failure is found : Repair if necessary. (Refer to GROUP 90, Circuit Diagrams – MFI System <2.4L ENGINE>P.90-30. Then go to Step 26.)



STEP 15. Check the ground circuit voltage at PCM connector C-40.

(1) Do not disconnect PCM connector C-40.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 57 and ground by backprobing.

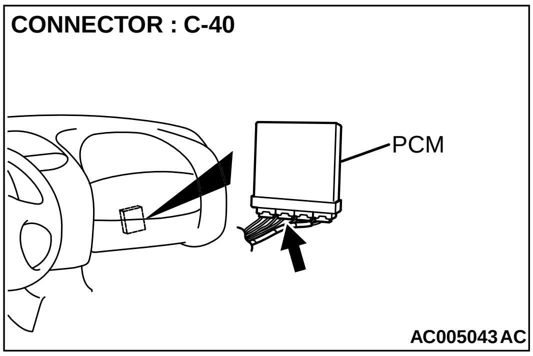
- Voltage should be 0.5 volts or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading below the specified value?

YES : Check connectors D-15, C-71, C-17, C-40 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-40 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-40 for open circuit or damage. Then repair if necessary. Then go to Step 26 .

NO : Go to Step 16.



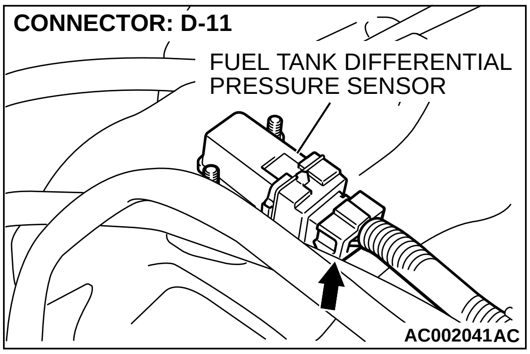
STEP 16. Check PCM connector C-40 for damage.

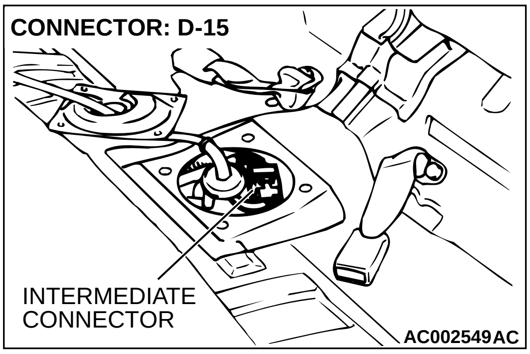
(1) Disconnect PCM connector C-40.

Q: Is there any failure at PCM connector C-40?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.

NO : Go to Step 26.





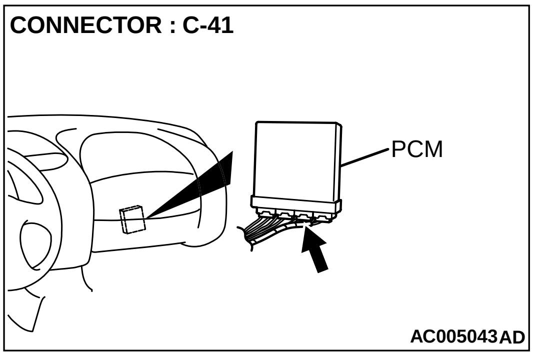
STEP 17. Check the harness between fuel tank differential pressure sensor connector D-11 and intermediate connector D-15 for open circuit or damage.

(1) Disconnect fuel tank differential pressure sensor connector D-11 and intermediate connector D-15.

Q: Is there any failure between fuel tank differential pressure sensor connector D-11 and intermediate connector D-15?

YES : Repair it. Then go to Step 26.

NO : Check connectors D-11, D-15 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.



STEP 18. Check PCM connector C-41 for damage.

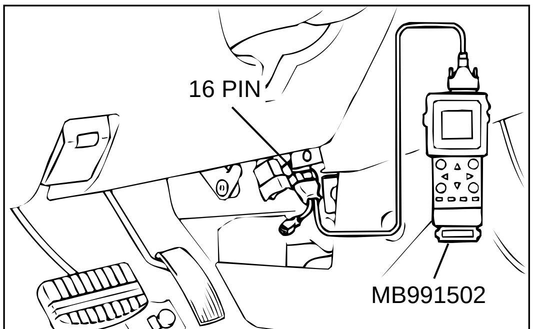
(1) Disconnect PCM connector C-41.

Q: Is there any failure at PCM connector C-41?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.

NO : Go to Step 19.

STEP 19. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



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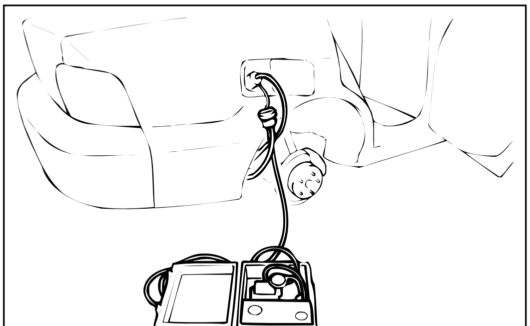
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be -1.5 to 1.5kPa.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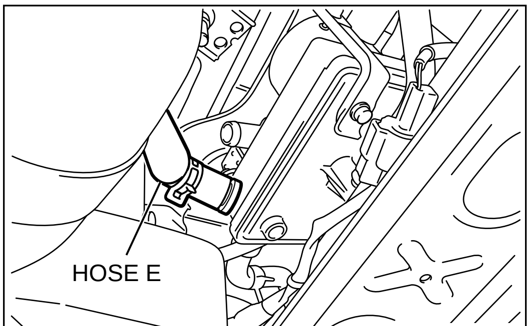
(5) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 26.
NO : Replace the PCM. Then go to Step 26.

STEP 20. Check for clogging in the evaporator line from hose E to hose G.



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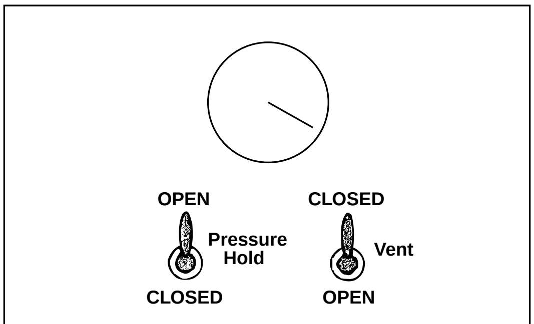
(1) Remove the module bracket mounting bolts, and disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Install the EVAP pressure pump outlet hose to the fuel tank filler neck as described in the pump manufacturer's instructions.



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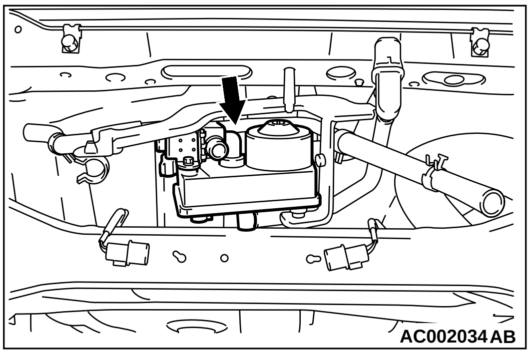
(3) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED.
(4) Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)
(5) When the hose G is unplugged, the air passes through the hose G.

Q: Does air pass through the hose E?

YES : Go to Step 21.
NO : Go to Step 23.

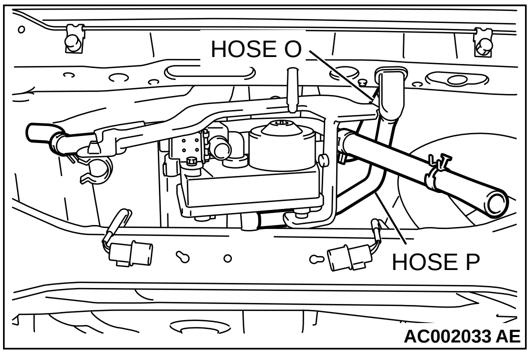


STEP 21. Check the vent valve module for clogging.

(1) Check the rover vent valve module for clogging. (Refer to GROUP 17 – Vent ValveP.17-96.)

Q: Are there any clogs?

YES : Replace the vent valve module. Then go to Step 26.
NO : Go to Step 22.

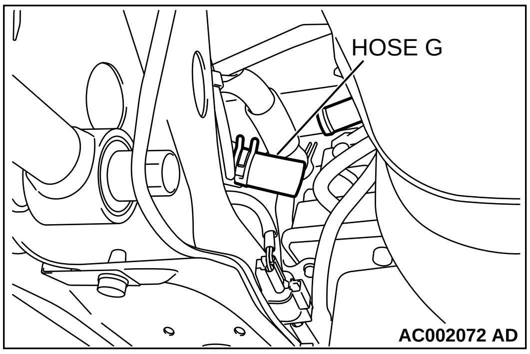


STEP 22. Check for clogging in the evaporator line from hose O and hose P.

(1) Carry out the clogging test with a hand vacuum pump on each hose from hose O and hose P.

Q: Are there any clogs?

YES : Replace that hose. Then go to Step 26.
NO : Go to Step 26.

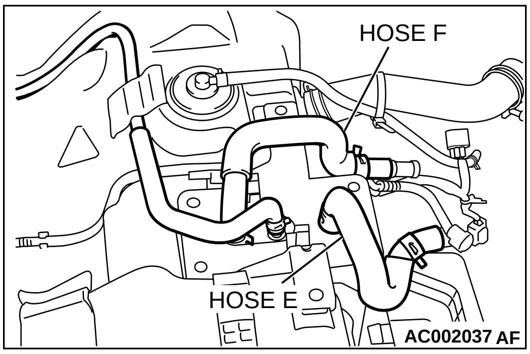


STEP 23. Check for clogging in the evaporator line from hose G.

(1) Carry out the clogging test with a hand vacuum pump on each hose from hose G.

Q: Are there any clogs?

YES : Replace that hose. Then go to Step 26.
NO : Go to Step 24.

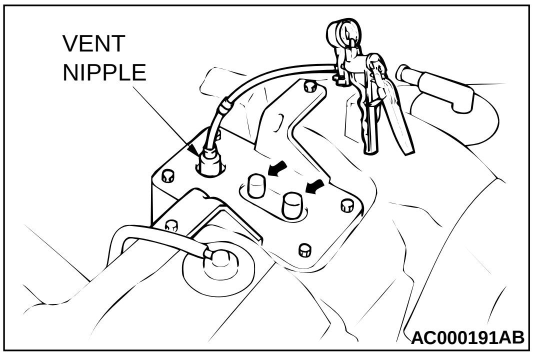


STEP 24. Check for clogging in the evaporator line from hose E and hose F.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) Carry out the clogging test with a hand vacuum pump on each hose from hose E and hose F.

Q: Are there any clogs?

YES : Replace that hose, reinstall the fuel tank. Then go to Step 26.
NO : Go to Step 25.



STEP 25. Check for clogging in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply vacuum. When each nipple is unplugged, the vacuum should fluctuate.

Q: Does the vacuum pump gauge reading fluctuate?

YES : Reinstall the fuel tank. Then go to Step 26.
NO : Replace the evaporative emission canister, reinstall the fuel tank. Then go to Step 26.

STEP 26. Test the OBD-II drive cycle.

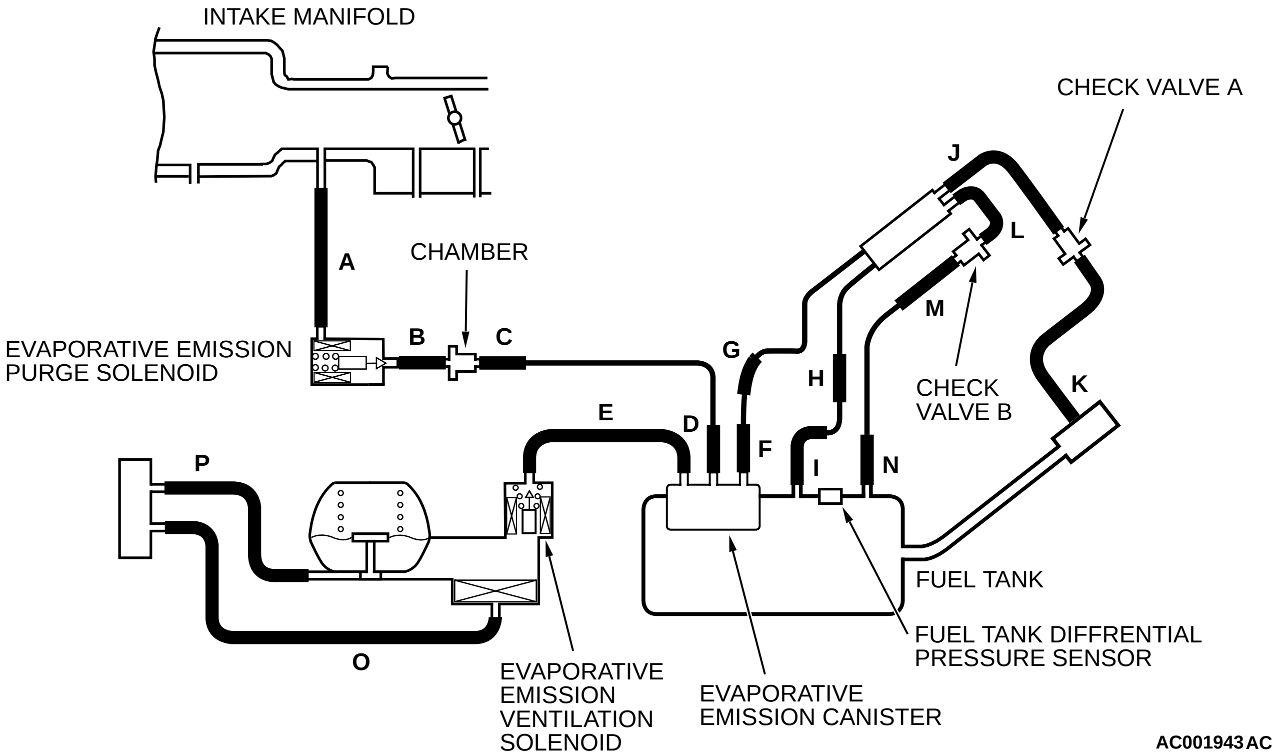
(1) Carry out a test drive with the drive cycle pattern. (Refer to P.13A-5, Procedure 1 – Evaporative Emission Control system Leak Monitor.)
(2) Read the diagnostic trouble code P0450 does not reset.

Q: Are the DTCs reset?

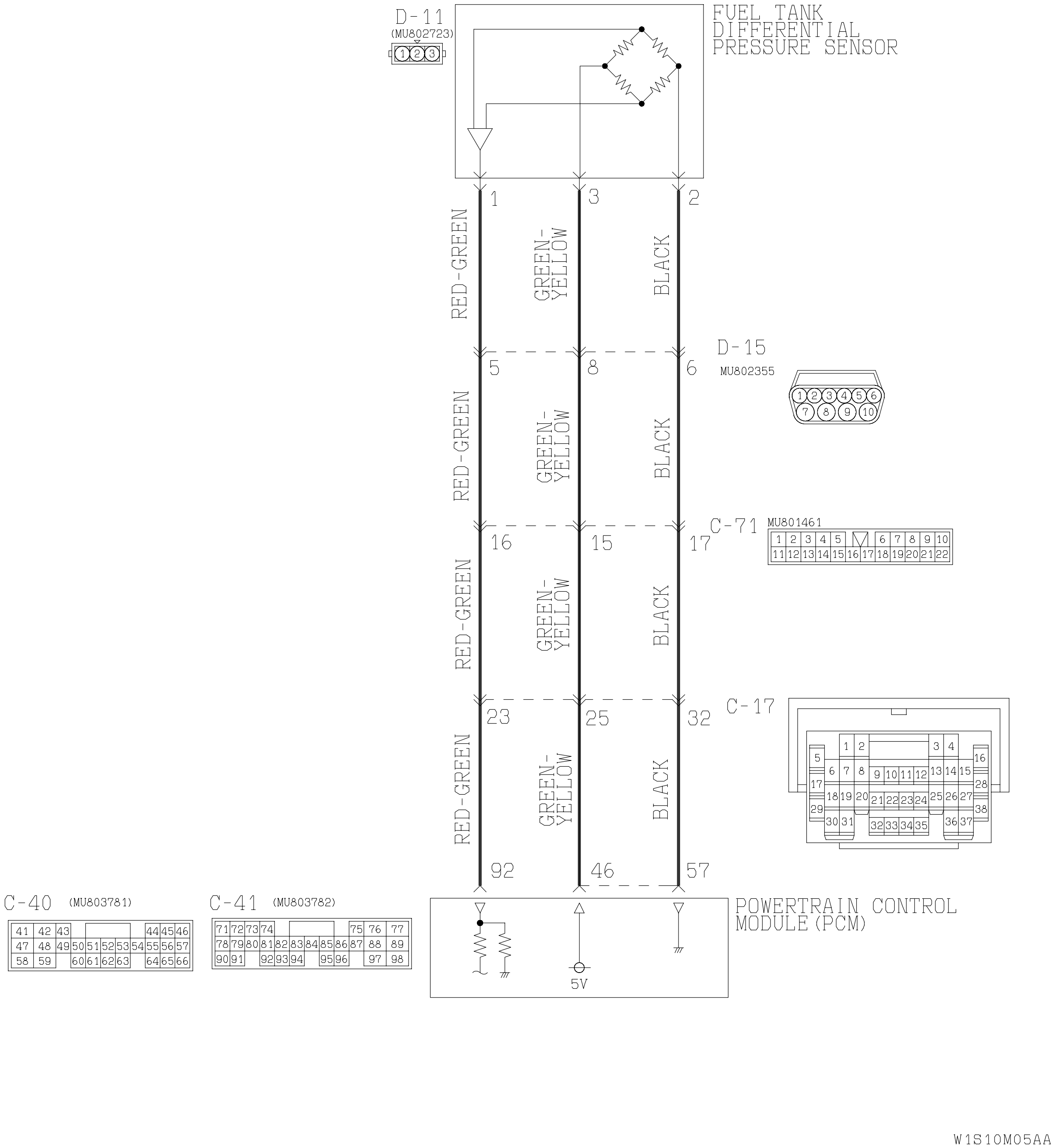
YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected.) Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent MalfunctionP.00-8.
NO : Replace the PCM.

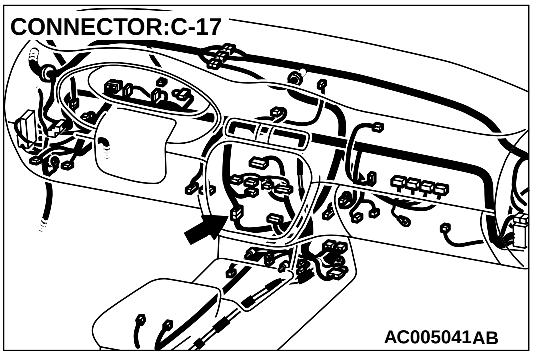
DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance

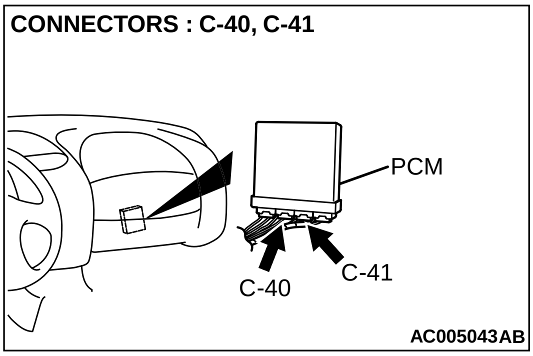
SYSTEM DIAGRAM

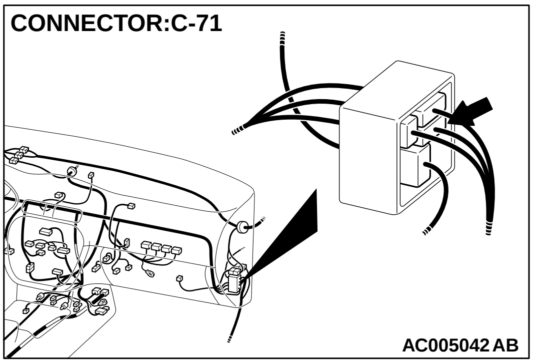


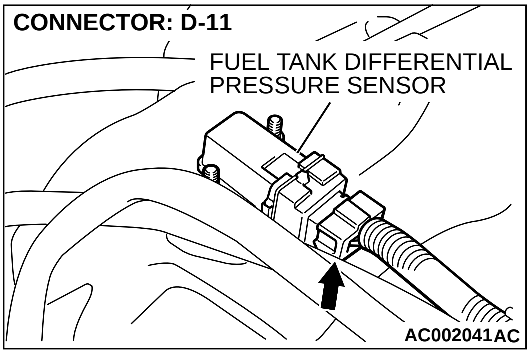
Fuel Tank Differential Pressure Sensor Circuit

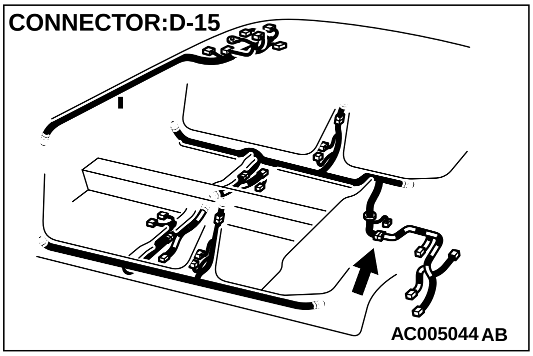












CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the PCM (terminal 46.) The ground terminal (terminal 2) is grounded with the PCM (terminal 57.)
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the PCM (terminal 92.)

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the PCM monitors the fuel tank differential pressure sensor output voltage.
- There are three different sets (A, B, C) of test conditions and the judgment criteria. Based on these test conditions and judgment criteria, the PCM judges if the fuel tank differential pressure sensor output voltage is normal.

NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

DTC SET CONDITIONS

Test Conditions A: Fuel tank differential pressure sensor output voltage is less than the upper limit of the predetermined value

- Intake air temperature is higher than 5°C (41°F.)
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 25 and 80 percent.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Evaporative emission purge solenoid is driven at a 100 percent duty when the intake air temperature is between 5 and 45°C (41 – 113°F.)

Judgement Criteria A

- The sensor output voltage remains 4.0 V or more for 10 seconds or more.

Test Conditions B: Fuel tank differential pressure sensor output voltage is more than the lower limit of the predetermined value

- Intake air temperature is higher than 5°C (41°F.)
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 25 and 80 percent.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Evaporative emission purge solenoid is not driven when the intake air temperature is 5°X (41°F) or more.

Judgment Criteria B

- The sensor output voltage remains less than 1.0 V for 10 seconds or more.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, or loose connector.
- PCM failed.
- Blockage of evaporative emission system (causing high pressure.)

OVERVIEW OF TROUBLESHOOTING

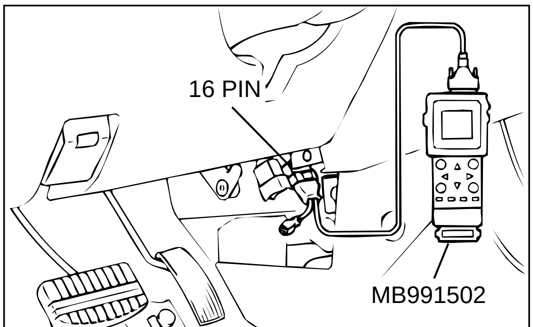
- The DTC P0450 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or PCM.
  2. Faulty fuel filler neck evaporative emission ventilation solenoid or blocked vapor line.
- If the fuel filler neck evaporative emission ventilation solenoid is faulty and stays closed or the vapor line is blocked, the pressure inside the fuel tank is increased as the evaporative fuel is not purged especially at hot ambient temperatures. Once the pressure inside the fuel tank reaches 5 kPa (0.073 psi), the sensor output voltage also reaches 4.0 volts. This will set the DTC P0451.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and the scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR73.)
  The mechanical gauge reading is used to verify the scan tool MB991502 reading.
  A comparison of the mechanical gauge to the scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



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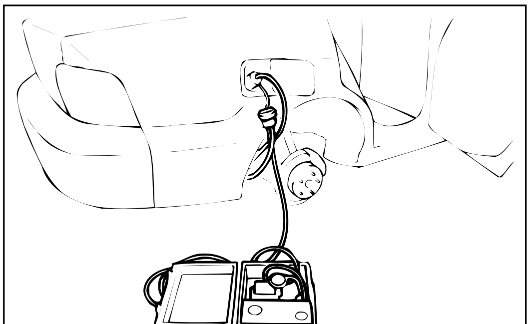
⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be -1.5 to 1.5kPa.


AC000186

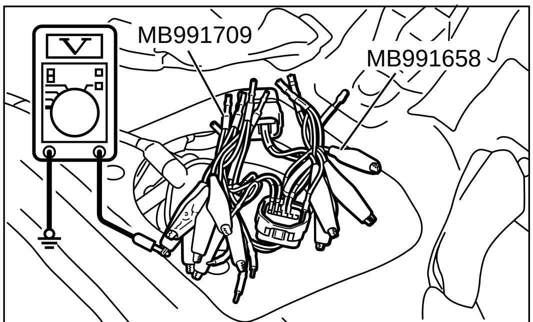
(5) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 20.
NO : Go to Step 2.

STEP 2. Check the output circuit voltage at intermediate connector D-15.

(1) Remove the rear seat cushion. (Refer to GROUP 52A, Rear SeatP.52A-20.)
(2) Remove the protector.
(3) Do not disconnect intermediate connector D-15.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.



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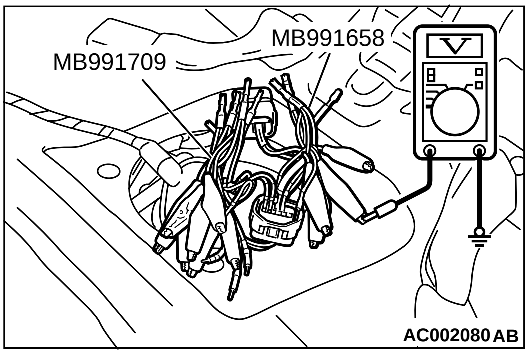
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 10.
NO : Go to Step 3.

STEP 3. Check the 5-volt supply circuit voltage at intermediate connector D-15.



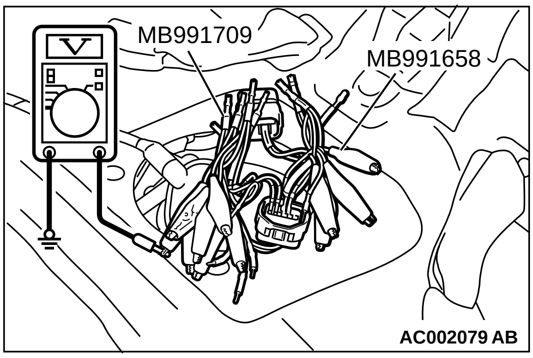
(1) Do not disconnect intermediate connector D-15.
(2) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 8 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 4.
NO : Go to Step 11.

STEP 4. Check the ground circuit voltage at intermediate connector D-15.



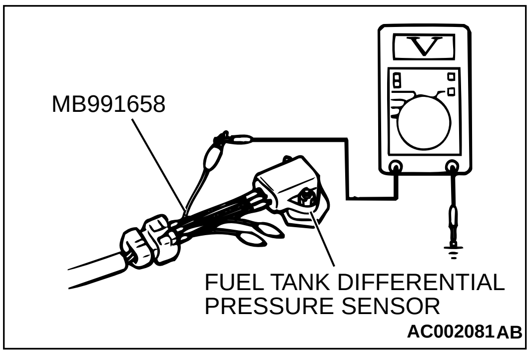
(1) Do not disconnect intermediate connector D-15.
(2) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 6 and ground by backprobing.
- Voltage should be between 0.5 volts or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 5.
NO : Go to Step 15.

STEP 5. Check the output circuit voltage at fuel tank differential pressure connector D-11.



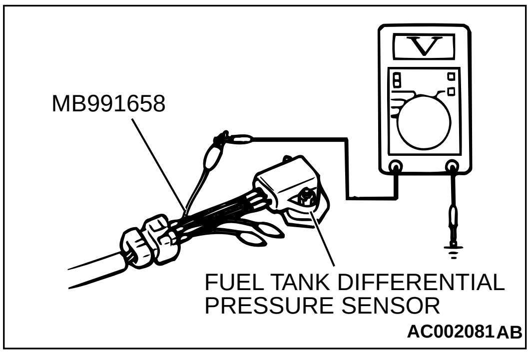
(1) Remove the center pipe.
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-11.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 17.
NO : Go to Step 6.

STEP 6. Check the 5-volt supply circuit voltage at fuel tank differential pressure sensor connector D-11.



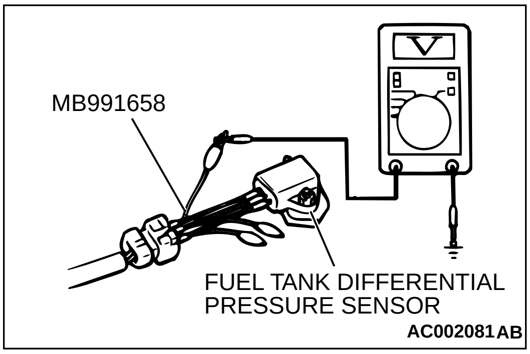
(1) Do not disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 7.
NO : Go to Step 17.

STEP 7. Check the ground circuit voltage at fuel tank differential pressure sensor connector D-11.



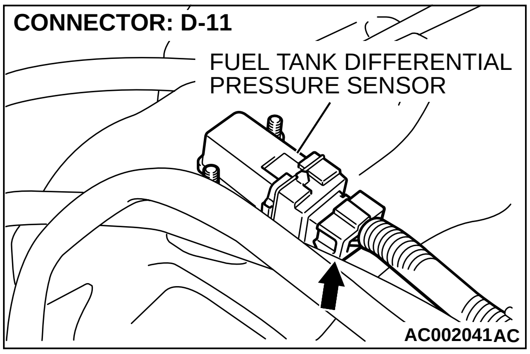
(1) Disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 2 and ground by backprobing.
- Voltage should be between 0.5 volts or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 8.
NO : Go to Step 17.

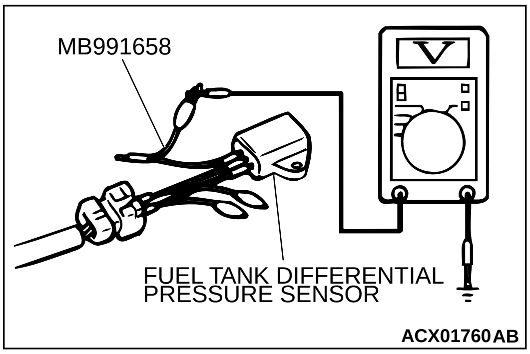
STEP 8. Check fuel tank differential pressure sensor connector D-11 for damage.



(1) Disconnect fuel tank differential pressure sensor connector D-11.

Q: Is there any failure at fuel tank differential pressure sensor connector D-11?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.



STEP 9. Check the output voltage at fuel tank differential pressure sensor connector D-11.

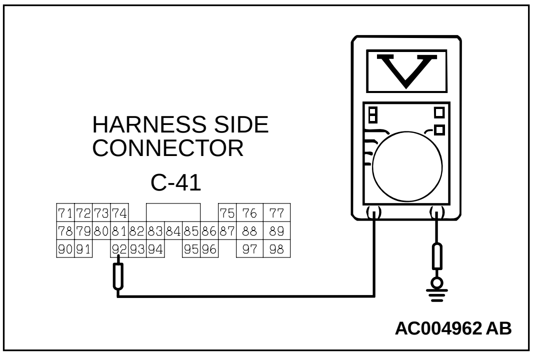
(1) Disconnect fuel tank differential pressure sensor connector D-11.
(2) Use special tool (MB991658) to connect terminals 2 and 3 of the disconnected sensor connector and those of the harness side connector, respectively.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Check connectors D-15, C-71, C-17, C-41 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-41 are in good condition, check the harness between fuel tank differential pressure sensor connector D-11 and PCM connector C-41 for short circuit to ground, then repair if necessary. Then go to Step 26.

NO : Replace the fuel tank differential pressure sensor. Then go to Step 26.



STEP 10. Check the output circuit voltage at PCM connector C-41.

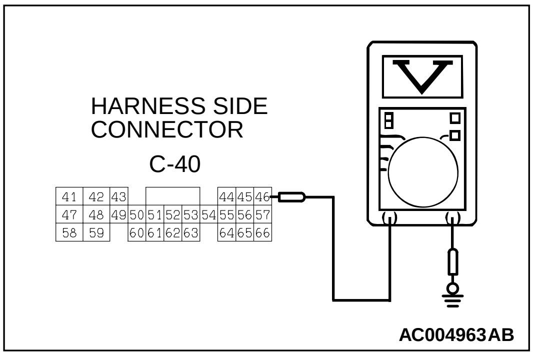
(1) Do not disconnect the PCM connector C-41.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 92 and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Go to Step 18.

NO : Check connectors D-15, C-71, C-17, C-41 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-41 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-41 for open circuit or damage. Then repair if necessary. Then go to Step 26 .



STEP 11. Check the 5-volt supply circuit voltage at PCM connector C-40.

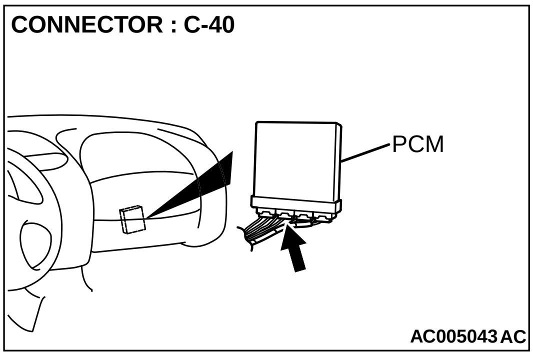
(1) Do not disconnect PCM connector C-40.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 46 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading within the specified value?

YES : Check connectors D-15, C-71, C-17, C-40 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-40 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-40 for open circuit or damage. Then repair if necessary. Then go to Step 26 .

NO : Go to Step 12.



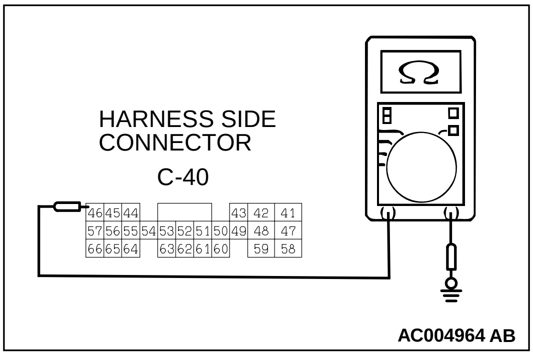
STEP 12. Check PCM connector C-40 for damage.

(1) Disconnect PCM connector C-40.

Q: Is there any failure at PCM connector C-40?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.

NO : Go to Step 13.



STEP 13. Check the sensor power supply line for short circuit to ground at PCM connector C-40.

(1) Disconnect PCM connector C-40 and measure at the harness side.
(2) Check for the continuity between terminal 46 and ground.
- There should be 2 ohms or more.

Q: Does the multi-meter reading exceed the specified value?

YES : Go to Step 26.

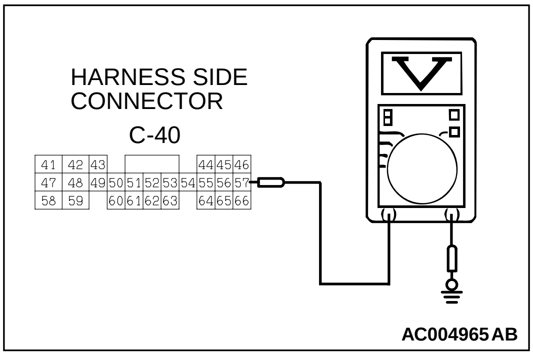
NO : Go to Step 14.

STEP 14. Check the sensor power supply lines.

(1) Check all the sensor power supply lines for damage, which flow through the harness PCM connector (terminal 46.)

Q: Is there any failure in the sensor power supply lines?

When a failure is found : Repair if necessary. (Refer to GROUP 90, Circuit Diagrams – MFI System <2.4L ENGINE>P.90-30. Then go to Step 26.)



STEP 15. Check the ground circuit voltage at PCM connector C-40.

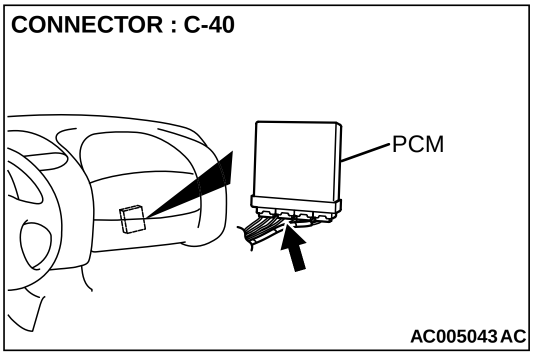
(1) Do not disconnect PCM connector C-40.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 57 and ground by backprobing.
- Voltage should be 0.5 volts or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the multi-meter reading below the specified value?

YES : Check connectors D-15, C-71, C-17, C-40 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If connectors D-15, C-71, C-17, C-40 are in good condition, check the harness between intermediate connector D-15 and PCM connector C-40 for open circuit or damage. Then repair if necessary. Then go to Step 26 .

NO : Go to Step 16.



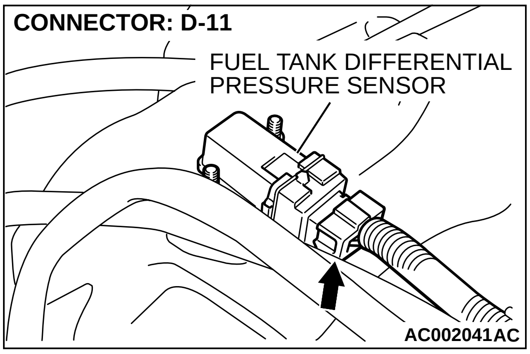
STEP 16. Check PCM connector C-40 for damage.

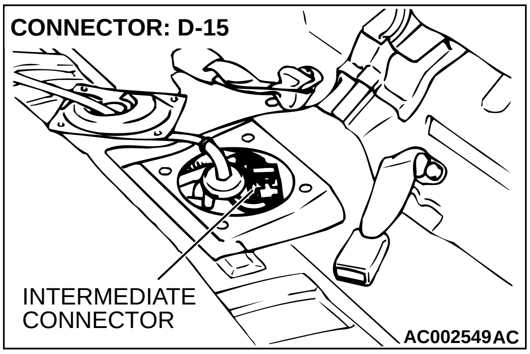
(1) Disconnect PCM connector C-40.

Q: Is there any failure at PCM connector C-40?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.

NO : Go to Step 26.





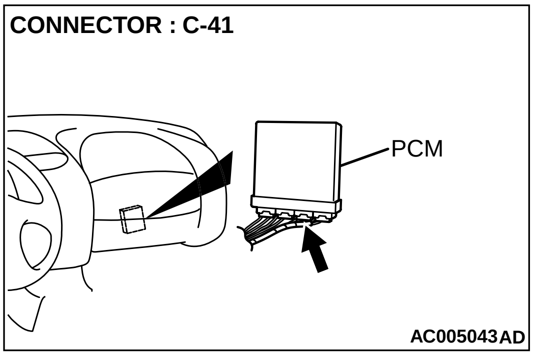
STEP 17. Check the harness between fuel tank differential pressure sensor connector D-11 and intermediate connector D-15 for open circuit or damage.

(1) Disconnect fuel tank differential pressure sensor connector D-11 and intermediate connector D-15.

Q: Is there any failure between fuel tank differential pressure sensor connector D-11 and intermediate connector D-15?

YES : Repair it. Then go to Step 26.

NO : Check connectors D-11, D-15 and repair or replace as required. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.



STEP 18. Check PCM connector C-41 for damage.

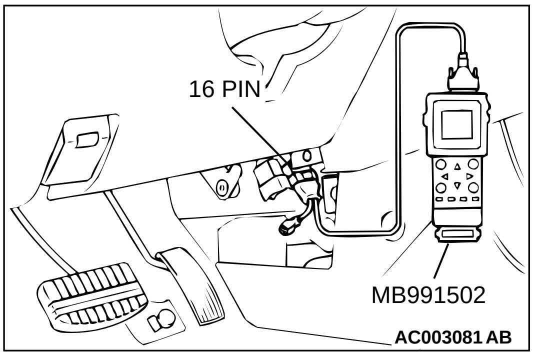
(1) Disconnect PCM connector C-41.

Q: Is there any failure at PCM connector C-41?

YES : Repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. Then go to Step 26.

NO : Go to Step 19.

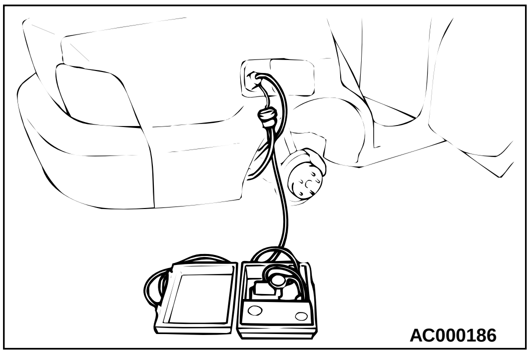
STEP 19. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa.

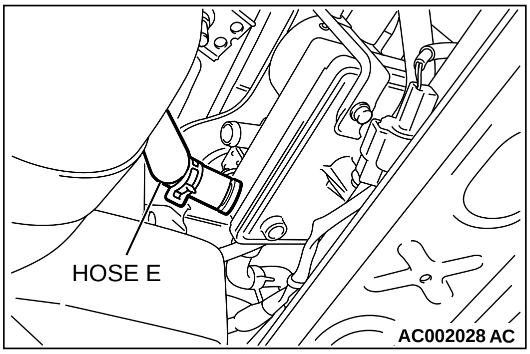


(5) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

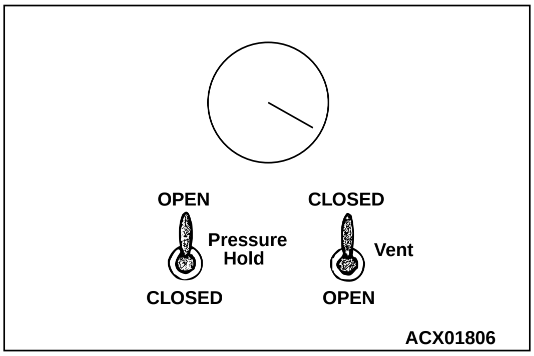
Q: Is the scan tool reading within the specified value?

YES : Go to Step 26.
NO : Replace the PCM. Then go to Step 26.

STEP 20. Check for clogging in the evaporator line from hose E to hose G.



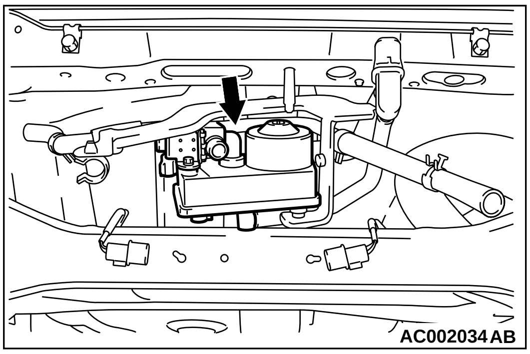
(1) Remove the module bracket mounting bolts, and disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Install the EVAP pressure pump outlet hose to the fuel tank filler neck as described in the pump manufacturer's instructions.



(3) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED.
(4) Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)
(5) When the hose G is unplugged, the air passes through the hose G.

Q: Does air pass through the hose E?

YES : Go to Step 21.
NO : Go to Step 23.

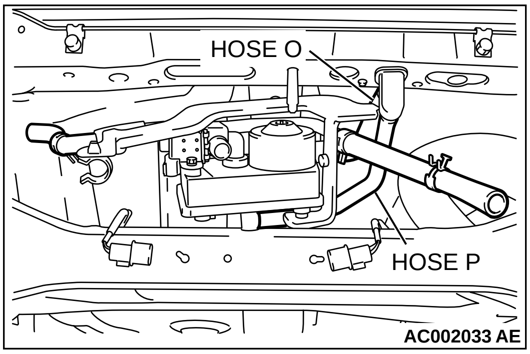


STEP 21. Check the vent valve module for clogging.

(1) Check the rover vent valve module for clogging. (Refer to GROUP 17 – Vent ValveP.17-96.)

Q: Are there any clogs?

YES : Replace the vent valve module. Then go to Step 26.
NO : Go to Step 22.

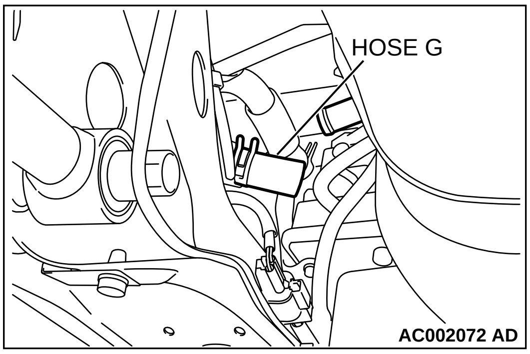


STEP 22. Check for clogging in the evaporator line from hose O and hose P.

(1) Carry out the clogging test with a hand vacuum pump on each hose from hose O and hose P.

Q: Are there any clogs?

YES : Replace that hose. Then go to Step 26.
NO : Go to Step 26.



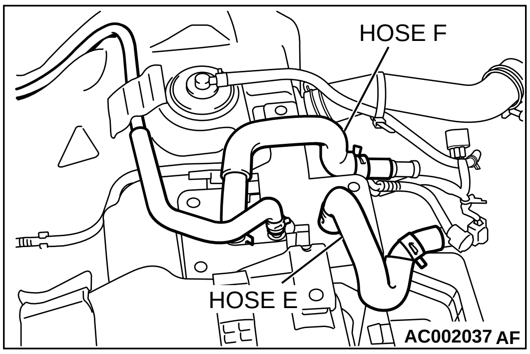
STEP 23. Check for clogging in the evaporator line from hose G.

(1) Carry out the clogging test with a hand vacuum pump on each hose from hose G.

Q: Are there any clogs?

YES : Replace that hose. Then go to Step 26.
NO : Go to Step 24.

STEP 24. Check for clogging in the evaporator line from hose E and hose F.

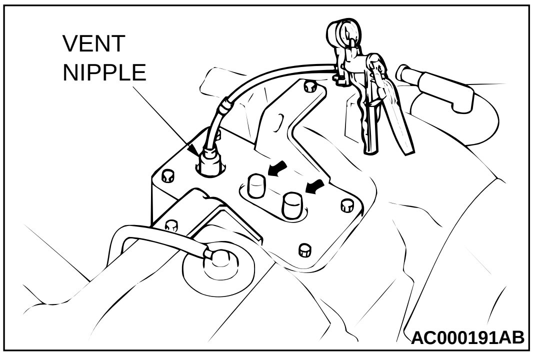


(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) Carry out the clogging test with a hand vacuum pump on each hose from hose E and hose F.

Q: Are there any clogs?

YES : Replace that hose, reinstall the fuel tank. Then go to Step 26.
NO : Go to Step 25.

STEP 25. Check for clogging in the evaporative emission canister.



(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply vacuum. When each nipple is unplugged, the vacuum should fluctuate.

Q: Does the vacuum pump gauge reading fluctuate?

YES : Reinstall the fuel tank. Then go to Step 26.
NO : Replace the evaporative emission canister, reinstall the fuel tank. Then go to Step 26.

STEP 26. Test the OBD-II drive cycle.

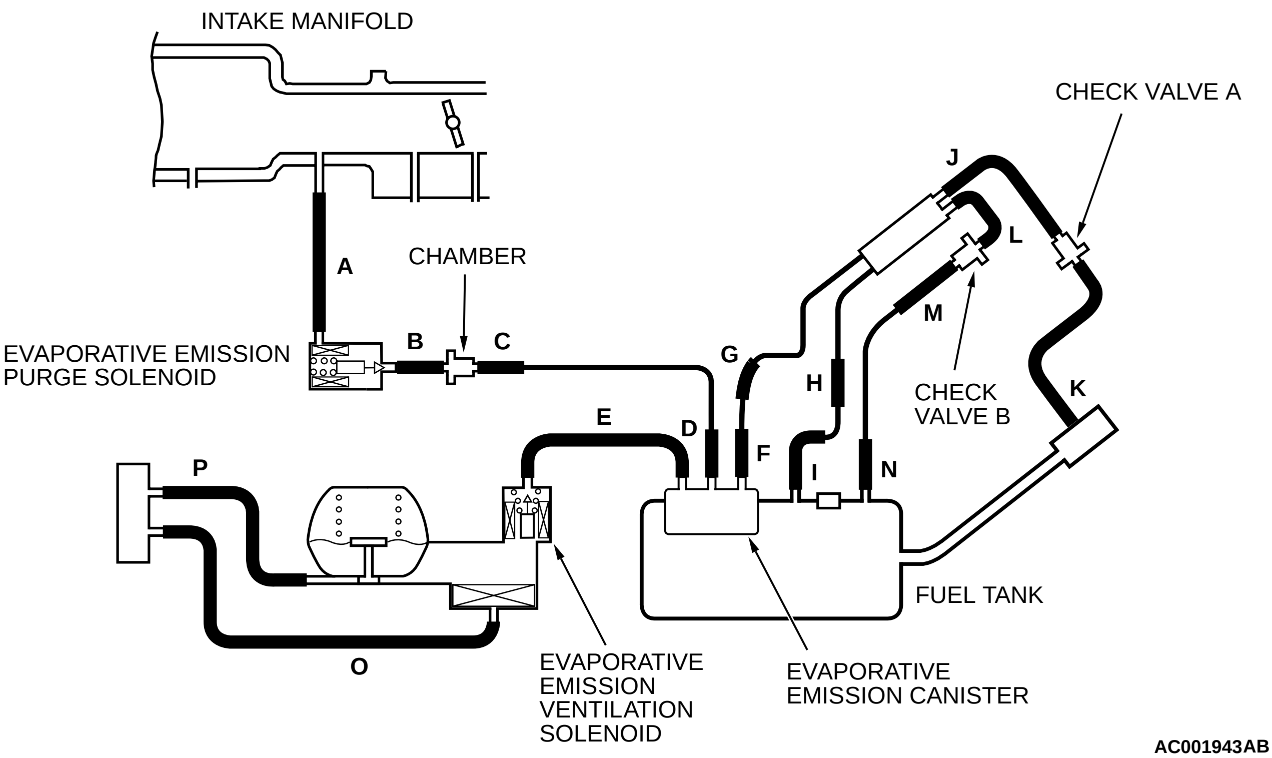
(1) Carry out a test drive with the drive cycle pattern. (Refer to P.13A-5, Procedure 1 – Evaporative Emission Control system Leak Monitor.)
(2) Read the diagnostic trouble code P0450 does not reset.

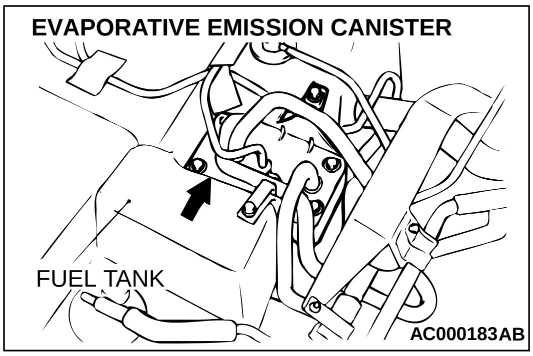
Q: Are the DTCs reset?

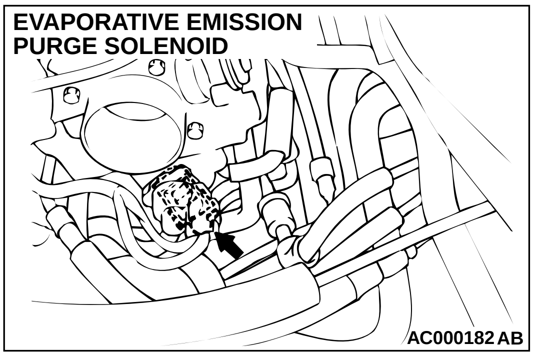
YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected.) Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent MalfunctionP.00-8.
NO : Replace the PCM.

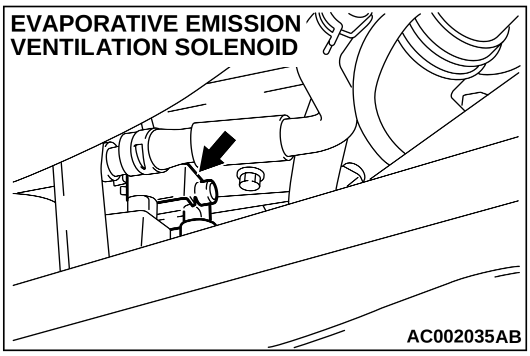
DTC P0455: Evaporative Emission Control System Leak Detected (Gross Leak)

SYSTEM DIAGRAM









TECHNICAL DESCRIPTION

- To judge if there is leak or clog in the fuel system, the PCM measures the change of the pressure inside the fuel tank.
- The PCM turns on the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.

- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi.)
- The PCM determines if there is leak or clog in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions A: At Start up

- Intake air temperature is 30°C (86°F) or less when the engine is started.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.

Test Conditions B: For Test to Run

- With in 16 minutes after the engine is started.
- Engine coolant temperature is higher than 60°C (140°F.)
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is above 76 kPa (11 psi.)
- Volumetric efficiency is between 20 and 80 percent.
- Vehicle speed is 30 km/h (18.7 mph) or more.

Test Conditions C: For Test to Stop

- Intake air temperature is less than 5°C (41°F.)
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises to 451 Pa (0.065 psi.)
- The pressure fluctuation width is less than 647 Pa (0.094 psi.)
- Fuel tank differential pressure sensor output voltage 1 – 4 V.

Judgment Criteria

- The fluctuation of fuel tank internal pressure is less than 324 Pa (0.047 psi) in 20 seconds after the evaporative emission purge solenoid had been driven when the fuel tank and vapor line were closed.

NOTE: The monitoring time (75 – 125 seconds) depends on the fuel level and the temperature in the fuel tank.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

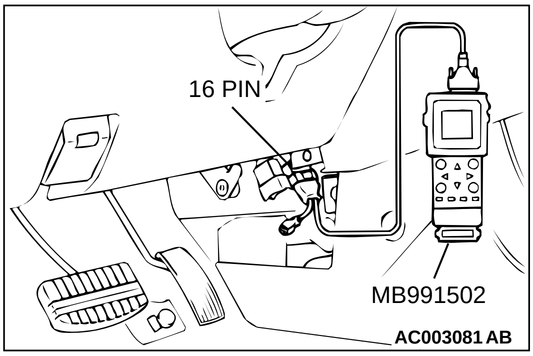
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0455, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge reading to the scan tool MB991502 reading determines the reading problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

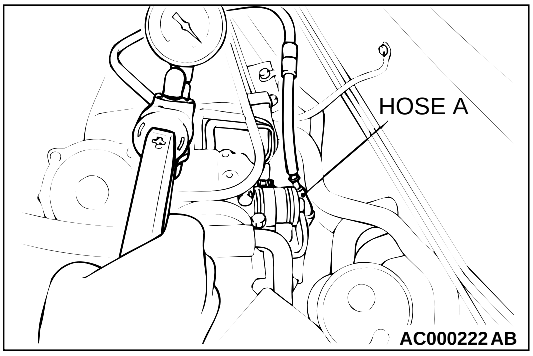
Required Special Tool:
MB991502: Scan Tool (MUT-II)



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa.) If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.



STEP 1. Check for leaks in the evaporator line hose A and evaporative emission purge solenoid valve.

(1) Disconnect hose A at the intake manifold side, and then connect a hand vacuum pump to the hose.

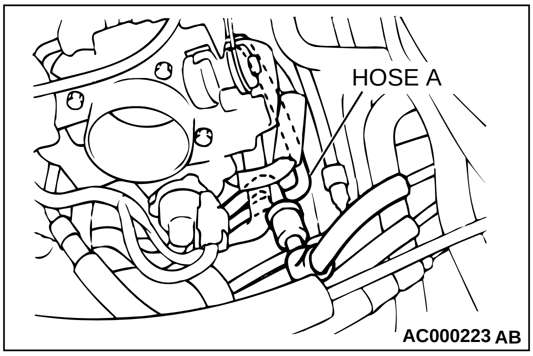
(2) Apply vacuum.

NOTE: The vacuum should be 40 kPa (5.8 psi) or less.

Q: Is the vacuum maintained?

YES : Go to Step 4.

NO : Go to Step 2.



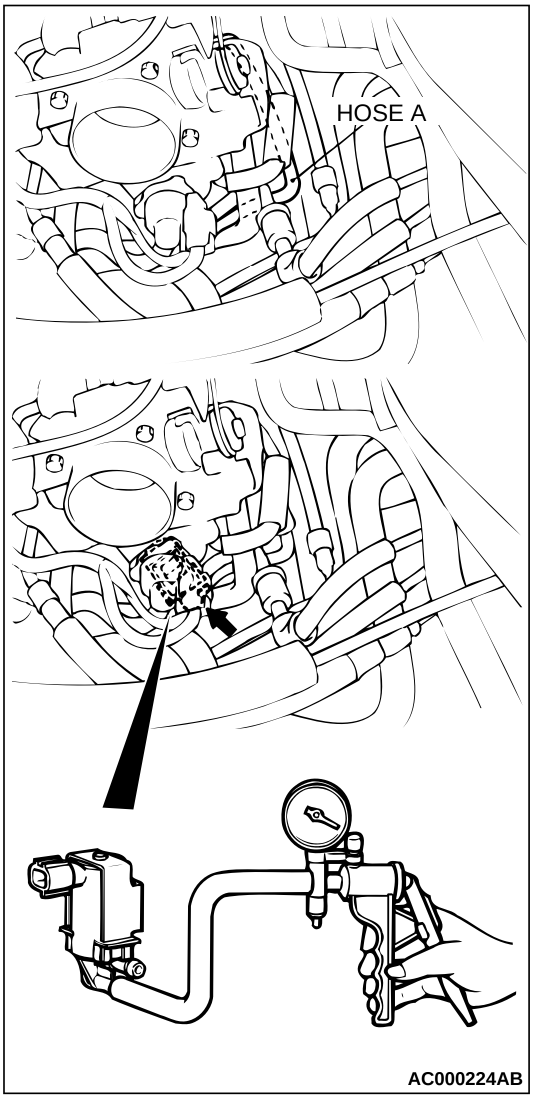
STEP 2. Check for leaks in the evaporator line hose A.

(1) The leakage test with a hand vacuum pump on hose A.

Q: Are there any leaks?

YES : Replace that hose. Then go to Step 34.

NO : Go to Step 3.



STEP 3. Check the evaporative emission purge solenoid valve using the scan tool MB991502. (Actuator test item 08)

(1) Turn the ignition switch to the "ON" position.
(2) Connect the hand vacuum pump to the nipple of the evaporative emission purge solenoid from which the hoses have been disconnected.
(3) Apply a vacuum on the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.
If the vacuum fluctuates, refer to P.13A-207, diagnosis step for evaporative emission purge solenoid trouble code DTC P0443.
(4) While maintaining the vacuum, carry out the actuator test with scan tool MB991502.

Q: Does the vacuum pump gauge indicate the atmospheric pressure when the evaporative emission purge solenoid is activated?

The evaporative emission purge solenoid valve operates normally, and the vacuum pump gauge reading returns to the atmospheric pressure : Go to Step 34.

The evaporative emission purge solenoid valve operates normally, but the vacuum pump gauge does not indicate the atmospheric pressure : Replace the evaporative emission purge solenoid. Then go to Step 34.

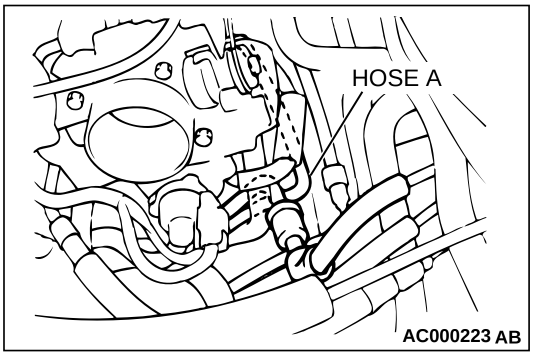
The evaporative emission purge solenoid valve does not operate normally : Refer to P.13A-207, diagnosis step for evaporative emission purge solenoid trouble code DTC P0443.

STEP 4. Check for clogging in the evaporator line hose A and evaporative emission purge solenoid valve.

(1) Use scan tool MB991502 to activate the evaporative emission purge solenoid valve.

Q: Are there any clogs?

YES : Go to Step 5.
NO : Go to Step 6.



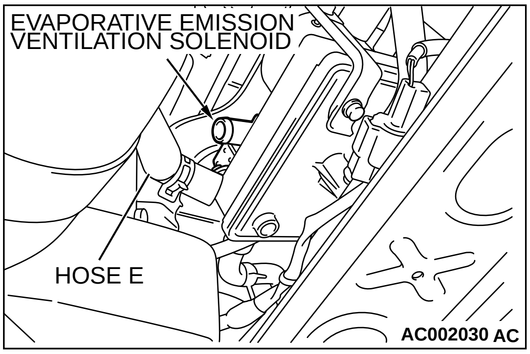
STEP 5. Check for clogging in the evaporator line hose A.

(1) Sequentially apply vacuum with a hand vacuum pump connected to hose A.

Q: Are there any clogs?

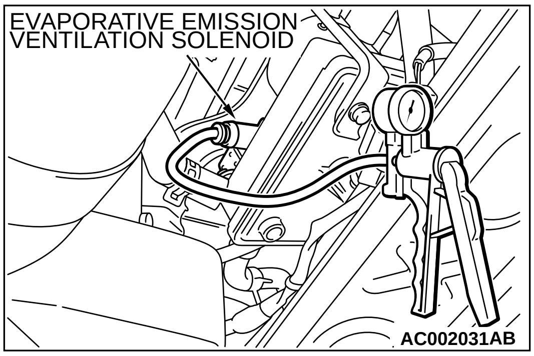
YES : Replace that hose, and perform the purge flow check. (Refer to GROUP 17, Engine Emission Control – Evaporative Emission Control System – Purge Control System CheckP.17-85.)

NO : Go to Step 34.



STEP 6. Check the evaporative emission ventilation solenoid using the scan tool MB991502. (Actuator test item 29)

(1) Turn the ignition switch to the "ON" position, remove the module bracket mounting volts and disconnect hose E from the evaporative emission ventilation solenoid side.



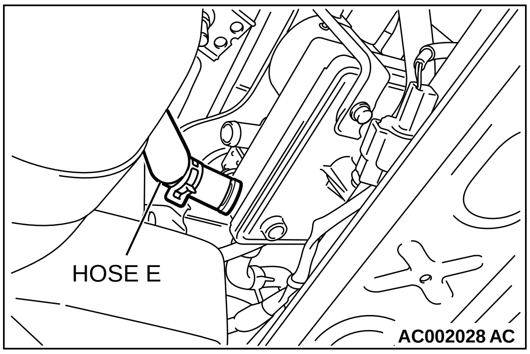
(2) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(3) Apply a vacuum on the hand vacuum pump, and confirm that pressure is applied.
If the vacuum is maintained, refer to P.13A-214, evaporative emission ventilation solenoid trouble code DTC P0446.
(4) Drive the evaporative emission ventilation solenoid with the scan tool MB991502 actuator test, and confirm that the vacuum does not fluctuate when the vacuum is applied with the hand vacuum pump.

Q: Does the vacuum pump gauge reading return to the atmospheric pressure when the evaporative emission ventilation solenoid valve is activated?

The evaporative emission ventilation solenoid valve operates normally and the vacuum pump gauge reading does not fluctuate : Go to Step 7.

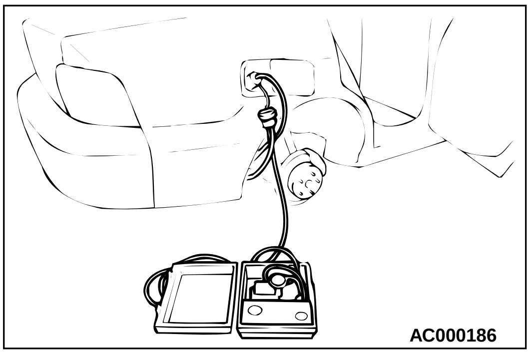
The evaporative emission ventilation solenoid valve operates normally, but the vacuum can not be maintained : Replace the evaporative emission ventilation solenoid. Then go to Step 34.

The evaporative emission ventilation solenoid valve does not operate normally : Refer to P.13A-214, diagnosis step for evaporative emission ventilation solenoid trouble code DTC P0446.



STEP 7. Pressure test for evaporator line from hose B to hose N.

(1) Disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.

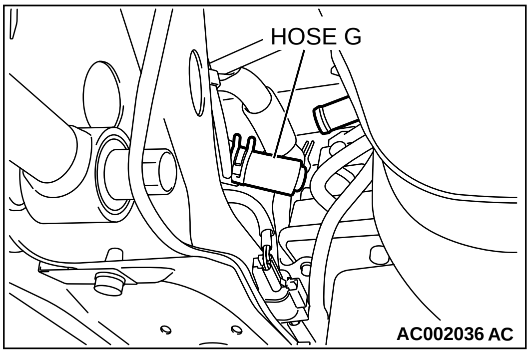


(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

Q: Are there any leaks in the evaporator line?

YES : Go to Step 8.
NO : Go to Step 21.

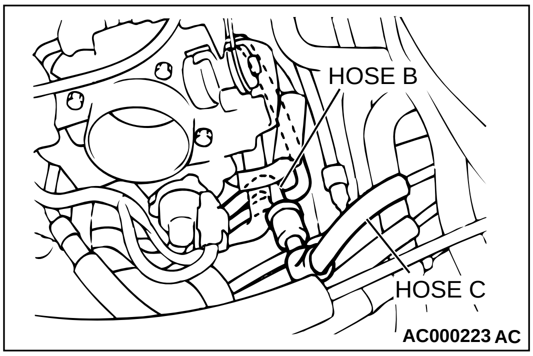


STEP 8. Pressure test for evaporator line from hose G to hose N.

(1) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Is the pressure maintained inside the evaporator line?

YES : Go to Step 9.
NO : Go to Step 13.



STEP 9. Check for leaks in the evaporator line hose B and hose C.

(1) The leakage test with a hand vacuum pump on each hose from hose B and hose C.

Q: Can the leaks be pinpointed?

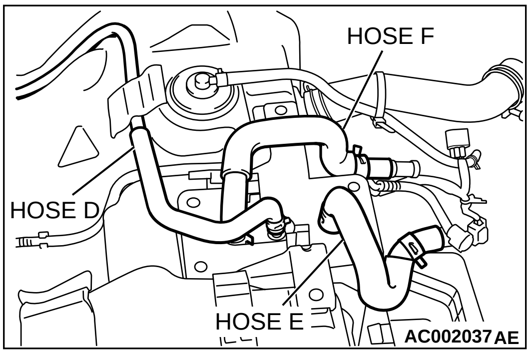
YES : Replace that hose. Then go to Step 34.
NO : Go to Step 10.

STEP 10. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Does the vacuum pump gauge reading fluctuate?

YES : Replace the chamber, then go to Step 34.
NO : Go to Step 11.

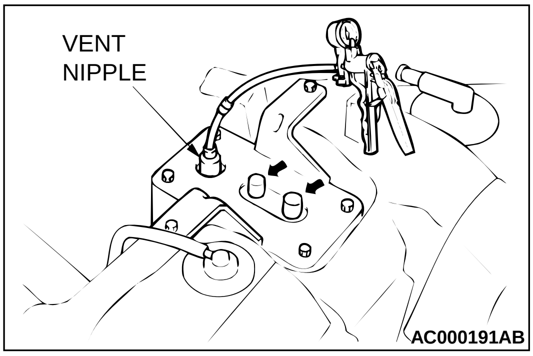


STEP 11. Check for leaks in the evaporator line from hose D to hose F.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The leakage test with a hand vacuum pump on each hose from hose D to hose F.

Q: Can the leaks be pinpointed?

YES : Replace that hose, reinstall the fuel tank. Then go to Step 34.
NO : Go to Step 12.



STEP 12. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

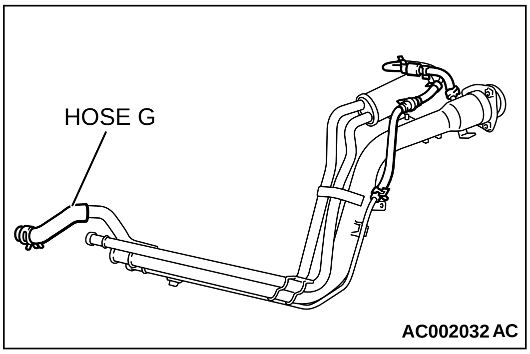
Q: Does the vacuum pump gauge reading fluctuate?

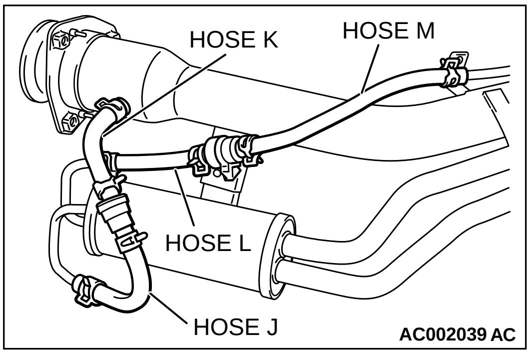
YES : Replace the evaporative emission canister, and reinstall the fuel tank. Then go to Step 34.
NO : Reinstall the fuel tank, then go to Step 34.

STEP 13. Check for leaks in the evaporator line hose G, J, K, L and hose M.

(1) Remove the filler neck assembly. (Refer to GROUP 13C, Fuel tankP.13C-6.)

(2) Sequentially apply vacuum with a hand vacuum pump connected to hose G, J, K, L and hose M.



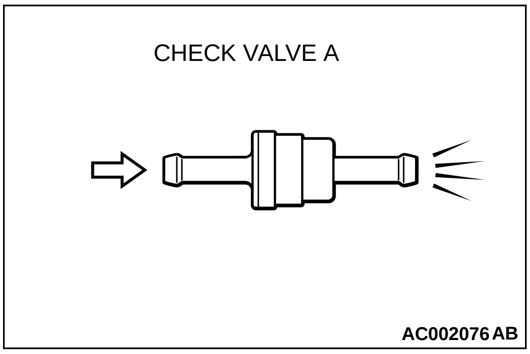


Q: Can the leaks be pinpointed?

YES : Replace that hose, reinstall the filler neck assembly. Then go to Step 34.

NO : Go to Step 14.

STEP 14. Check the check valve A.



(1) Only when you blow the check valve from the direction shown, it should pass air.

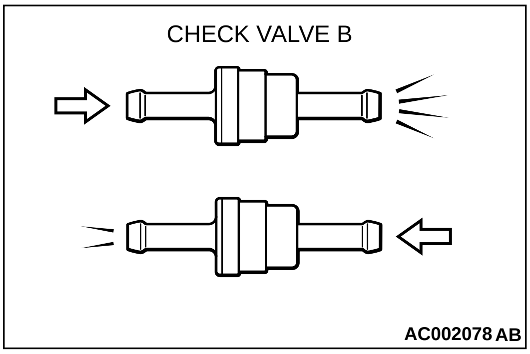
(2) When you blow the check valve, on air should leak from the check valve body.

Q: Is there any failure?

YES : Replace it, reinstall the filler neck assembly. Then go to Step 34.

NO : Go to Step 15.

STEP 15. Check the check valve B.



(1) When you blow the check valve from the arrow direction shown above, it should pass more air.

(2) When you blow the check valve from the arrow direction shown below, it should pass less air.

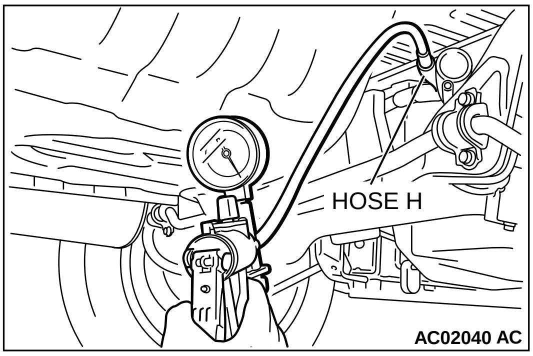
(3) When you blow the check valve, on air should leak from the check valve body.

Q: Is there any failure?

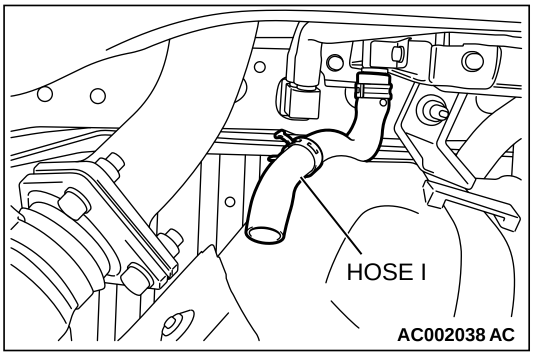
YES : Replace it, reinstall the filler neck assembly and filler neck protector. Then go to Step 34.

NO : Go to Step 16.

STEP 16. Check for leaks in the evaporator line from hose H to hose I.



(1) Disconnect hose H at the liquid separator side, and then connect a hand vacuum pump to the hose.



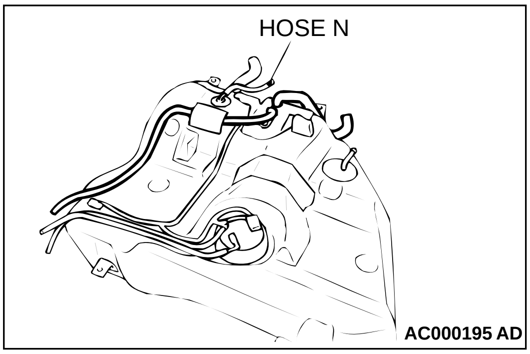
(2) Disconnect hose I at the fuel tank side, and then plug the hose.
(3) Apply vacuum by using the hand vacuum pump.

Q: Is the vacuum maintained inside the evaporator line?

YES : Go to Step 17.
NO : Go to Step 20.

STEP 17. Check for leaks in the evaporator line from hose N.

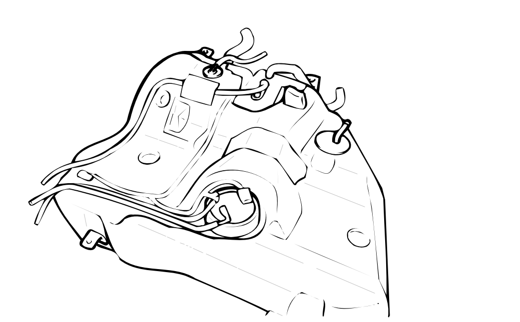
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The leakage test with a hand vacuum pump on each hose from hose N.



Q: Can the leaks be pinpointed?

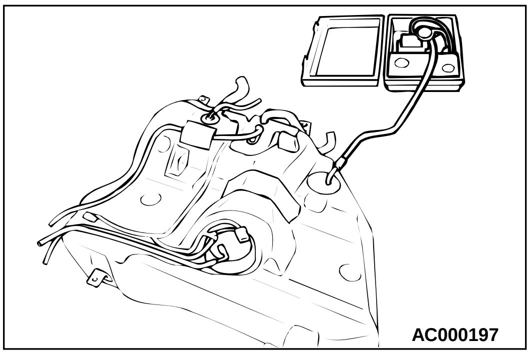
YES : Replace that hose. Then go to Step 34.
NO : Go to Step 18.

STEP 18. Check for leaks in the fuel tank.

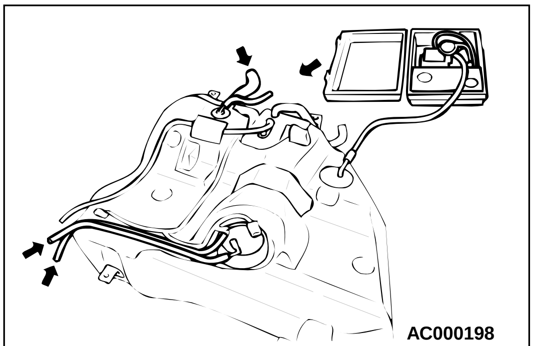

AC000196

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.


AC000197

(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.


AC000198

(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Can the leaks be pinpointed?

There is leaks at the fuel pump assembly or the inner pressure sensor installation section : Reassemble the parts, check again that there are no leaks, reinstall the fuel tank. Then go to Step 34.

There is leaks at another section : Go to Step 19.

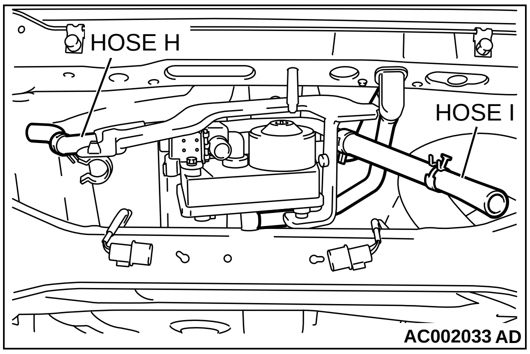
STEP 19. Visually check for cracks in the fuel tank filler neck.

(1) Visually check for cracks in the fuel tank filler neck.

Q: Can the leaks be found out?

YES : Replace the fuel tank filler neck assembly and reinstall the fuel tank. Then go to Step 34.

NO : Reinstall the fuel tank.Then go to Step 34.

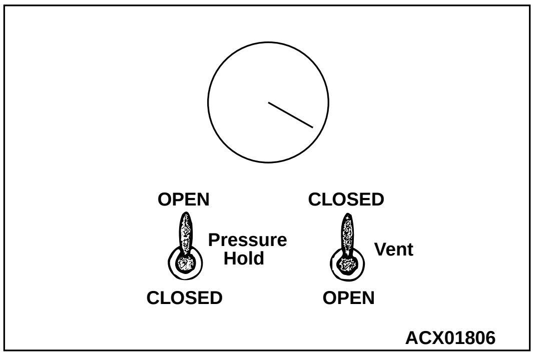


STEP 20. Check for leaks in the evaporator line from hose H to hose I.

(1) The leakage test with a hand vacuum pump on each hose from hose H to hose I.

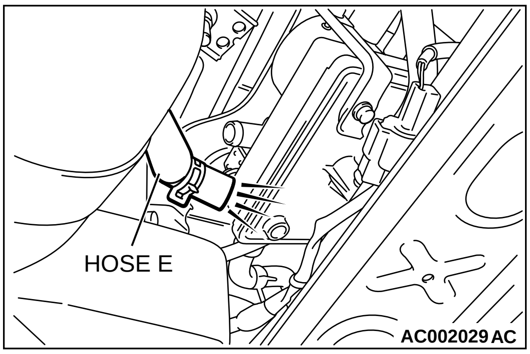
Q: Can the leaks be pin pointed?

YES : Replace that hose, and go to Step 34.
NO : Go to Step 34.



STEP 21. Check for clogging in the evaporator line from hose E to hose G.

(1) Unplug hose E.
(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)

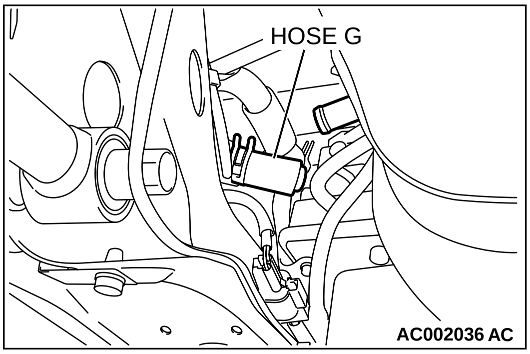


(3) Air should pass through hose E.

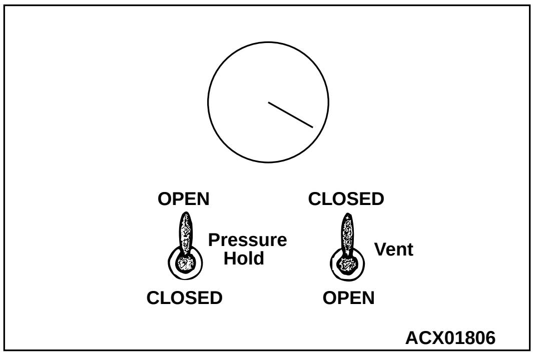
Q: Does air pass through hose E?

YES : Go to Step 25.
NO : Go to Step 22.

STEP 22. Check for clogging in the evaporator line from hose G to hose N.



(1) Disconnect hose G from the evaporative emission canister side, and unplug the hose G.



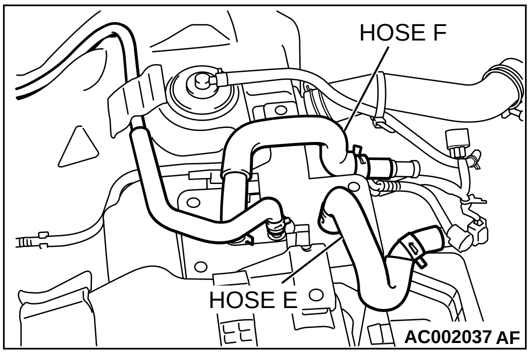
(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)
(3) Air should pass through hose G.

Q: Does air pass through hose G?

YES : Go to Step 23.
NO : Go to Step 29.

STEP 23. Check for clogging in the evaporator line from hose E and hose F.

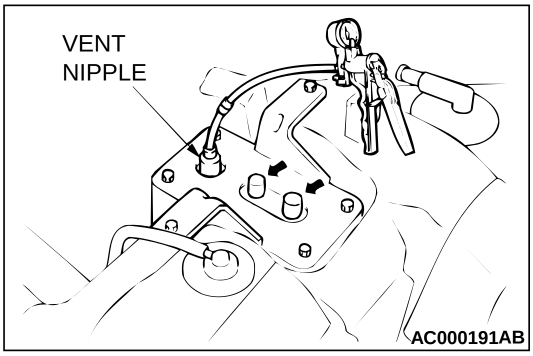
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)



(2) The clogging test with a hand vacuum pump on each hose from hose E and hose F.

Q: Are there any clogs?

YES : Replace that hose, and perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 24.

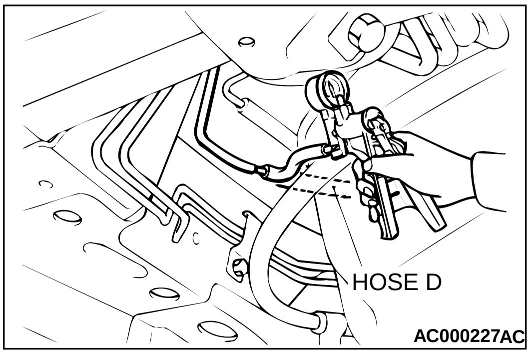


STEP 24. Check for clogging in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply a vacuum, when each nipple is unplugged, the vacuum should fluctuate.

Q: Does the vacuum pump gauge reading fluctuate?

YES : Reinstall the fuel tank. Then go to step 34.
NO : Replace the evaporative emission canister, reinstall the fuel tank. Then perform the OBD-II drive cycleP.13A-5.



STEP 25. Check for clogging in the evaporator line hose D.

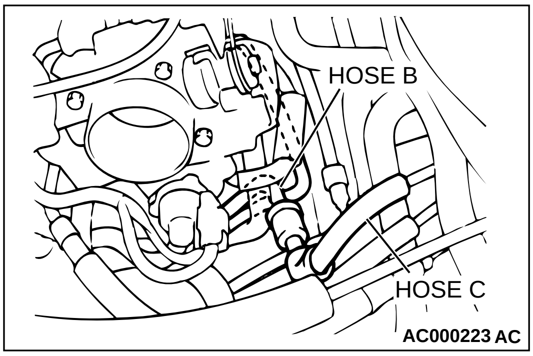
(1) Disconnect hose D at the intake manifold side, and then connect a hand vacuum pump to hose D at the floor pipe side.
(2) Apply vacuum.

NOTE: The vacuum should be 40 kPa (5.8 psi) or less.

(3) Use scan tool MB991502 to activate the evaporative emission purge solenoid valve. The vacuum should leak.

Q: Is the vacuum maintained inside the evaporator line?

YES : Go to Step 26.
NO : Go to Step 28.



STEP 26. Check for clogging in the evaporator line hose B to hose C.

(1) The clogging test with a hand vacuum pump on each hose from hose B to hose C.

Q: Are there any clogs?

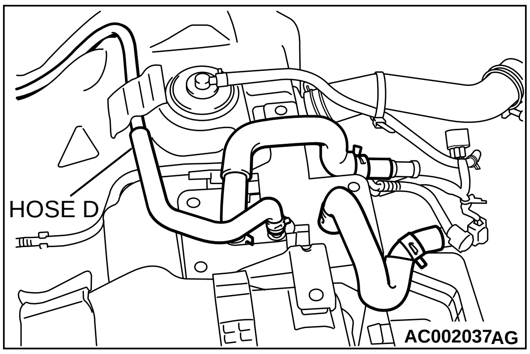
YES : Replace that hose, and perform the purge flow check. (Refer to GROUP 17, Purge Control System CheckP.17-85.)
NO : Go to step 27.

STEP 27. Check for clogging in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum. When the nipple is unplugged, the vacuum should fluctuate.

Q: Does the vacuum pump gauge reading fluctuates?

YES : Go to Step 34.
NO : Replace the chamber, and perform OBD-II drive cycleP.13A-5.

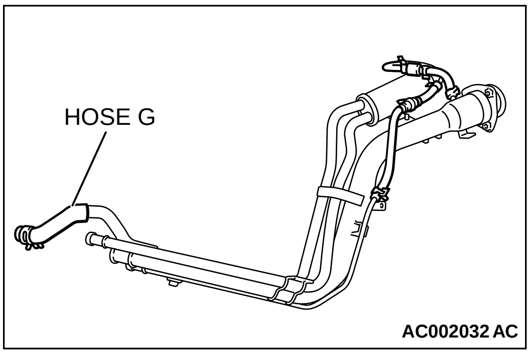


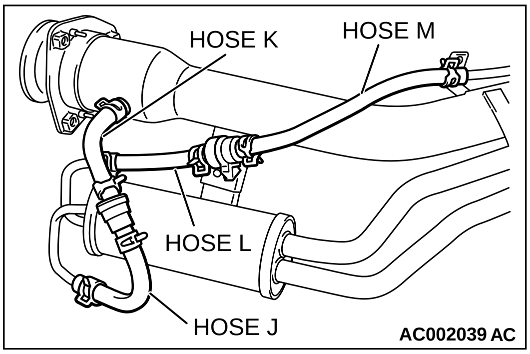
STEP 28. Check for clogging in the evaporator line from hose D.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) The clogging test with a hand vacuum pump on each hose from hose D.

Q: Are there any clogs?

YES : Replace that hose, and perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 29.



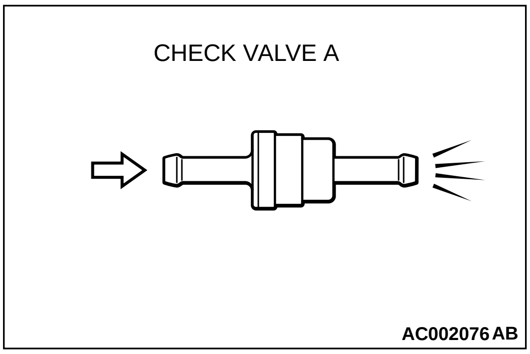


STEP 29. Check for clogging in the evaporator line hose G, J, K, L and hose M.

(1) Remove the filler neck assembly. (Refer to GROUP 13C, Fuel tankP.13C-6.)
(2) The clogging test with a hand vacuum pump on each hose from hose G, J, K, L and hose M.

Q: Are there any clogs?

YES : Replace that hose, reinstall the filler neck assembly and filler neck protector, and perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 30.

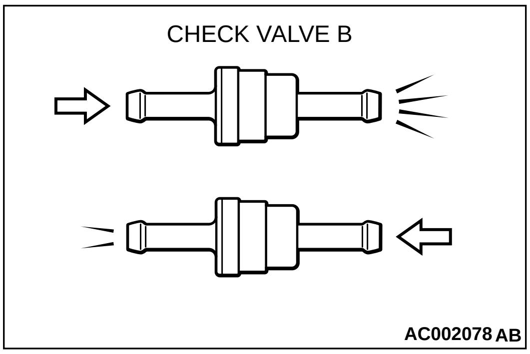


STEP 30. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, on air should leak from the check valve body.

Q: Is there any failure?

YES : Replace it, then perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 31.

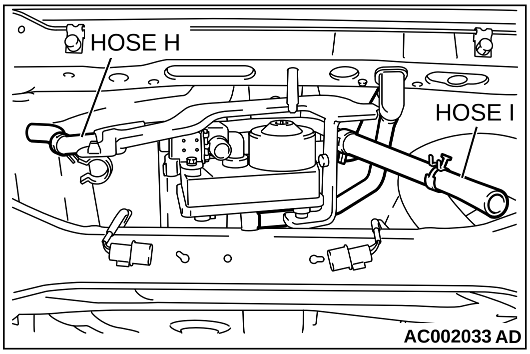


STEP 31. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, on air should leak from the check valve body.

Q: Is there any failure?

YES : Replace it, then perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 32.



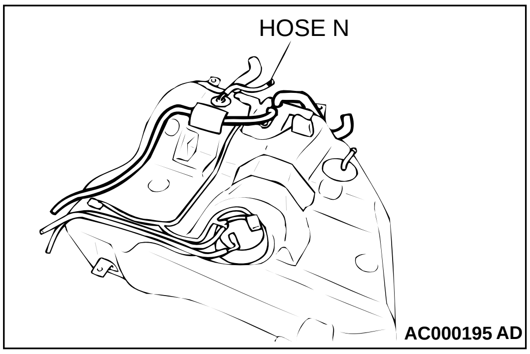
STEP 32. Check for clogging in the evaporator line from hose H to hose I.

(1) The clogging test with a hand vacuum pump on each hose from hose H to hose I.

Q: Are there any clogs?

YES : Replace that hose, reinstall the fuel tank, and perform the OBD-II drive cycleP.13A-5.
NO : Go to Step 33.

STEP 33. Check for clogging in the evaporator line from hose N.

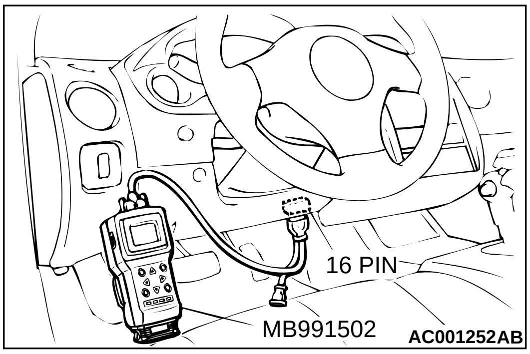


(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel TankP.13C-6.)
(2) Carry out the clogging test with a hand vacuum pump on each hose from hose N.

Q: Are there any clogs?

YES : Replace that hose, reinstall the fuel tank, and perform the OBD-II drive cycleP.13A-5.
NO : Go to step 34.

STEP 34. Evaporative Emission System Monitor Test using scan tool MB991502.



(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using the scan tool MB991502.
(3) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(4) Start the engine.
(5) Select "System Test," and press the "YES" key.
(6) Select "Evap Leak Mon," and press the "YES" key.
(7) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-438. and adjust to the standard value.

(8) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."

Q: What kind of message is displayed on scan tool MB991502?

When the message "Evap Leak Mon. Completed. Test Passed" is displayed : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.
When the message "Evap Leak Mon. Completed. Test Failed and DTCs Set" is displayed : Go to Step 1 .
When the message "Evap Lead Mon. discontinued. Retest again from the first" is displayed : Turn the ignition switch to the "LOCK" (OFF) position once, then repeat this monitor test from the start.

DTC P0500: Vehicle Speed Sensor Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the vehicle speed sensor is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

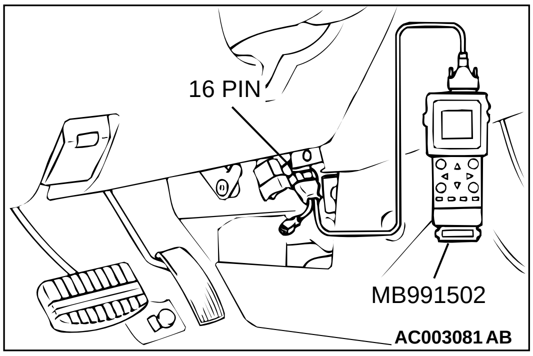
Check Conditions, Judgment Criteria

- Vehicle speed sensor failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

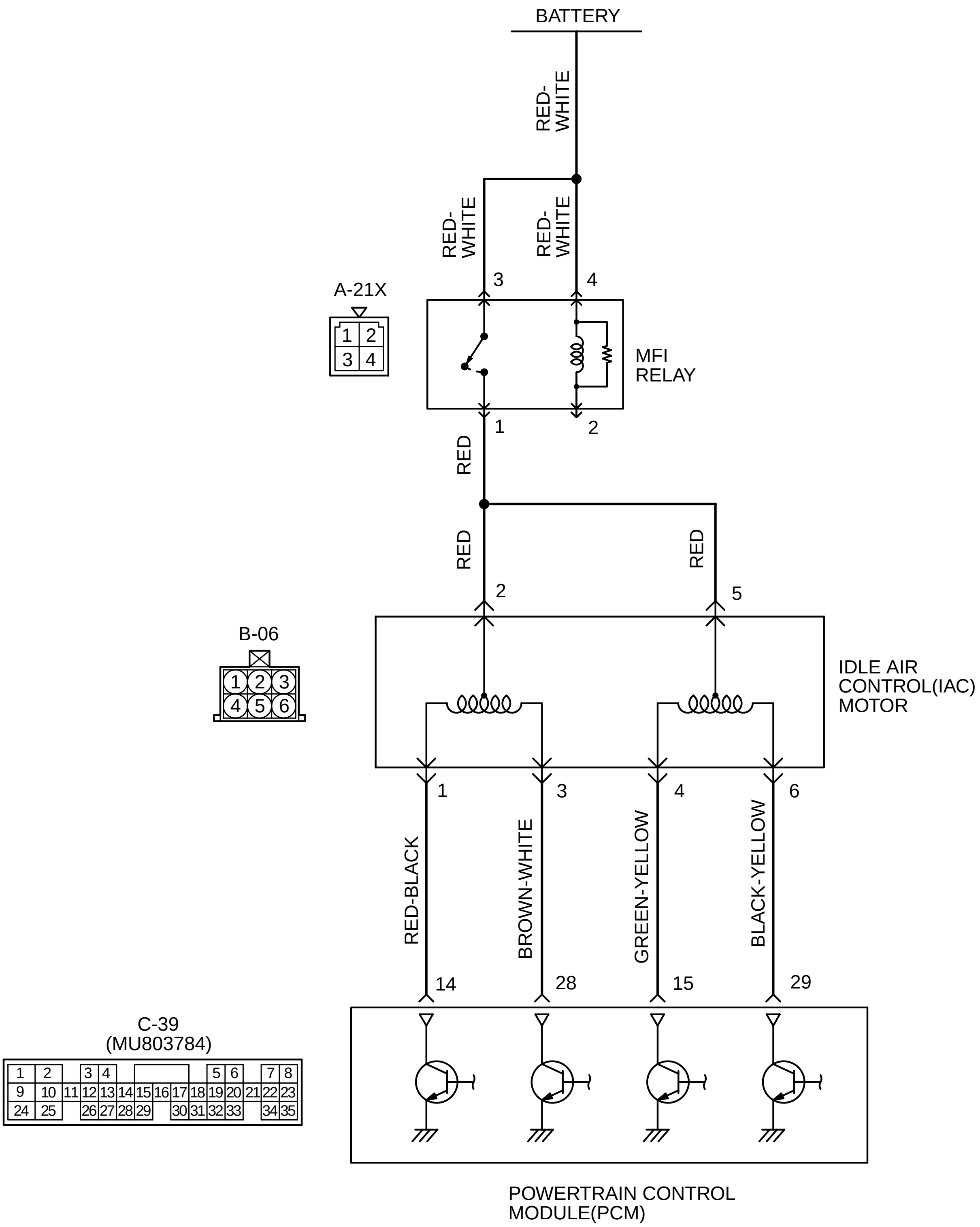
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0500 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0500 does not reset.

DTC P0506: Idle Control System RPM Lower Than Expected



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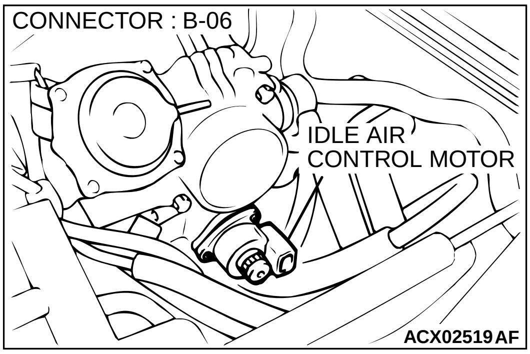
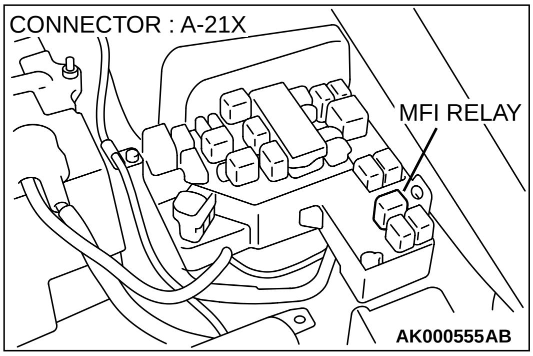
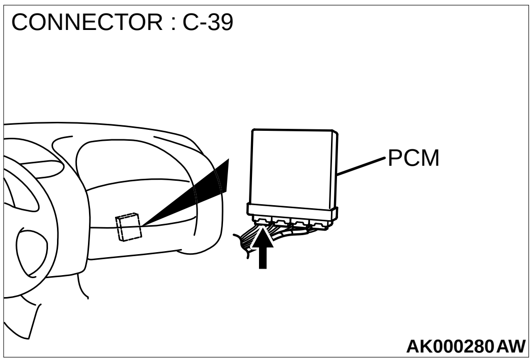






CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 1).
- The PCM (terminals 14, 15, 28, 29) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The PCM checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than approximately 82° C (180° F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: "OFF."
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than -10° C (14° F).

Judgment Criteria

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

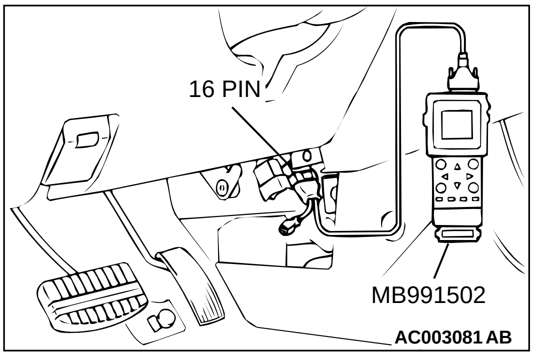
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)
MB991709: Test harness



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

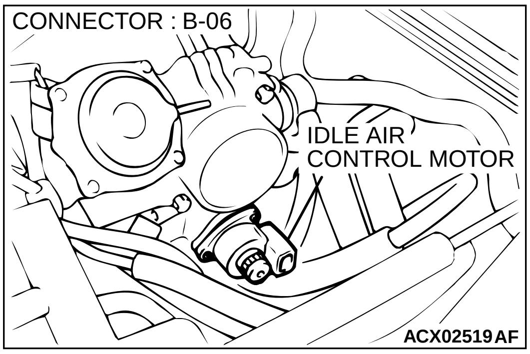
Q: Is the diagnostic trouble code other than P0506 output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.

STEP 2. Check the throttle body (throttle valve area)

Q: Is the throttle valve area dirty?

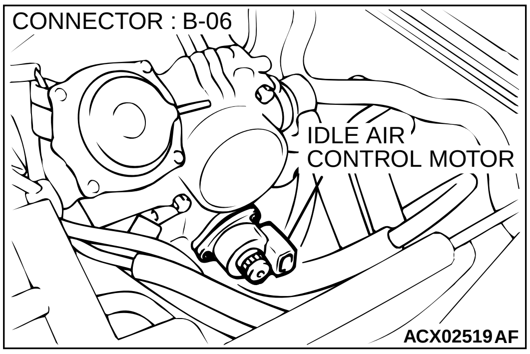
YES : Perform cleaning. Refer to, Throttle body (throttle valve area) cleaning(P.13A-436). Then go to Step 14.
NO : Go to Step 3.



STEP 3. Check connector B-06 at idle air control motor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



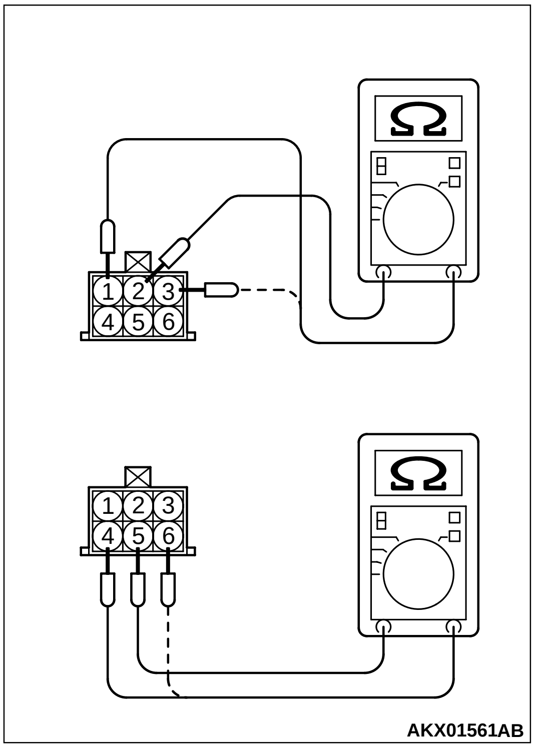
STEP 4. Check the idle air control motor coil resistance.

(1) Disconnect the idle air control motor connector B-06.
(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20° C (68° F)]

(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

Standard value: 28 – 33 ohm [at 20° C (68° F)]



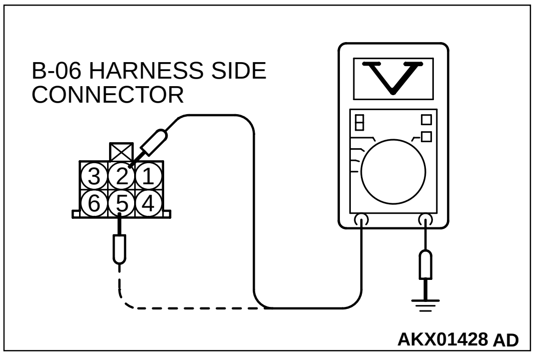
Q: Is the resistance normal?

YES : Go to Step 5.
NO : Replace the idle air control motor. Then go to Step 14.

STEP 5. Check the power supply voltage at idle air control motor harness side connector B-06.

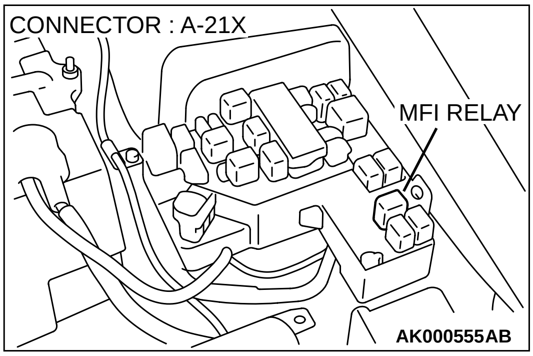
(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2, 5 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.



Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 6.

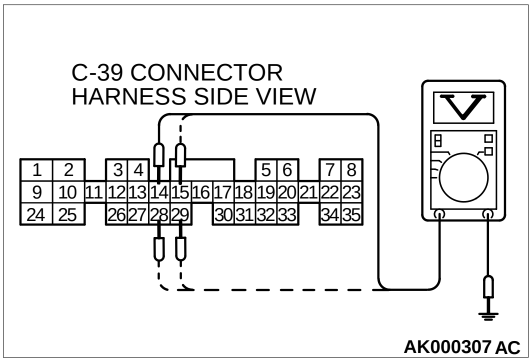


STEP 6. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and idle air control motor connector B-06 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



STEP 7. Check the power supply voltage at PCM connector C-39 by backprobing

(1) Do not disconnect the connector C-39.

(2) Measure the voltage between terminal (14, 15, 28, 29) and ground by backprobing.

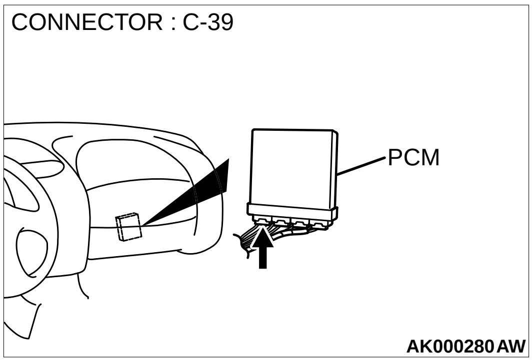
- The voltage is 1V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK"(OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.

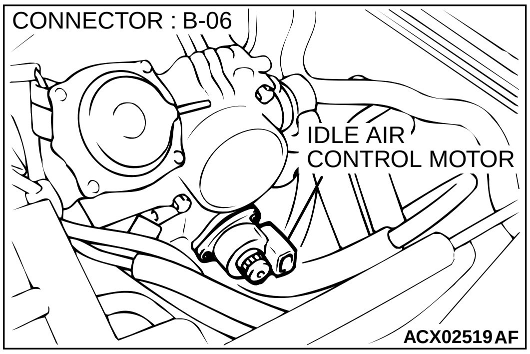


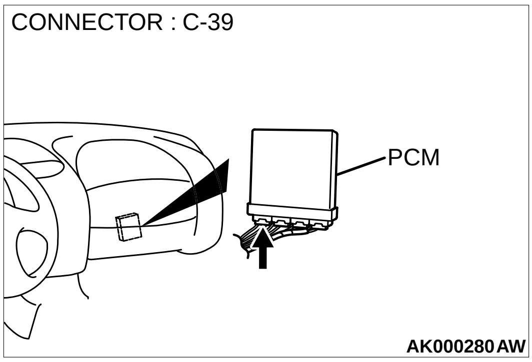
STEP 8. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



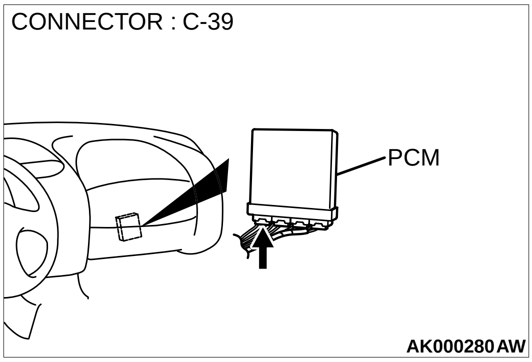


STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-06 and PCM connector C-39.

a. Idle air control motor connector B-06 terminal 1 and PCM connector C-39 terminal 14.
b. Idle air control motor connector B-06 terminal 3 and PCM connector C-39 terminal 28.
c. Idle air control motor connector B-06 terminal 4 and PCM connector C-39 terminal 15.
d. Idle air control motor connector B-06 terminal 6 and PCM connector C-39 terminal 29.

Q: Is the harness wire in good condition?

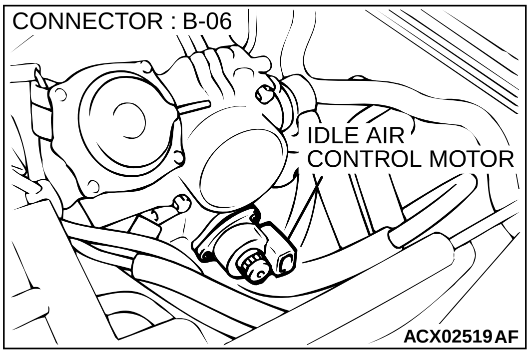
YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

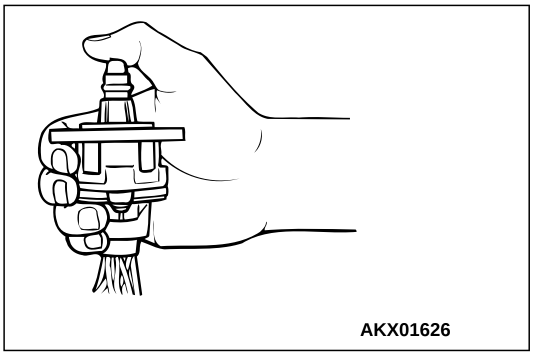


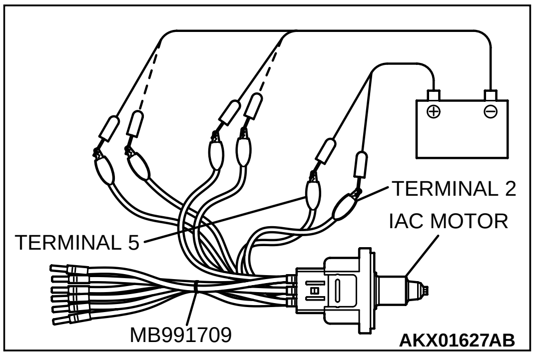
STEP 10. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.







STEP 11. Check the idle air control motor operation using special tool MB991709.

(1) Remove the idle air control motor.
(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the battery (+) terminal.
(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the battery (-) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

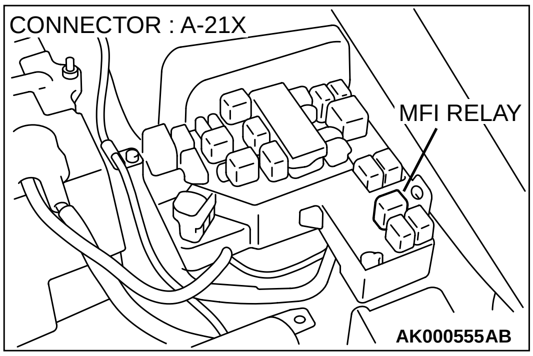
(5) Then. Use jumper wires to connect the terminal 5 of the idle air control motor connector to the battery (+) terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the battery (-) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

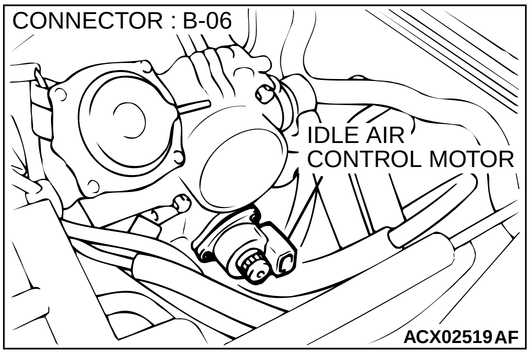
(7) Install the idle air control motor. Refer to, Throttle Body – Disassembly and Assembly(P.13A-452).

Q: Is the idle air control motor operating properly?

YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

STEP 12. Check for harness damage between MFI relay connector A-21X terminal 1 and idle air control motor connector B-06 terminal 2, 5.



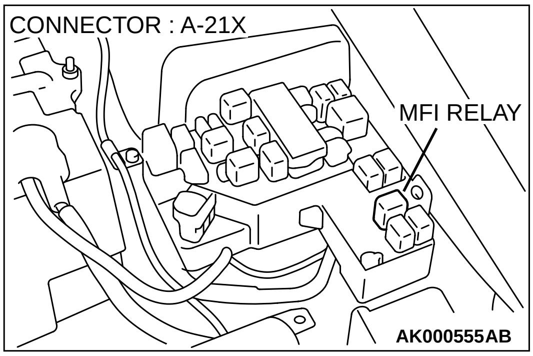


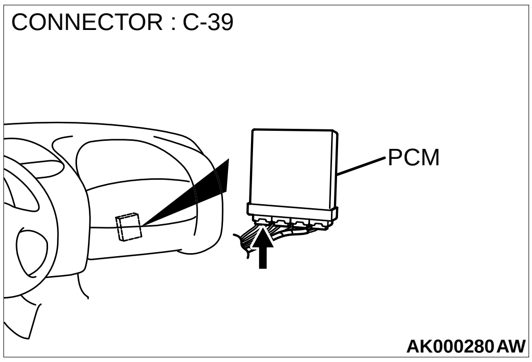
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

STEP 13. Check for harness damage between idle air control motor connector B-06 and PCM connector C-39.





a. Idle air control motor connector B-06 terminal 1 and PCM connector C-39 terminal 14.
b. Idle air control motor connector B-06 terminal 3 and PCM connector C-39 terminal 28.
c. Idle air control motor connector B-06 terminal 4 and PCM connector C-39 terminal 15.
d. Idle air control motor connector B-06 terminal 6 and PCM connector C-39 terminal 29.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

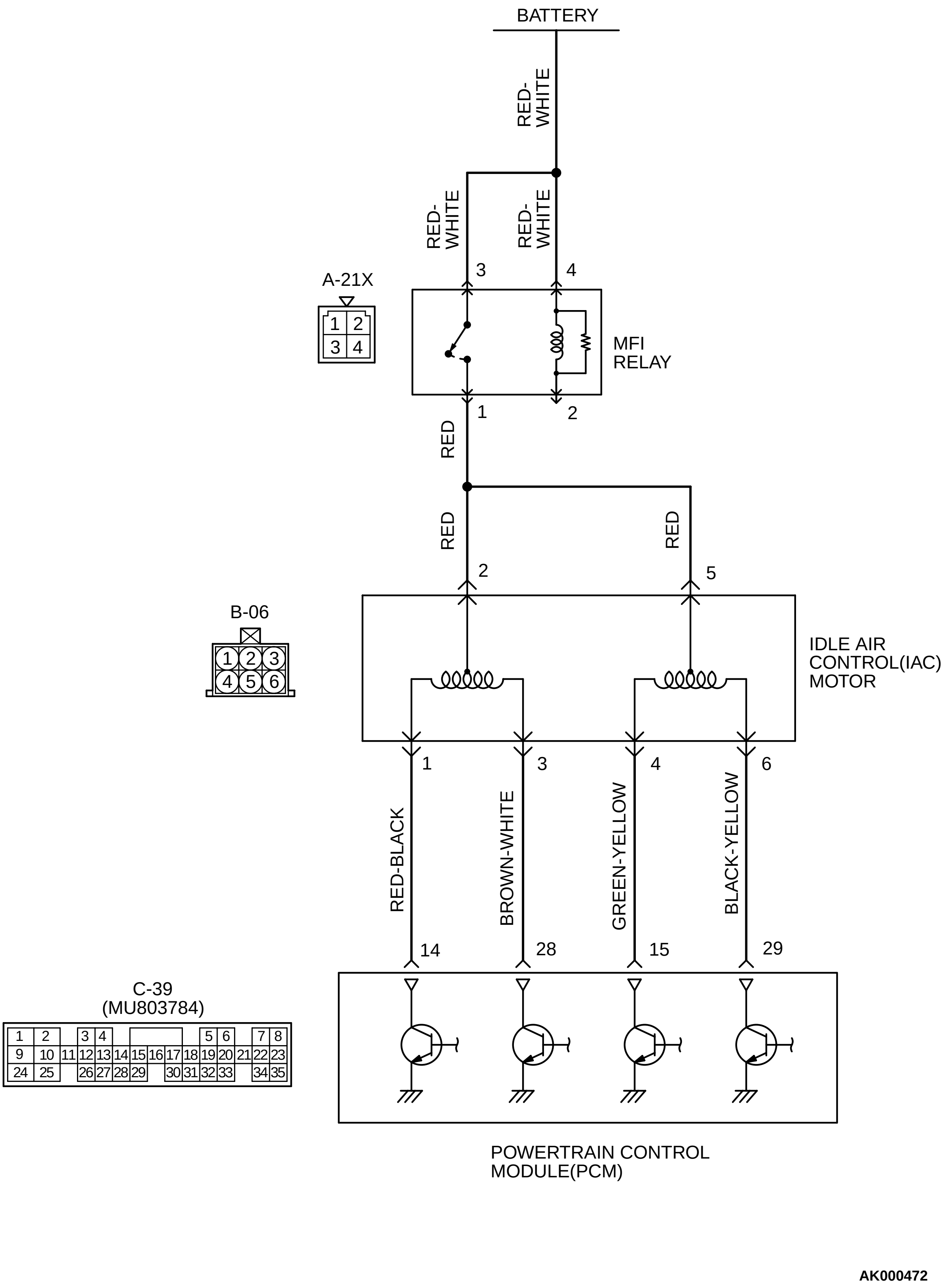
STEP 14. Test the OBD-II drive cycle.

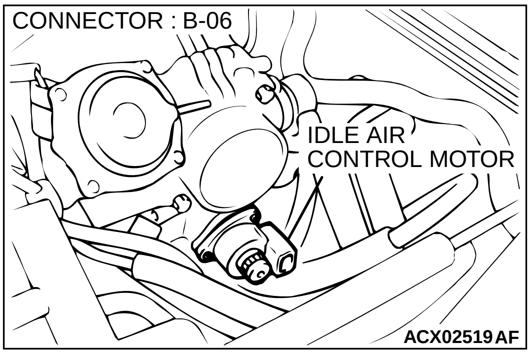
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

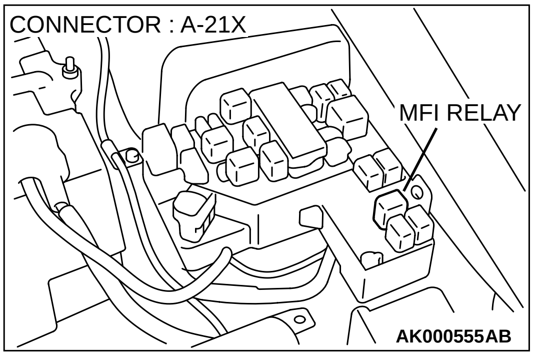
Q: Is the DTC P0506 is output?

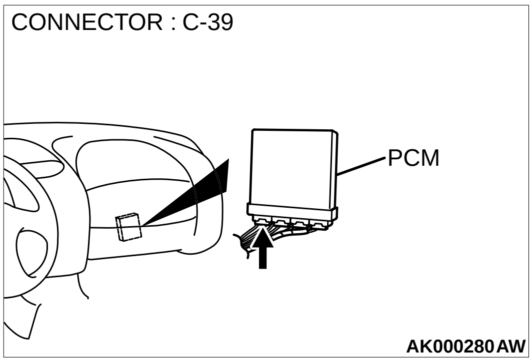
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0507: Idle Control System RPM Higher Than Expected









CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 1).
- The PCM (terminals 14, 15, 28, 29) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The PCM checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Vehicle speed has reached 1.5 km/h (0.93 mph) or more at least once.
- Under the closed loop idle speed control.

Judgment Criteria

- Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 12 seconds.

Check Conditions

- Vehicle speed has reached 1.5 km/h (0.93 mph) or more at least once.
- Under the closed loop idle speed control.
- The maximum atmospheric temperature is lower than 45° C (113° F) during closed loop idle speed control.
- Engine coolant temperature is higher than 82° C (180° F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than -10° C (14° F).

Judgment Criteria

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min or more for 12 seconds.

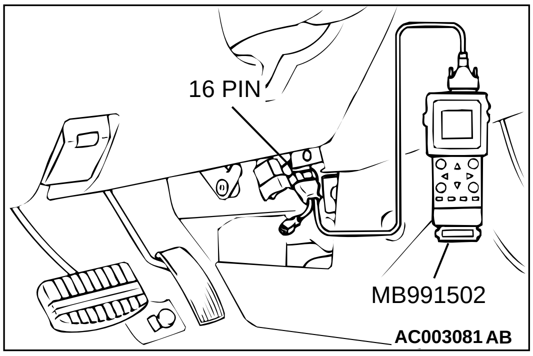
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)
MB991709: Test harness

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the diagnostic trouble code other than P0507 output?

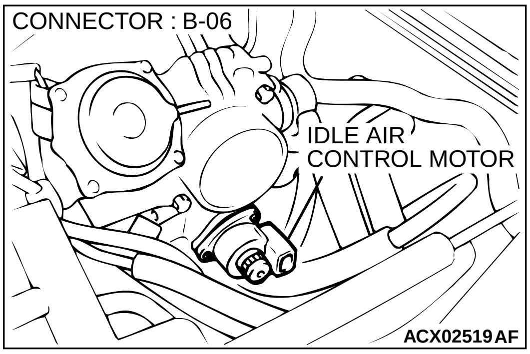
YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

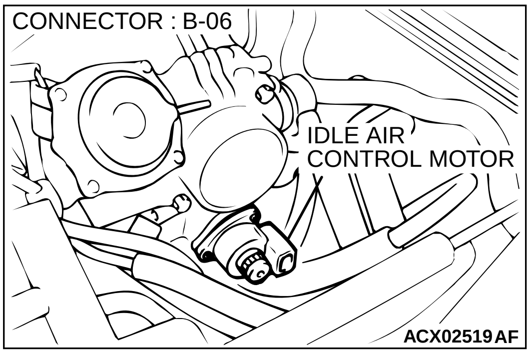
YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 14.

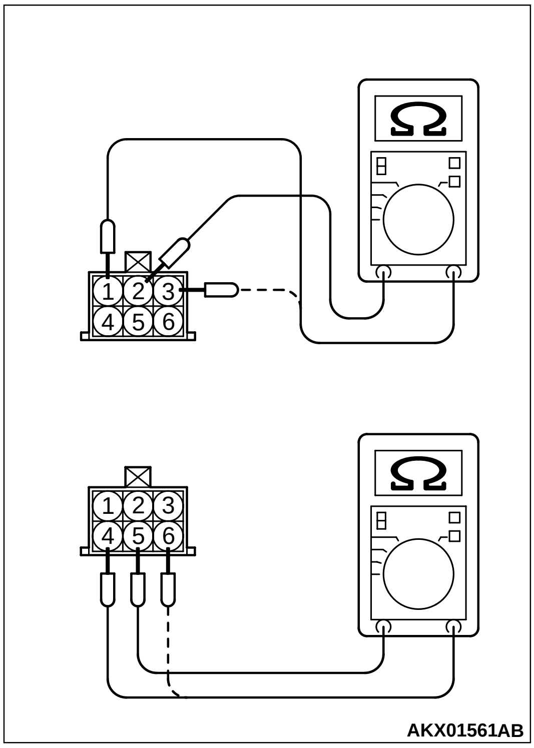
STEP 3. Check connector B-06 at idle air control motor for damage.



Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.





STEP 4. Check the idle air control motor coil resistance.

(1) Disconnect the idle air control motor connector B-06.

(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20° C (68° F)]

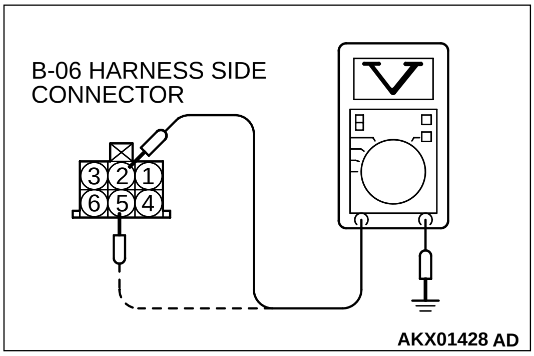
(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

Standard value: 28 – 33 ohm [at 20° C (68° F)]

Q: Is the resistance normal?

YES : Go to Step 5.

NO : Replace the idle air control motor. Then go to Step 14.



STEP 5. Check the power supply voltage at idle air control motor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2, 5 and ground.

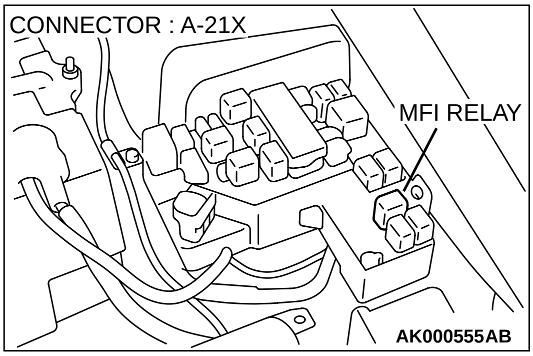
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 6.

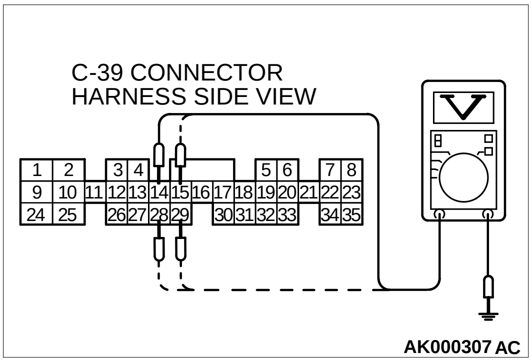


STEP 6. Check connector A-21X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-21X terminal 1 and idle air control motor connector B-06 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



STEP 7. Check the power supply voltage at PCM connector C-39 by backprobing

(1) Do not disconnect the connector C-39.

(2) Measure the voltage between terminal (14, 15, 28, 29) and ground by backprobing.

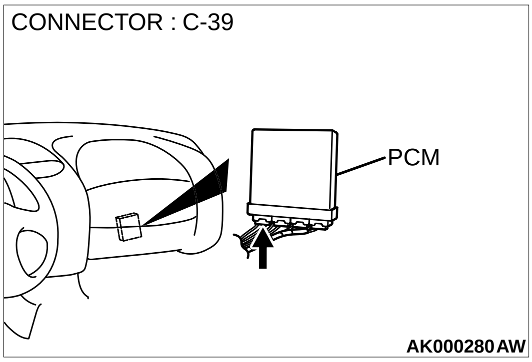
- The voltage is 1V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK"(OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.



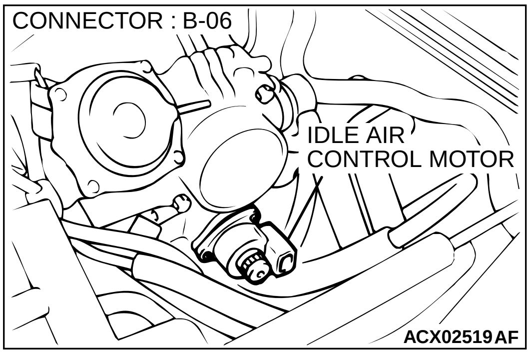
STEP 8. Check connector C-39 at PCM for damage.

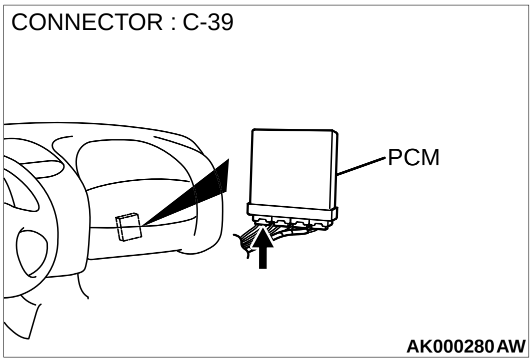
Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.

STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-06 and PCM connector C-39.



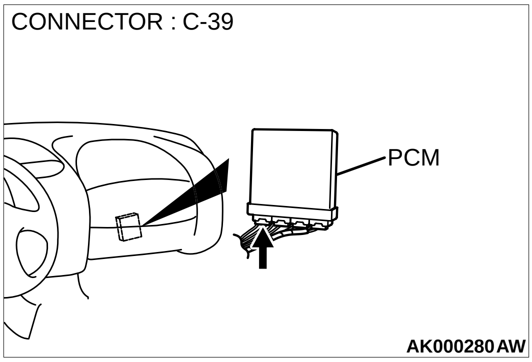


a. Idle air control motor connector B-06 terminal 1 and PCM connector C-39 terminal 14.
b. Idle air control motor connector B-06 terminal 3 and PCM connector C-39 terminal 28.
c. Idle air control motor connector B-06 terminal 4 and PCM connector C-39 terminal 15.
d. Idle air control motor connector B-06 terminal 6 and PCM connector C-39 terminal 29.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

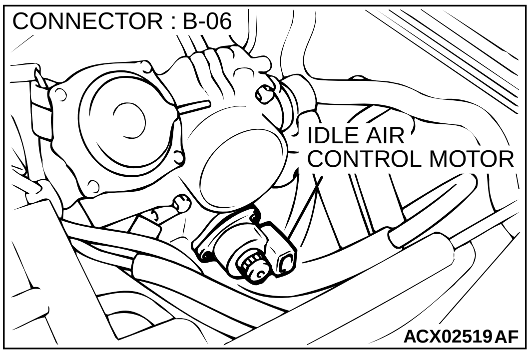
STEP 10. Check connector C-39 at PCM for damage.

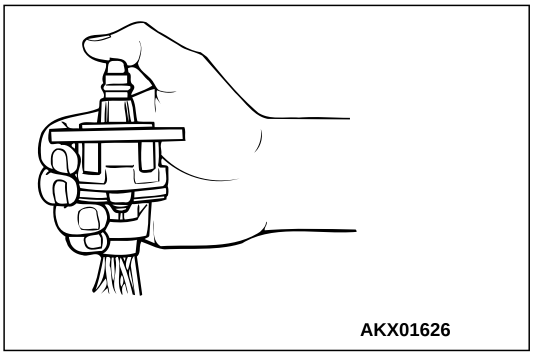


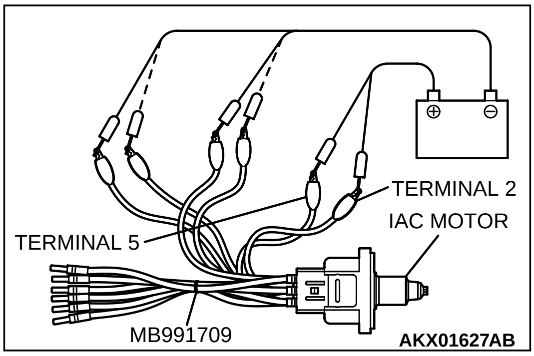
Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.

STEP 11. Check the idle air control motor operation using special tool MB991709.







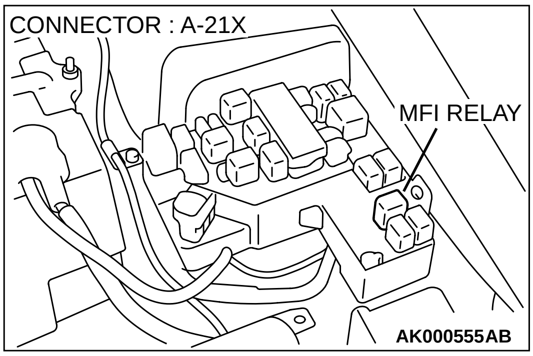
(1) Remove the idle air control motor.
(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the battery (+) terminal.
(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the battery (-) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

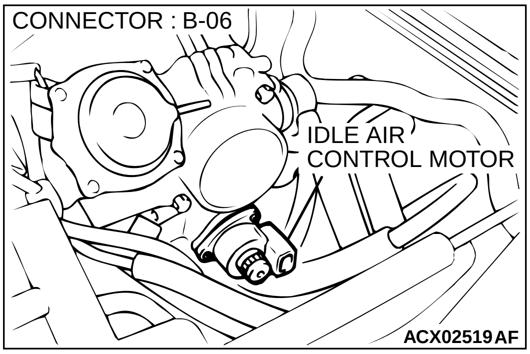
(5) Then. Use jumper wires to connect the terminal 5 of the idle air control motor connector to the battery (+) terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the battery (-) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(7) Install the idle air control motor. Refer to, Throttle Body – Disassembly and Assembly(P.13A-452).

Q: Is the idle air control motor operating properly?

YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

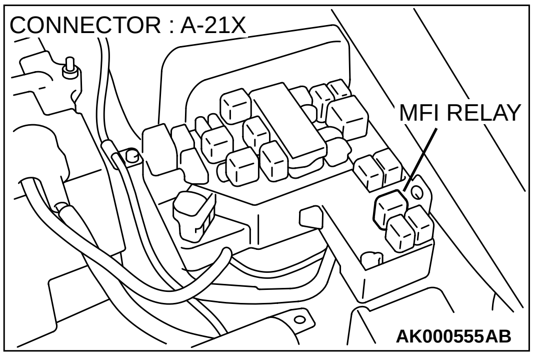


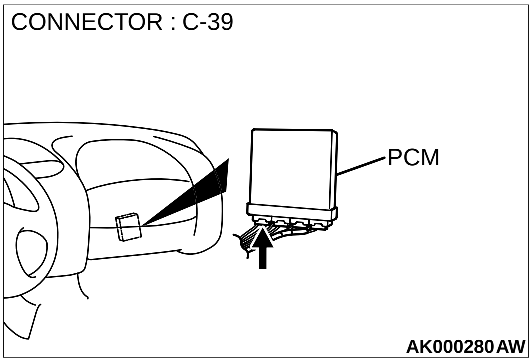


STEP 12. Check for harness damage between MFI relay connector A-21X terminal 1 and idle air control motor connector B-06 terminal 2, 5.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.





STEP 13. Check for harness damage between idle air control motor connector B-06 and PCM connector C-39.

a. Idle air control motor connector B-06 terminal 1 and PCM connector C-39 terminal 14.
b. Idle air control motor connector B-06 terminal 3 and PCM connector C-39 terminal 28.
c. Idle air control motor connector B-06 terminal 4 and PCM connector C-39 terminal 15.
d. Idle air control motor connector B-06 terminal 6 and PCM connector C-39 terminal 29.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

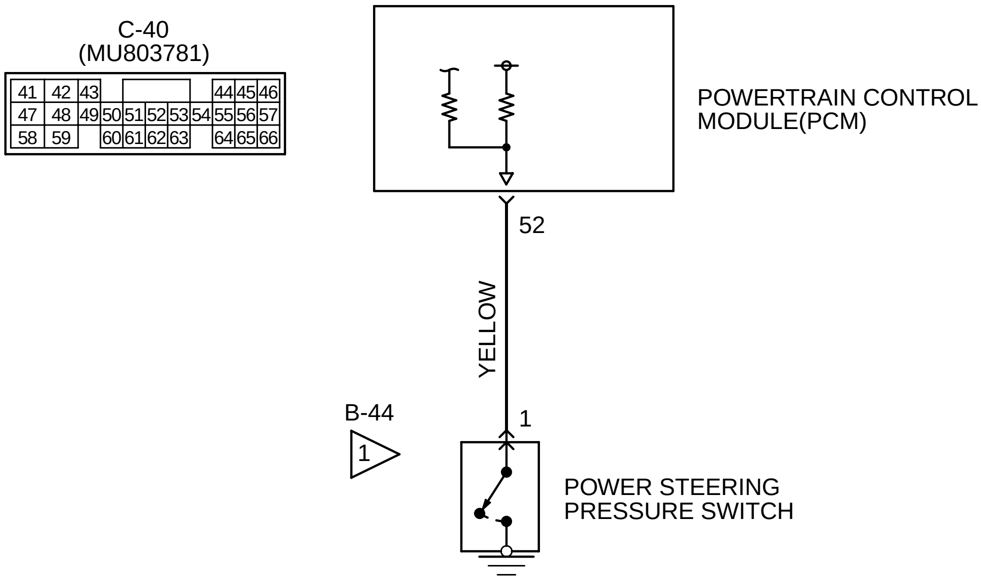
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0507 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance



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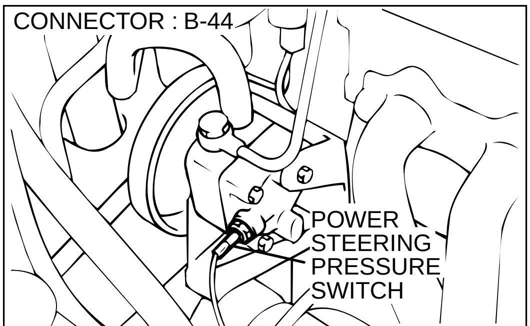

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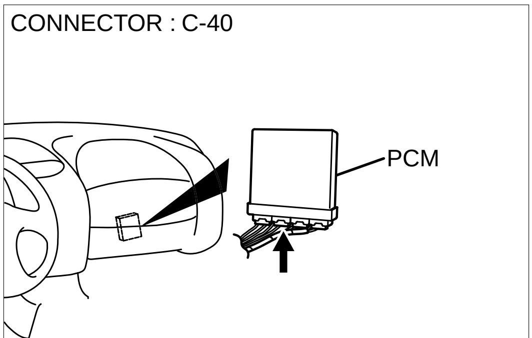


AK000280AV

CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal 1) from the PCM (terminal 52) via the resistor in the PCM.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the PCM.

- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF."
- The PCM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DTC SET CONDITIONS

Check Conditions

- Intake air temperature is higher than -10° C (14° F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Engine coolant temperature is higher than 30° C (86° F).
- Drive for four seconds or more with the engine speed at 2,500 r/min or more, the volumetric efficiency at 55 percent or more, and vehicle speed is 5 km/h (3.1 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (0.93 mph) or less]. Repeat 10 times or more.

Judgment Criteria

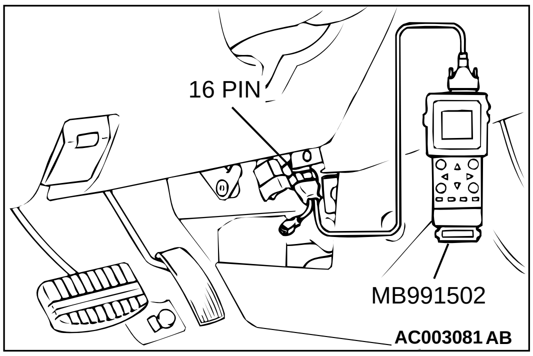
- Power steering pressure switch continues to be "ON."

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

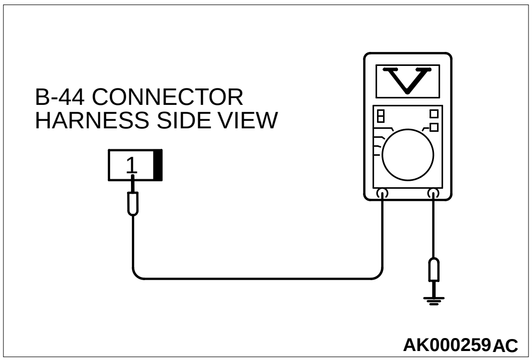
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points(P.00-8).
NO : Go to Step 2.



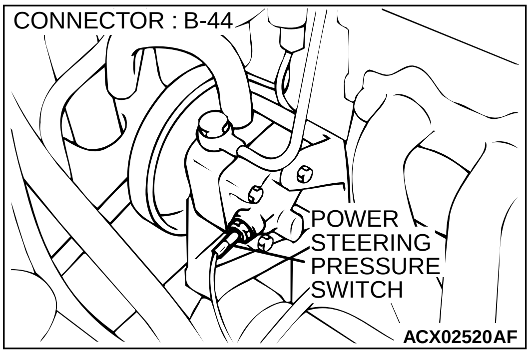
STEP 2. Check the power supply voltage at power steering pressure switch connector B-44 by backprobing

(1) Do not disconnect the connector B-44.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When steering wheel is stationary, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

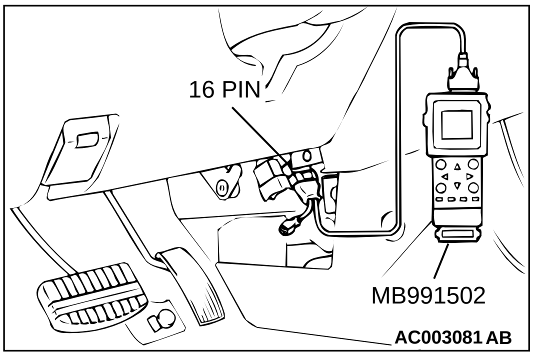
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-44 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

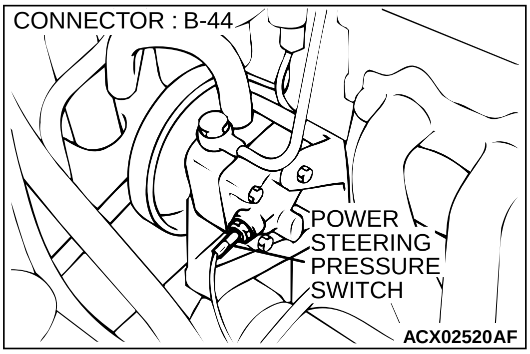
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

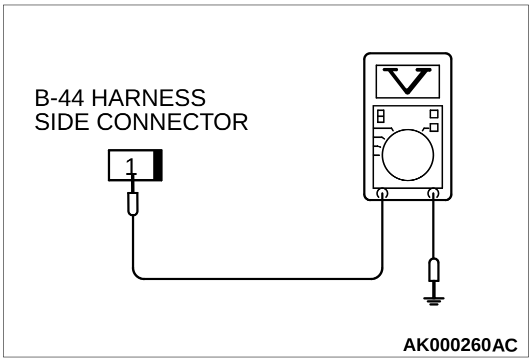
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00E-2).
NO : Replace the PCM. Then go to Step 14.



STEP 5. Check connector B-44 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



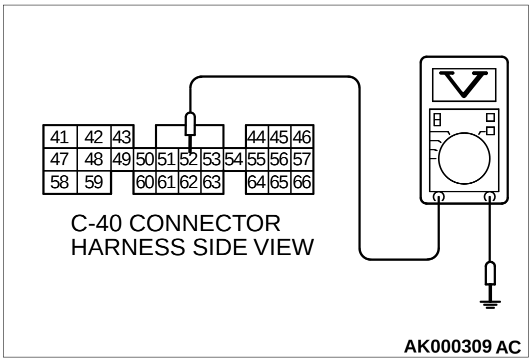
STEP 6. Check the power supply voltage at power steering pressure switch harness side connector B-44.

(1) Disconnect the connector B-44 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.
NO : Go to Step 7.



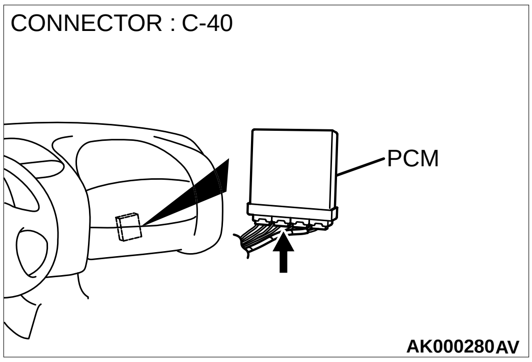
STEP 7. Check the power supply voltage at PCM connector C-40 by backprobing

(1) Do not disconnect the PCM connector C-40.
(2) Disconnect the power steering pressure switch connector B-44.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 52 and ground by backprobing.
- Voltage should be between battery positive voltage.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 9.

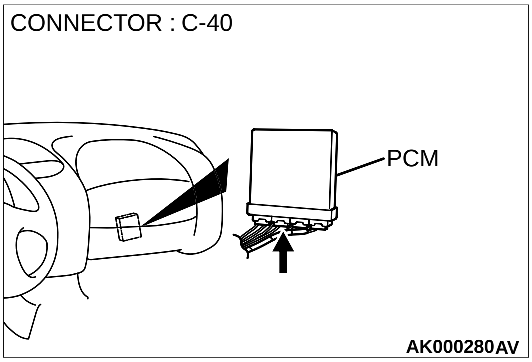


STEP 8. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between power steering pressure switch connector B-44 terminal 1 and PCM connector C-40 terminal 52 because of open circuit. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.

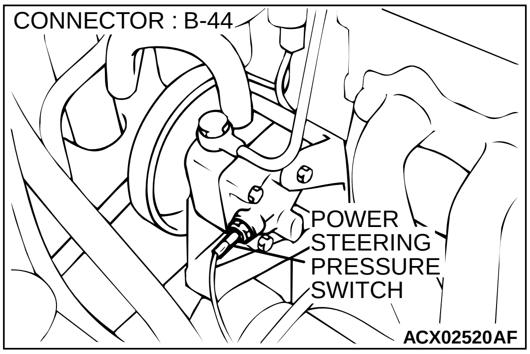


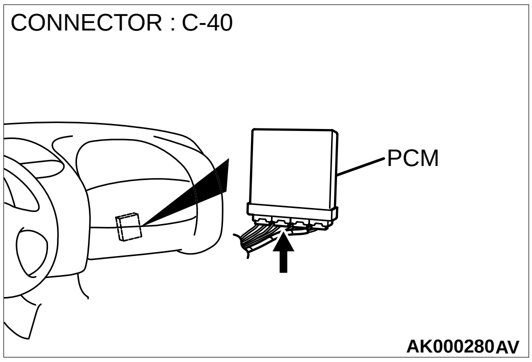
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.



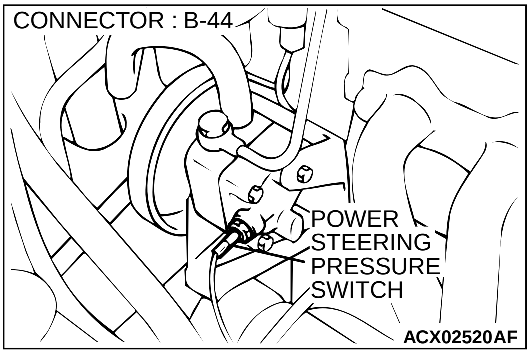


STEP 10. Check for short circuit to ground between power steering pressure switch connector B-44 terminal 1 and PCM connector C-40 terminal 52.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

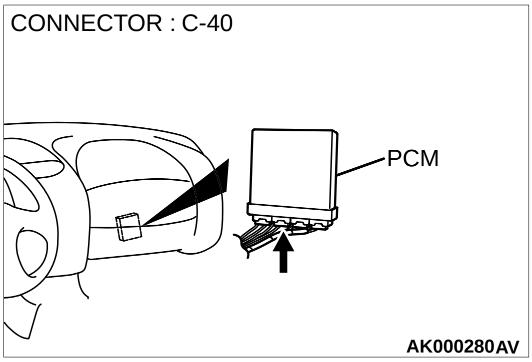


STEP 11. Replace the power steering pressure switch.

(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0551 is output?

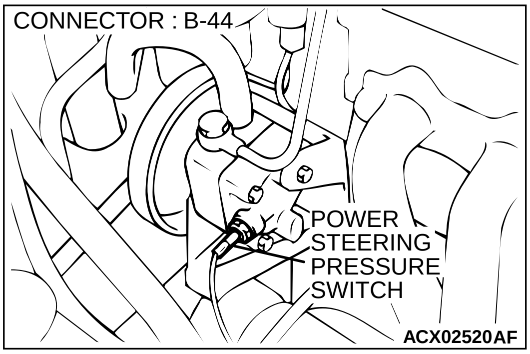
YES : Go to Step 12.
NO : Go to Step 14.

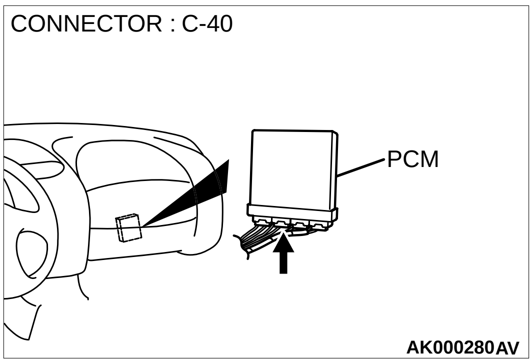


STEP 12. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 14.

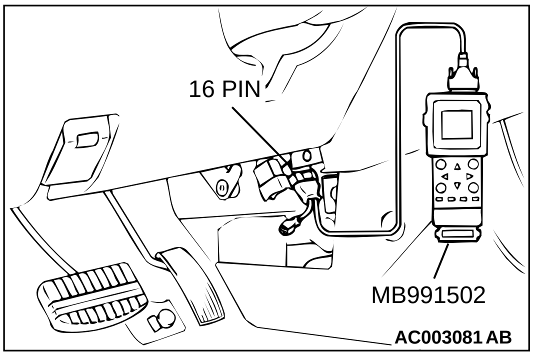




STEP 13. Check for harness damage between power steering pressure switch connector B-44 terminal 1 and PCM connector C-40 terminal 52.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.



STEP 14. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the switch operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0705: Transmission Range Sensor Circuit Malfunction (PRNDL Input)

TECHNICAL DESCRIPTION

- When a malfunction of the park/neutral position switch is detected, the transaxle control CPU in the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

DTC SET CONDITIONS

Check Conditions, Judgment Criteria

- Park/neutral position switch failure signal is input to the engine control CPU from the transaxle control CPU.

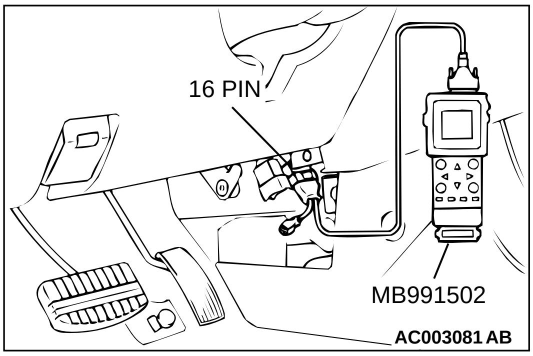
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Park/neutral position switch failed.
- Open or shorted park/neutral position switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0705 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0705 does not reset.

DTC P0710 : Transmission Fluid Temperature Sensor Circuit Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the fluid temperature sensor is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Oil temperature sensor failed.
- Open or shorted oil temperature sensor circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

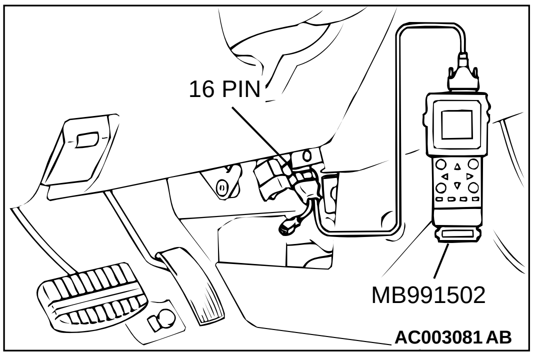
Check Conditions, Judgment Criteria

- Oil temperature sensor failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0710 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0710 does not reset.

DTC P0715: Input/Turbine Speed Sensor Circuit Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the input shaft speed sensor is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Input shaft speed sensor failed.
- Open or shorted input shaft speed sensor circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

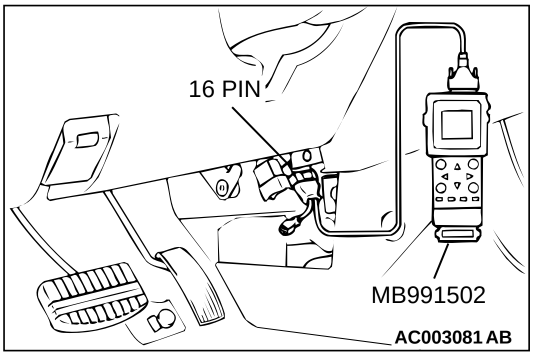
Check Conditions, Judgment Criteria

- Input shaft speed sensor failure signal is input to the engine control CPU from the transaxle control CPU. Both CPUs are in the PCM.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ **CAUTION**
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0715 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0715 does not reset.

DTC P0720: Output Speed Sensor Circuit Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the output shaft speed sensor is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

DTC SET CONDITIONS

Check Conditions, Judgment Criteria

- Output shaft speed sensor failure signal is input to the engine control CPU from the transaxle control CPU.

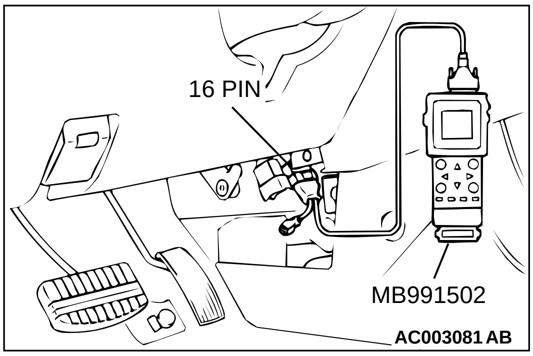
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Output shaft speed sensor failed.
- Open or shorted output shaft speed sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0720 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0720 does not reset.

DTC P0725: Engine Speed Input Circuit Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the crankshaft position sensor is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

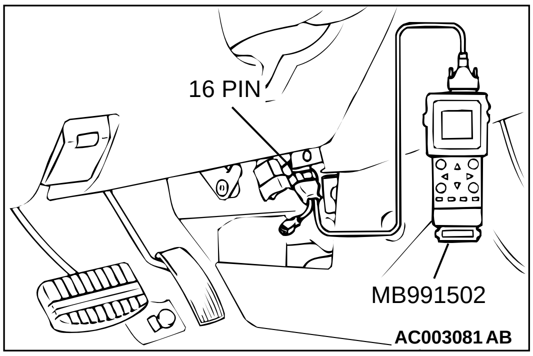
Check Conditions, Judgment Criteria

- Crankshaft position sensor failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0725 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0725 does not reset.

DTC P0740: Torque Converter Clutch System Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the torque converter clutch or its related system is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

DTC SET CONDITIONS

Check Conditions, Judgment Criteria

- Failed signal of the torque converter clutch or its related system is input to the engine control CPU from the transaxle control CPU.

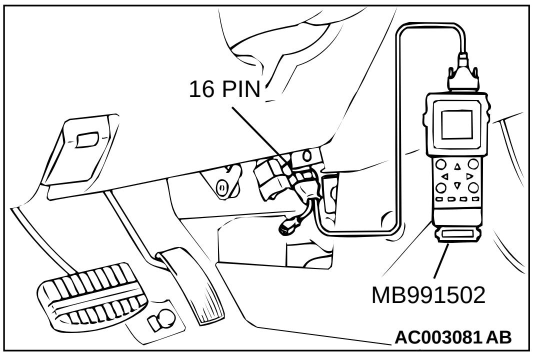
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Torque converter clutch or its related system failed.
- Open or shorted torque converter clutch or its related system circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0740 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0740 does not reset.

DTC P0750: Shift Solenoid A Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the shift solenoid A (low-reverse solenoid) is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Low-reverse solenoid failed.
- Open or shorted low-reverse solenoid circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

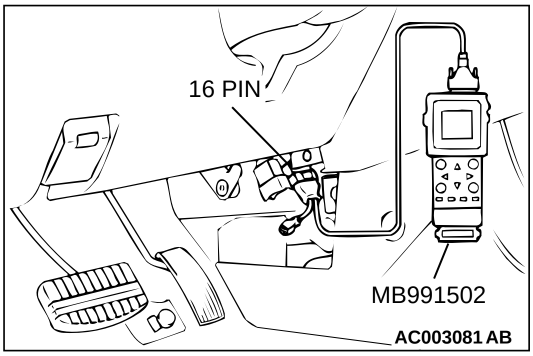
Check Conditions, Judgment Criteria

- Low-reverse solenoid failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.13B-367).

NO : If DTC P0750 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0750 does not reset.

DTC P0755: Shift Solenoid B Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the shift solenoid B (underdrive solenoid) is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Underdrive solenoid failed.
- Open or shorted underdrive solenoid circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

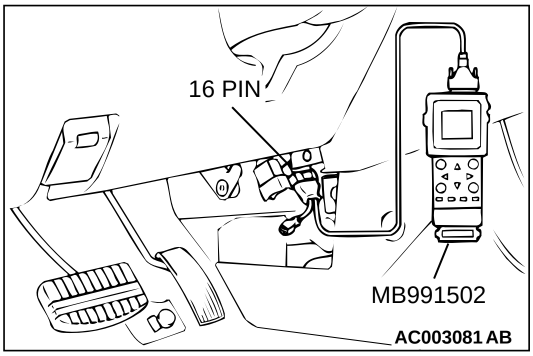
Check Conditions, Judgment Criteria

- Underdrive solenoid failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0755 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0755 does not reset.

DTC P0760: Shift Solenoid C Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the shift solenoid C (Second solenoid) is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Second solenoid failed.
- Open or shorted second solenoid circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

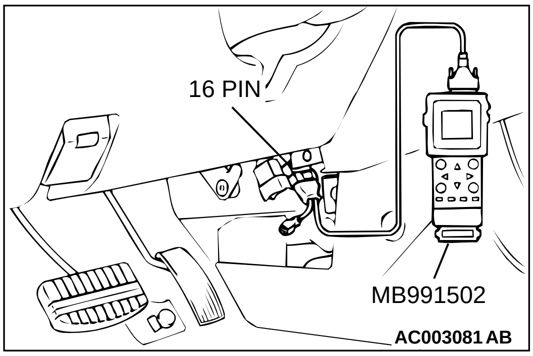
Check Conditions, Judgment Criteria

- Second solenoid failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0760 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0760 does not reset.

DTC P0765: Shift Solenoid D Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the shift solenoid D (overdrive solenoid) is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU in the PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Overdrive solenoid failed.
- Open or shorted second solenoid circuit, or loose connector.
- PCM failed.

DTC SET CONDITIONS

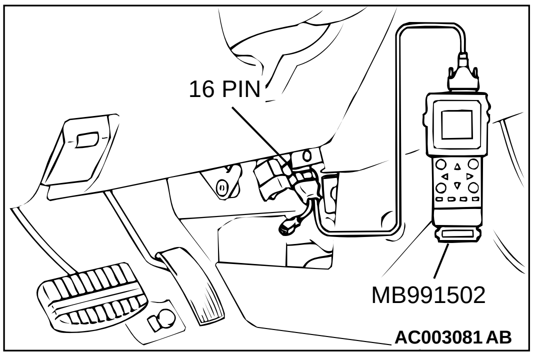
Check Conditions, Judgment Criteria

- Overdrive solenoid failure signal is input to the engine control CPU from the transaxle control CPU.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

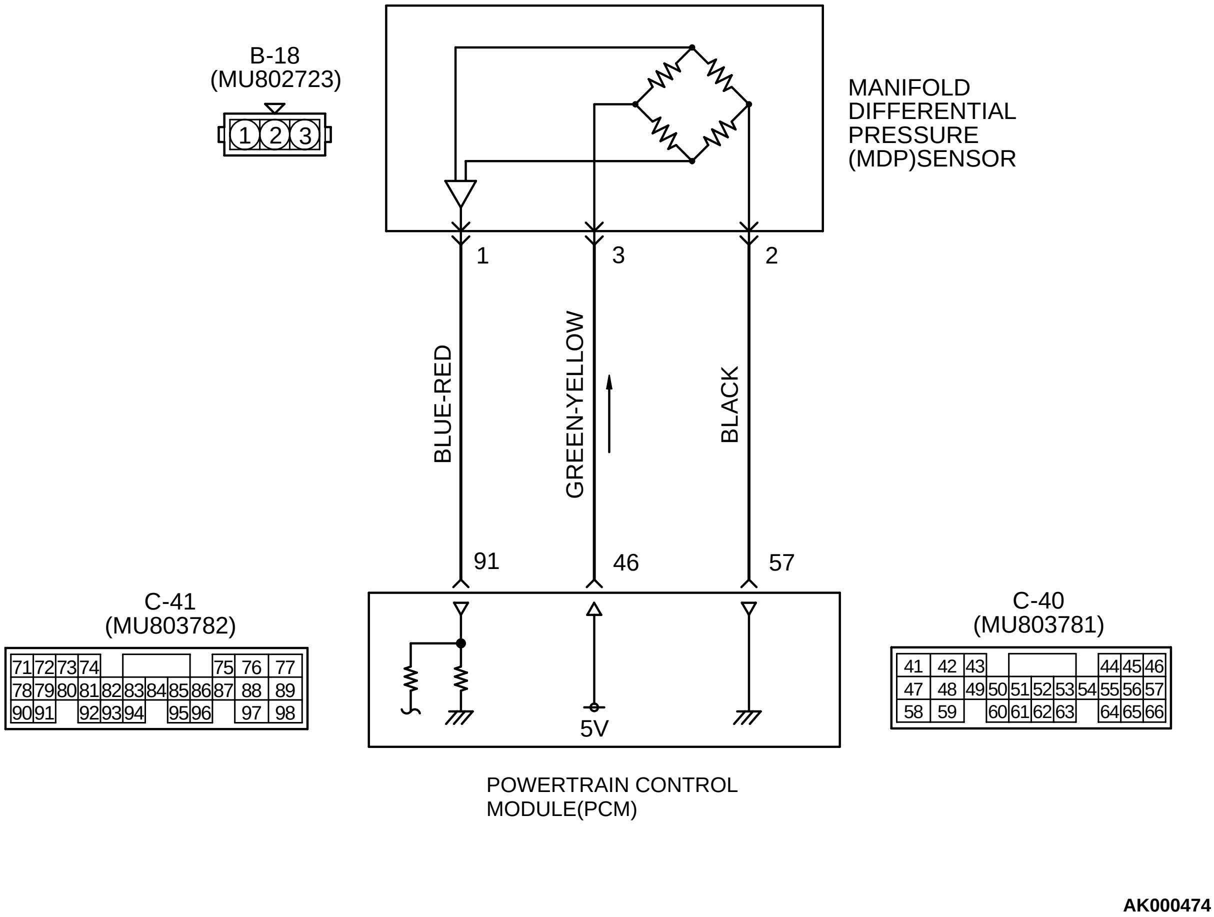
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

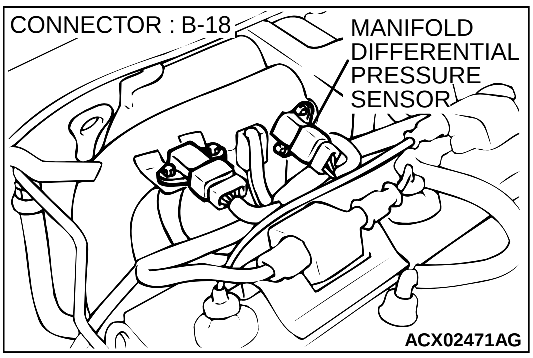
Q: Is the A/T-DTC is output?

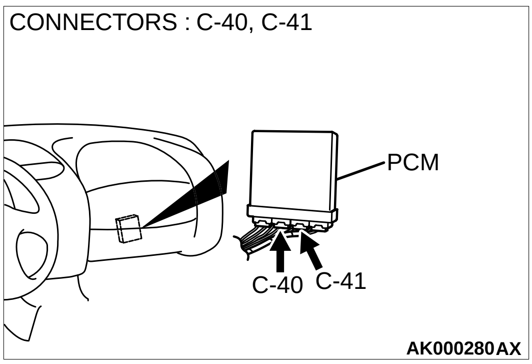
YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P0765 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P0765 does not reset.

DTC P1400: Manifold Differential Pressure Sensor Circuit Malfunction







CIRCUIT OPERATION

- A 5-volt voltage is applied on the manifold differential pressure sensor power terminal (terminal 3) from the PCM (terminal 46). The ground terminal (terminal 2) is grounded with the PCM (terminal 57).
- A voltage proportional to the pressure in the intake manifold plenum is sent from the manifold differential pressure sensor output terminal (terminal 1) to the PCM (terminal 91).

TECHNICAL DESCRIPTION

- The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold.
- The PCM checks whether the voltage output by manifold differential pressure sensor is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Eight minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0° C (32° F) when starting.
- Engine coolant temperature is higher than 45° C (113° F).
- Intake air temperature is higher than 5° C (41° F).
- Volumetric efficiency is between 30 and 45 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.6 volts [corresponding to an absolute pressure of 118 kPa (17 psi) or higher] for 2 seconds.

or

- Manifold differential pressure sensor output voltage has continued to be lower than 0.1 volt [corresponding to an absolute pressure of 2.4 kPa (0.3 psi) or lower] for 2 seconds.

Check Conditions

- Eight minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0° C (32° F) or more when starting.
- Engine coolant temperature is higher than 45° C (113° F).
- Intake air temperature is higher than 5° C (41° F).
- Volumetric efficiency is lower than 30 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.2 volts [corresponding to an absolute pressure of 108 kPa (16 psi) or higher] for 2 seconds.

Check Conditions

- Eight minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0° C (32° F) or more when starting.
- Engine coolant temperature is higher than 45° C (113° F).
- Intake air temperature is higher than 5° C (41° F).
- Volumetric efficiency is higher than 70 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be lower than 1.8 volts [corresponding to an absolute pressure of 46 kPa (4.6 psi) or lower] for 2 seconds.

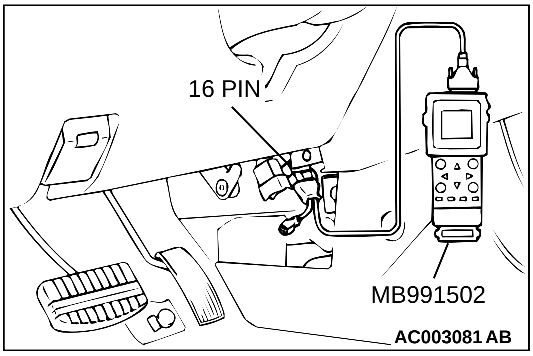
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold differential pressure sensor failed.
- Open or shorted manifold differential pressure sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

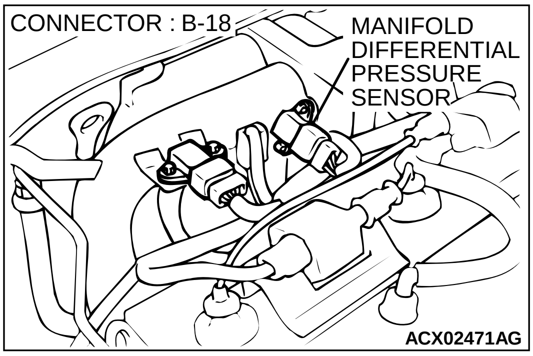
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
- While engine is idling, pressure should be between 62 and 76 kPa.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

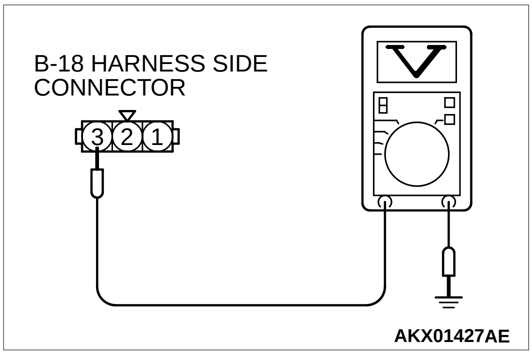
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 2.



STEP 2. Check connector B-18 at manifold differential pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



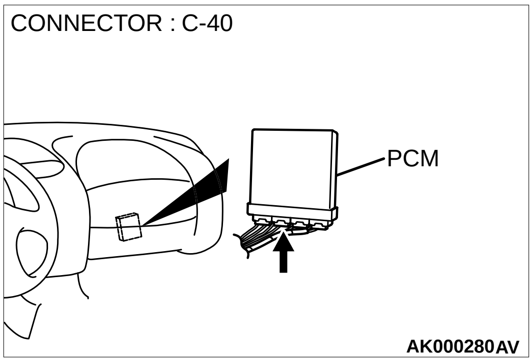
STEP 3. Check the sensor supply voltage at manifold differential pressure sensor harness side connector B-18.

(1) Disconnect the connector B-18 and measure at the harness side.
(2) Turn the ignition switch to "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 4.

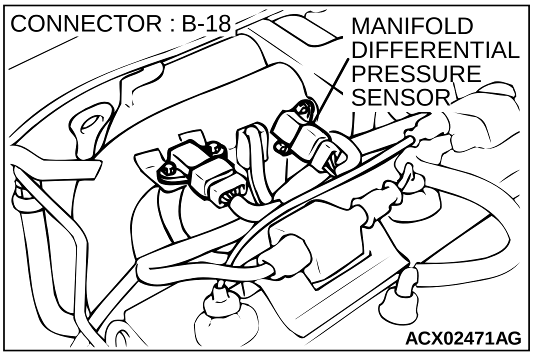


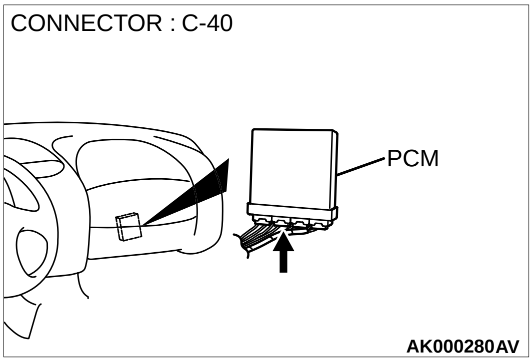
STEP 4. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



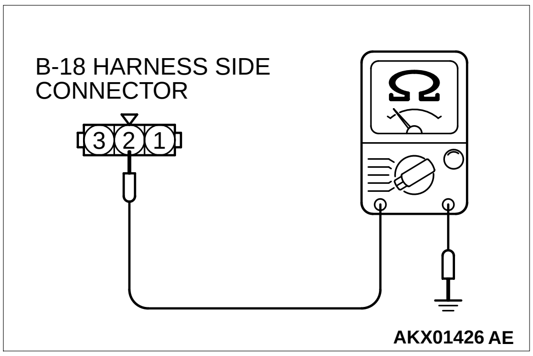


STEP 5. Check for open circuit and short circuit to ground between manifold differential pressure sensor connector B-18 terminal 3 and PCM connector C-40 terminal 46.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



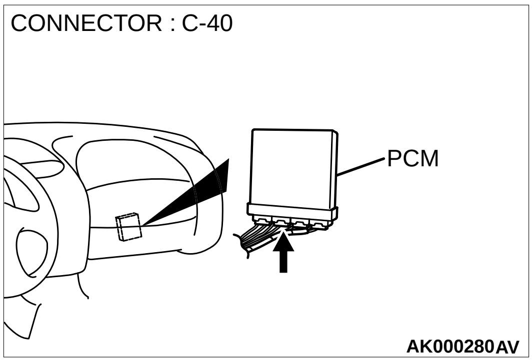
STEP 6. Check the continuity at manifold differential pressure sensor harness side connector B-18.

(1) Disconnect the connector B-18 and measure at the harness side.
(2) Measure the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Go to Step 7.

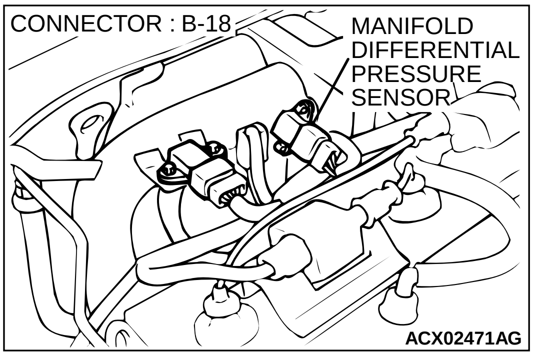


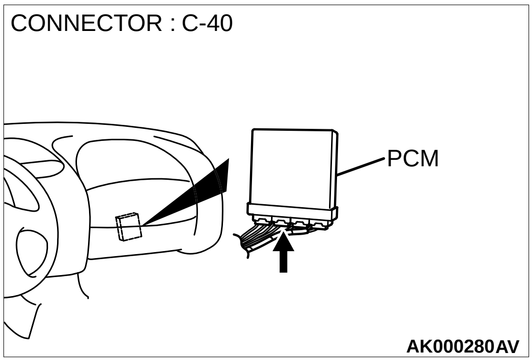
STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.



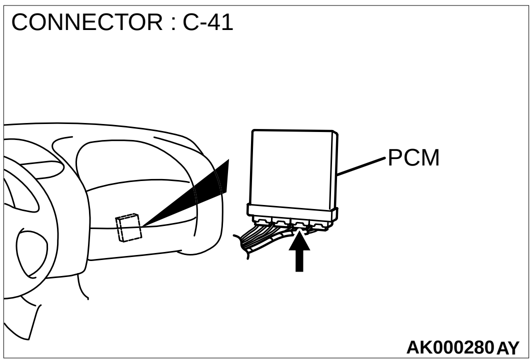


STEP 8. Check for open circuit and harness damage between manifold differential pressure sensor connector B-18 terminal 2 and PCM connector C-40 terminal 57.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



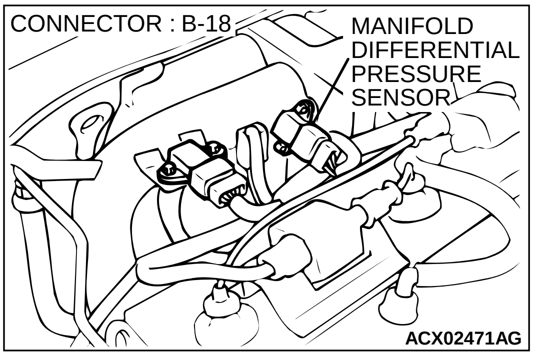
STEP 9. Check connector C-41 at PCM for damage.

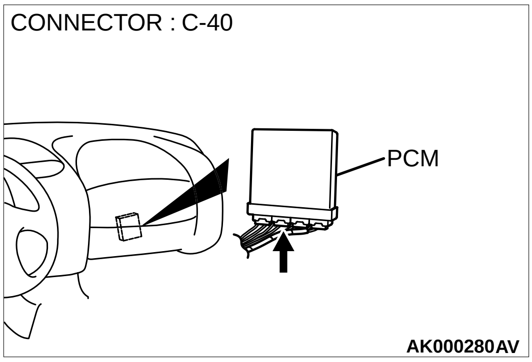
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 12.

STEP 10. Check for harness damage between manifold differential pressure sensor connector B-18 terminal 3 and PCM connector C-40 terminal 46.

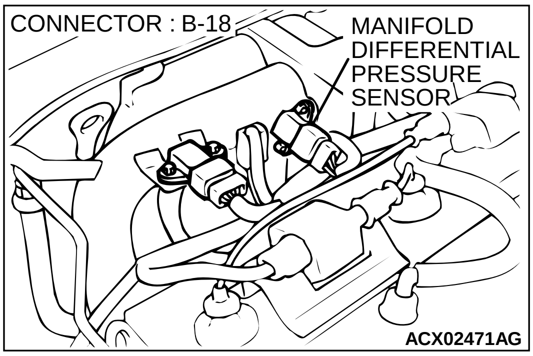


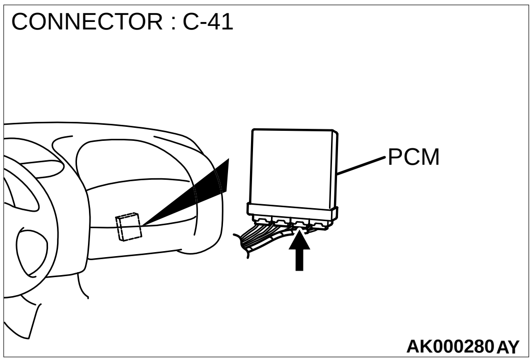


Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check for open circuit and short circuit to ground and harness damage between manifold differential pressure sensor connector B-18 terminal 1 and PCM connector C-41 terminal 91.





Q: Is the harness wire in good condition?

YES : Replace the manifold differential pressure sensor. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

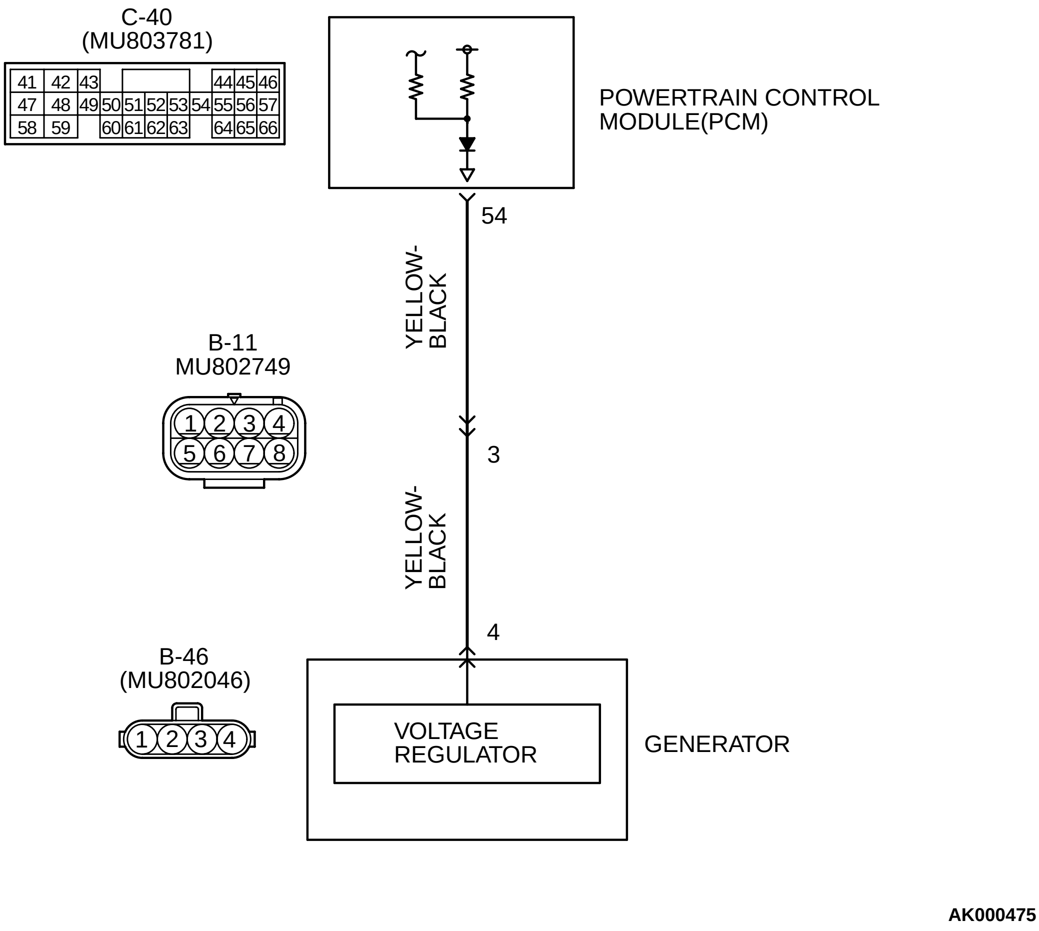
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

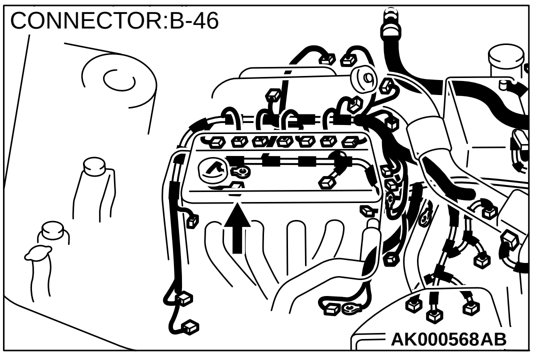
(2) Check the diagnostic trouble code (DTC).

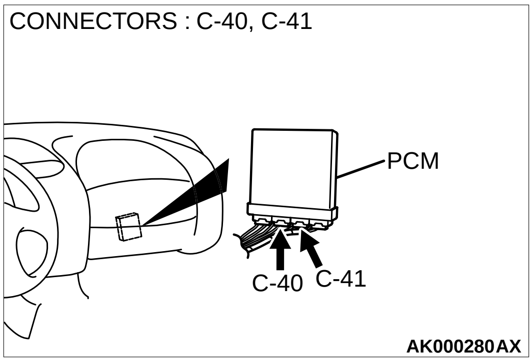
Q: Is the DTC P1400 is output?

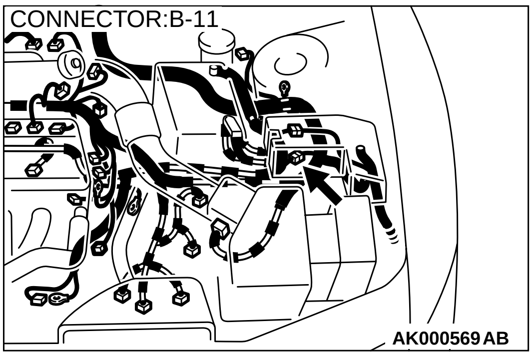
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1500: Generator FR Terminal Circuit Malfunction









CIRCUIT OPERATION

- The PCM (terminal 54) apply a battery positive voltage into the generator FR terminal 4 via resistance inside the unit.

TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the PCM.
- The PCM detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

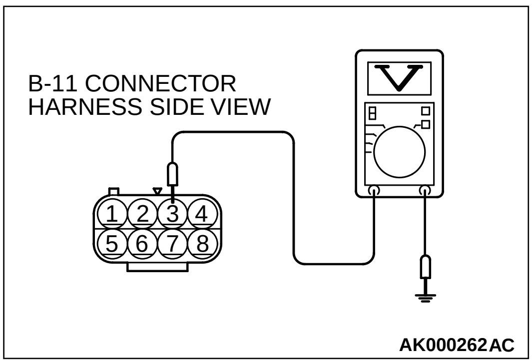
Judgement Criteria

- Input voltage from the generator FR terminal has continued to be approximately battery positive voltage for 20 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set area:)

- Open circuit in generator FR terminal circuit.
- PCM failed.

DIAGNOSIS



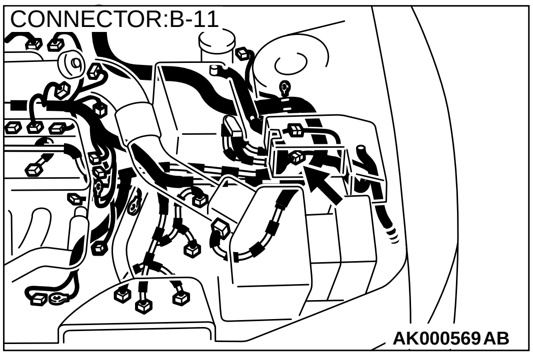
STEP 1. Check the voltage at generator intermediate connector B-11 by backprobing

(1) Do not disconnect the connector B-11.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 3 and ground by backprobing.
  a. Engine: warming up
  b. Radiator fan: stopped
  c. Headlight switch: OFF to ON
  d. Rear defogger switch: OFF to ON
  e. Stoplight switch: OFF to ON
  - Voltage should be drops.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check connector B-11 at generator intermediate connector for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 11.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).

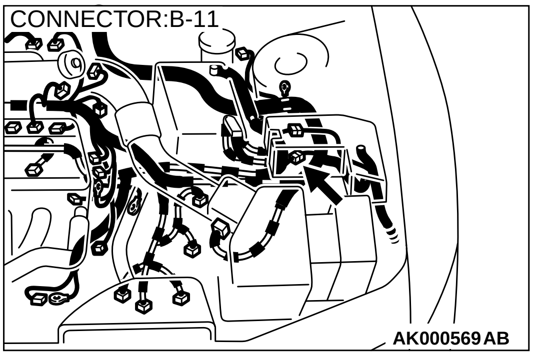
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P1500 is output?

YES : Replace the PCM. Then go to Step 11.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).

STEP 4. Check connector B-11 at generator intermediate connector for damage.

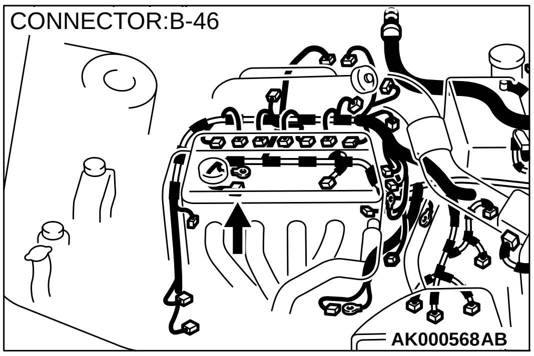


Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 11.

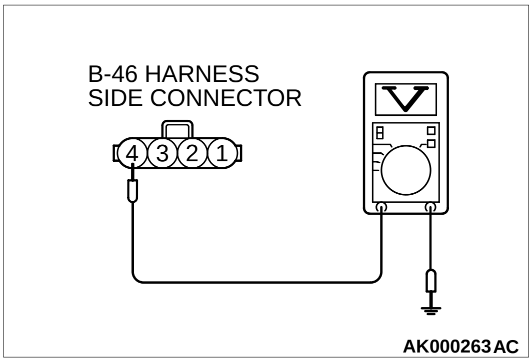
STEP 5. Check connector B-46 at generator connector for damage.



Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 11.



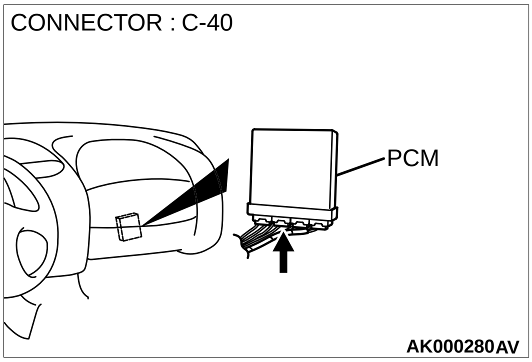
STEP 6. Check the voltage at generator harness side connector B-46.

(1) Disconnect the connector B-46 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

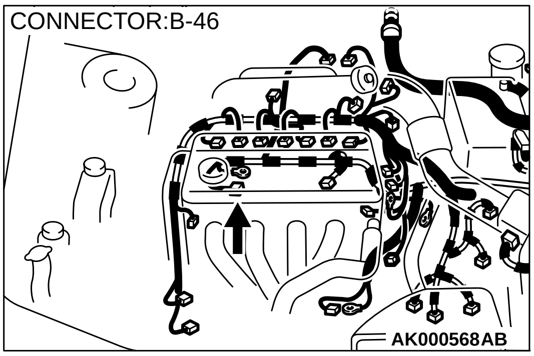
YES : Go to Step 9.
NO : Go to Step 7.

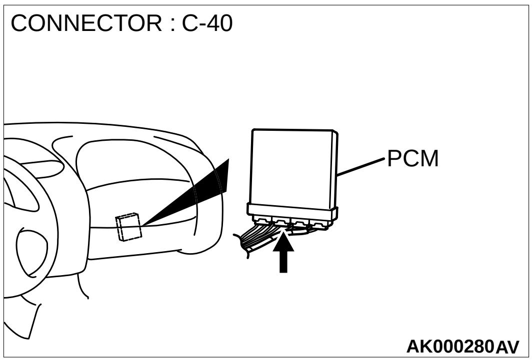


STEP 7. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 11.

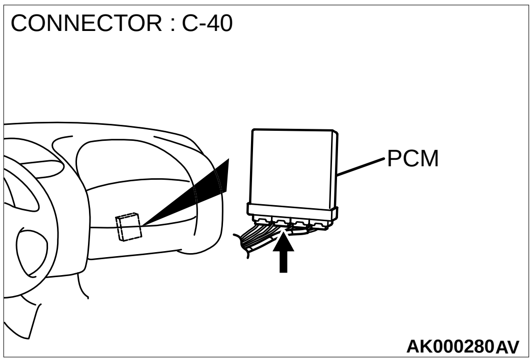




STEP 8. Check for open circuit and short circuit to ground between generator connector B-46 terminal 4 and PCM connector C-40 terminal 54.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 11.
NO : Repair it. Then go to Step 11.

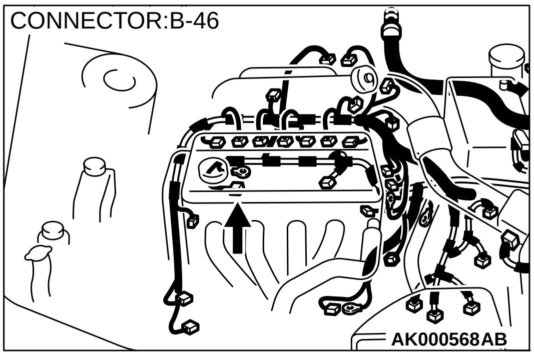


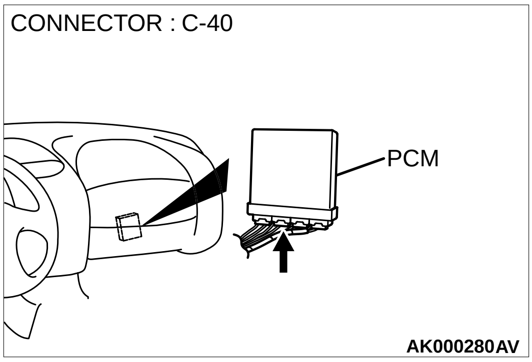
STEP 9. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then go to Step 11.





STEP 10. Check for harness damage between generator connector B-46 terminal 4 and PCM connector C-40 terminal 54.

Q: Is the harness wire in good condition?

YES : Replace the generator. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor(P.13A-5).
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P1500 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1610: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- PCM monitors the communication condition with the immobilizer-ECU and the message from the immobilizer-ECU, and when the abnormality is found, PCM makes the engine not to start.

DTC SET CONDITIONS

Check Conditions

- Ignition switch: ON

Judgment Criteria

- When the communication error between PCM and the immobilizer-ECU continues for 2 seconds or more.
- When PCM receives the communication of prohibition for starting from the immobilizer-ECU.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of PCM.

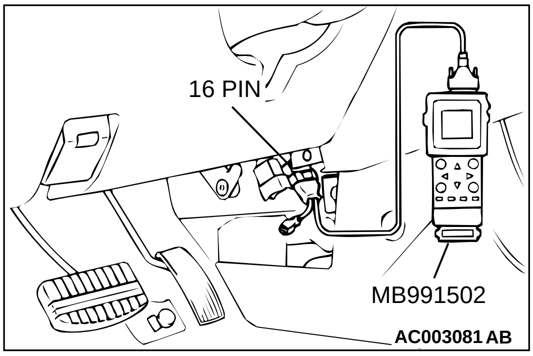
DIAGNOSIS

Required Special Tools

MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



STEP 1. Using scan tool MB991502, read the immobilizer diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the immobilizer system-DTC
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer system-DTC is output?

YES : Refer to GROUP 54A, Ignition Switch and Immobilizer System – Diagnostic Trouble Code Chart.P.54A-10

NO : If DTC P1610 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P1610 does not reset.

DTC P1751: A/T Control Relay Malfunction

TECHNICAL DESCRIPTION

- When a malfunction of the A/T control relay is detected, the transaxle control CPU inside the powertrain control module (PCM) outputs a malfunction signal to the engine control CPU inside the PCM.

DTC SET CONDITIONS

Check Conditions, Judgment Criteria

- A/T control relay failure signal is input to the engine control CPU from the transaxle control CPU.

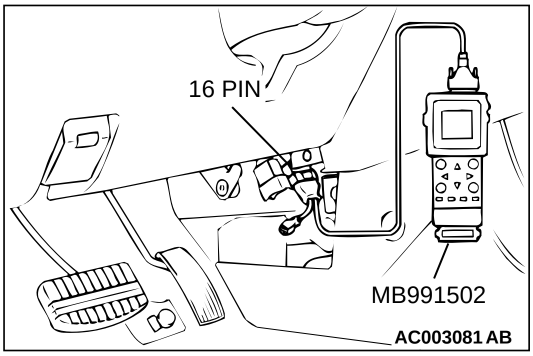
TROUBLESHOOTING HINTS(The most likely causes for this code to be set are:)

- A/T control relay failed.
- Open or shorted A/T control relay circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools

MB991502: Scan Tool(MUT-II)



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STEP 1. Using scan tool MB991502, read the A/T diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the A/T-DTC.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

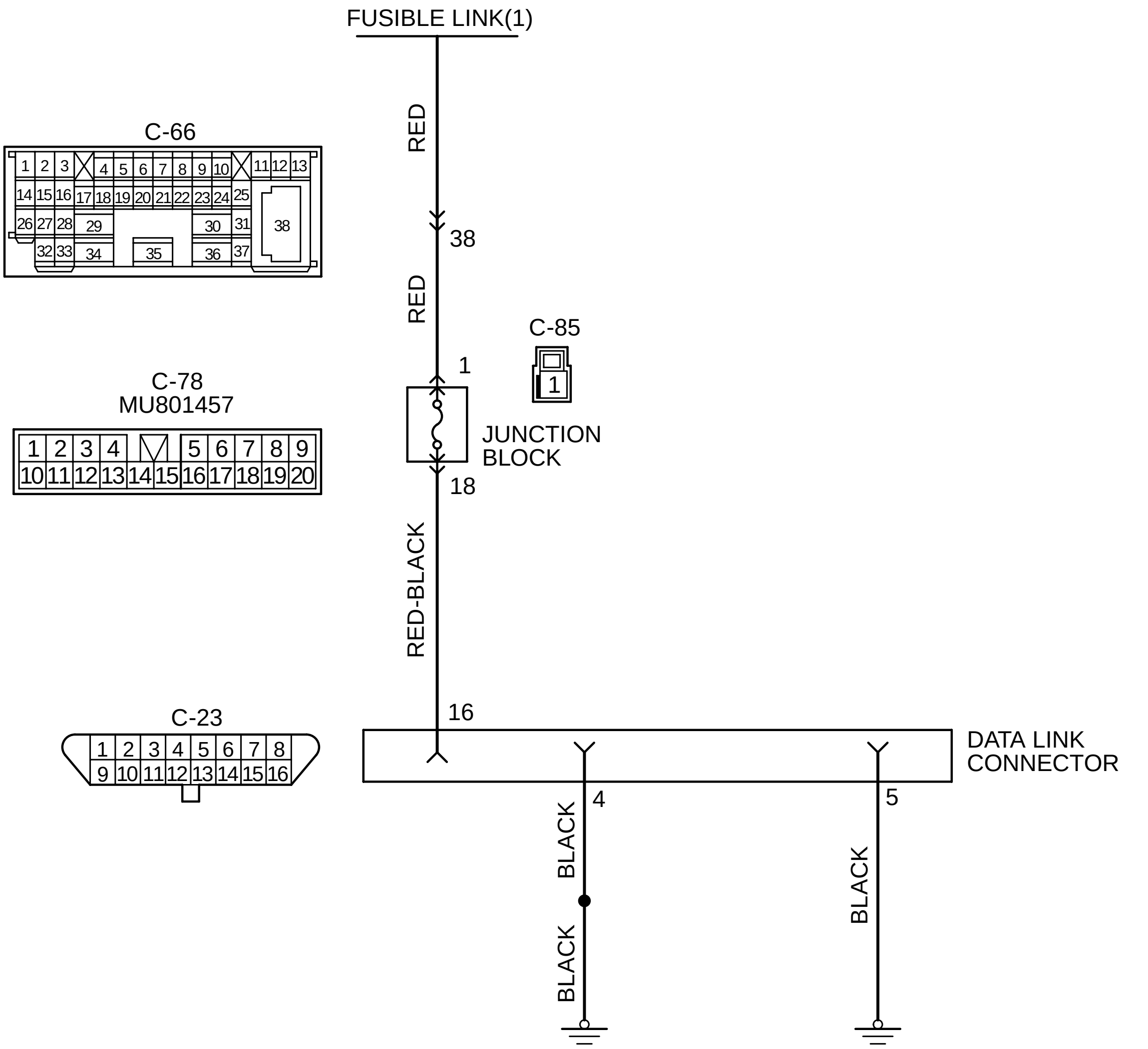
Q: Is the A/T-DTC is output?

YES : Refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart(P.23A-37).

NO : If DTC P1751 is output again after the MFI-DTC has been erased, replace the PCM. Then check that the DTC P1751 does not reset.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with Scan Tool Is Not Possible. (Comunication with All Systems Is Not Possible.)



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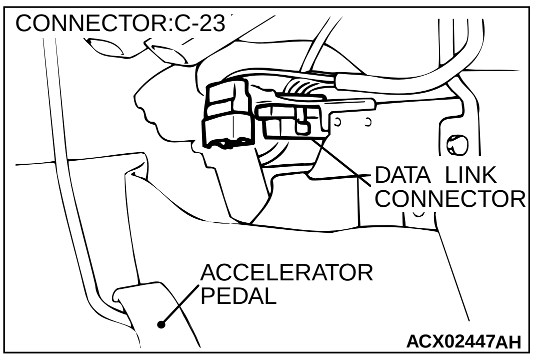

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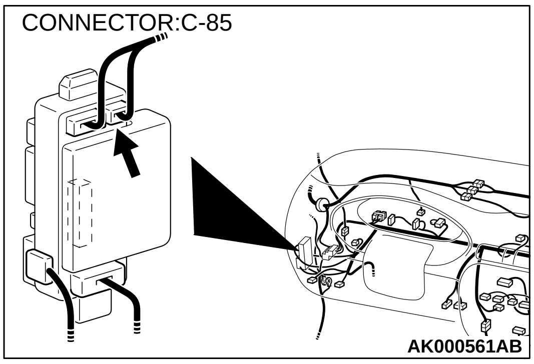

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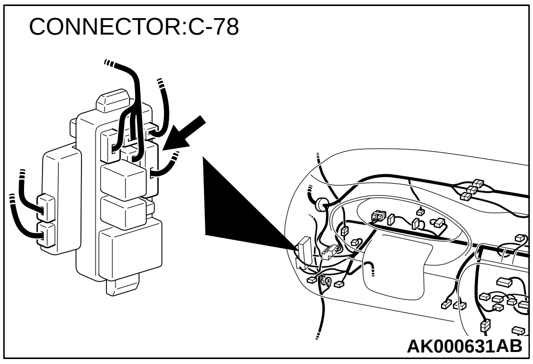
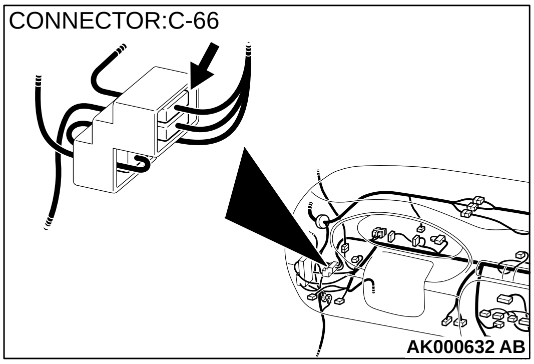




CIRCUIT OPERATION

- A battery positive voltage is applied on the data link connector power terminal (terminal 16). The ground terminals (terminal 4, 5) are grounded to the vehicle body.

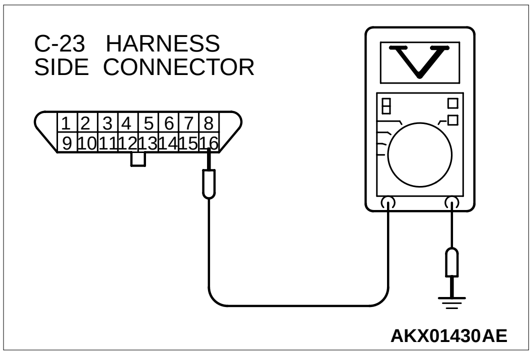
COMMENT

- The cause is probably a defect in power supply system (including ground) for the on-board diagnostic test mode line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the data link connector.
- Damaged harness wire.

DIAGNOSIS



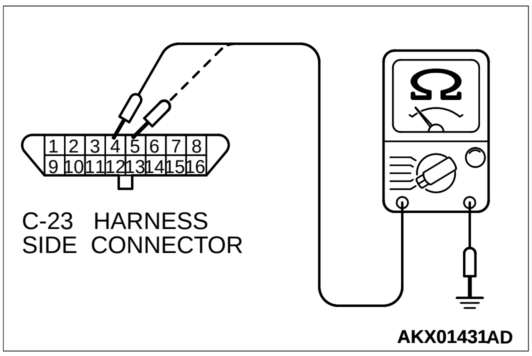
STEP 1. Check the power supply voltage at data link connector C-23.

(1) Measure voltage between terminal 16 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to step 2.

NO : Check harness connectors C-66, C-78 and C-85 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). If intermediate connectors are in good condition, repair harness wire between fusible link (1) and data link connector C-23 terminal 16 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the continuity at data link connector C-23.

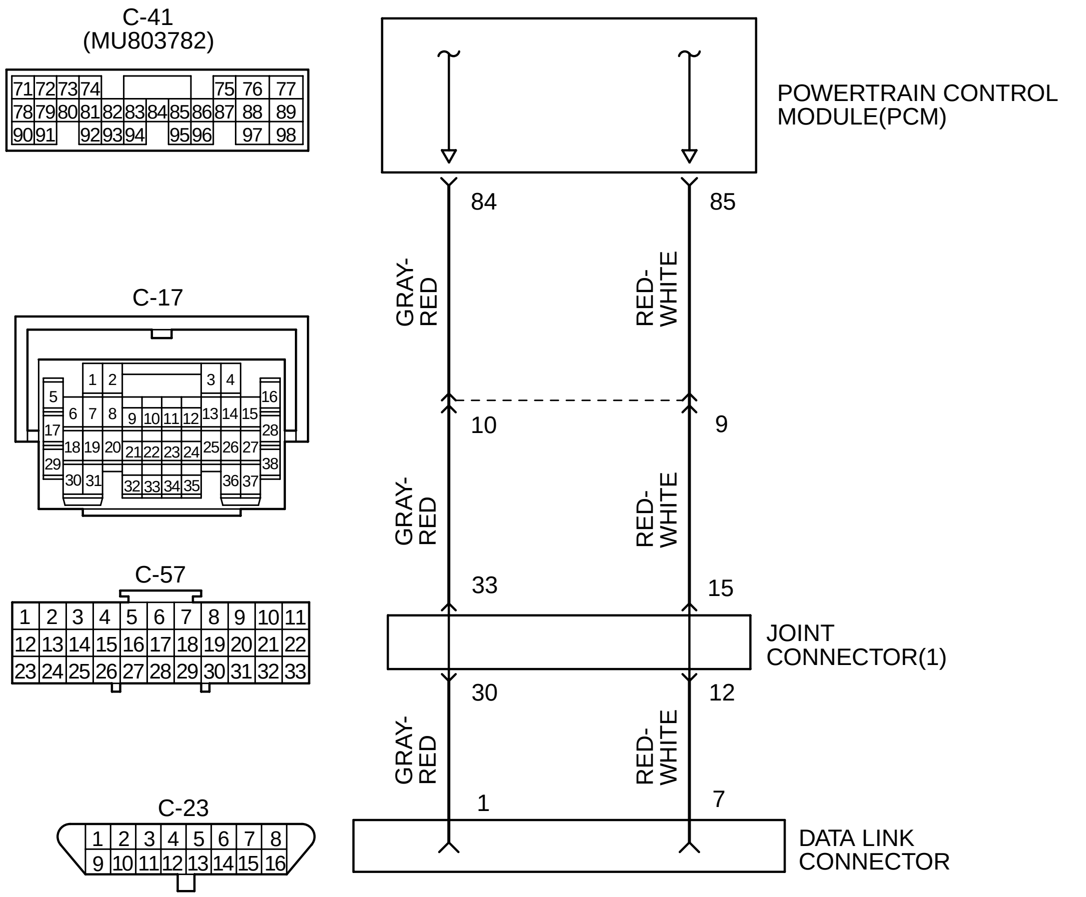
(1) Check for the continuity between terminal 4, 5 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Replace the scan tool. Then confirm that the malfunction symptom is eliminated.

NO : Repair harness wire between data link connector C-23 terminal 4, 5 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 2: Communication with PCM Only Is Not Possible.



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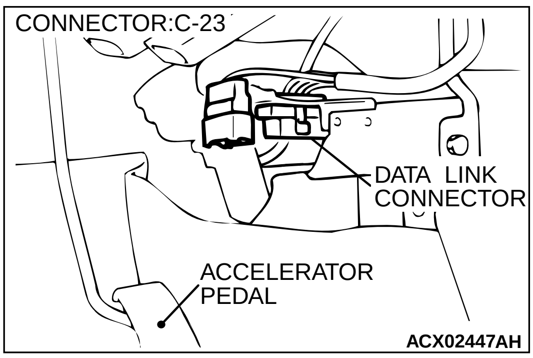
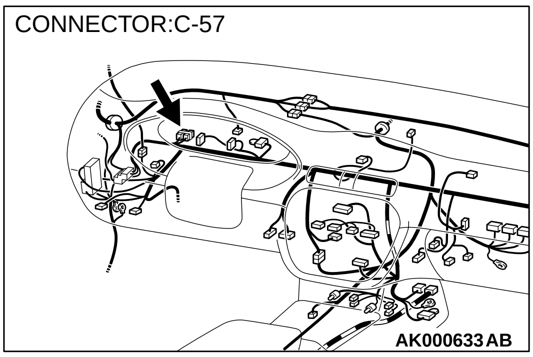
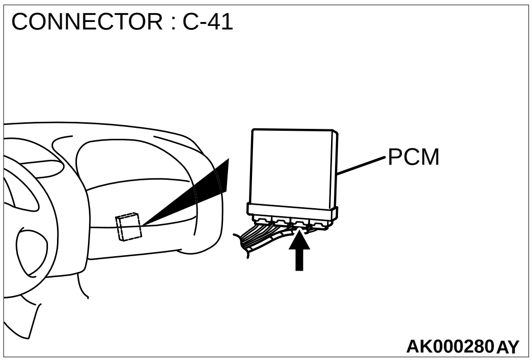
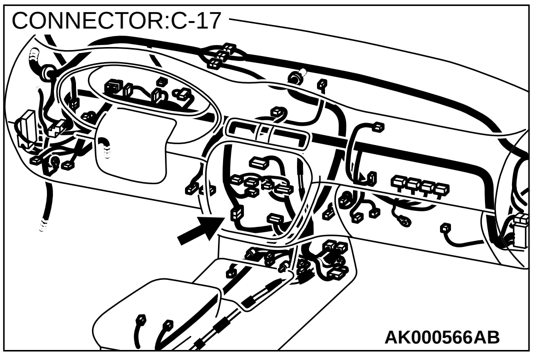








CIRCUIT OPERATION

- A diagnostic output is made from the PCM (terminal 85) to the diagnostic output terminal (terminal 7) of the data link connector.
- When diagnostic test mode control terminal (terminal 1) of the data link connector is grounded, the PCM (terminal 84) changes to the diagnostic test mode.

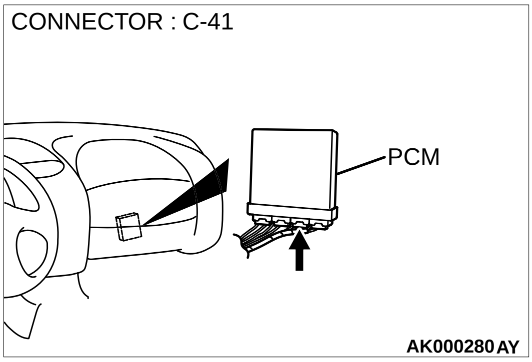
COMMENT

- No power supply to PCM.
- Defective ground circuit of PCM.
- Defective PCM.
- Improper communication line between PCM and scan tool.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of PCM power supply circuit.
- Malfunction of the PCM.
- Open circuit between PCM and data link connector.

DIAGNOSIS

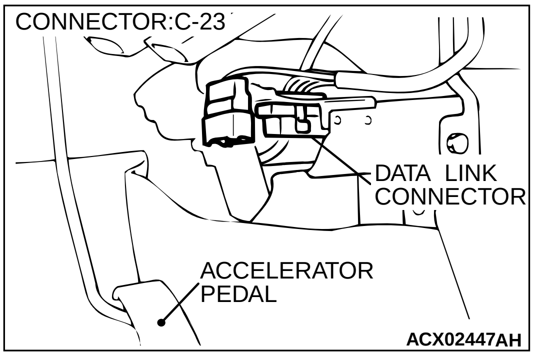


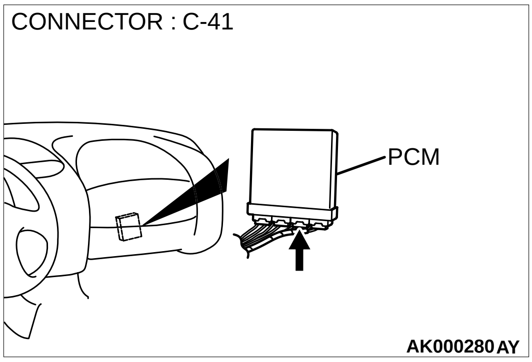
STEP 1. Check connector C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





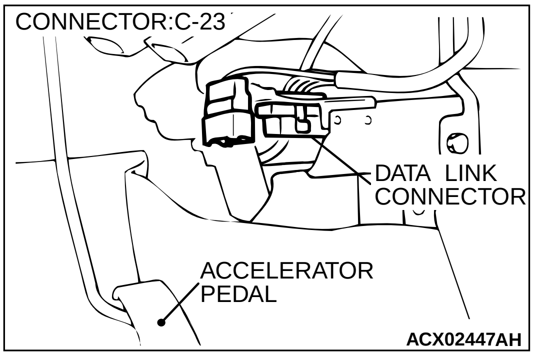
STEP 2. Check for open circuit, short circuit to ground and harness damage between data link connector C-23 terminal 1 and PCM connector C-41 terminal 84.

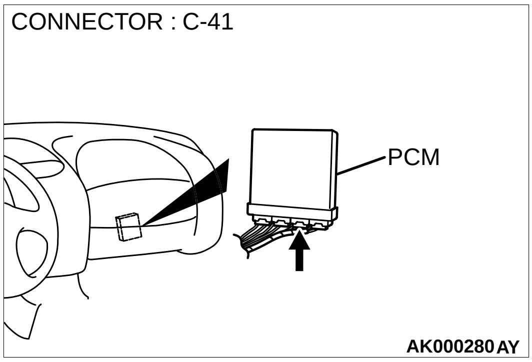
NOTE: Check harness after checking intermediate connectors C-17 and C-57. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 3.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.





STEP 3. Check for open circuit, short circuit to ground and harness damage between data link connector C-23 terminal 7 and PCM connector C-41 terminal 85.

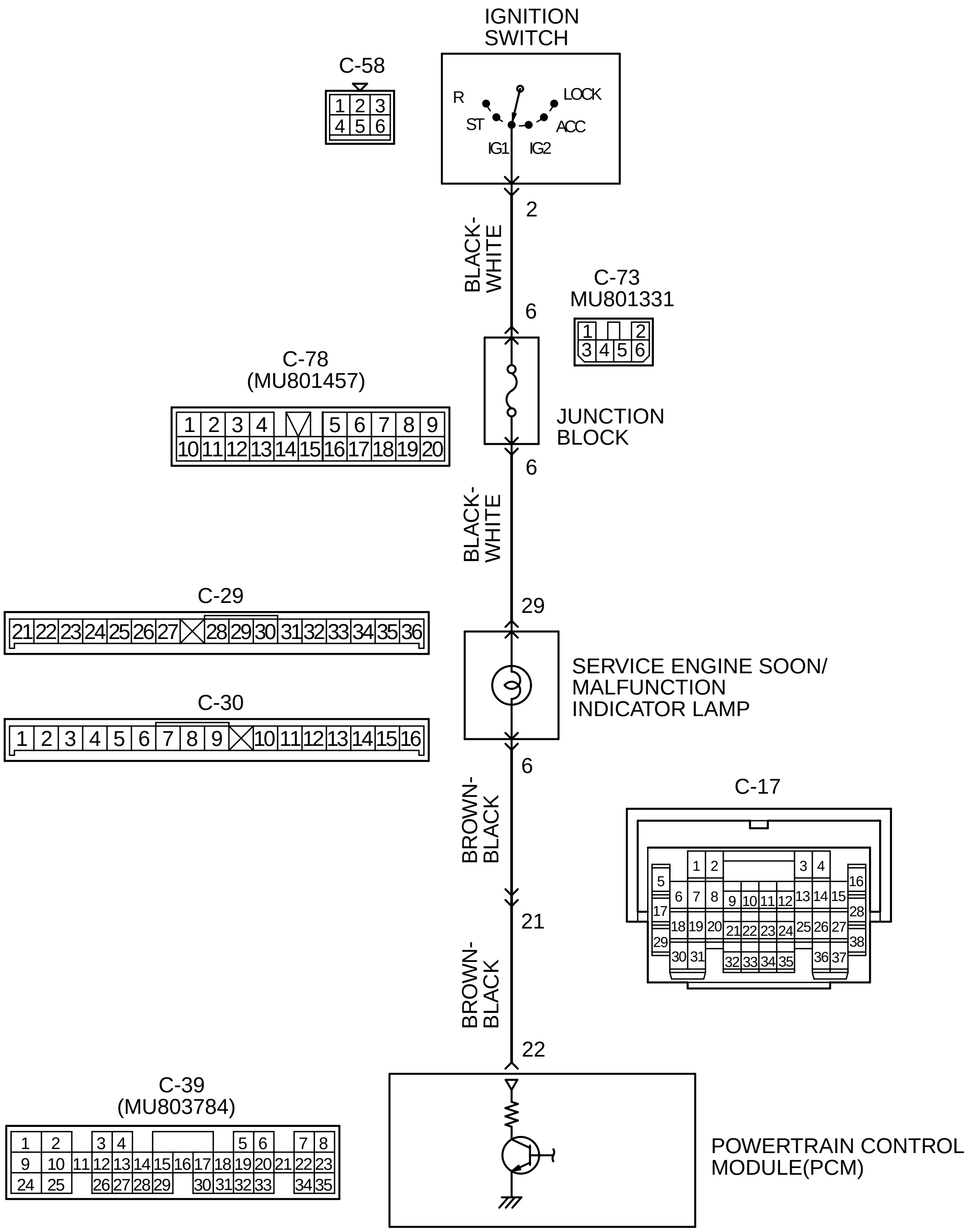
NOTE: Check harness after checking intermediate connectors C-17 and C-57. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Refer to, INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch-IG System(P.13A-379).

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 3: The Service Engine Soon/Malfunction Indicator Lamp Does Not Illuminate Right after the Ignition Switch Is Turned to the "ON" Position.



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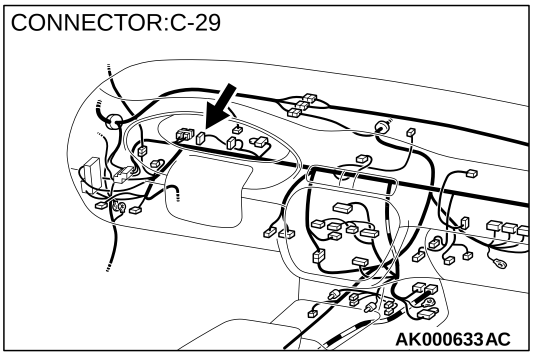
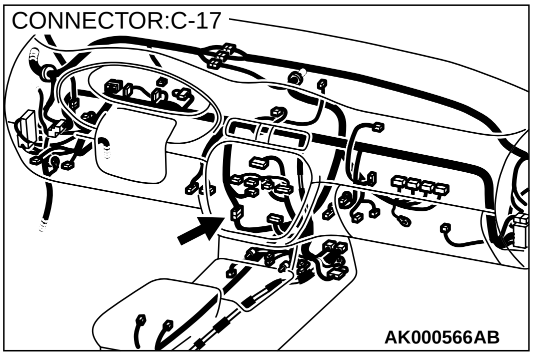
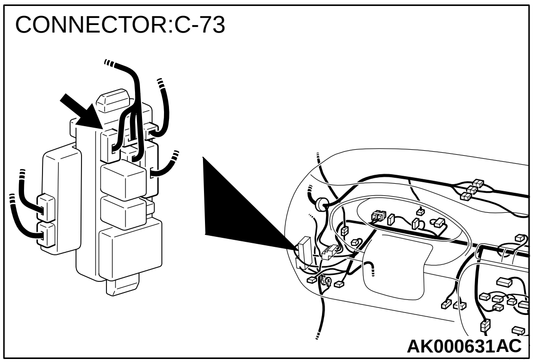
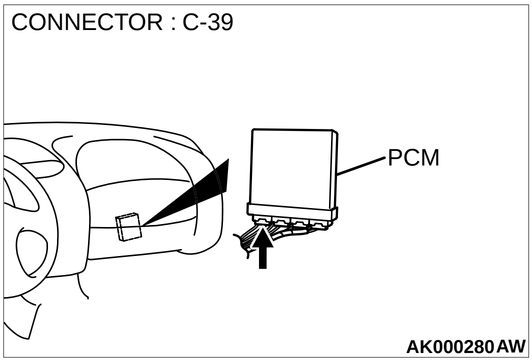
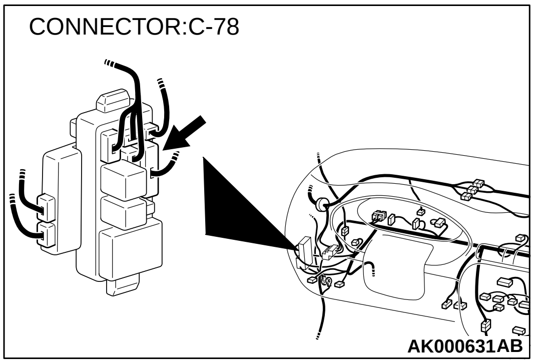
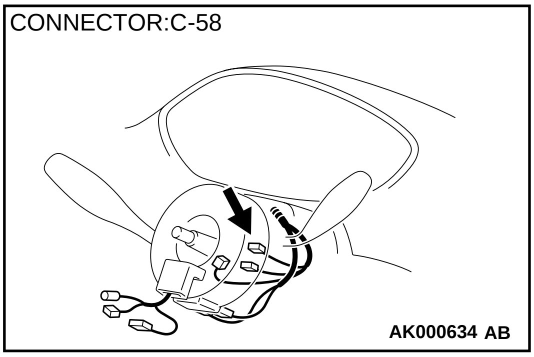


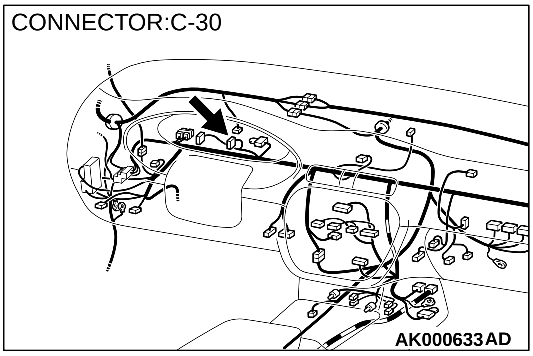












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The PCM controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the PCM ON and OFF.

COMMENT

- The PCM causes the service engine soon/ malfunction indicator lamp to illuminate for 5 seconds immediately after the ignition switch is turned to the "ON" position occurred.

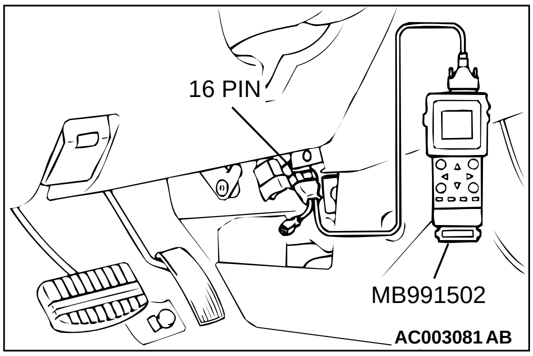
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Burnt-out bulb.
- Defective service engine soon/malfunction indicator lamp circuit.

- Malfunction of the PCM.

DIAGNOSIS

Required Special Tool:
MB991502:Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 16: Power Supply Voltage.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before. connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 16, Power Supply Voltage.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

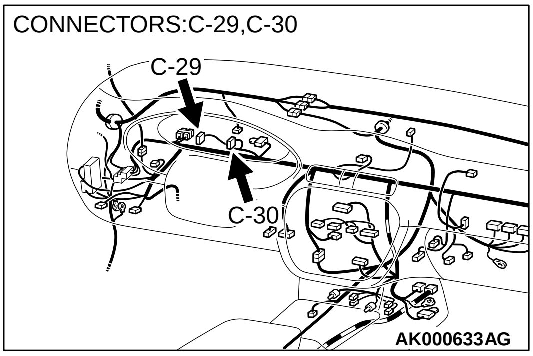
Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch-IG System (P.13A-379).

STEP 2. Check the burned-out bulb.

Q: Is the valve normal?

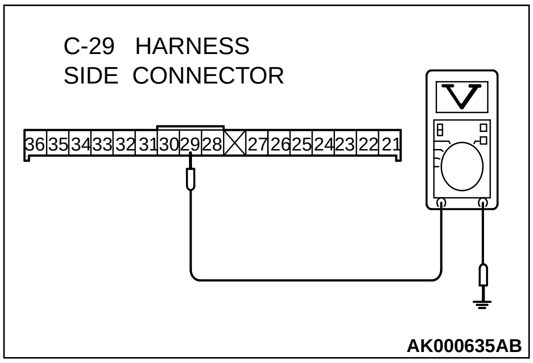
YES : Go to step 3.
NO : Replace the bulb. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check connector C-29,C-30 at the combination meter for damage.

Q: Is the connector in good condition?

YES : Go to step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.



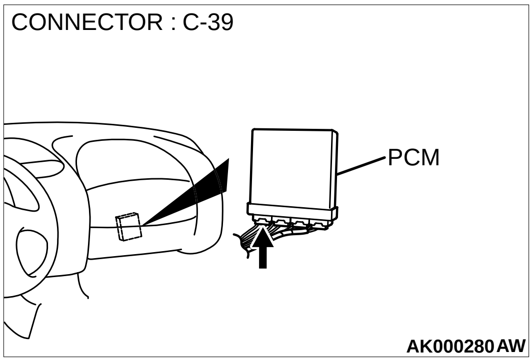
STEP 4. Check the power supply voltage at combination meter harness side connector C-29.

(1) Disconnect the connector C-29 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 29 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

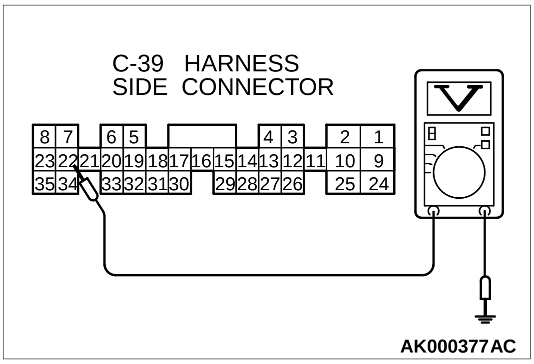
YES : Go to Step 5.
NO : Check harness connectors C-73 and C-78 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-58 terminal 2 and combination meter connector C-29 terminal 29 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 6. Check the power supply voltage PCM connector C-39.

(1) Disconnect the connector C-39 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 22 and ground.
- Voltage should be battery positive voltage.

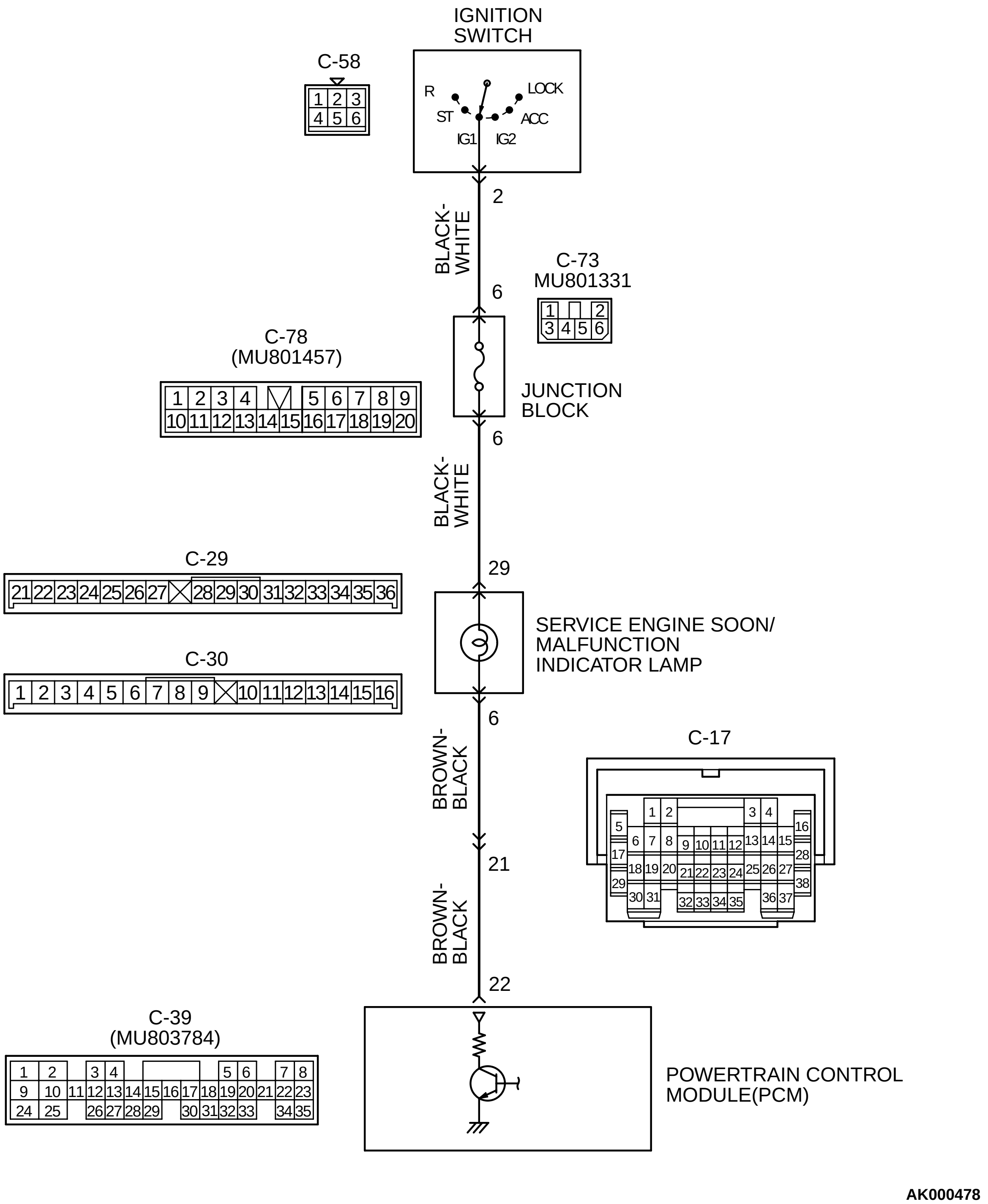
(4) Turn the ignition switch to the "LOCK" (OFF) position.

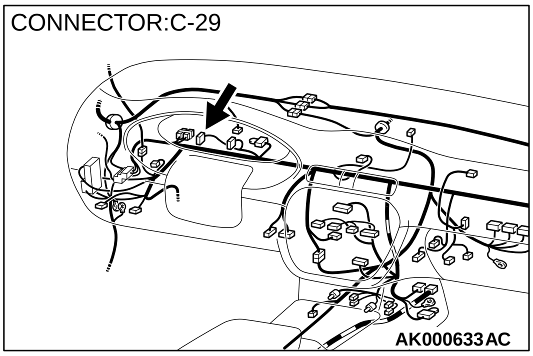
Q: Is the voltage normal?

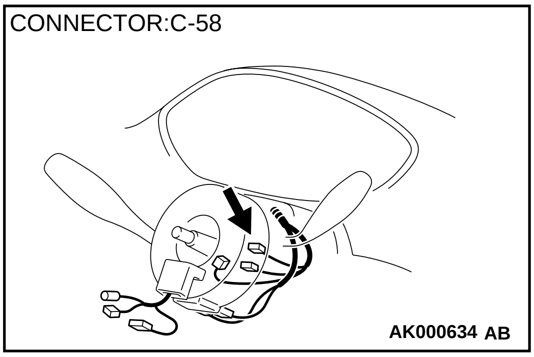
YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

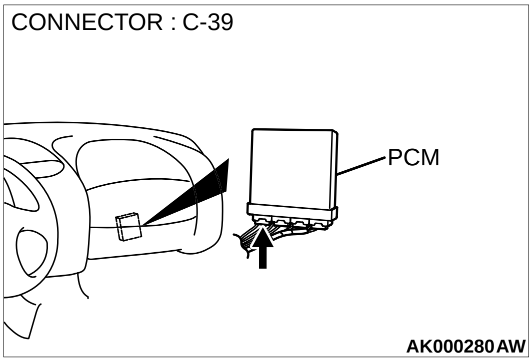
NO : Check harness connectors C-17 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors is in good condition, repair harness wire between combination meter connector C-30 terminal 6 and PCM connector C-39 terminal 22 because of open circuit. Then confirm that the malfunction symptom is eliminated.

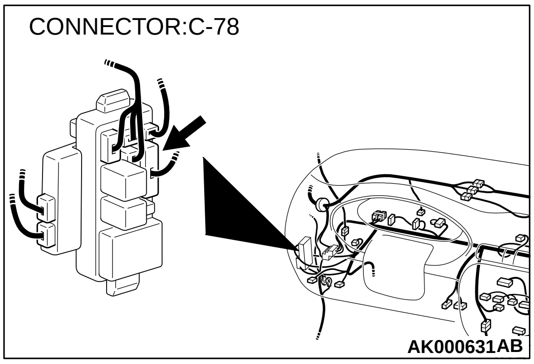
INSPECTION PROCEDURE 4: The Service Engine Soon/Malfunction Indicator Lamp Remains Illuminated and Never Goes Out.

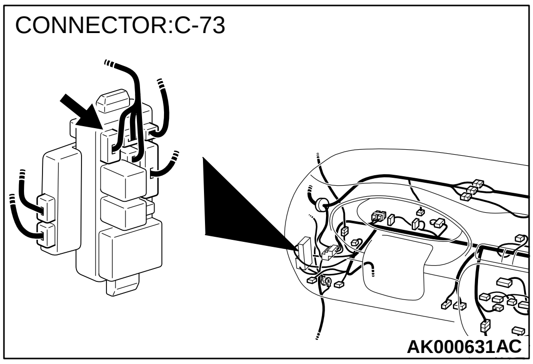


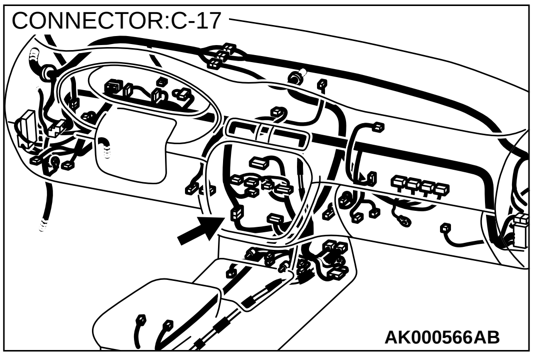












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The PCM controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the PCM ON and OFF.

COMMENT

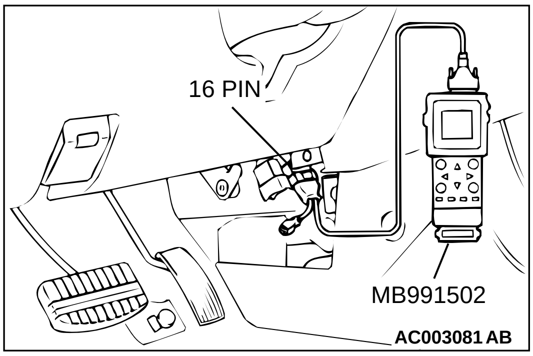
- In cases such as the above, the cause is probably that the PCM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Short-circuit between the service engine soon/ malfunction indicator lamp and PCM.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tool:
MB991502:Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

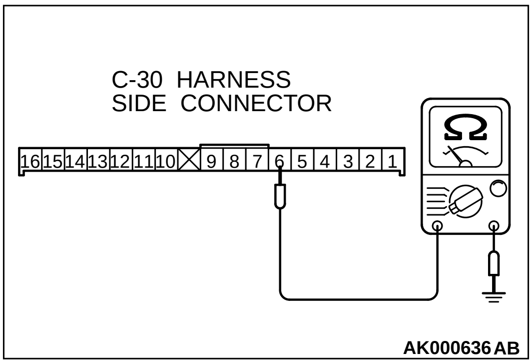
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to Diagnostic Trouble Code Chart (P.13A-20).
NO : Go to Step. 2.



STEP 2. Check the continuity at combination meter harness side connector C-30.

(1) Disconnect the connector C-30 and measure at the harness side.
(2) Check for the continuity between terminal 6 and ground.
- Should be open loop.

Q: Is the continuity normal?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.
NO : Check harness connectors C-17 at the intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). If intermediate connectors is in good condition, repair harness wire between combination meter connector C-30 terminal 6 and PCM connector C-39 terminal 22 because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 5: Cranks, Won't Start

Cranks, Won't Start Circuit
- Refer to, Ignition circuit (P.13A-396).

CIRCUIT OPERATION
- Refer to, Ignition circuit (P.13A-396).

COMMENT
- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of the fuel pump system.
- Malfunction of the injector system.
- Malfunction of the PCM.
- Contaminated fuel.

DIAGNOSIS

Required Special Tools
MB991502: Scan Tool (MUT-II)

STEP 1. Check the Battery positive voltage.

(1) Measure the Battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q: Is the voltage normal?

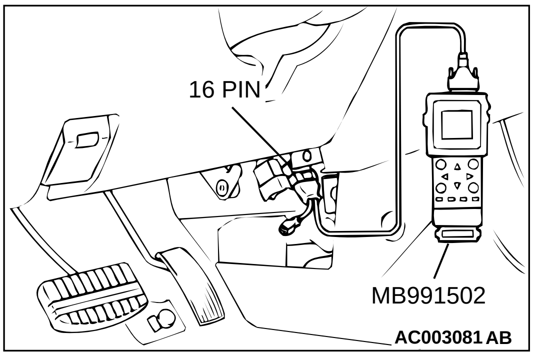
YES : Go to Step 2.
NO : Check the battery. Refer to GROUP 54A, Battery - Battery check (P.54A-5). Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the timing belt for breaks.

Q: Is the timing belt good condition?

YES : Go to Step 3.
NO : Replace timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 3 Using scan tool MB991502, check data list.



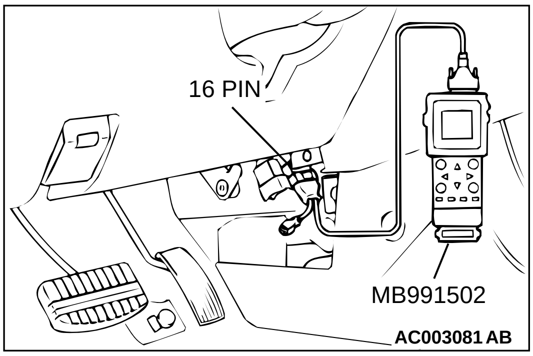
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data List. Refer to Data List Reference Table(P.13A-405).
  a. Item 16: Power Supply Voltage.
  b. Item 22: Crankshaft Position Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace.Then confirm that the malfunction symptom is eliminated.

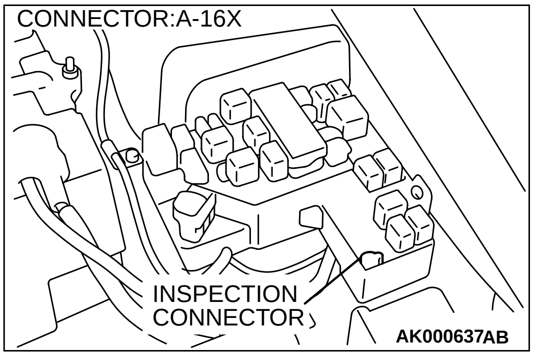
STEP 4. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table(P.13A-416).
  a. Item 07: Fuel pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace.Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the ignition system.

(1) Connect the tachometer to inspection connector A-16X terminal 3.

(2) Crank the engine.

- The tachometer should indicate cranking speed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the cranking speed normal?

YES : Go to Step 6.

NO : Refer to INSPECTION PROCEDURE 32 – Ignition Circuit System(P.13A-396).

STEP 6. Check the ignition timing.

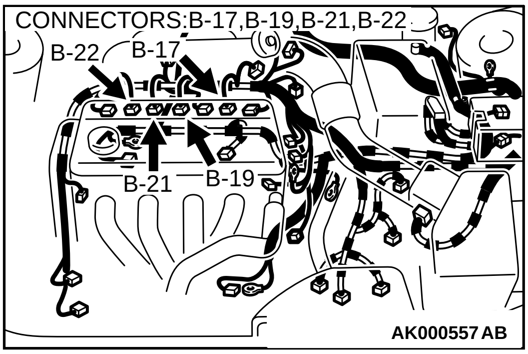
(1) Check the ignition timing at cranking.

Standard value:5° BTDC ϕ 3°

Q: Is the ignition timing normal?

YES : Go to Step 7.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

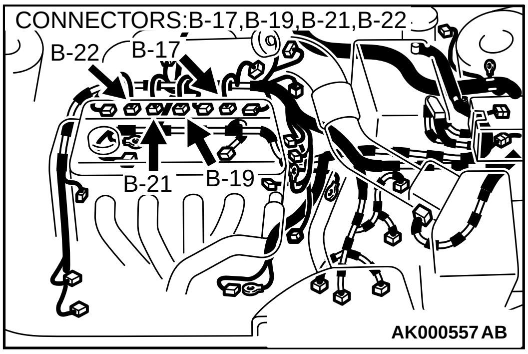


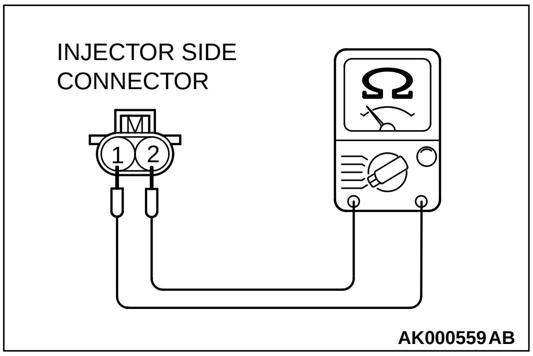
STEP 7. Check harness connector B-17 or B-19 or B-21 or B-22 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : :Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





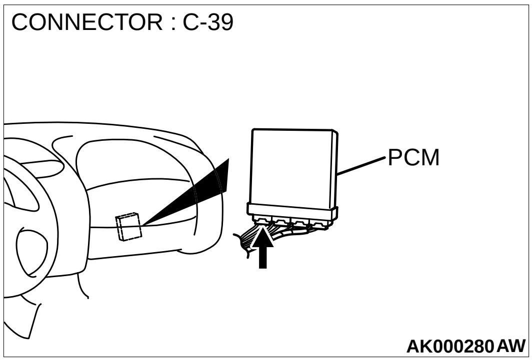
STEP 8. Check the injector.

(1) Disconnect the injector connector B-17, B-19, B-21, B-22.
(2) Measure the resistance between each injector side connector terminal 1 and 2.

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

Q: Is the resistance standard value?

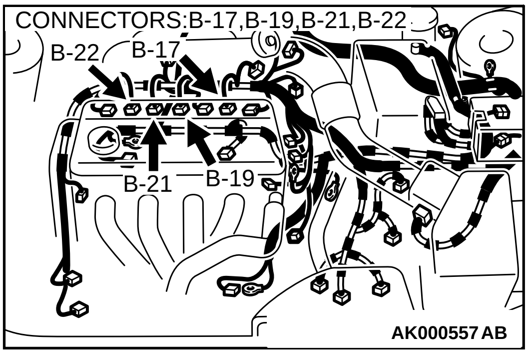
YES : Go to Step 9.
NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.

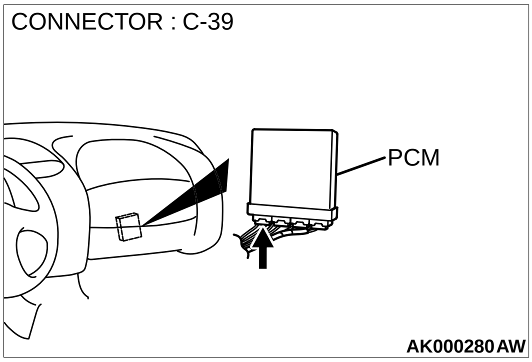


STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 10. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check if fuel is contaminated.
d. Check compression.
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 6: Fires Up and Dies.

COMMENT

- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Contaminated fuel.
- Poor compression.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

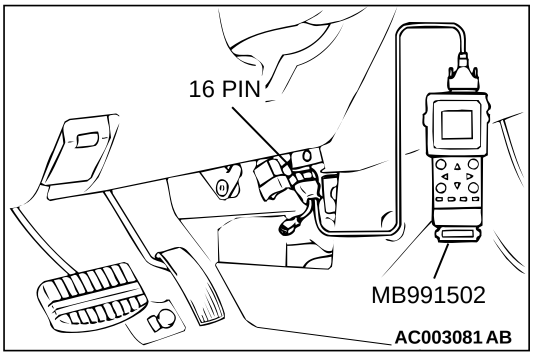
STEP 1. Check the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q: Is the voltage normal?

YES : Go to Step 2.

NO : Refer to GROUP 54A,Battery – Battery check(P.54A-5).



STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

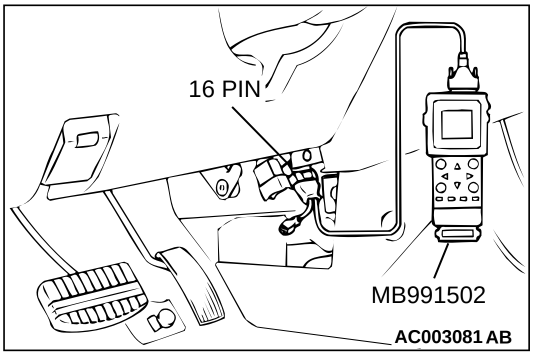
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 3.

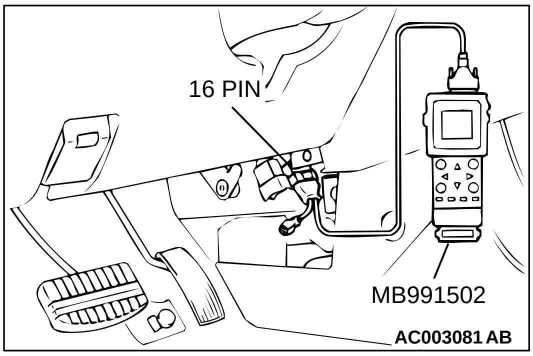


STEP 3. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

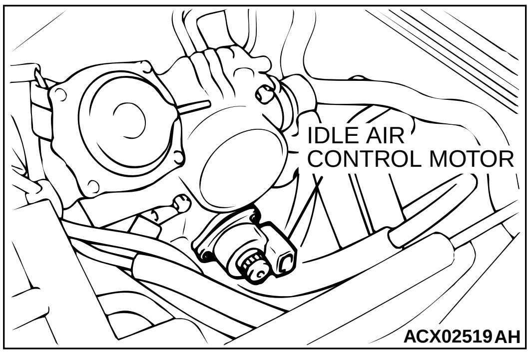
YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the engine start-ability.

(1) Depress the accelerator pedal slightly, and start the engine.

Q: Is the start ability good?

YES : Go to Step 6.
NO : Go to Step 7.



STEP 6. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20° C (68° F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20° C(68° F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).

- An operation sound is heard.

Q: Did you hear the operation sound?

YES : Refer to, Clean the throttle valve area(P.13A-436).

NO : Refer to DTC P0506 Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 Idle Control System RPM Higher Than Expected(P.13A-274).

STEP 7. Check the ignition timing.

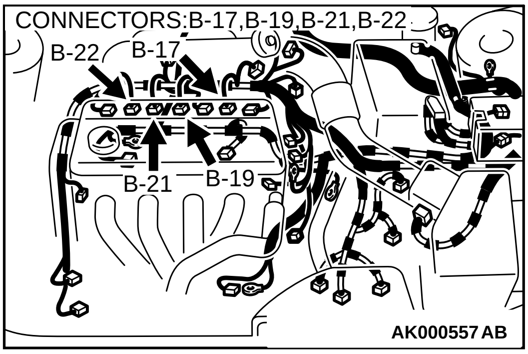
(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ϕ 3°

Q: Is the ignition timing normal?

YES : Go to Step 8.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

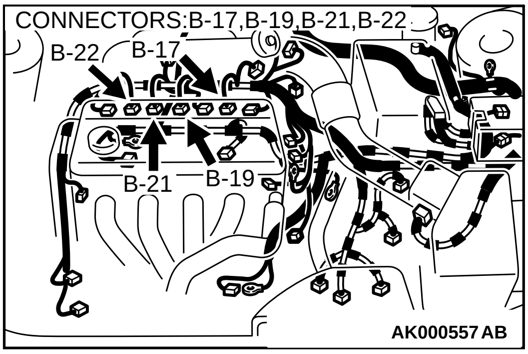


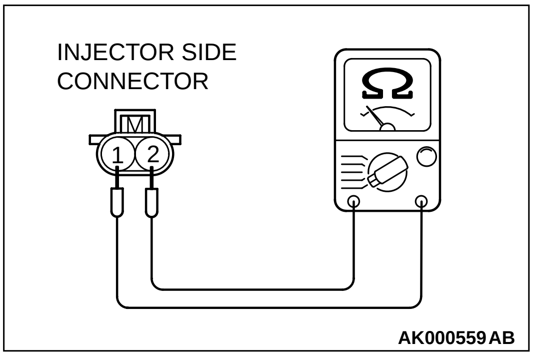
STEP 8. Check harness connector B-17 or B-19 or B-21 or B-22 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 9. Check the injector.

(1) Disconnect the injector connector B-17, B-19, B-21, B-22.

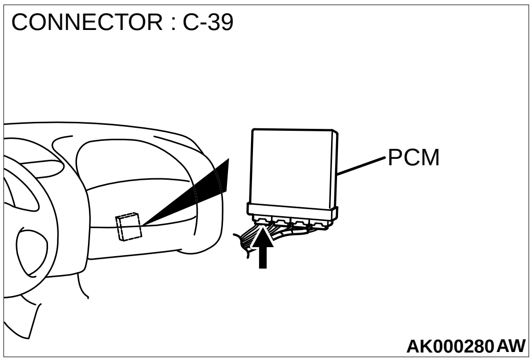
(2) Measure the resistance between each injector side connector terminal 1 and 2.

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

Q: Is the resistance standard value?

YES : Go to Step 10.

NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.

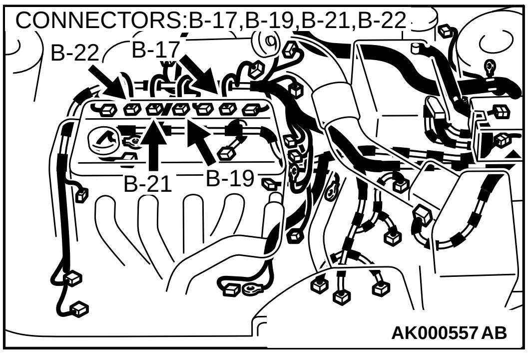


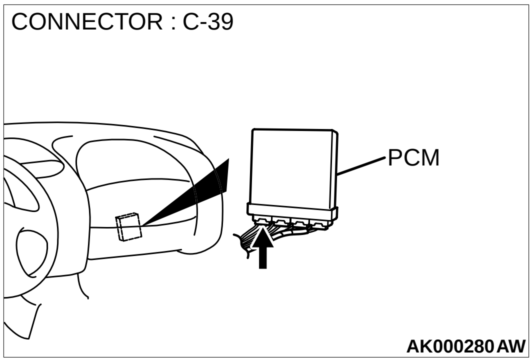
STEP 10. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 11. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.

a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check fuel lines for clogging.
e. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 7: Hard Starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor fuel quality. (Contamination)
- Poor compression.

DIAGNOSIS

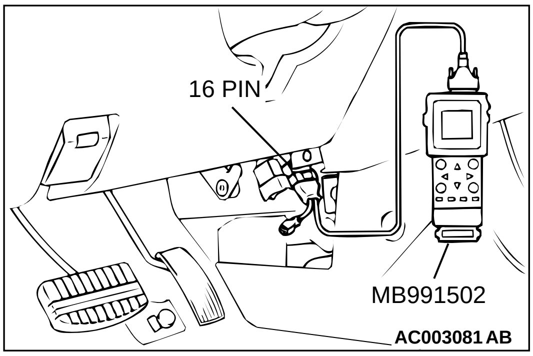
Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Check the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
- The voltage is 8 volts or more.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to GROUP 54A, Battery – Battery check(P.54A-5).



STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

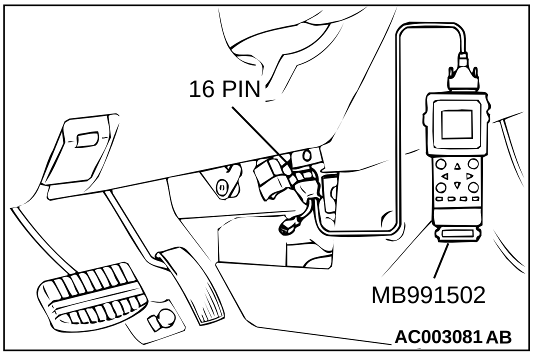
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 3.

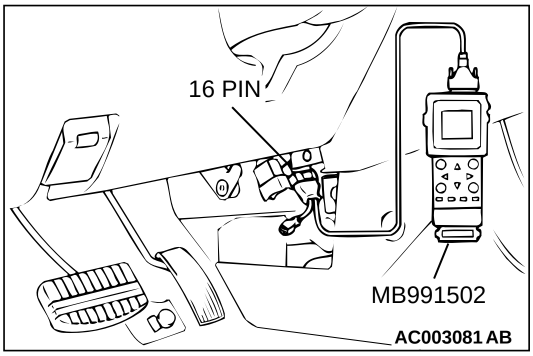


STEP 3. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table(P.13A-416).
a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table(P.13A-405).
a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

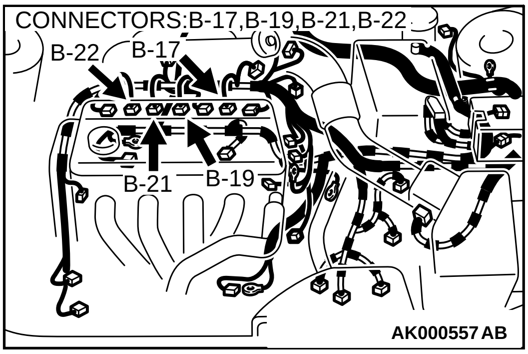
STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value:5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 6.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

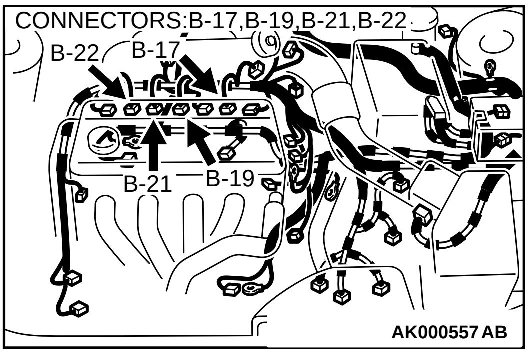


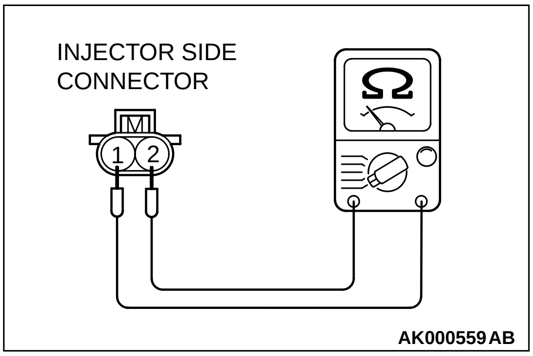
STEP 6. Check harness connector B-17 or B-19 or B-21 or B-22 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 7. Check the injector.

(1) Disconnect the injector connector B-17, B-19, B-21, B-22.

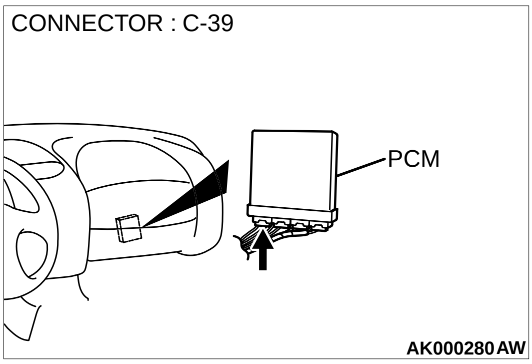
(2) Measure the resistance between each injector side connector terminal 1 and 2.

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

Q: Is the resistance standard value?

YES : Go to Step 8.

NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.

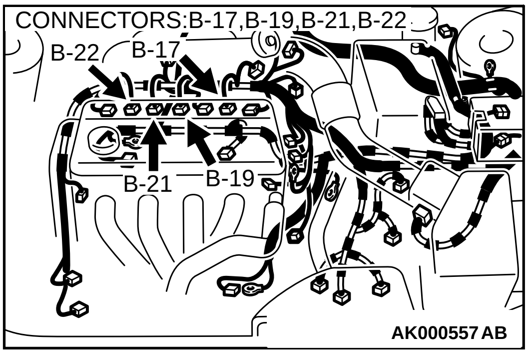


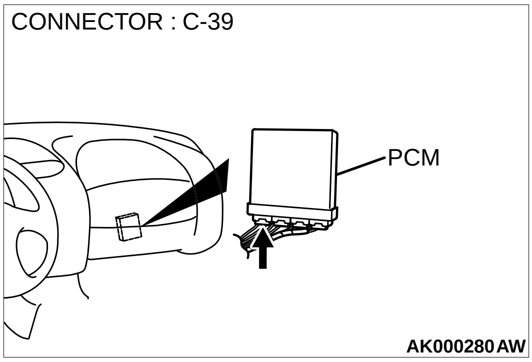
STEP 8. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 9. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-22 terminal 2 and PCM connector C-39 terminal 1 when checking No.1 cylinder.
b. Check the harness wire between injector connector B-21 terminal 2 and PCM connector C-39 terminal 9 when checking No.2 cylinder.
c. Check the harness wire between injector connector B-19 terminal 2 and PCM connector C-39 terminal 24 when checking No.3 cylinder.
d. Check the harness wire between injector connector B-17 terminal 2 and PCM connector C-39 terminal 2 when checking No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosens, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 8: Unstable Idle (Rough Idle, Hunting).

COMMENT

- In cases such as the above, the cause is probably the air/fuel mixture or idle air control motor. Other systems affecting idle quality include the ignition system and compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Malfunction of the evaporative emission purge solenoid system.
- Poor compression pressure.
- Vacuum leak.
- Malfunction of the EGR solenoid system.

DIAGNOSIS

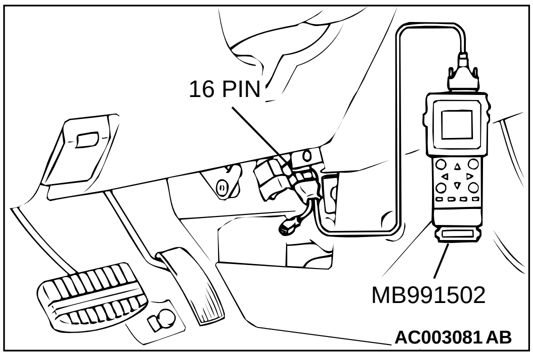
Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up.Then, if a malfunction occurs, go to Step 2.

NO : Go to Step 2.



STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch is to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 3.

STEP 3. Check the engine idling state.

Q: Is it hunting remarkably?

YES : Go to Step 4.
NO : Go to Step 5.

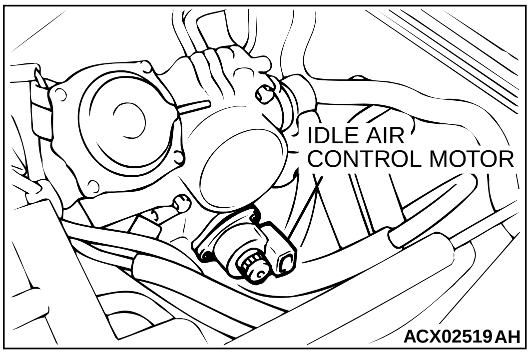
STEP 4. Check the following items.

(1) Carry out the following cleaning.
a. Clean the throttle valve area (refer to P.13A-436).
(2) After cleaning, confirm that the malfunction symptom is eliminated.

Q: Is the malfunction symptom resolved?

YES : The check is completed.
NO : Check the following items, and repair or replace the defective items.
a. Broken intake manifold gasket.
b. Broken air intake hose.
c. Broken vacuum hose.
d. Positive crankcase ventilation valve does not operate.
Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20° C (68° F) or below.

NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below is also okay.

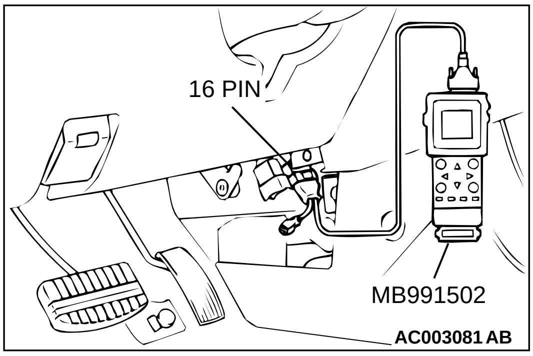
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound is heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected (P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected(P.13A-274).

STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



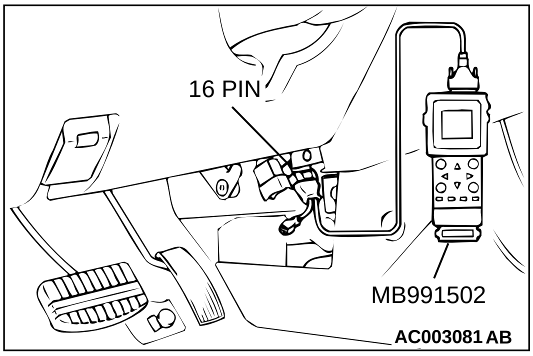
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
 a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

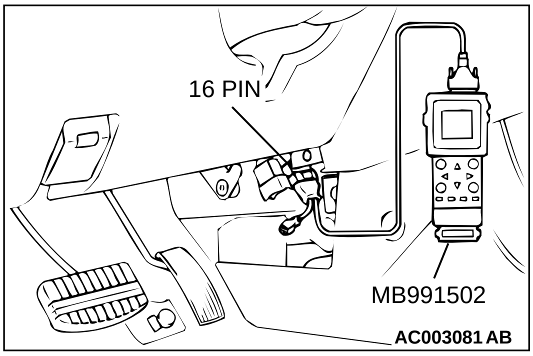


STEP 7. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric Pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 59: Heated Oxygen Sensor (rear)
  e. Item 11: Heated Oxygen Sensor (front)
  f. Item 27: Power Steering Pressure Switch.
  g. Item 28: A/C Switch
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

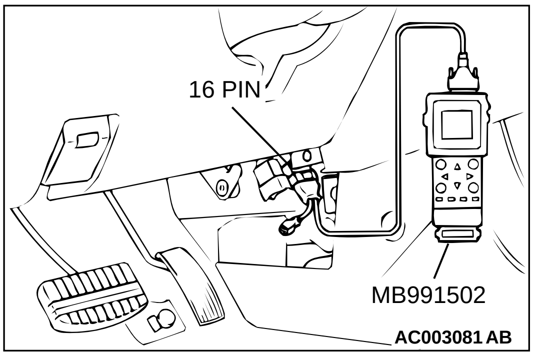


STEP 8. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 08: Evaporative Emission Purge Solenoid.
  b. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

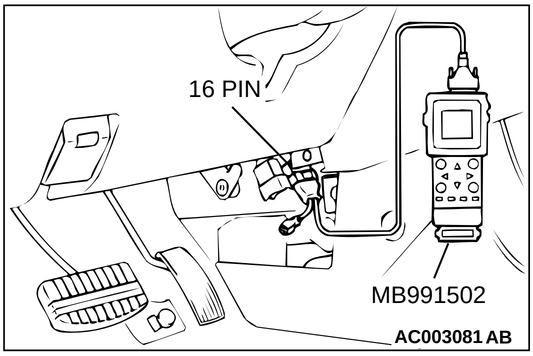


STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 45: Idle Air Control Motor Position.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 10.
NO : Adjust the basic idle speed. Refer to, Basic Idle Speed Adjustment(P.13A-438).



STEP 10. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.

(2) Check the following items of the data list. Refer to, Data List Reference Table(P.13A-405).

a. Item 11: Heated Oxygen Sensor (front)
- Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while idling after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.

a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.

a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the purge control system.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
e. Check the EGR control system.

Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 9: Idle speed is high (improper idle speed).

COMMENT

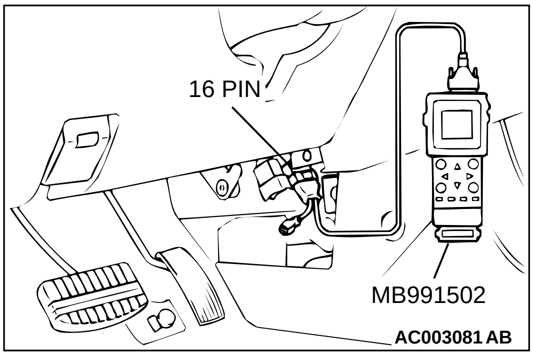
- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)



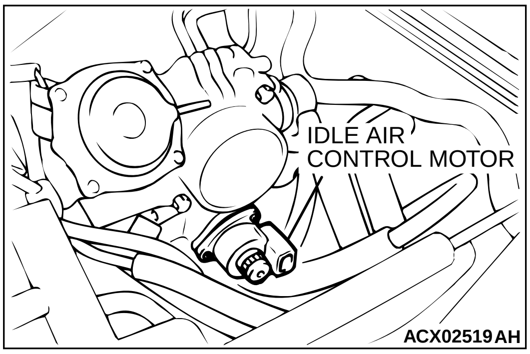
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20° C (68° F) or below.

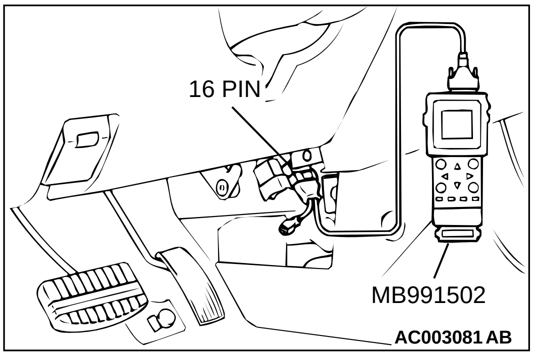
NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below is also okay.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected (P.13A-274).



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 21: Engine Coolant Temperature Sensor.
  b. Item 28: A/C Switch.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Adjust the basic idle speed.

Refer to, Basic Idle Speed Adjustment for the adjustment procedure (P.13A-438).

Standard value: 700 $\pm$ 50 r/min

Q: Is the Idle speed normal?

YES : Refer to, Clean the throttle valve area(P.13A-436).
NO : The check is completed.

INSPECTION PROCEDURE 10: Idle Speed Is Low (Improper Idle Speed).

COMMENT

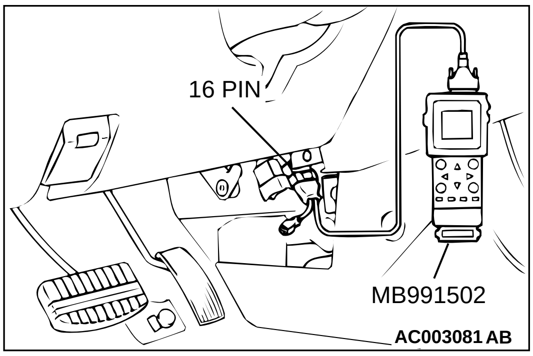
- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

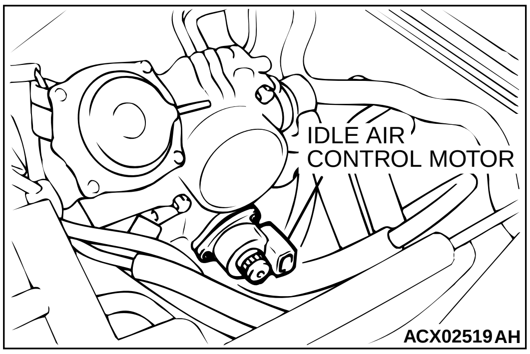
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20° C (68° F) or below.

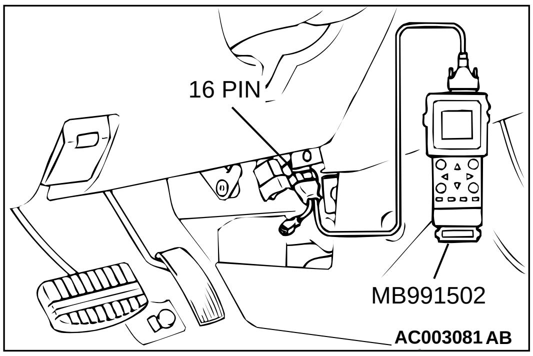
NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected (P.13A-274).



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
   a. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Adjust the basic idle speed.

Refer to, Basic Idle Speed Adjustment for the adjustment procedure (P.13A-438).

Standard value: 700 ± 50 r/min

Q: Is the idle speed normal?

YES : Refer to, Clean the throttle valve area(P.13A-436).
NO : The check is completed.

INSPECTION PROCEDURE 11: When the engine is cold, it stalls at idle (die out).

COMMENT
- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the IAC system.

- Malfunction of the throttle body.
- Malfunction of the injector system.
- Malfunction of the ignition system.

DIAGNOSIS

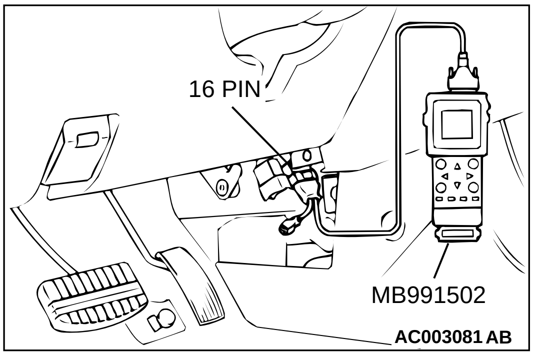
Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 3.

STEP 3. Checking by operating the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

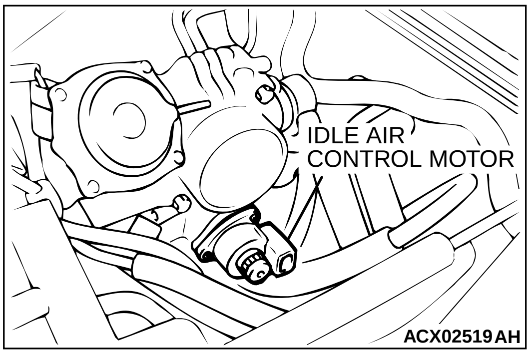
YES : Refer to, Clean the throttle valve area(P.13A-436).
NO : Go to Step 4.

STEP 4. Check the engine idling.

Q: Is the idling good enough after warm up?

YES : Go to Step 5.
NO : Refer to, INSPECTION PROCEDURE 8 – Unstable Idle (Rough Idle, Hunting)(P.13A-335).

STEP 5. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20° C (68° F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below.

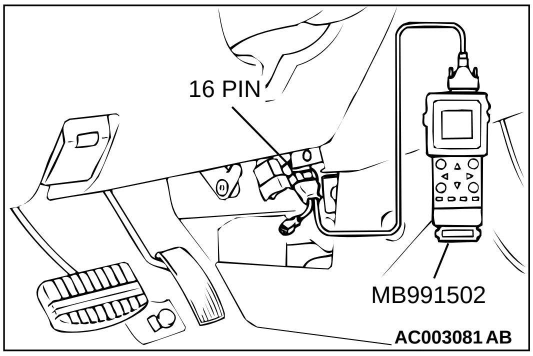
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected (P.13A-274).

STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



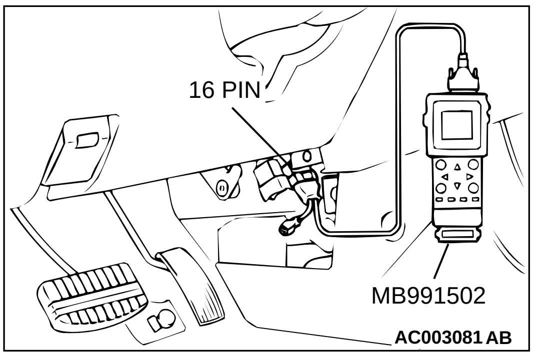
⚠ **CAUTION**
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

STEP 7. Using scan tool MB991502, check data list.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.

a. Check the ignition coil, spark plugs, spark plug cables.
b. Check compression pressure.
c. Check the engine oil viscosity.

Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 12: When the Engine Is Hot, It Stalls at Idle (Die Out).

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture, idle air control motor or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a loose connector.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Vacuum leak.
- Improper connector contact.

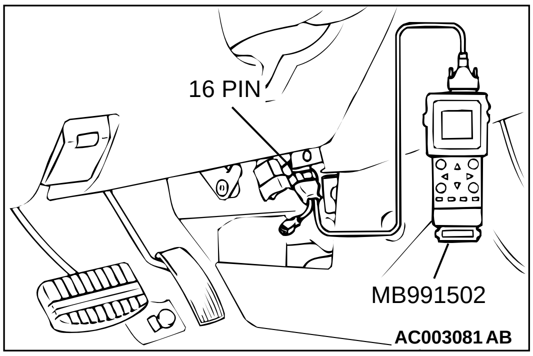
DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

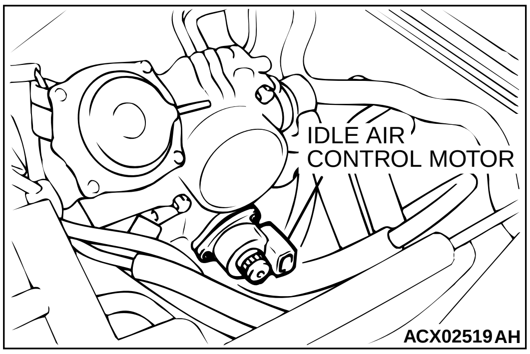
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 3.



STEP 3. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20° C (68° F) or below.

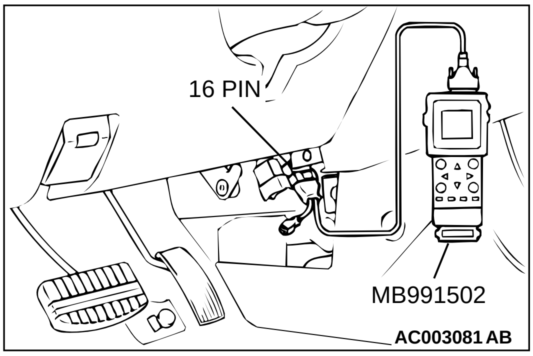
NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 4.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected (P.13A-274).



STEP 4. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

STEP 5. Checking by operating the accelerator pedal

Q: Does the engine stall right after the accelerator pedal is released?

YES : Refer to, Clean the throttle valve area(P.13A-436).
NO : Go to Step 6.

STEP 6. Engine stall reproduction test.

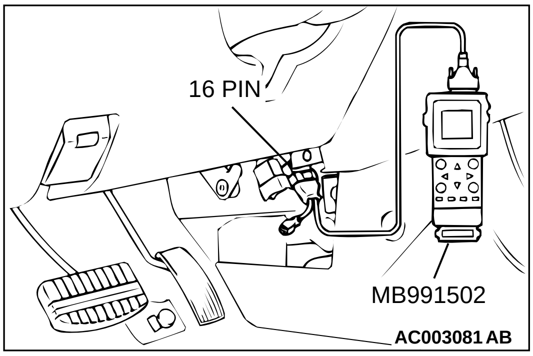
Q: Is it easy to reproduce the engine stall?

YES : Go to Step 7.
NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.

a. Crankshaft position sensor signal.
b. Volume air flow sensor signal.
c. Injector drive signal.
d. Primary and secondary ignition signal.
e. Fuel pump drive signal.
f. PCM power supply voltage.

Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991502, check data list.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

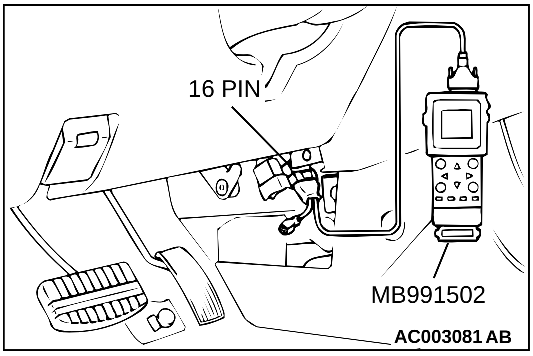
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).

a. Item 13: Intake Air Temperature Sensor.
b. Item 25: Barometric Pressure Sensor.
c. Item 21: Engine Coolant Temperature Sensor.
d. Item 59: Heated Oxygen Sensor (rear)
e. Item 11: Heated Oxygen Sensor (front)
f. Item 27: Power Steering Pressure Switch.
g. Item 28: A/C Switch.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

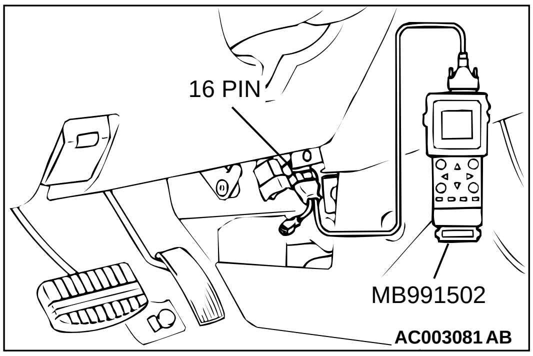


STEP 8. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 11: Heated Oxygen Sensor (front)
  - Fluctuates between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

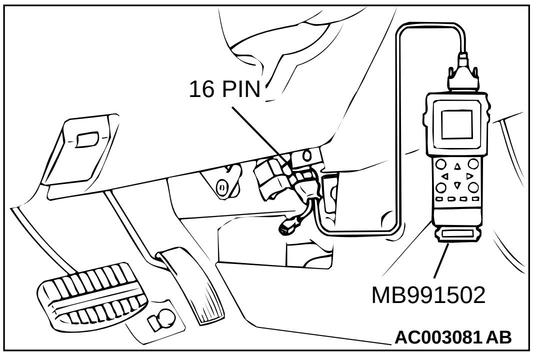
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Go to Step 11.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 11. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 45: Idle Air Control Motor Position.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
    - Broken intake manifold gasket.
    - Broken air intake hose.
    - Broken vacuum hose.
    - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.
Then confirm that the malfunction symptom is eliminated.

NO : Adjusting the basic idle speed. Refer to, Basic Idle Speed Adjustment(P.13A-438).

STEP 12. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check if the injectors are clogged.
  c. Check compression pressure.
  d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 13: The Engine Stalls when Accelerating (Pass Out).

COMMENT

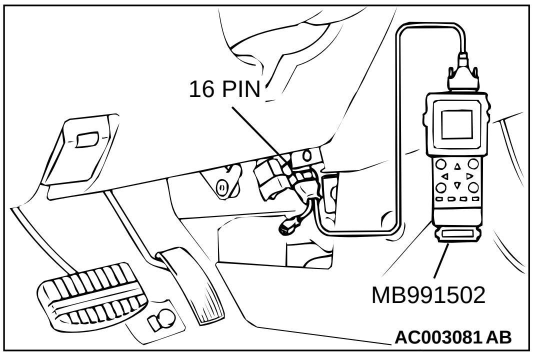
- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Vacuum leak.
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)



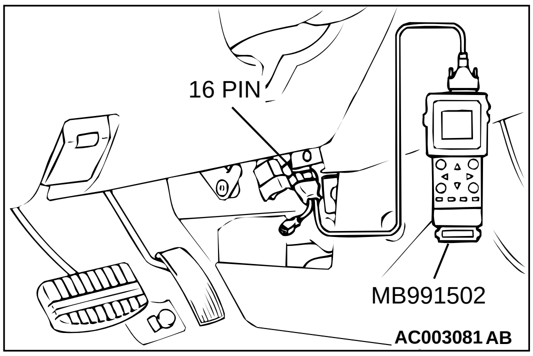
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
   a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
   a. Check the ignition coil, spark plugs, spark plug cables.
   b. Check for vacuum leaks.
      - Broken intake manifold gasket.
      - Broken or disconnected vacuum hose.
      - Improper operation of the PCV valve.
      - Broken air intake hose.

   Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 14: The engine stalls when decelerating.

COMMENT
- The intake air volume may be insufficient due to a defective idle air control motor system.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

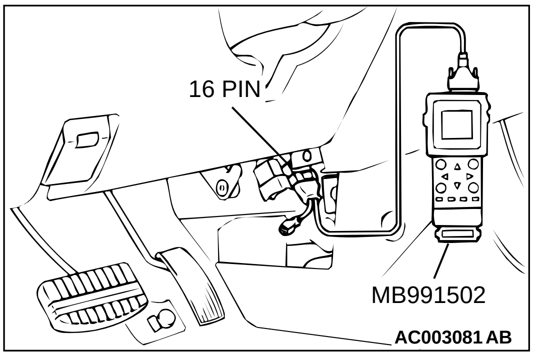
STEP 1. Check if the battery terminal is disconnected

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then if a malfunction occurs, go to step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

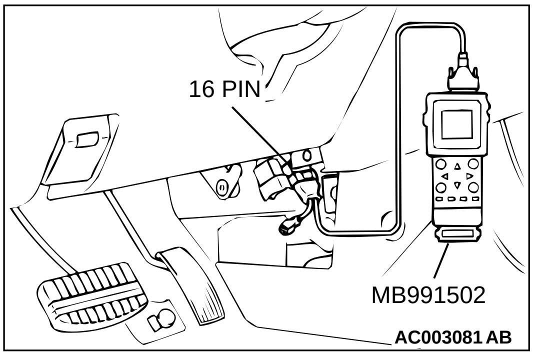
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).

NO : Go to Step 3.

STEP 3. Using scan tool MB991502, check data list.



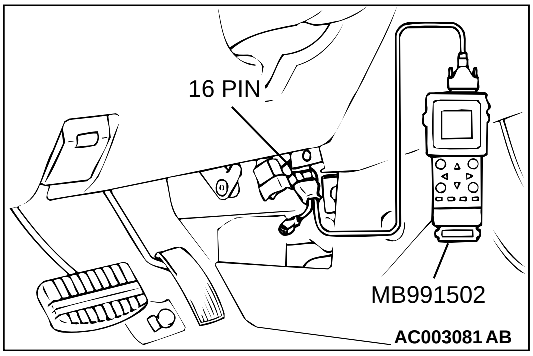
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 14: Throttle Position Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991502, check actuator test.

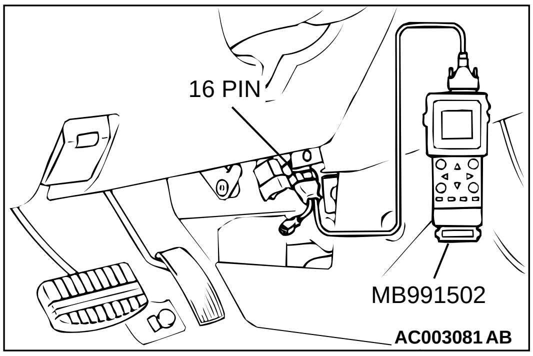


(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 5. Using scan tool MB991502, check data list item 45: Idle Air Control Position.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 45, Idle Air Control Position.
  a. The idle air control motor should drop to the 0 - 2 position during deceleration (from 1,000 r/min or more).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operation properly?

YES : Check the following items, and repair, replace or clean the defective sections.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check the throttle valve area. (refer to P.13A-436).
Then confirm that the malfunction symptom is eliminated.

NO : Refer to, DTC P0500 – Vehicle Speed Sensor Malfunction (P.13A-264).

INSPECTION PROCEDURE 15: Hesitation, sag or stumble.

COMMENT

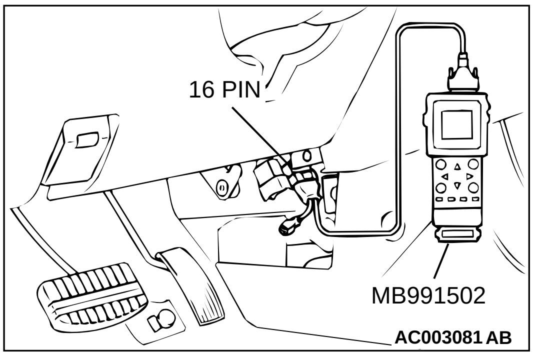
- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be defective.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Malfunction of the EGR solenoid system.
- Poor compression pressure.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

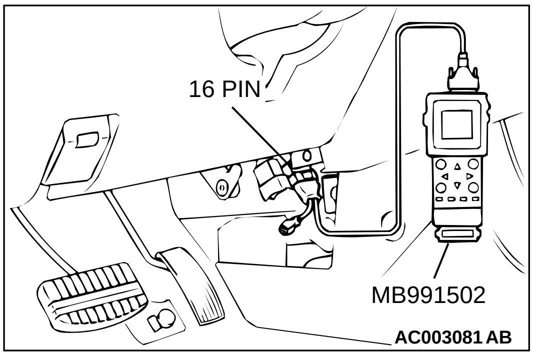
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.

(1) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
   a. Item 01, 02, 03, 04: Injector.
(2) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

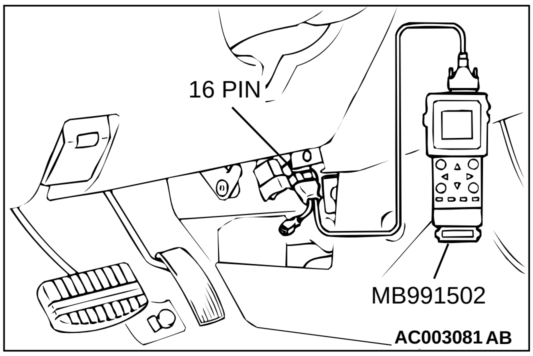
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

STEP 3. Check the ignition timing.

(1) Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list test.

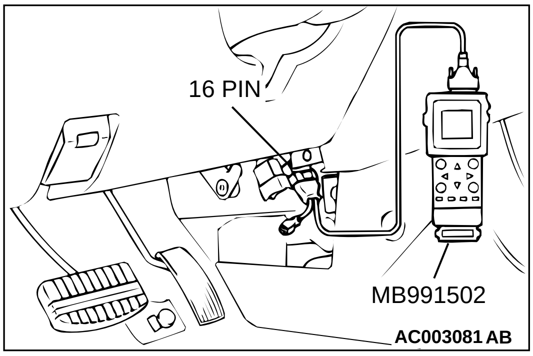
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
   a. Item 13: Intake Air Temperature Sensor.
   b. Item 25: Barometric pressure Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
   d. Item 14: Throttle Position Sensor.
   e. Item 59: Heated Oxygen Sensor (rear)
   f. Item 11: Heated Oxygen Sensor (front)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

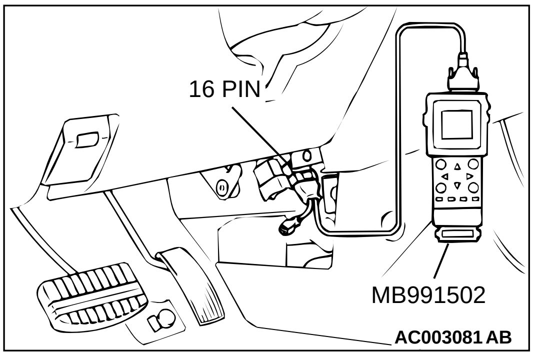


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 11: Heated Oxygen Sensor (front)
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while idling after the engine has warmed-up.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
    - Broken intake manifold gasket.
    - Broken air intake hose.
    - Broken vacuum hose.
    - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.
  Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.
c. Check compression pressure.
d. Check the fuel filter or fuel line for clogging.
Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 16: Acceleration shock.

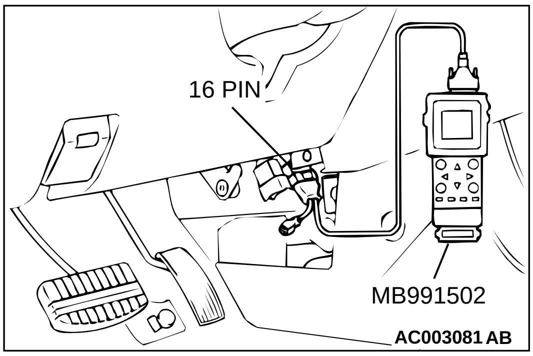
COMMENT
- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).

NO : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check for occurrence of ignition leak.
Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 17: Deceleration Shock

COMMENT

- There may be a sudden change in air flow through the IAC, causing the vehicle to decelerate rapidly for an instant.

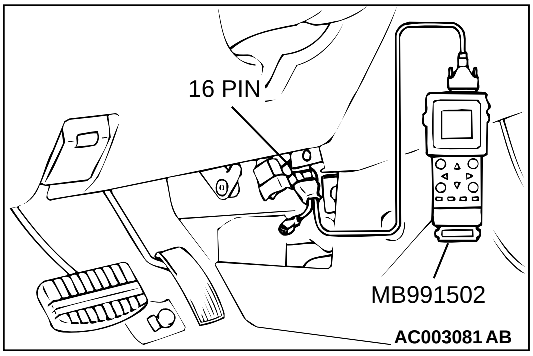
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



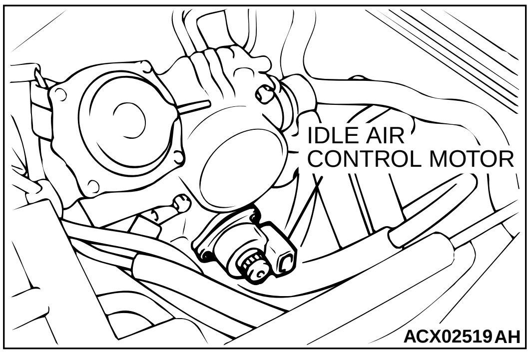
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go To Step 2.

STEP 2. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20° C (68° F) or below.

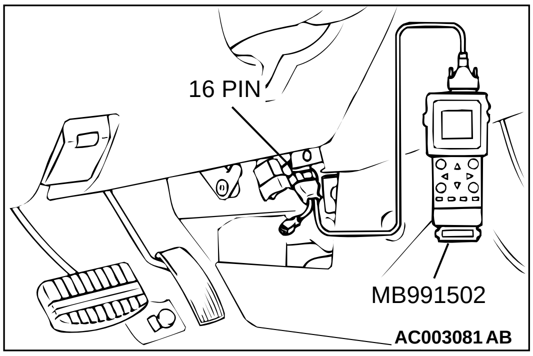
NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20° C (68° F) or below.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
  - An operation sound should heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected(P.13A-265), DTC P0507 – Idle Control System RPM Higher Than Expected (P.13A-274).



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 14: Throttle Position Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to, Clean the throttle valve area(P.13A-436).
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 18: Poor acceleration.

COMMENT

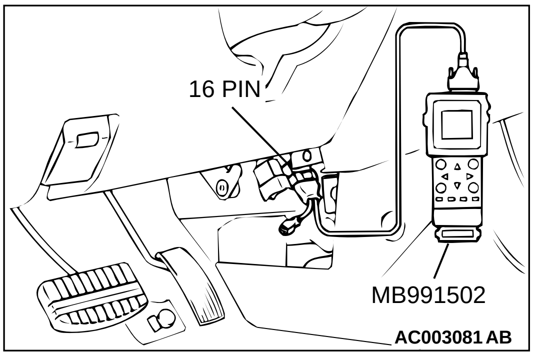
- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Poor compression pressure.
- Clogged exhaust system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

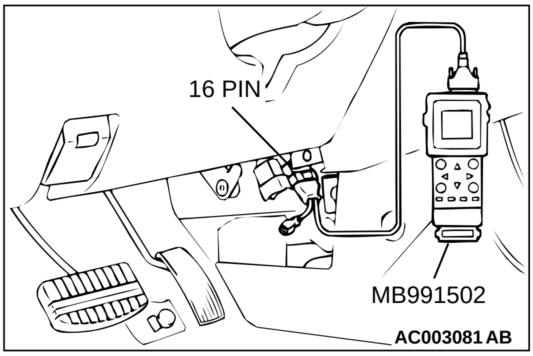
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 01, 02, 03, 04: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

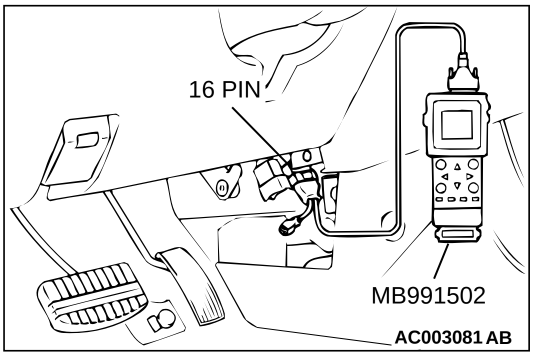
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



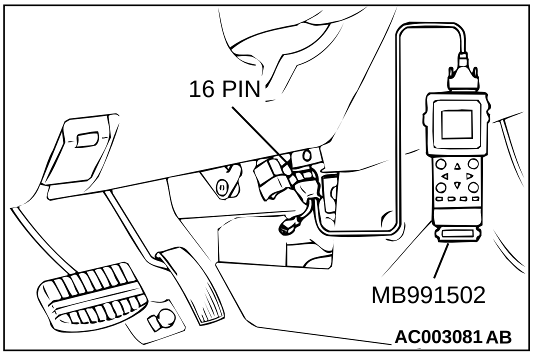
STEP 4. Using scan tool MB991502, check data list.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric Pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 59: Heated Oxygen Sensor (rear)
  f. Item 11: Heated Oxygen Sensor (front)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

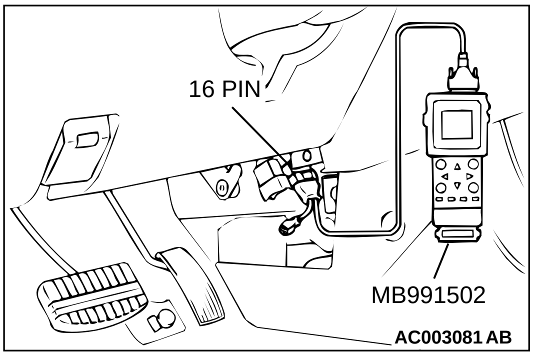


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 11: Heated Oxygen Sensor (front)
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
  - Broken intake manifold gasket.
  - Broken air intake hose.
  - Broken vacuum hose.
  - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.

a. Check the ignition coil, spark plugs, spark plug cables.
b. Check compression pressure.
c. Check the fuel filter or fuel line for clogging.
d. Broken air intake hose.
e. Clogged air cleaner.
f. Clogged exhaust system.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 19: Surge.

COMMENT

- Defective ignition system, abnormal air/fuel ratio, etc. are suspected.

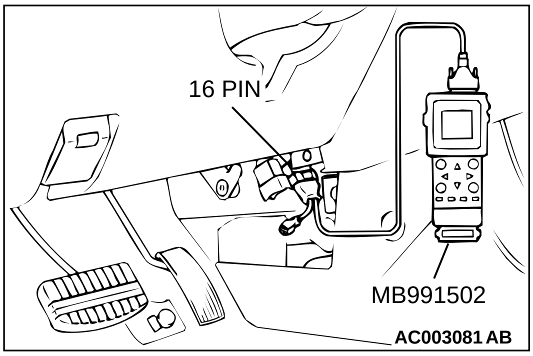
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR solenoid system.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

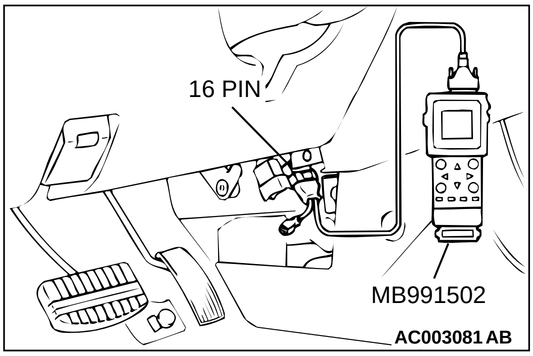


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "ON" position.

Q: Is the DTC output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 01, 02, 03, 04: Injector.
(3) Turn the ignition switch to the "ON" position.

Q: Is the actuator operating properly?

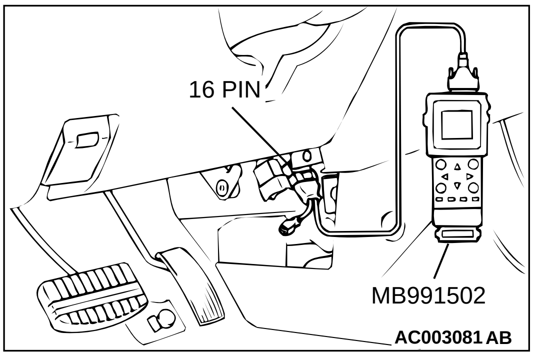
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction(P.13A-154).

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

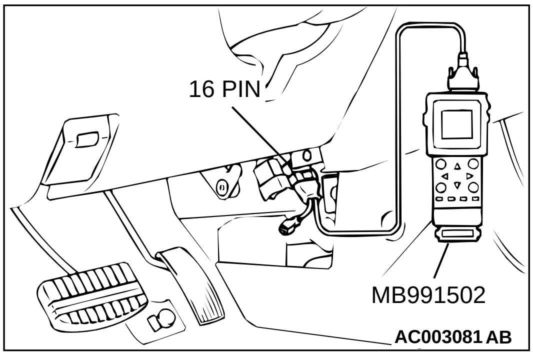
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 59: Left Bank Heated Oxygen Sensor (rear)
  f. Item 11: Left Bank Heated Oxygen Sensor (front)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

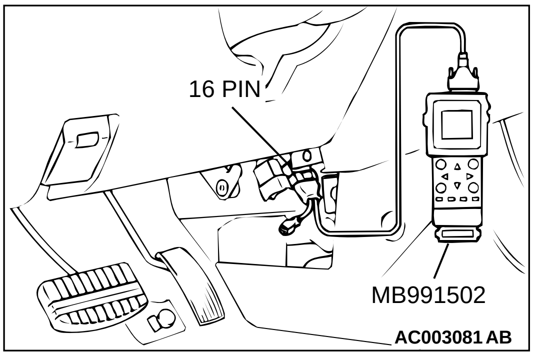


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table(P.13A-416).
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 11: Left Bank Heated Oxygen Sensor (front)
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
    - Broken intake manifold gasket.
    - Broken air intake hose.
    - Broken vacuum hose.
    - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.

  Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.
Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 20: Knocking

COMMENT
- The cause is the heat range of the spark plug is inappropriate.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Incorrect heat range of the spark plug.

DIAGNOSIS

STEP 1. Check the following items.
Check the following items, and repair or replace the defective items.
a. Check the spark plugs.
b. Fuel quality, octane level.
c. Check if the foreign materials (water, kerosene, etc.) got into fuel.
Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 21: Dieseling.

COMMENT
- Fuel leakage from injectors is suspected, or carbon build up.

TROUBLESHOOTING HINTS(The most likely causes for this case:)
- Fuel leakage from injectors.

DIAGNOSIS

STEP 1. Check the injectors for fuel leakage.
Replace the leaking injector. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 22: Too high CO and HC concentration when idling

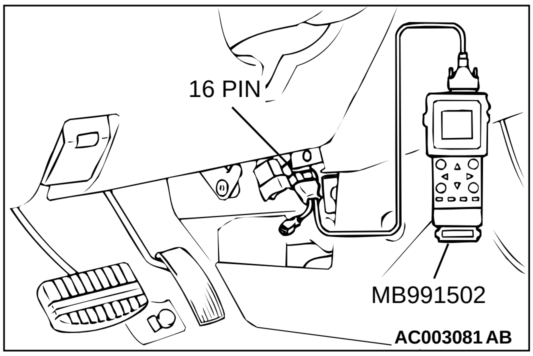
COMMENT
- Abnormal air/fuel ratio is suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of air/fuel ratio control system.
- Deteriorated catalyst.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

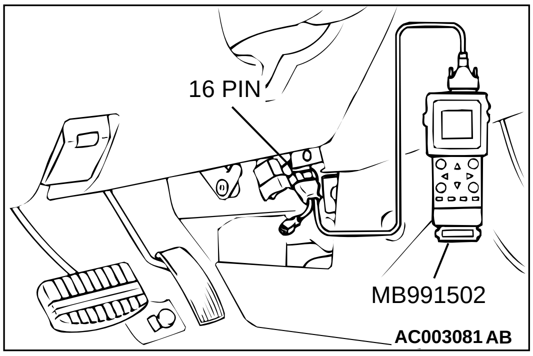
YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 2.

STEP 2. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Go to Step 3.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 3. Using scan tool MB991502, check data list.

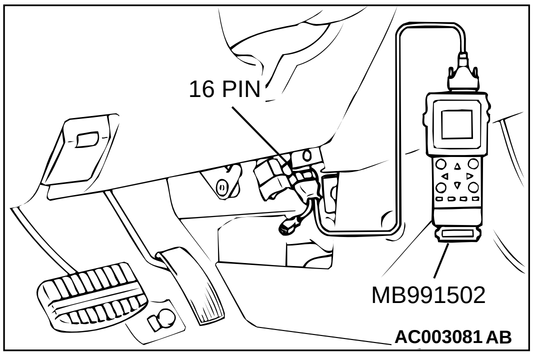


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 21: Engine Coolant Temperature Sensor.
  b. Item 13: Intake Air Temperature Sensor.
  c. Item 25: Barometric pressure Sensor.
  d. Item 59: Heated Oxygen Sensor (rear)
  e. Item 11: Heated Oxygen Sensor (front)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.

(2) Check the following items of the data list. Refer to, Data List Reference Table(P.13A-405).

a. Item 11: Heated Oxygen Sensor (front)

- Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while idling after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated. If not resolved, go to step 6.

NO : Go to Step 5.

STEP 5. Check the fuel pressure.

Refer to, Fuel Pressure Test(P.13A-439).

Q: Is the fuel pressure normal?

YES : Go to Step 6.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the following items.

(1) Check the following items, and repair or replace the defective items.

a. Check the injectors for fuel leakage.

b. Check the ignition coil, spark plugs, spark plug cables.

c. Check compression pressure.

d. Check the positive crank case ventilation system.

e. Check the evaporative emission control system.

f. Check the EGR system.

(2) Then check the malfunction symptom.

Q: Is the malfunction symptom is eliminated.

YES : The check is completed.

NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 23: Transient, Mass Emission Tailpipe Test Failure.

COMMENT

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system.
- Deteriorated catalyst.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust gas with the engine at normal operating temperature.

Q: After enough warm up, was the exhaust gas checked enough?

YES : Go to Step 2.
NO : Check it again after enough warm up.

STEP 2. Check the following items.

(1) Check the following items.
a. Check all vacuum hoses and connectors.
b. Check electrical wires and connectors for obvious problems.
c. Check the exhaust system for missing or damaged parts.

Q: Are they normal?

YES : Go to Step 3.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

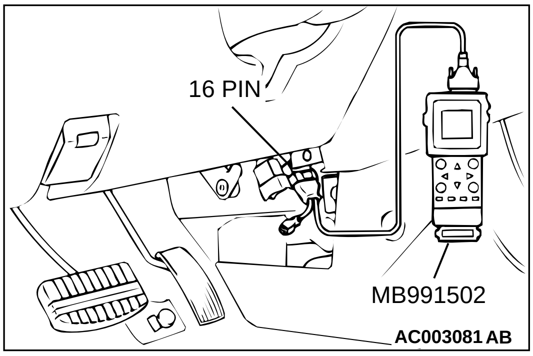
STEP 3. Check the drive ability.

(1) Check if the malfunction symptom described on the symptom chart is occurring.

Q: Is the drive – ability normal?

YES : Go to Step 4.
NO : Refer to, Trouble Symptom Chart(P.13A-22).

STEP 4. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart(P.13A-20).
NO : Go to Step 5.

STEP 5. Check the ignition timing.

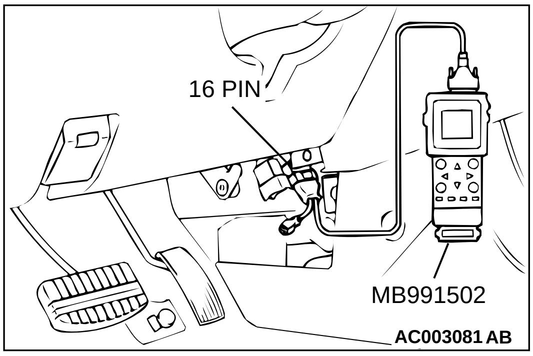
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check (P.11A-6).

Q: Is the ignition timing normal?

YES : Go to Step 6.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 6. Using scan tool MB991502, check data list.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

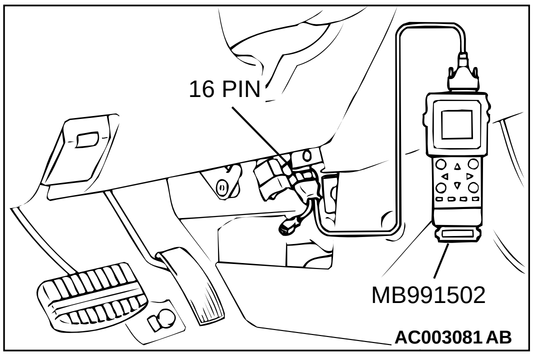
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table(P.13A-405).
  a. Item 21: Engine Coolant Temperature Sensor.
  b. Item 13: Intake Air Temperature Sensor.
  c. Item 25: Barometric pressure Sensor.
  d. Item 59: Heated Oxygen Sensor (rear)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 7.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991502, check data list item 11: heated oxygen sensor (front).

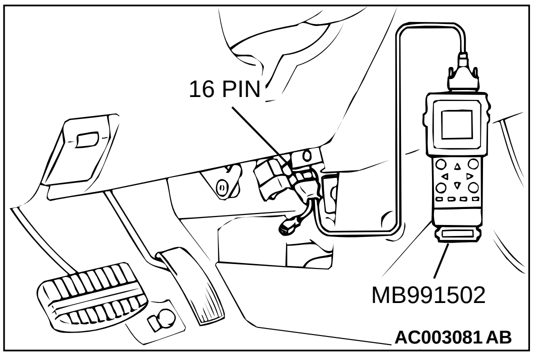


(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is decelerated suddenly from 4000 r/min, the output voltage should increase from 200 mV or less to 600 – 1000 mV in a few seconds.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.

NO : Refer to, DTC P0130 – Oxygen Sensor Circuit Malfunction (sensor 1)(P.13A-105), DTC P0133 – Oxygen Sensor Circuit Slow Response (sensor 1)(P.13A-113).



STEP 8. Using scan tool MB991502, check data list item 11: Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Voltage should fluctuate between 0 – 0.4 volts and 0.6 - 1.0 volts while after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 9.
NO : Go to Step 11.

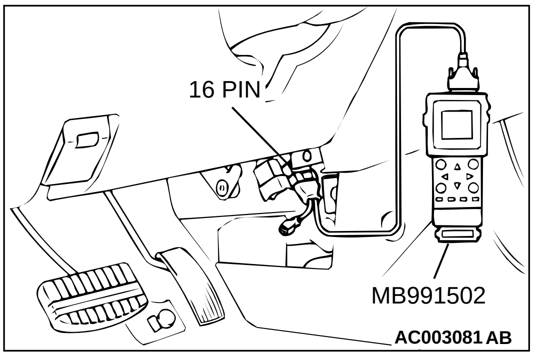
STEP 9. Check the EGR system.

Refer to GROUP 17, Emission Control System – EGR System Check (P.17-91).

Q: Is the EGR system normal?

YES : Go to Step 10.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 10. Using scan tool MB991502, check data list item 59: Heated oxygen sensor (rear).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Average voltage should be 0.6 volts or less, when idling.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 12.
NO : Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test (P.13A-439).

Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the following items.

(1) Check the following items, and repair or replace the defective items.

a. Check the injectors for fuel leakage.
b. Check the ignition coil, spark plugs, spark plug cables.
c. Check compression pressure.
d. Check the positive crankcase ventilation system.
e. Check the evaporative emission control system.

(2) Then check the malfunction symptom.

Q: Is the malfunction symptom eliminated?

YES : The check is completed.
NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 24: Purge Flow Test of the Evaporative Emission Canister Failure.

COMMENT

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

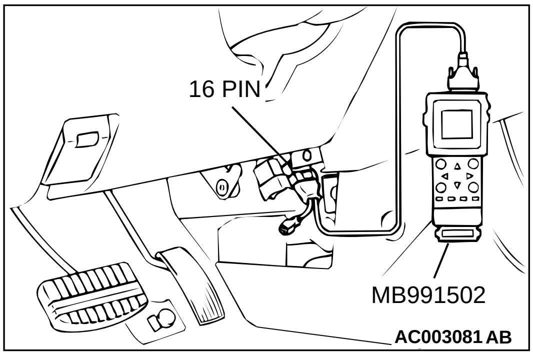
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart (P.13A-20).
NO : Refer to GROUP 17, Emission Control System-Purge Control System Check (Purge Flow Check) (P.17-85).

INSPECTION PROCEDURE 25: Pressure Test of the Evaporative System Failure.

COMMENT

- The test fails if there is a leak from the fuel tank or vapor line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Loose fuel tank filler tube cap.

- Broken seal in fuel tank, vapor line evaporative emission canister.

DIAGNOSIS

STEP 1. Check the evaporative emission purge solenoid

Refer to GROUP 17, Emission Control System – Evaporative Emission Purge Solenoid Check(P.17-86).

Q: Is the evaporative emission purge solenoid normal?

YES : Go to Step 2.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the evaporative emission ventilation solenoid.

Refer to GROUP 17, Emission Control System – Evaporative Emission Ventilation Solenoid Check (P.17-88).

Q: Is the evaporative emission ventilation solenoid normal?

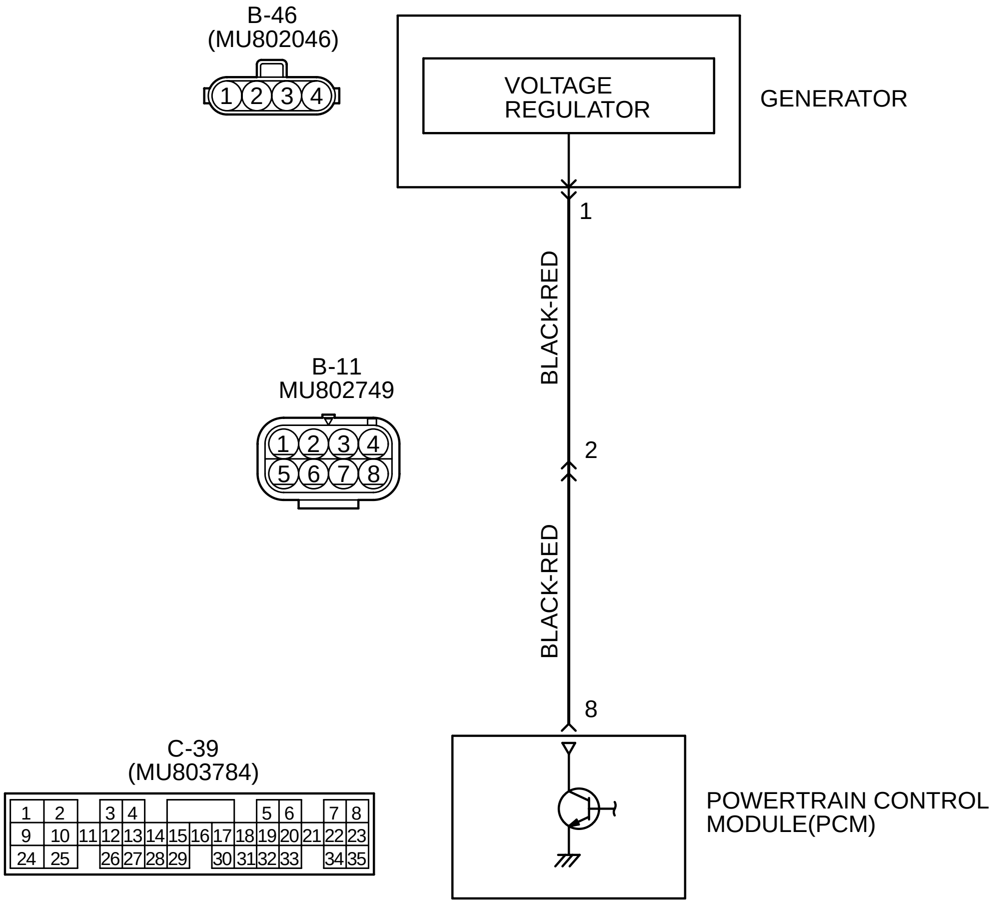
YES : Check the following items, and repair or replace the defective items.

a. Check for leaks from the vapor line or evaporative emission canister.
b. Check for leaks from the fuel tank.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 26: Generator output voltage is low (approximately 12.3 volts)



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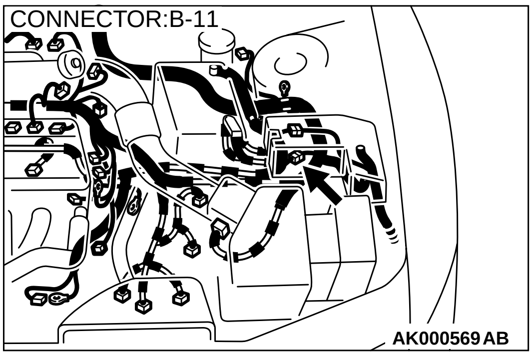
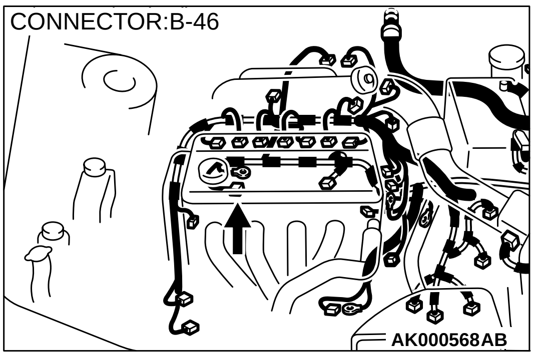
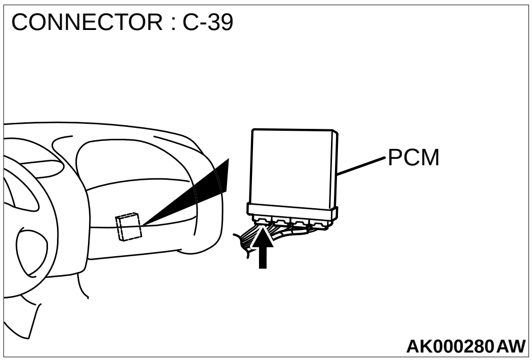






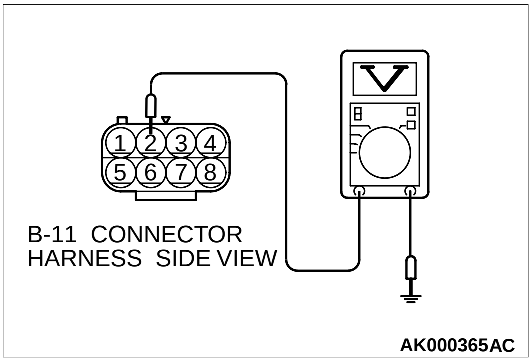
CIRCUIT OPERATION

- The PCM controls generator out put current by duty-controlling continuity between the generator G terminal (terminal 1) and ground.

TROUBLESHOOTING HINTS (The most likely causes for this charging system:)

- Malfunction of the charging system.
- Short circuit in harness between generator G terminal and PCM.
- PCM failed.

DIAGNOSIS



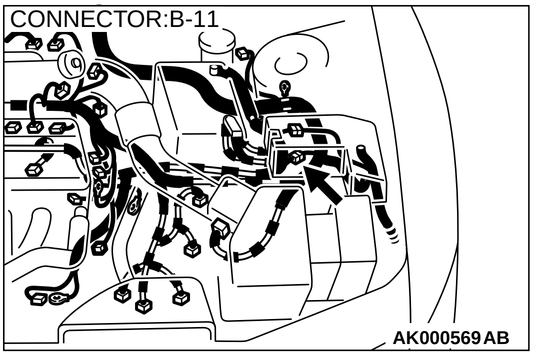
STEP 1. Check the voltage at generator intermediate connector B-11 by backprobing

(1) Do not disconnect the connector B-11.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 2 and ground by backprobing.
   a. Engine: warming up
   b. Radiator fan: stopped
   c. Headlight switch: OFF to ON
   d. Rear defogger switch: OFF to ON
   e. Stoplight switch: OFF to ON
   - Voltage rises by 0.2-3.5 volts.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

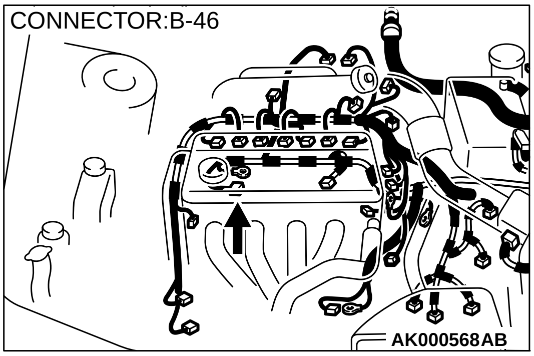
YES : Replace the generator. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 2.



STEP 2. Check connector B-11 at generator intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.

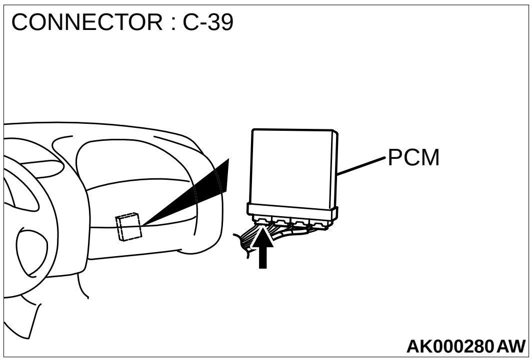


STEP 3. Check connector B-46 at generator connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.

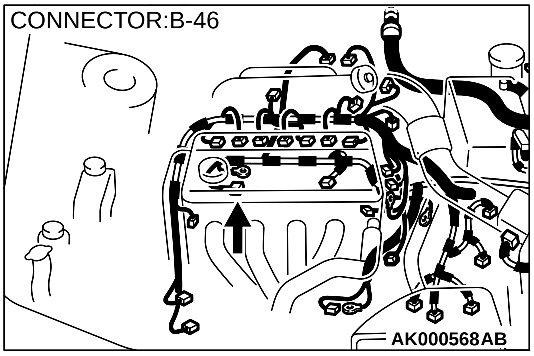


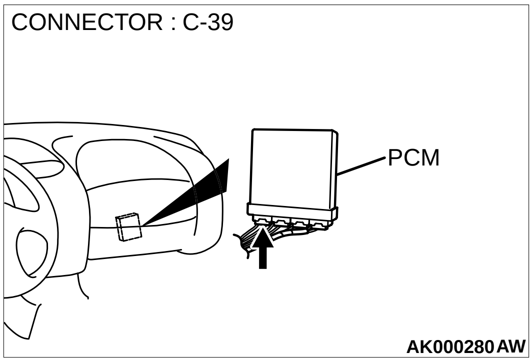
STEP 4. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





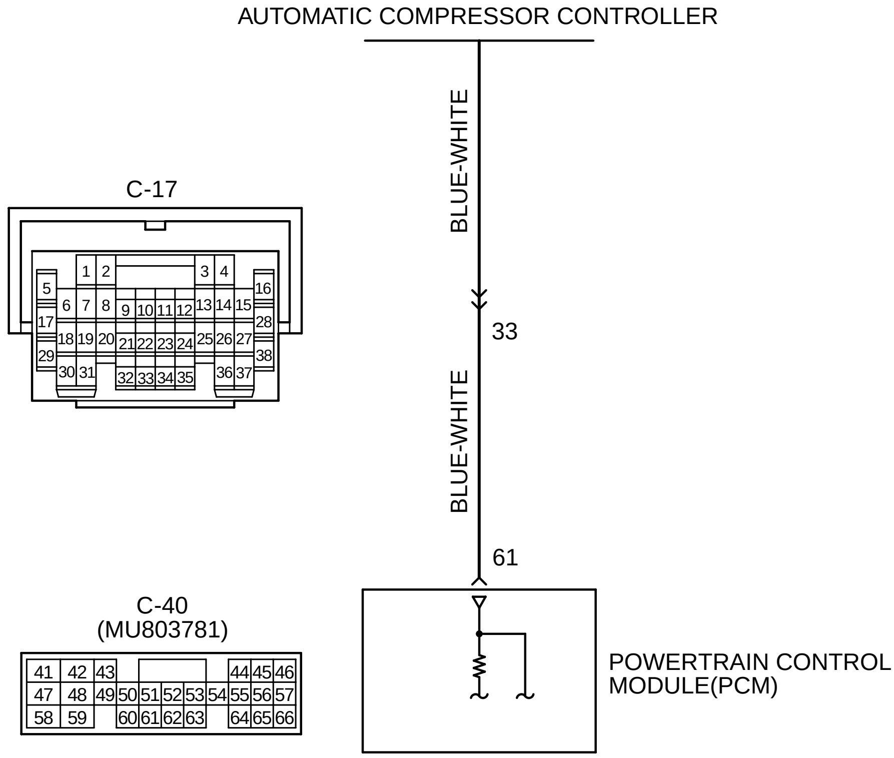
STEP 5. Check for open circuit and short circuit to ground and harness damage between generator connector B-46 terminal 1 and PCM connector C-39 terminal 8.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 27: Incorrect Idle Speed When the A/C is Operating (A/C Switch 2 Signal)



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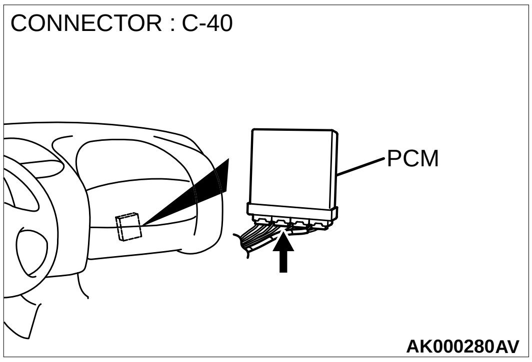

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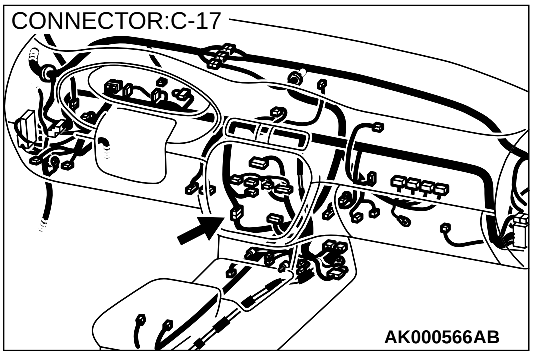

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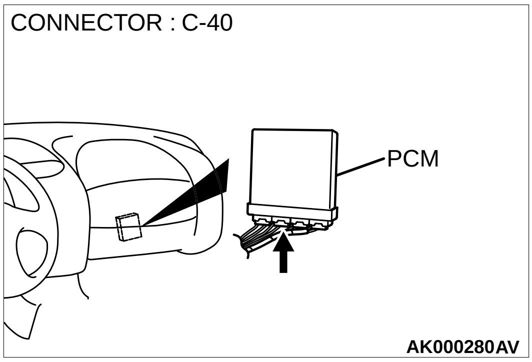
CIRCUIT OPERATION

- The PCM increases the engine idle speed by driving the IAC motor when the automatic compressor-ECU sends a "A/C on" signal to the module.
- The automatic compressor-ECU detects how the air conditioning is applying load to the engine, and converts the information to a voltage signal (High voltage=low load, Low voltage=high load). This voltage signal is called "A/C switch 2 signal." The PCM receives this A/C switch 2 signal from the automatic compressor controller through terminal 61, and determines the idle-up speed according to the high or low air conditioning load.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the A/C control system.
- Open or shorted circuit, or improper connector contact.
- PCM failed.

DIAGNOSIS

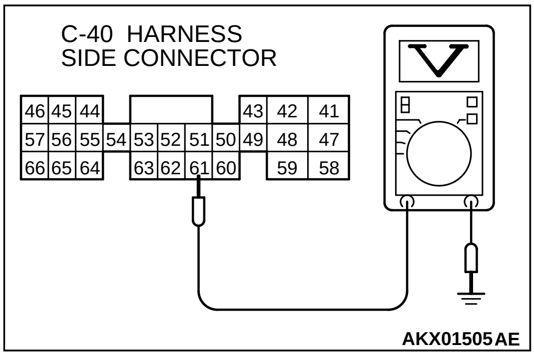


STEP 1. Check connector C-40 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the output voltage at PCM harness side connector C-40.

(1) Disconnect the connector C-40 and measure at the harness side.
(2) Start the engine and run at idle.
(3) Turn the A/C switch "ON".
(4) Measure the voltage between terminal 61 and ground.
- If atmospheric air temperature is 15 ° C (59° F) or less, the voltage should be 1 volt or less.
- If atmospheric air temperature is 18° C (65.4° F) more, the voltage should be battery positive voltage.

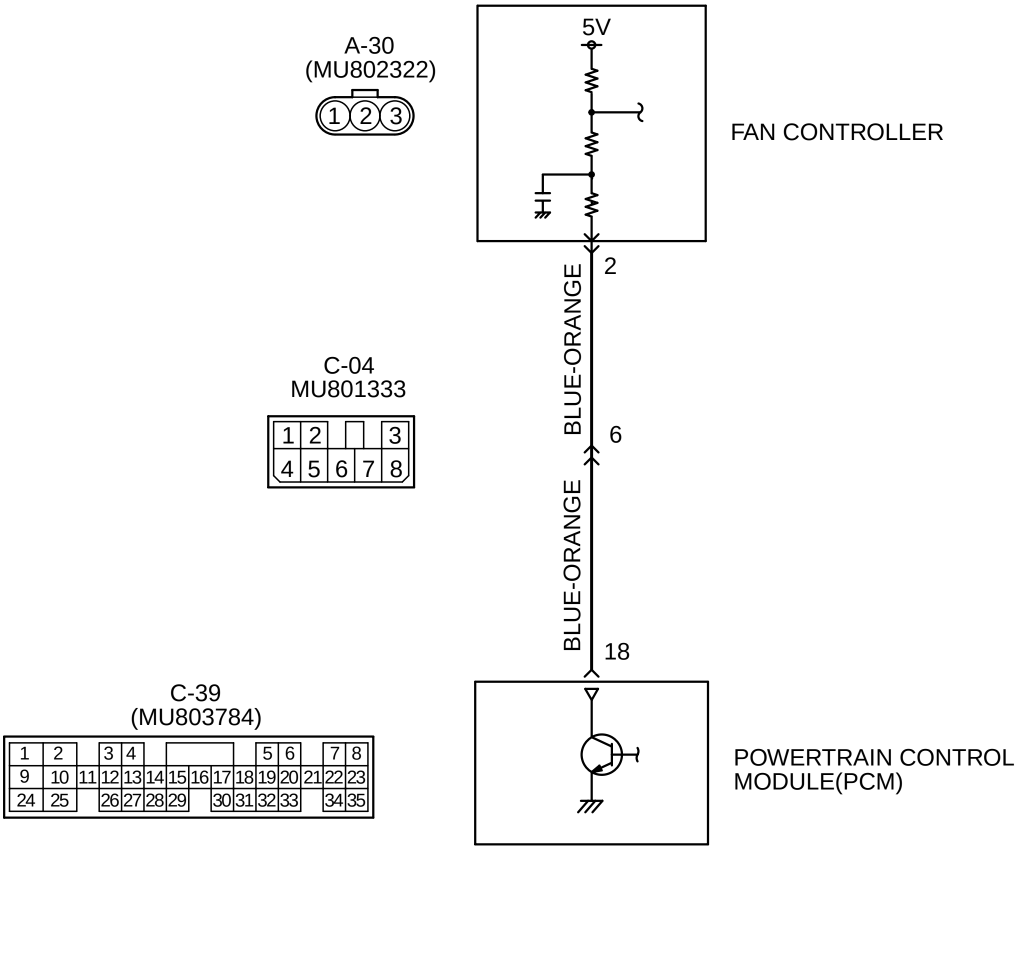
(5) Turn the A/C switch "OFF".
(6) Turn the ignition switch to the "LOCK" (OFF) position.

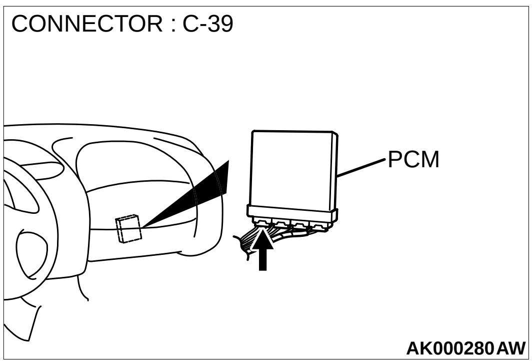
Q: Is the voltage normal?

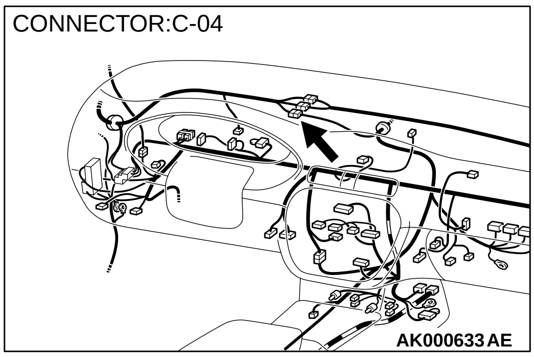
YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

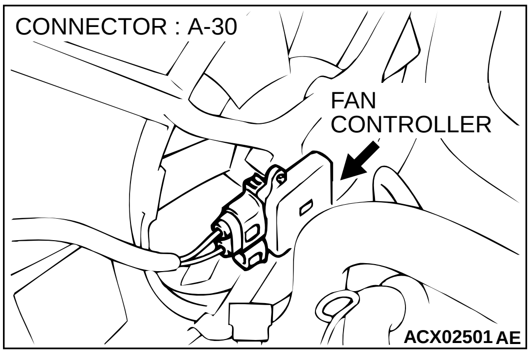
NO : Refer to GROUP 55, Introduction To Heater, Air Conditioning And Ventilation Diagnosis(P.55-4).

INSPECTION PROCEDURE 28: Fans (radlator fan) is inoperative









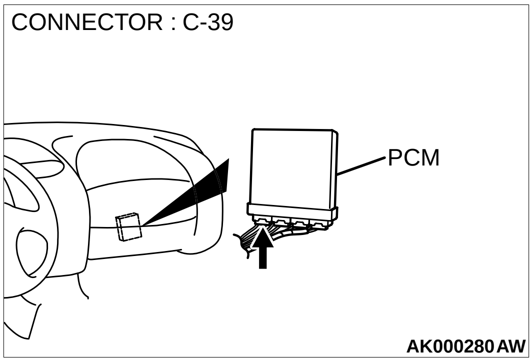
CIRCUIT OPERATION

- The PCM sends a duty signal to the fan controller according to engine coolant temperature, vehicle speed, and the condition of the A/C switch. (The closer the average voltage at the terminal comes to five volts, the higher the fan speed becomes).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the fan motor relay.
- Malfunction of the fan motor.
- Malfunction of the fan controller.
- Improper connector contact, open or short-circuited harness wire.
- PCM failed.

DIAGNOSIS

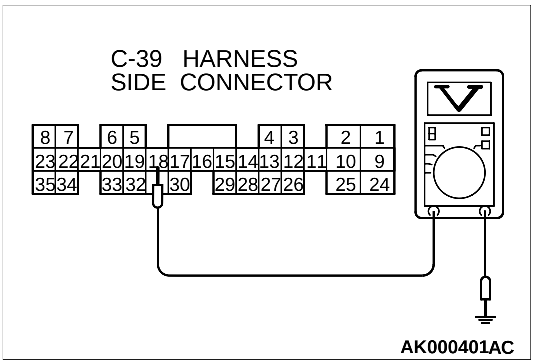


STEP 1. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the output voltage at PCM harness side connector C-39.

(1) Disconnect the C-39 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 18 and ground.
- Voltage should be between 4.8 and 5.2 volts. (Fan rotates at high speed.)

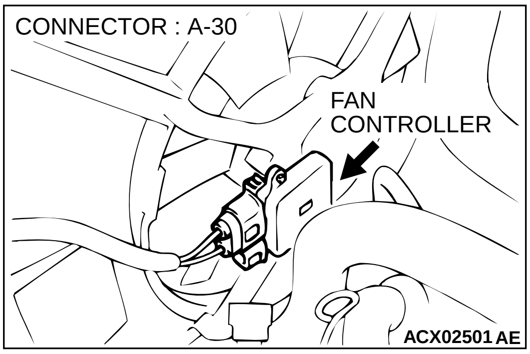
(4) Connect a jumper cable between terminal 18 and ground.
- The fan should stop.

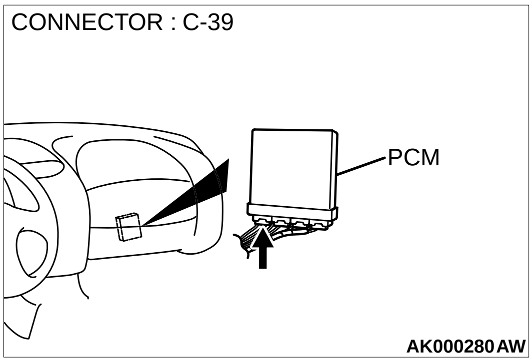
(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage and fan condition normal?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 3.





STEP 3. Check for open circuit and short circuit to ground and harness damage between fan controller A-30 terminal 2 and PCM connector C-39 terminal 18.

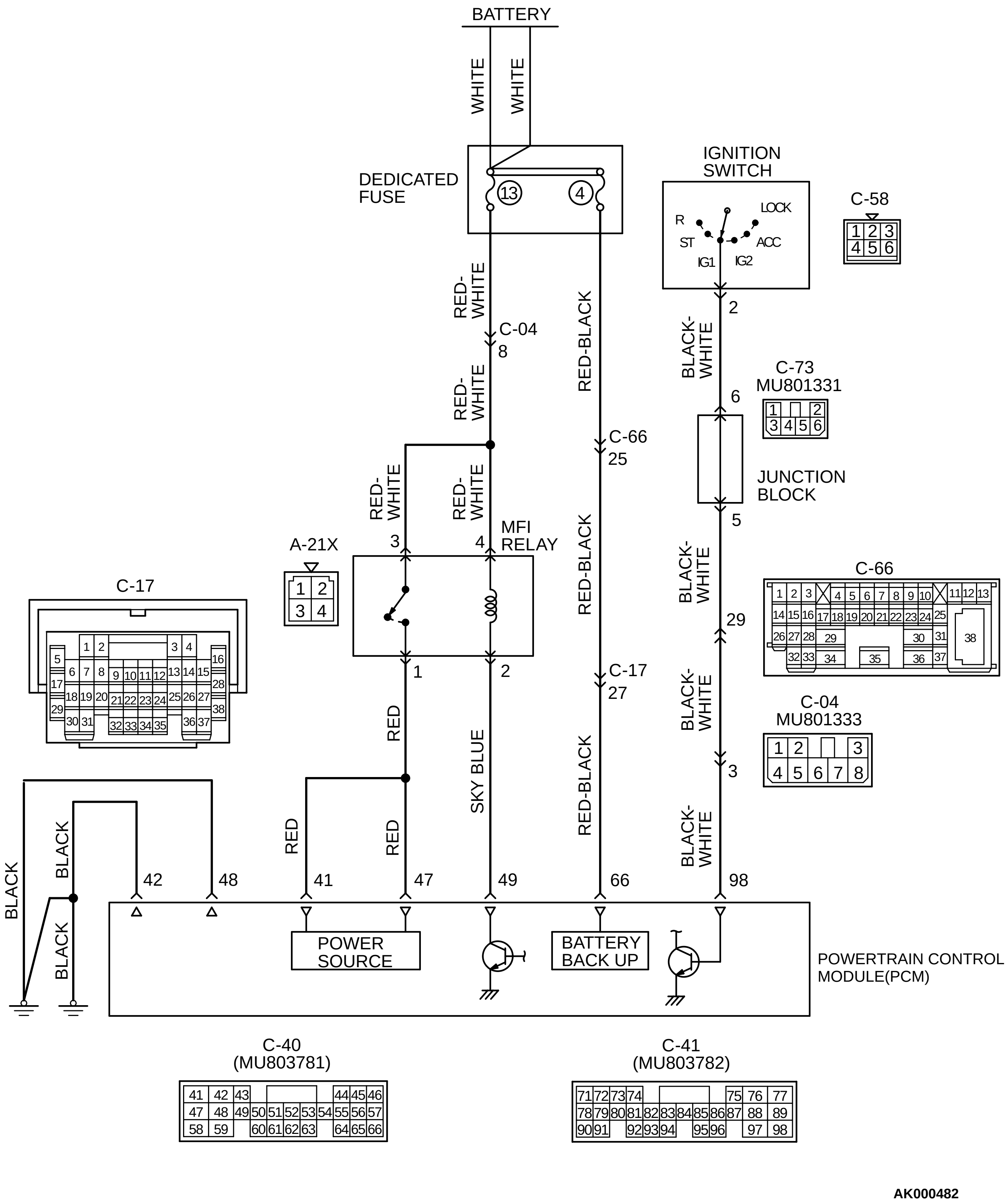
NOTE: Check harness after checking intermediate connector C-04. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.

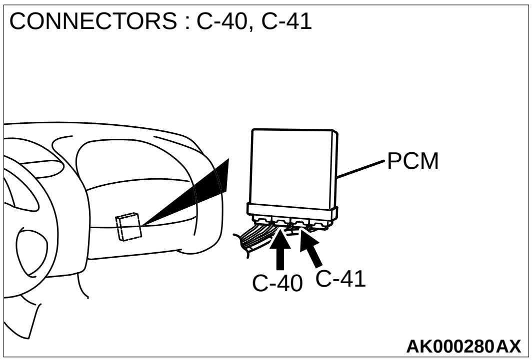
Q: Is the harness wire in good condition?

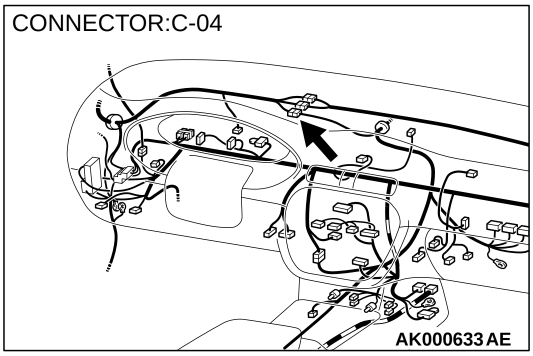
YES : Refer to GROUP 14-Engine Cooling Diagnosis-Symptom Chart(P.14-3).

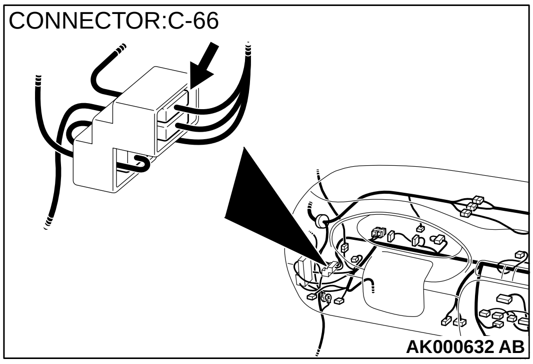
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

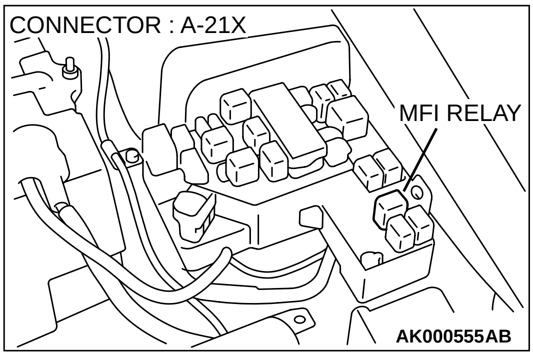
INSPECTION PROCEDURE 29: Power supply system and ignition switch-IG system.

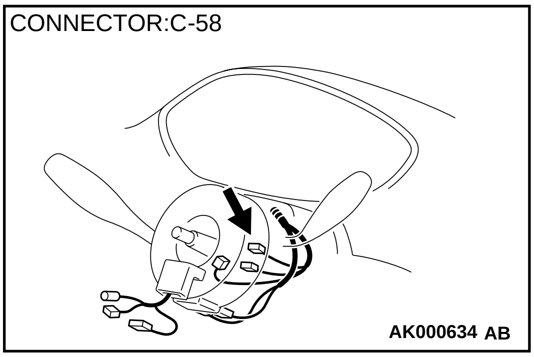


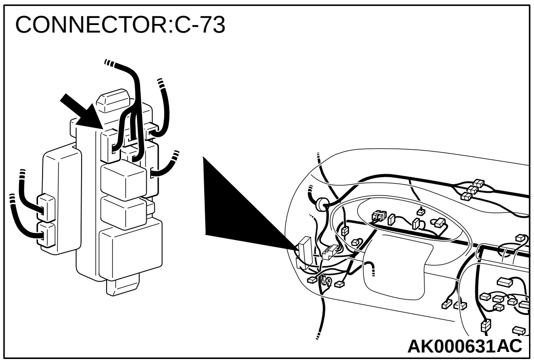


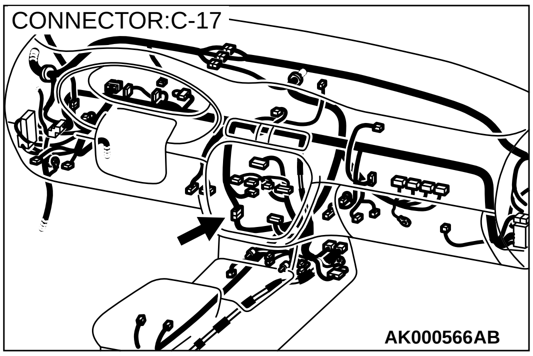












CIRCUIT OPERATION

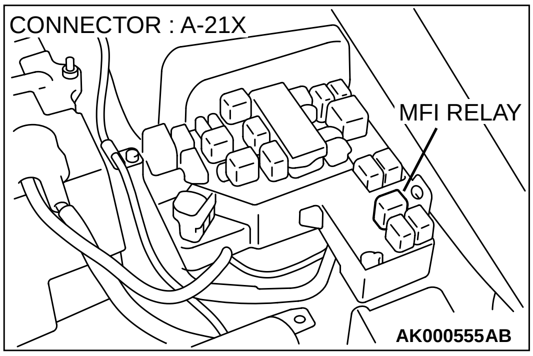
- Battery positive voltage is applied to the MFI relay (terminals 3, 4).
- When the ignition switch is turned to the "ON" position, The battery positive voltage is applied to the PCM (terminal 98). When the battery positive voltage is applied, the PCM turns the power transistor in the PCM "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" and the battery positive voltage is supplied to the PCM (terminal 41, 47) from the MFI relay (terminal 1).

- A battery positive voltage is constantly supplied to the PCM (terminal 66) as the backup power.
- The PCM (terminals 42, 48) is grounded to the vehicle body.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the MFI relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Disconnected PCM ground wire.
- Malfunction of the PCM.

DIAGNOSIS

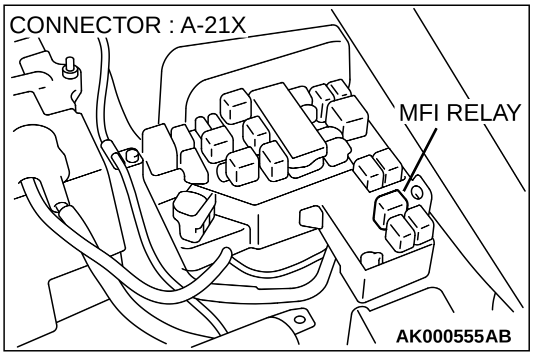


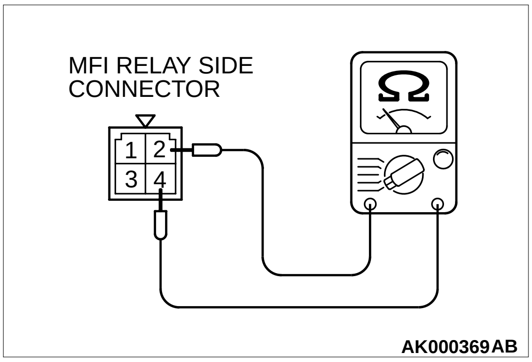
STEP 1. Check connector A-21X at MFI relay for damage.

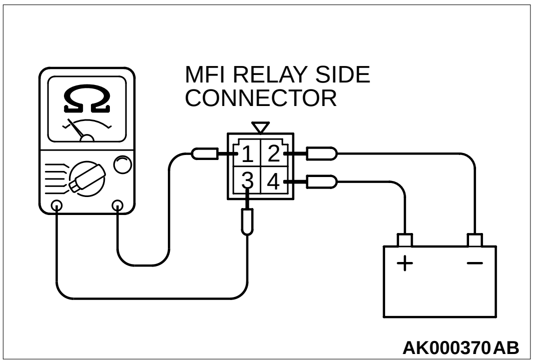
Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.







STEP 2. Check the MFI relay

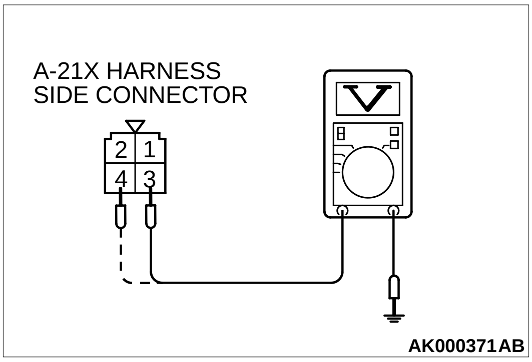
(1) Remove the MFI relay.
(2) Check for continuity between the MFI relay terminals 2 and 4.
- There should be continuity (approximately 70Ω)

(3) Use jumper wires to connect MFI relay terminal 4 to the positive battery terminal and terminal 2 to the negative battery terminal.
(4) Check the continuity between the MFI relay terminals 1 and 3 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohm.(Negative battery terminal connected)
- Should be open loop.(Negative battery terminal disconnected)

(5) Install the MFI relay.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.

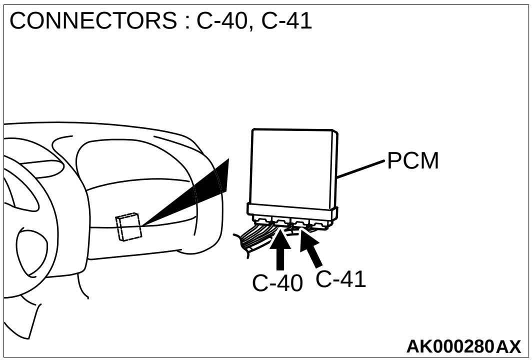


STEP 3. Check the power supply voltage at MFI relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Measure the voltage between terminal 3, 4 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Check harness connector C-04 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connector is in good condition, repair harness wire between fusible link (13) and MFI relay connector A-21X terminal 3, 4 because of open circuit. Then confirm that the malfunction symptom is eliminated.

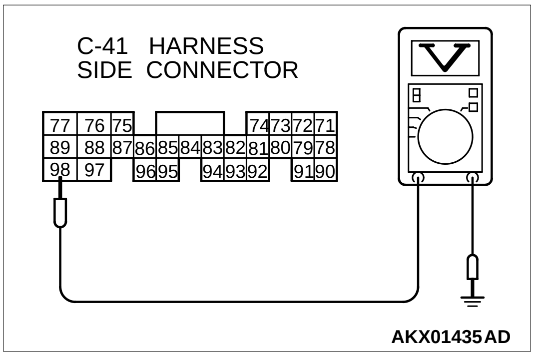


STEP 4. Check connector C-40 and C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the ignition switch-IG signal voltage at PCM harness side connector C-41.

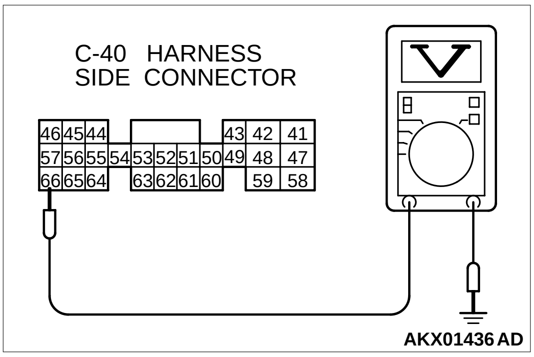
(1) Disconnect the connector C-41 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 98 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Check harness connector C-04, C-66 and C-73 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-58 terminal 2 and PCM connector C-41 terminal 98 because of open circuit. Then confirm that the malfunction symptom is eliminated.



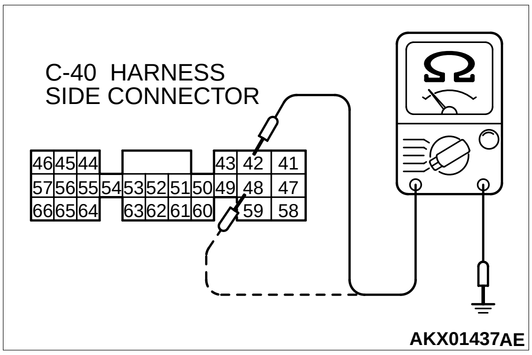
STEP 6. Check the backup power supply voltage at PCM harness side connector C-40.

(1) Disconnect the connector C-40 and measure at the harness side.
(2) Measure the voltage between terminal 66 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 7.

NO : Check harness connector C-17 and C-66 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors are in good condition, repair harness wire between fusible link (4) and PCM connector C-40 terminal 66 because of open circuit. Then confirm that the malfunction symptom is eliminated.

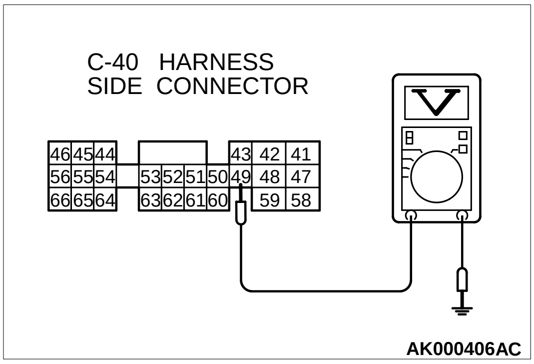


STEP 7. Check the continuity at PCM harness side connector C-40.

(1) Disconnect the connector C-40 and measure at the harness side.
(2) Check for the continuity between terminal (42, 48) and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 8.
NO : Repair harness wire between PCM connector C-40 terminal (42, 48) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.

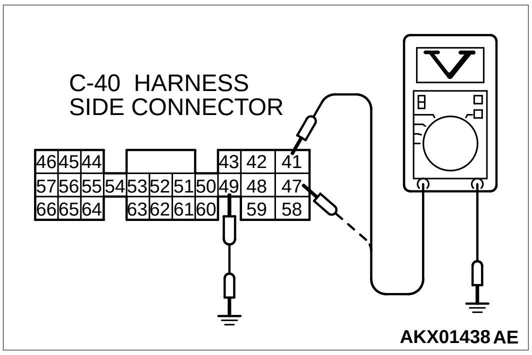


STEP 8. Check the power supply voltage at PCM harness side connector C-40.

(1) Disconnect the connector C-40 and measure at the harness side.
(2) Measure the voltage between terminal 49 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Repair harness wire between MFI relay connector A-21X terminal 2 and PCM connector C-40 terminal 49 because of open circuit. Then confirm that the malfunction symptom is eliminated.



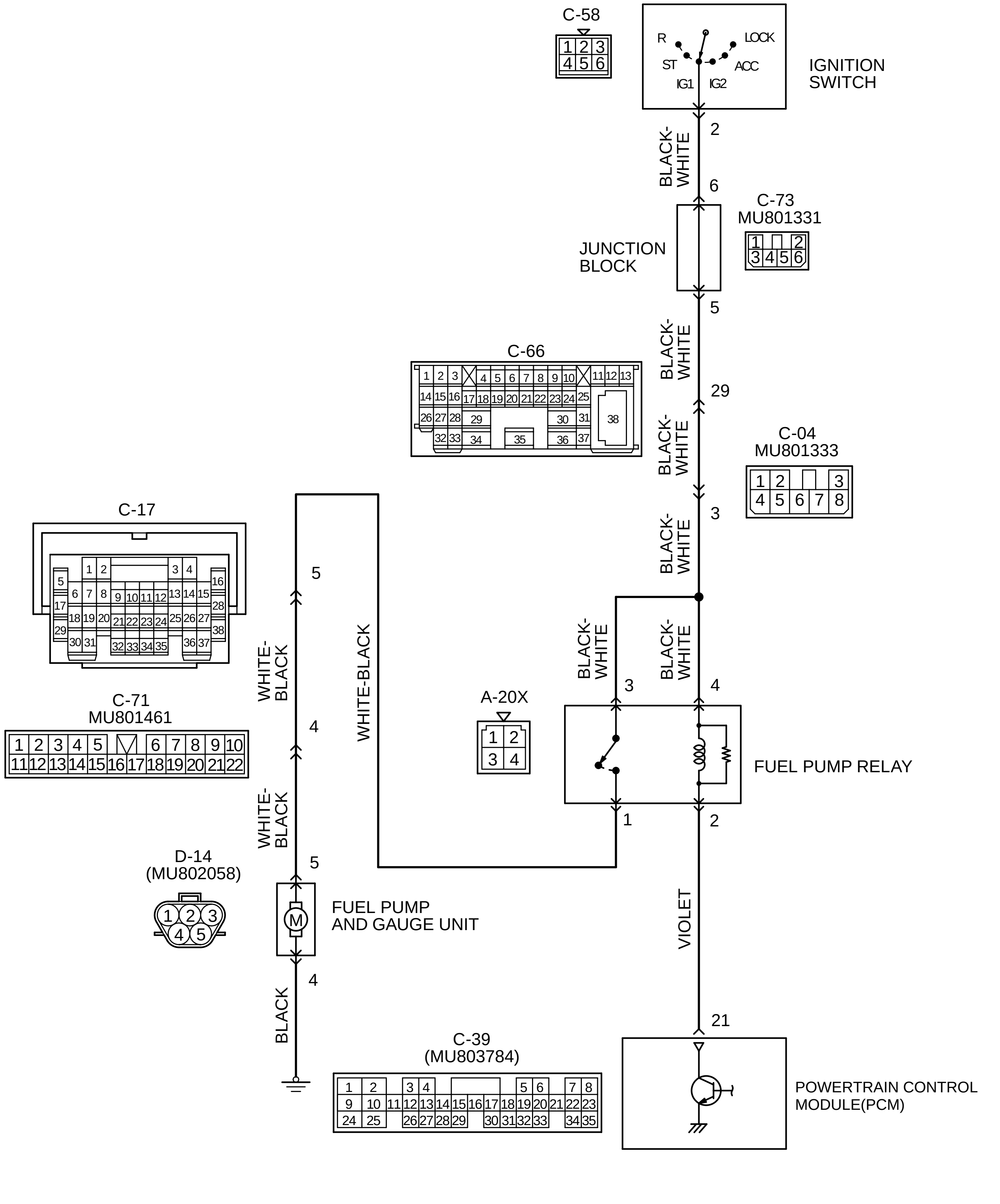
STEP 9. Check the power supply voltage at PCM harness side connector C-40.

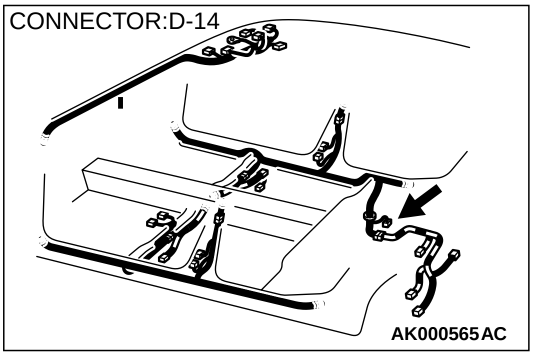
(1) Disconnect the connector C-40 and measure at the harness side.
(2) Using a jumper wire, connect terminal 49 to ground.
(3) Measure the voltage between terminal (41, 47) and ground.
- Voltage should be battery positive voltage.

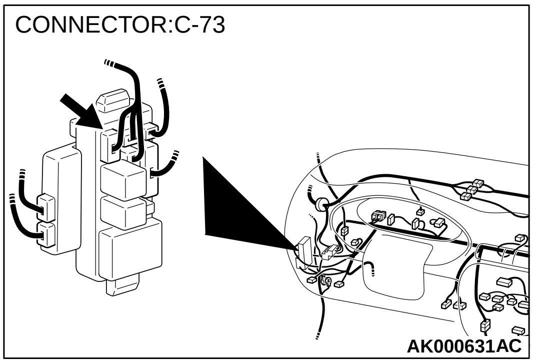
Q: Is the voltage normal?

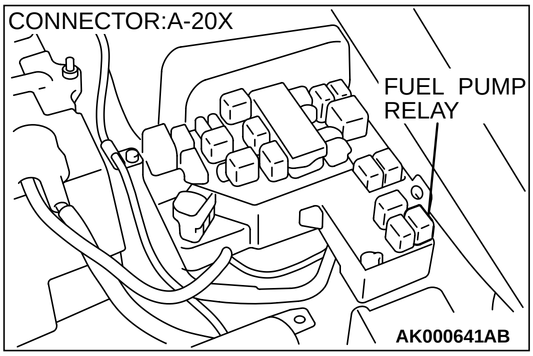
YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.
NO : Repair harness wire between MFI relay connector A-21X terminal 1 and PCM connector C-40 terminal (41, 47) because of open circuit. Then confirm that the malfunction symptom is eliminated.

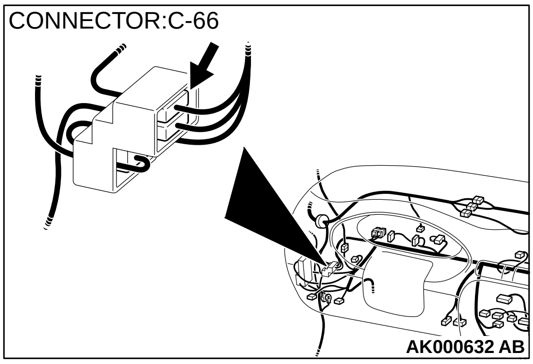
INSPECTION PROCEDURE 30: Fuel pump system.

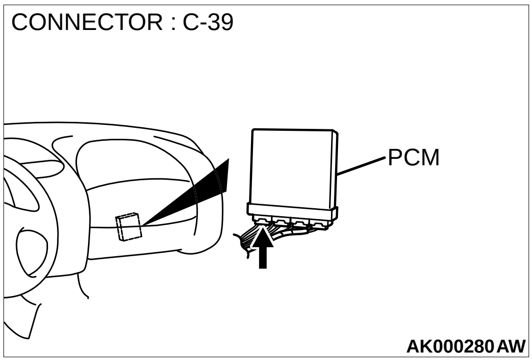


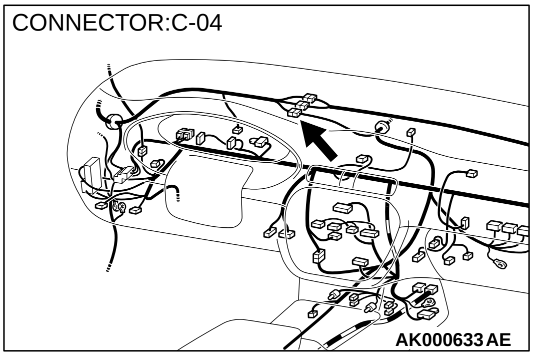

CONNECTOR:D-14
AK000565AC

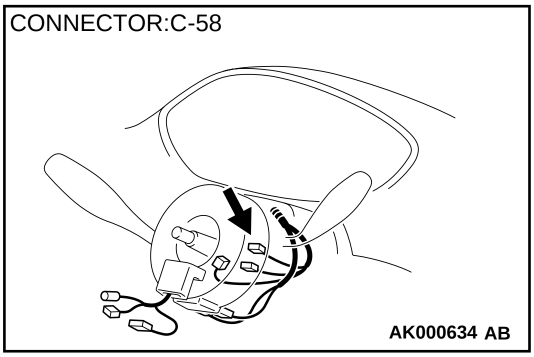

CONNECTOR:C-73
AK000631AC

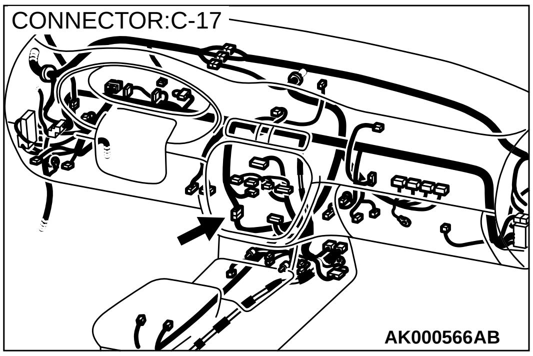

CONNECTOR:A-20X
FUEL PUMP
RELAY
AK000641AB

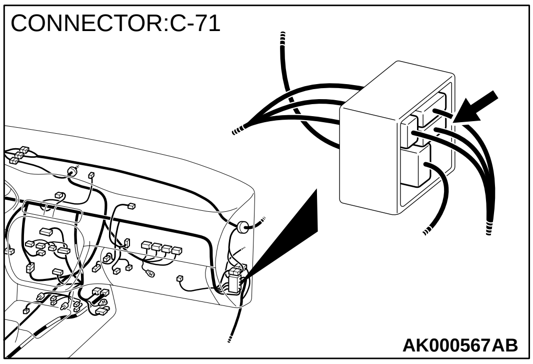

CONNECTOR:C-66
AK000632 AB


CONNECTOR : C-39
PCM
AK000280AW


CONNECTOR:C-04
AK000633AE


CONNECTOR:C-58
AK000634 AB


CONNECTOR:C-17
AK000566AB


CONNECTOR:C-71
AK000567AB

CIRCUIT OPERATION

- A battery positive voltage is applied on the fuel pump relay (terminal 3, 4) from the ignition switch-IG.
- During cranking and while the engine is running, the PCM turns the power transistor in the PCM ON to ground the fuel pump relay coil. With this, the fuel pump relay turns ON, and the battery positive voltage is supplied to the fuel pump from the fuel pump relay (terminal 1).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

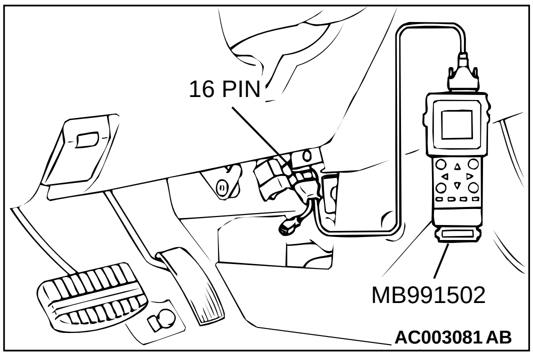
- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tool:

MB991502:Scan Tool (MUT- Ⅱ)

STEP 1. Using scan tool MB991502, check actuator test item 07: Fuel Pump.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

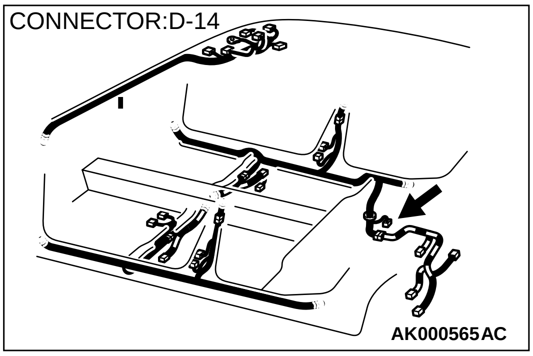
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 07, Fuel Pump.
- An operation sound of the fuel pump should be heard.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fuel pump operating properly?

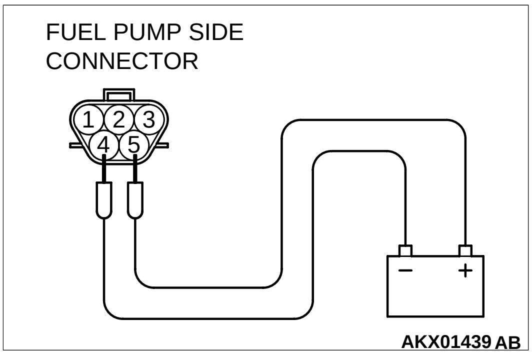
YES : That this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points (P.00-8).
NO : Go to Step 2.

STEP 2. Check connector D-14 at fuel pump for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.

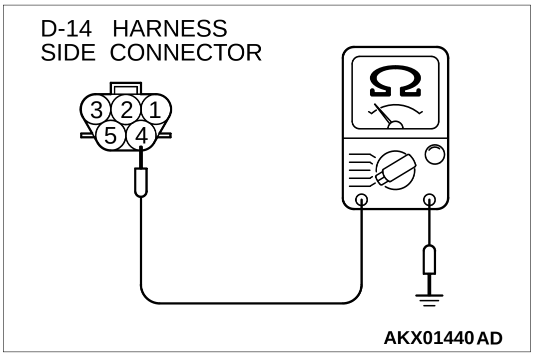


STEP 3 Check the fuel pump operation.

(1) Disconnect fuel pump connector D-14.
(2) Use jumper wires to connect fuel pump connector terminal 5 to the positive battery terminal and terminal 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 4.
NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.

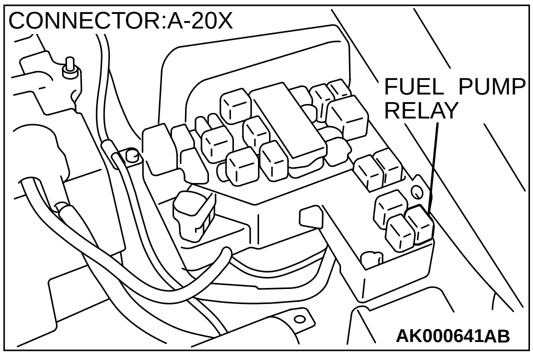


STEP 4. Check the continuity at fuel pump harness side connector D-14.

(1) Disconnect the connector D-14 and measure at the harness side.
(2) Check for the continuity between terminal 4 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

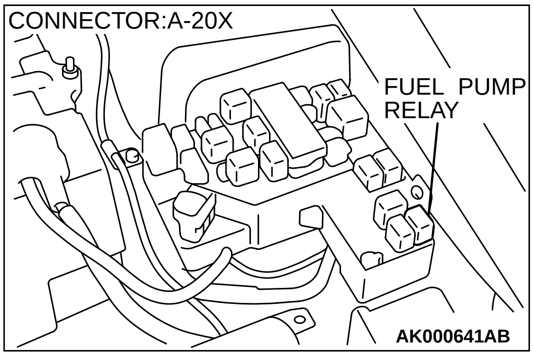
YES : Go to Step 5.
NO : Repair harness wire damage between fuel pump connector D-14 terminal 4 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

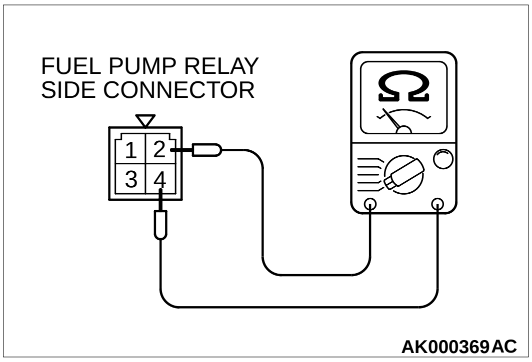


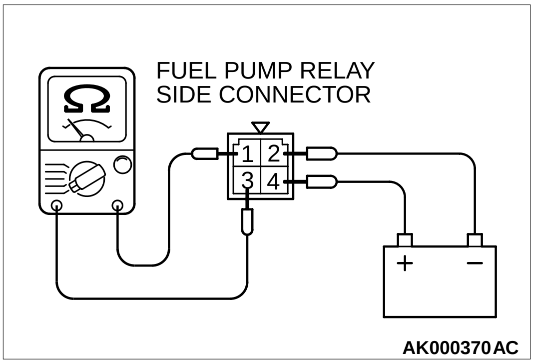
STEP 5. Check connector A-20X at fuel pump relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.







STEP 6. Check the fuel pump relay

(1) Remove the fuel pump relay.

(2) Check for continuity between the fuel pump relay terminals 2 and 4.

- There should be continuity (approximately 70 Ω)

(3) Use jumper wires to connect fuel pump relay terminal 4 to the positive battery terminal and terminal 2 to the negative battery terminal.

(4) Check the continuity between the fuel pump relay terminals 1 and 3 while connecting and disconnecting the jumper wire at the negative battery terminal.

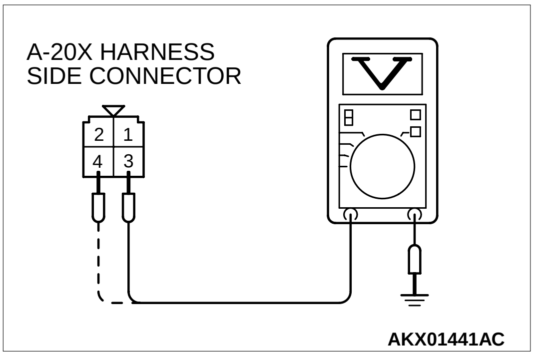
- Should be less than 2 ohm. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the fuel pump relay.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the fuel pump relay. Then confirm that the malfunction symptom is eliminated



STEP 7. Check the power supply voltage at fuel pump relay connector A-20X.

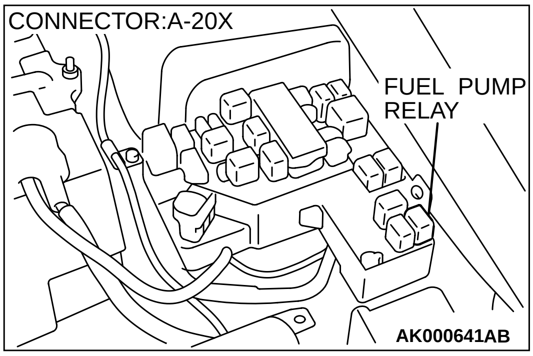
(1) Disconnect the connector A-20X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3, 4 and ground.
- Voltage should be battery positive voltage.

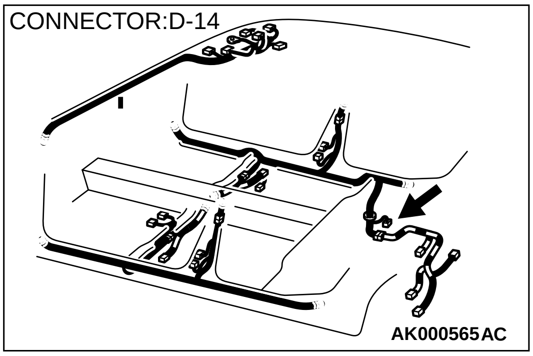
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Check harness connectors C-04, C-66 and C-73 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-58 terminal 2 and fuel pump relay connector A-20X terminal 3, 4 because of open circuit. Then confirm that the malfunction symptom is eliminated.





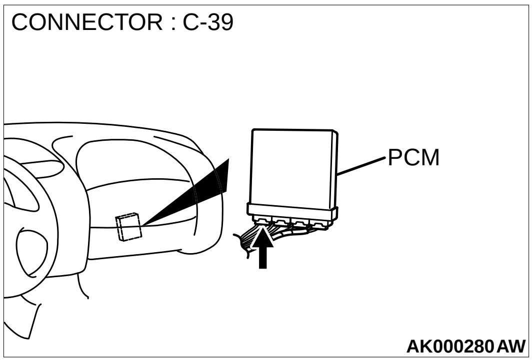
STEP 8. Check for open circuit and short circuit to ground and harness damage between fuel pump relay connector A-20X terminal 1 and fuel pump connector D-14 terminal 5.

NOTE: Check harness after checking intermediate connectors C-17 and C-71. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

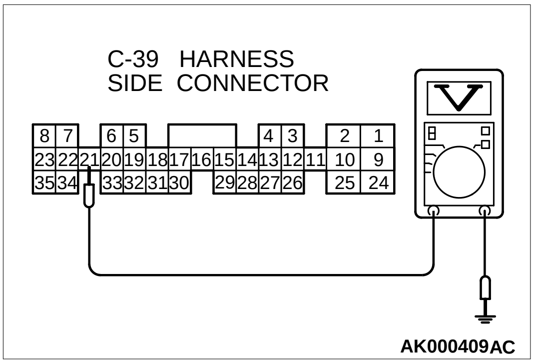


STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 10. Check the power supply voltage at PCM connector C-39.

(1) Disconnect the connector C-39 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 21 and ground.
- Voltage should be battery positive voltage.

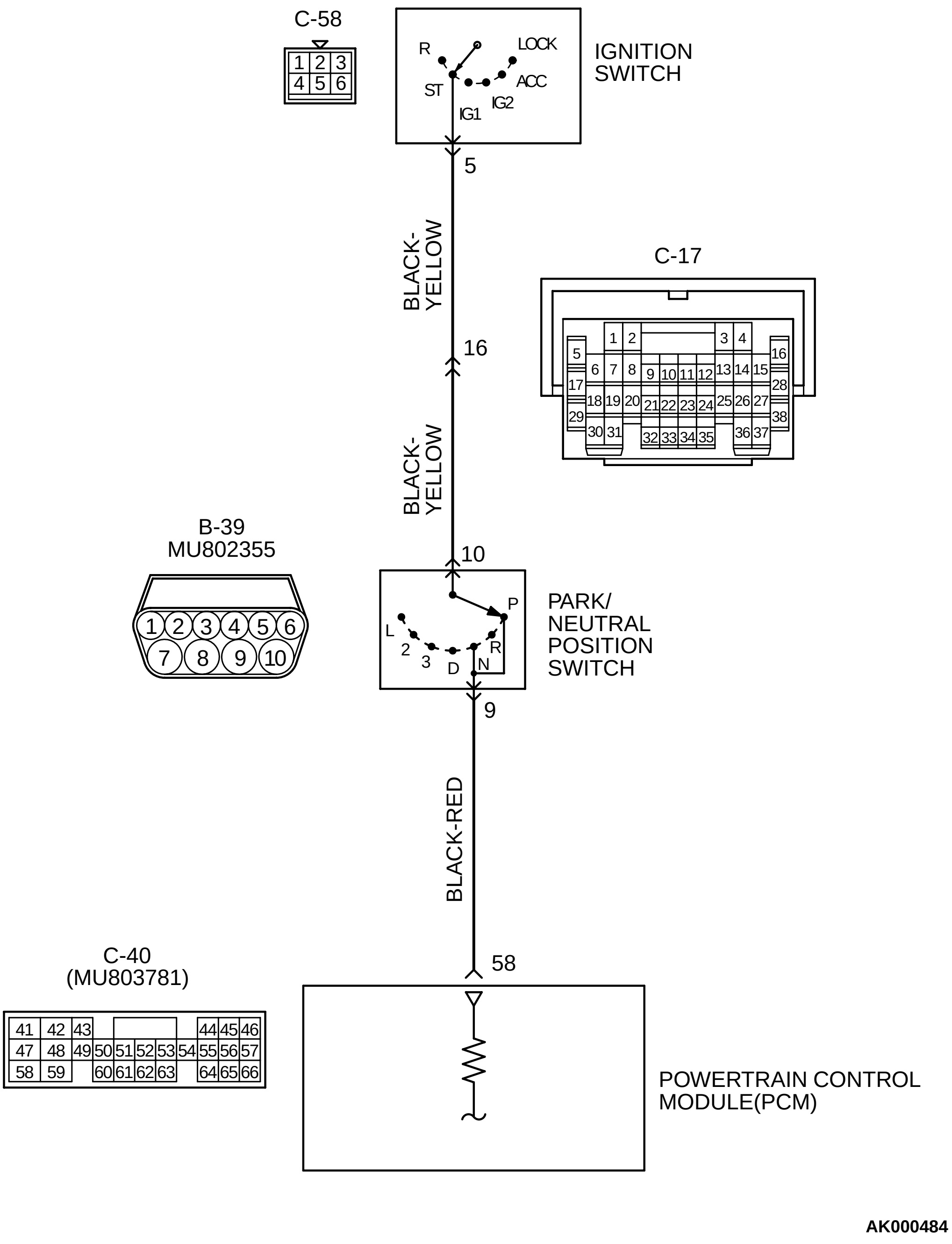
(4) Turn the ignition switch to the "LOCK" (OFF) position.

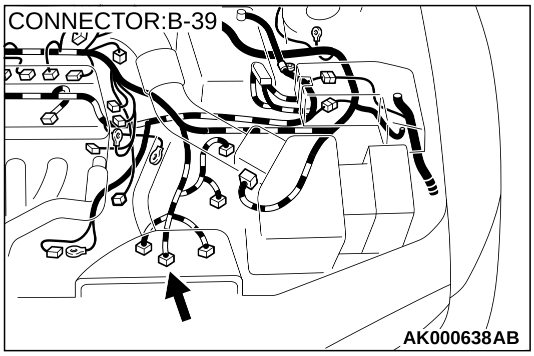
Q: Is the voltage normal?

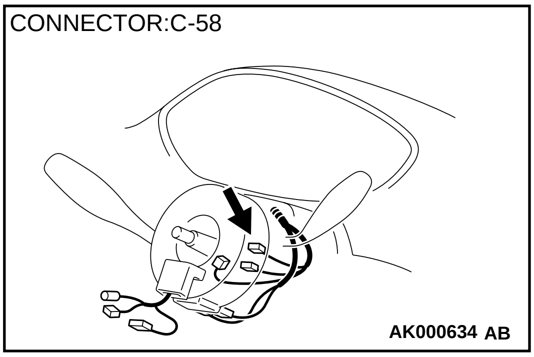
YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

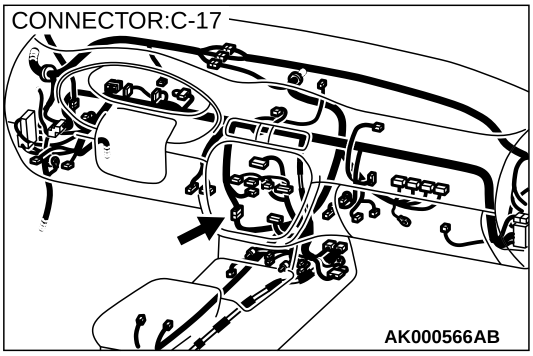
NO : Repair harness wire between fuel pump relay connector A-20X terminal 2 and PCM connector C-39 terminal 21because of open circuit. Then confirm that the malfunction symptom is eliminated.

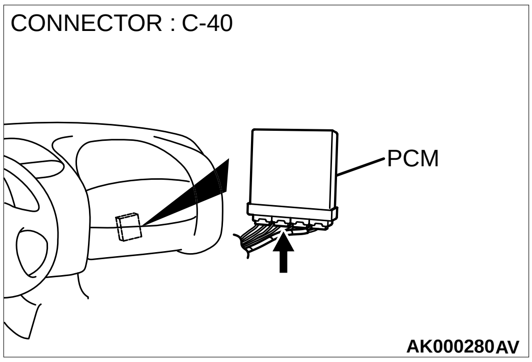
INSPECTION PROCEDURE 31: Ignition Switch-ST System and Park/Neutral Position Switch System.











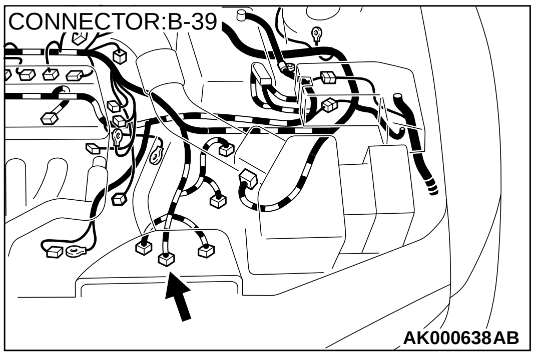
COMMENT

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to PCM (terminal 58) through the ignition switch and park/neutral position switch. Because of this, the PCM detects that the engine is cranking.
- The park/neutral position switch detects the selector lever position (P, N or other ranges) and converts it to a voltage signal (high or low). Then the park/neutral position switch sends that signal to the PCM.
  If the selector lever is moved to "P" or "N" range with the ignition switch turned on (except "START" position), continuity will exist between the PCM and ground through the park/neutral position switch and starter motor. The terminal voltage of the PCM will become low. If the selector lever is moved to the other ranges, continuity will be lost between the PCM and ground. The terminal voltage of the PCM will become high.

TROUBLESHOOTING HINTS (The most likely caused for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the park/neutral position switch.
- Improper connector contact, open circuit or short-circuit in the harness wire.
- Malfunction of the PCM.

DIAGNOSIS



STEP 1. Check connector B-39 at park/neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.

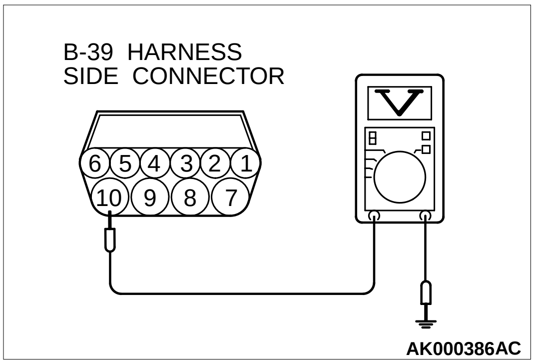
STEP 2. Check the park/neutral position switch.

Refer to GROUP 23A, On-vehicle Service – Essential Service – Park/neutral position switch continuity check(P.23A-278).

Q: Are there any abnormalities?

YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check the power supply voltage at park/neutral position switch connector B-39.

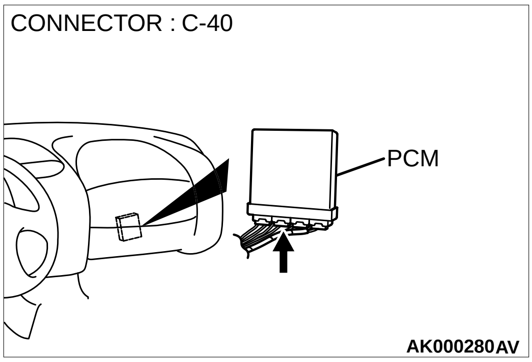
(1) Disconnect the connector B-39 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 10 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check connector C-17 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connector is in good condition, repair harness wire between ignition switch connector C-58 terminal 5 and park/neutral position switch connector B-39 terminal 10 because of open circuit. Then confirm that the malfunction symptom is eliminated.



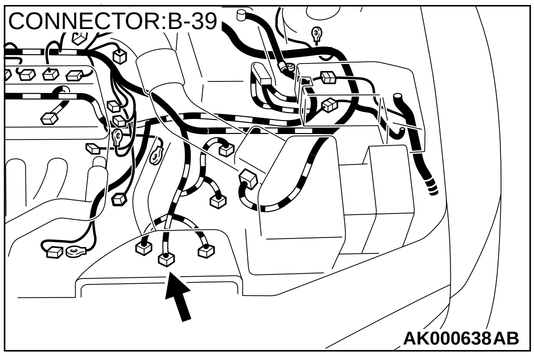
STEP 4. Check connector C-40 at PCM for damage.

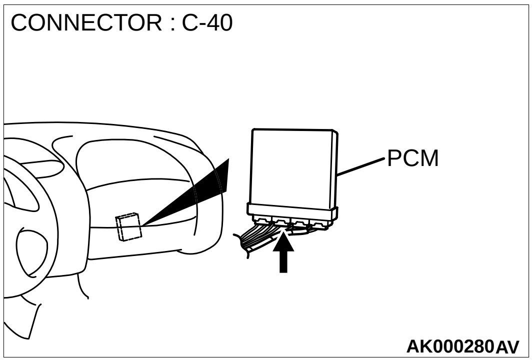
Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.

STEP 5. Check for open circuit and short circuit to ground and harness damage between park/neutral position switch connector B-39 terminal 9 and PCM connector C-40 terminal 58.



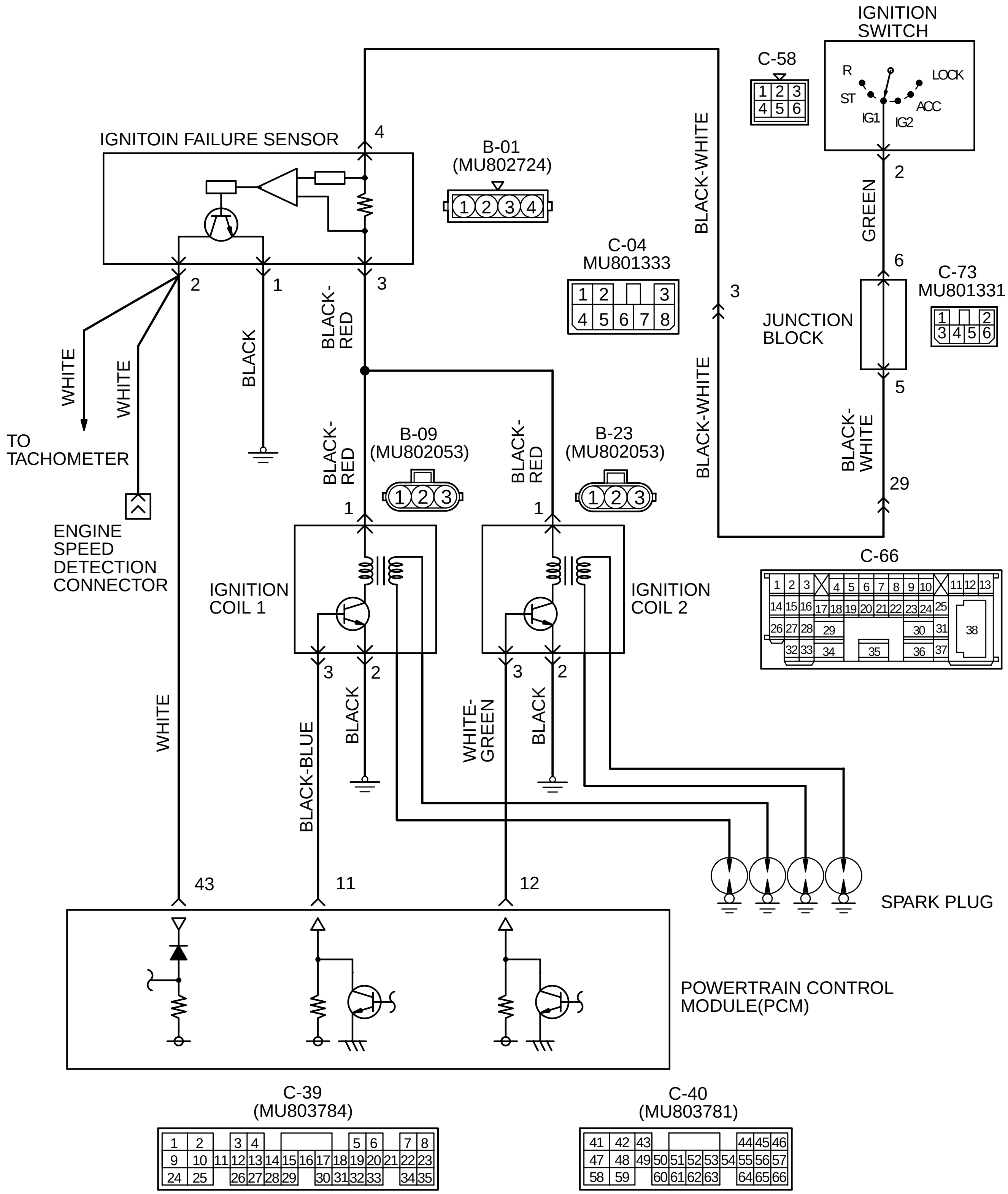


Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 32 : Ignition Circuit System



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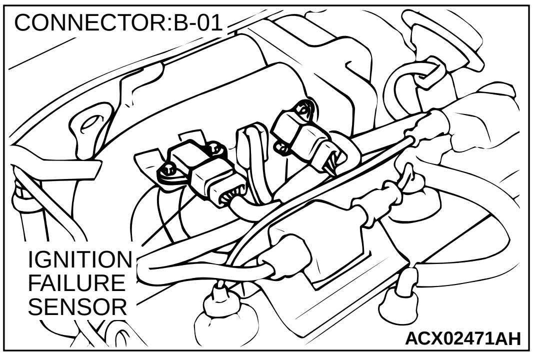
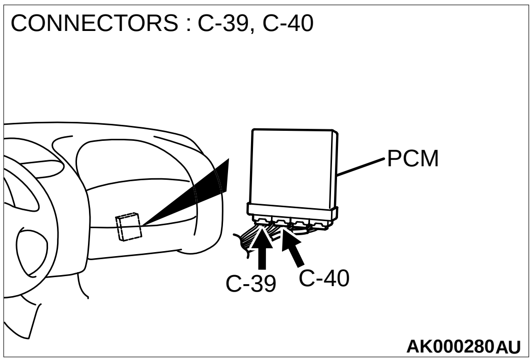
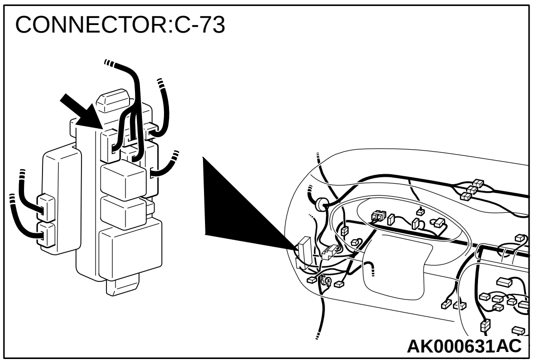
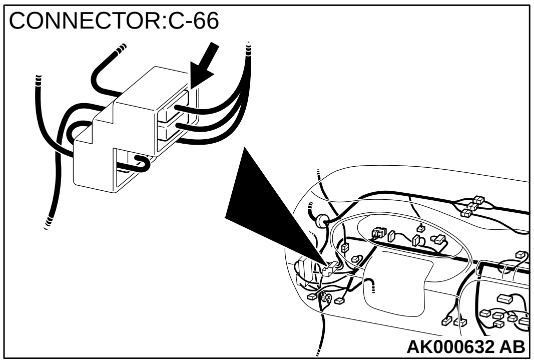
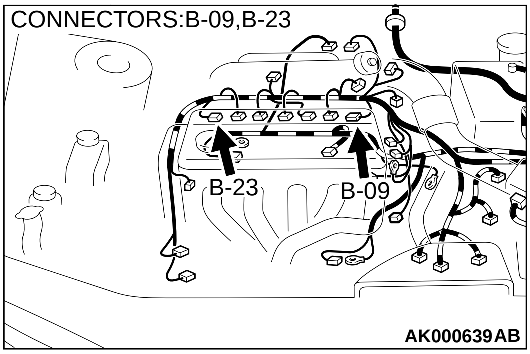
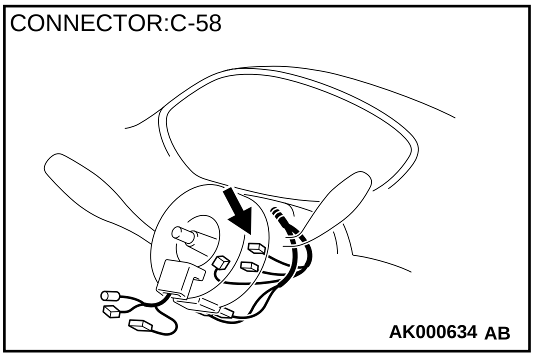


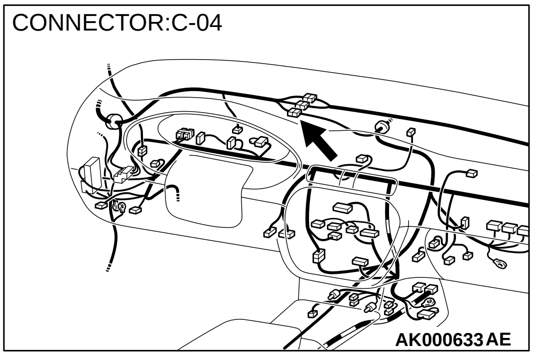












CIRCUIT OPERATION

- The ignition coil is energized by Battery positive voltage from the ignition switch through the ignition failure sensor.
- When the PCM turns off its internal power transistor, battery positive voltage is applied to the ignition power transistor (terminal 3) inside the ignition coil, causing the ignition power transistor to be turned on.
- If the ignition power transistor is turned on, the primary circuit of the ignition coil is energized by grounding the ignition coil through terminal 2, causing the primary current to flow to the ignition coil.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Malfunction of the ignition power transistor.
- Malfunction of the ignition failure sensor.

- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the PCM.

DIAGNOSIS

STEP 1. Check the ignition failure sensor.
Refer to GROUP 16, Ignition System – On-vehicle service – Ignition failure sensor check(P.16-34).

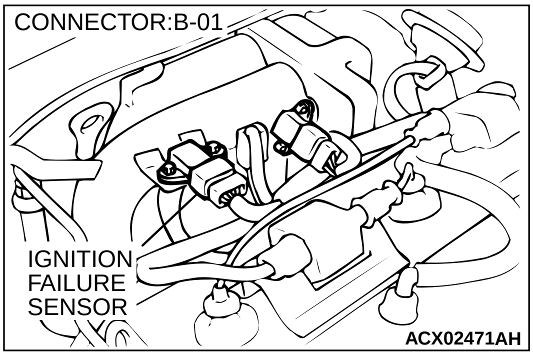
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Replace the ignition failure sensor. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the ignition coil.
Refer to GROUP 16, Ignition System – On-vehicle service – Ignition coil check(P.16-33).

Q: Are there any abnormalities?

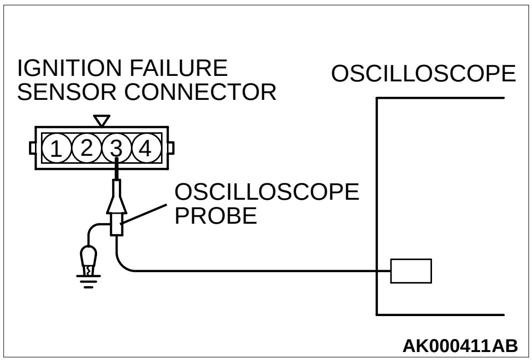
YES : Go to Step 3.
NO : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check harness connectors B-01 at ignition failure sensor for damage.

Q: Is the harness connector in good condition?

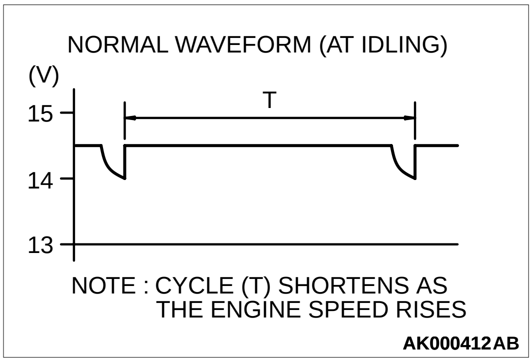
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 4. Using the oscilloscope, check the ignition failure sensor.

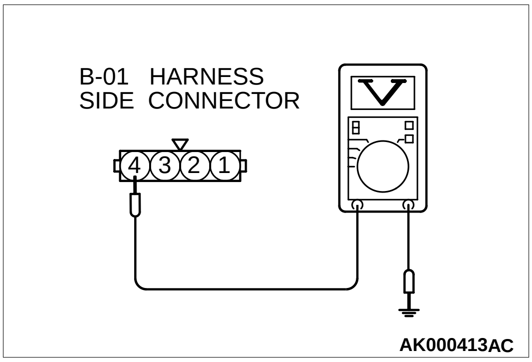
(1) Disconnect the ignition failure sensor connector B-01, and connect test harness special tool (MB991658) in between. (All terminals should be connected.)
(2) Connect the oscilloscope probe to the ignition failure sensor side connector terminal 3.
(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK"(OFF) position.



Q: Is the waveform normal?

YES : Go to Step 11.
NO : Go to Step 5.



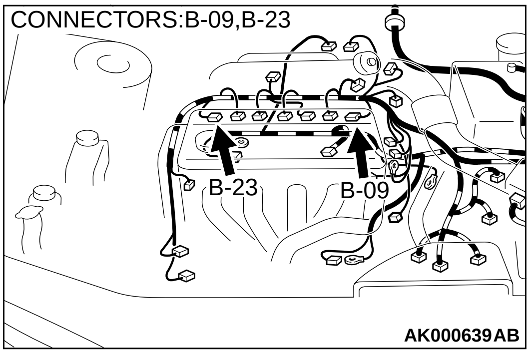
STEP 5. Check the power supply voltage at ignition failure sensor harness side connector B-01.

(1) Disconnect the connectors B-01 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Check connectors C-04, C-66 and C-73 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-58 terminal 2 and ignition failure sensor connector B-01 terminal 4 because of open circuit. Then confirm that the malfunction symptom is eliminated.

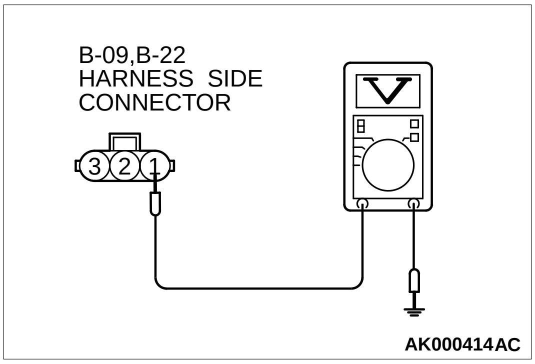


STEP 6. Check harness connector B-09, B-23 at ignition coil for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.



STEP 7. Check the power supply voltage at ignition coil connectors B-09, B-23.

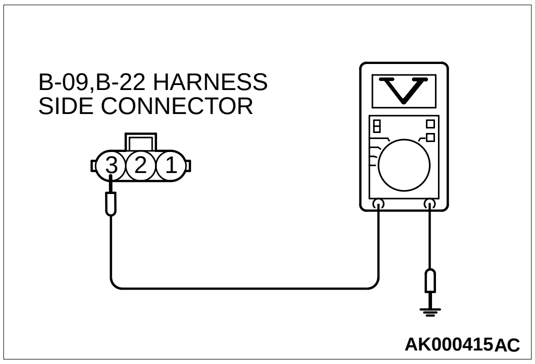
(1) Disconnect the connector B-09, B-23 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Repair harness wire between ignition failure connectors B-01 terminal 3 and ignition coil connectors B-09, B-23 terminals 1 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check the circuit at ignition coil harness side connector B-09, B-23.

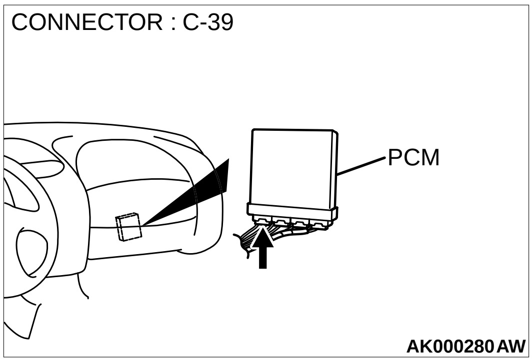
(1) Disconnect the connectors B-09, B-23 and measure at the harness side.
(2) Engine cranking.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be 0.3 and 3.0 volts.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

YES : Repair harness wire or harness damage between ignition coil connector B-09, B-23 terminal 2 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 9.

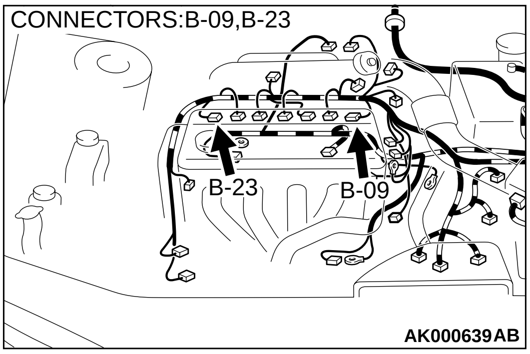


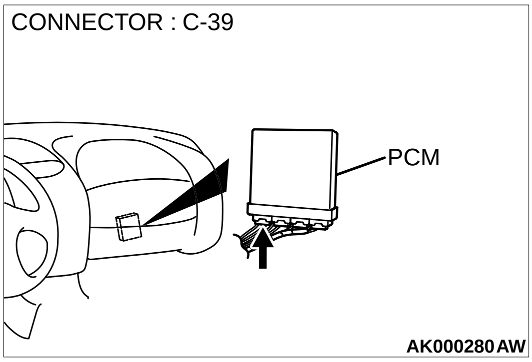
STEP 9. Check connector C-39 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





STEP 10. Check for open circuit between ignition coil connector and PCM connector.

a. Check the harness wire between ignition coil connector B-09 terminal 3 and PCM connector C-39 terminal 11 when checking ignition coil 1.

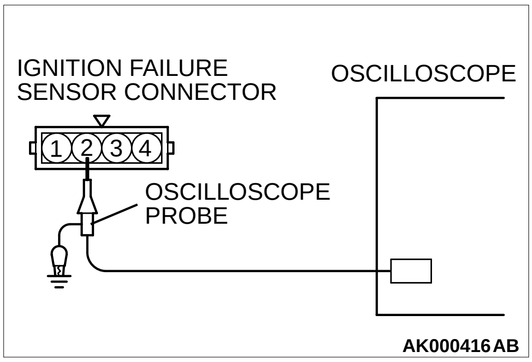
b. Check the harness wire between ignition coil connector B-23 terminal 3 and PCM connector C-39 terminal 12 when checking ignition coil 2.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

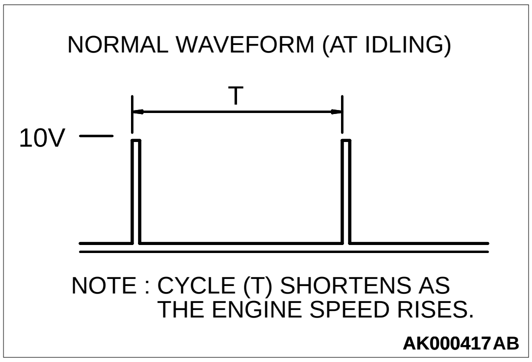
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Using the oscilloscope, check the ignition failure sensor.



(1) Disconnect the ignition failure sensor connector B-01, and connect test harness special tool (MB991658) in between. (All terminals should be connected.)
(2) Connect the oscilloscope probe to the ignition failure sensor side connector terminal 2.
(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

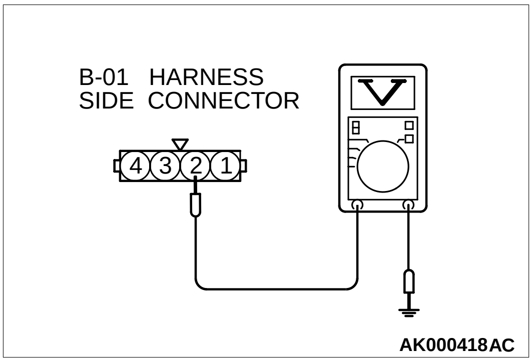
(5) Turn the ignition switch to the "LOCK"(OFF) position.



Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points(P.00-8).
NO : Go to Step 12.

STEP 12. Check the circuit at ignition failure sensor harness side connector B-01.



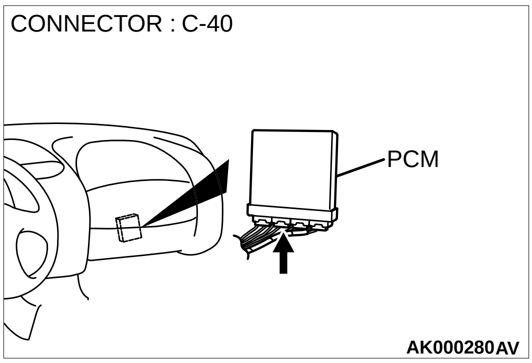
(1) Disconnect the connectors B-01 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be 4 volts or more.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

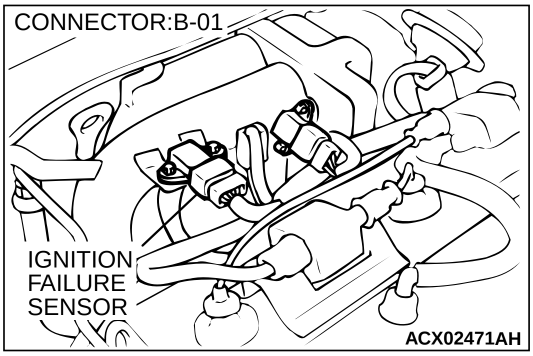
YES : Repair harness wire between ignition failure sensor connector B-01 terminal 1 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 13.

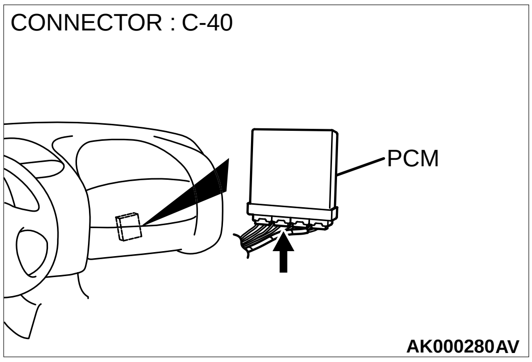
STEP 13. Check connector C-40 at PCM for damage.



Q: Is the connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection(P.00E-2). Then confirm that the malfunction symptom is eliminated.





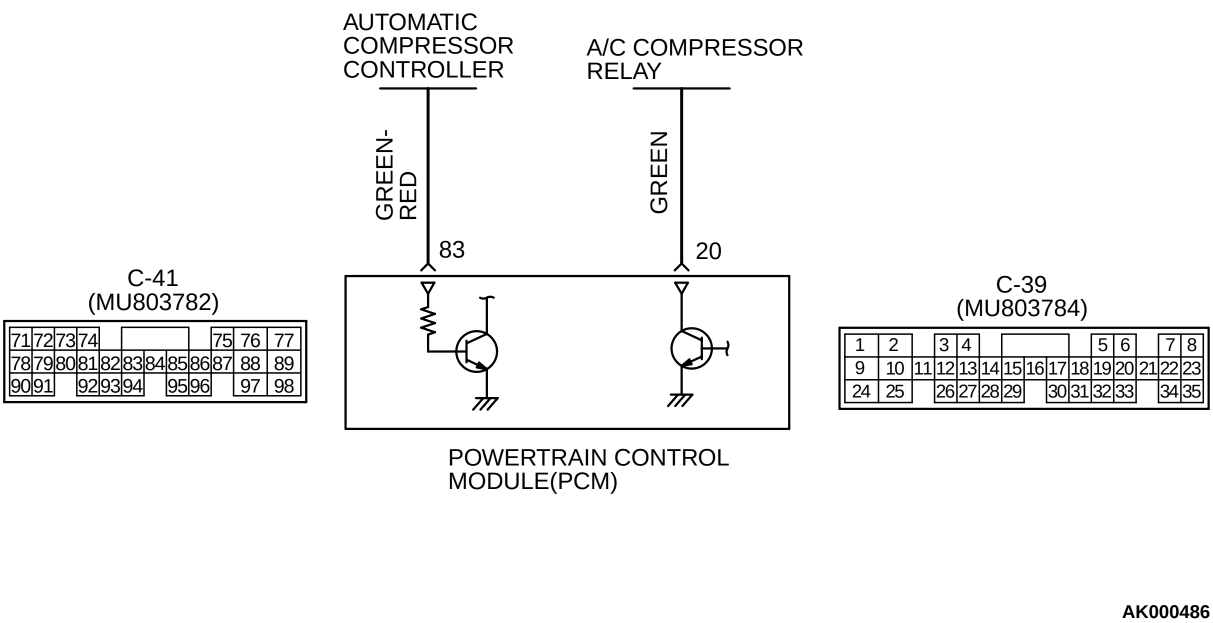
STEP 14. Check for open circuit between ignition failure sensor connector B-01 terminal 2 and PCM connector C-40 terminal 43.

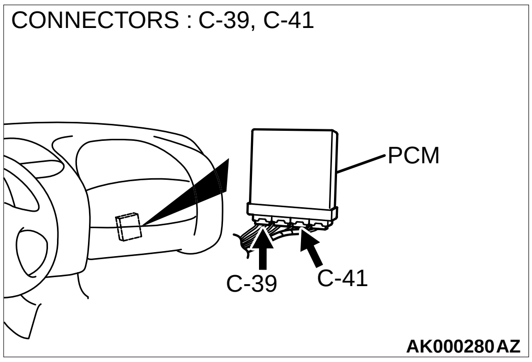
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 33: A/C system.





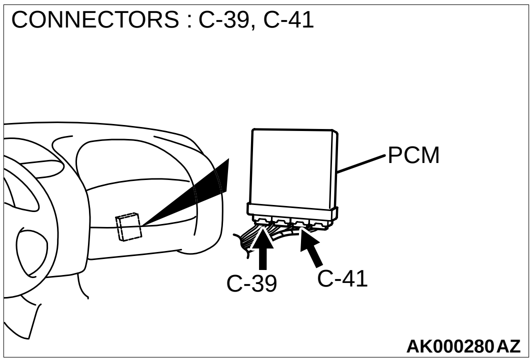
COMMENT

- When the A/C is "ON," the battery positive voltage is applied on the PCM (terminal 83) from the automatic compressor controller.
  When battery positive voltage is applied to the PCM, the PCM turns "ON" the power transistor in the PCM. The PCM delays A/C engagement momentarily while it increases idle rpm. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON," and the A/C compressor clutch functions.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Malfunction of the A/C switch.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the PCM.

DIAGNOSIS

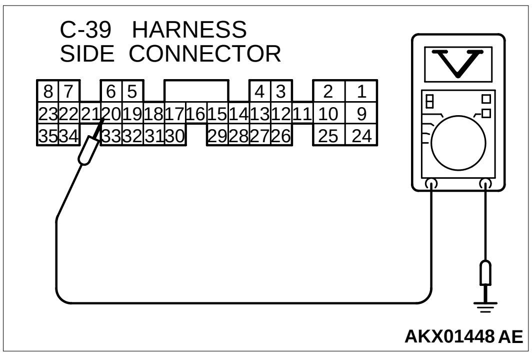


STEP 1. Check connector C-39, C-41 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection (P.00E-2). Then confirm that the malfunction symptom is eliminated.



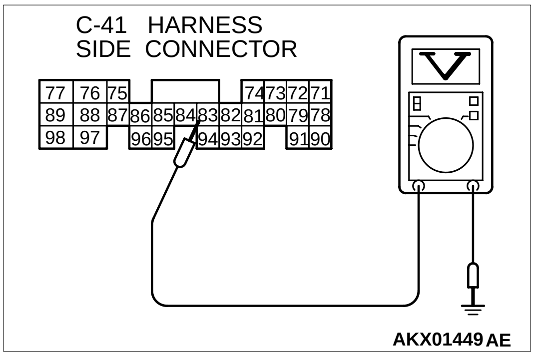
STEP 2. Check the circuit at PCM connector C-39.

(1) Disconnect the connectors C-39 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 20 and ground.
  - Voltage should be battery positive voltage.
(4) Using a jumper wire, connect terminal 20 to ground.
  - A/C compressor relay should turn "ON".
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Go to Step 3.

NO : Refer to GROUP 55, Heating and air conditioning – Introduction To Heater, Air Conditioning And Ventilation Diagnosis (P.55-4). Then confirm that the malfunction symptom is eliminated.



STEP 3. Check the circuit at PCM connector C-41.

(1) Disconnect the connectors C-41 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 83 and ground.
- Voltage should be 1 volt or less when the A/C switch is "OFF".
- Voltage should be battery positive voltage when the A/C switch is "ON".

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.
NO : Refer to GROUP 55, Heating and air conditioning – Introduction To Heater, Air Conditioning And Ventilation Diagnosis (P.55-4).

DATA LIST REFERENCE TABLE

M1131008900109

⚠ **CAUTION**

- **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

*NOTE: *1: If the idle speed is lower than the standard value on a very cold engine (approximately -20° C (-4° F) even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.*

*NOTE: *2: In a new vehicle [driven approximately 500 km (311 mile) or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.*

*NOTE: *3: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *4: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *5: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency.*

*NOTE: *6: Applicable to General Scan Tool (GST).*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C RELAY	49	A/C compressor clutch relay	Engine: warming up, idling	A/C switch: "OFF"	OFF (Compressor clutch is not operating)	Procedure No.33	P.13A-403
				A/C switch: "ON"	ON (Compressor clutch is operating)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C SWITCH	28	A/C switch	Engine: idle (when A/C switch is ON, A/C compressor should be operating)	A/C switch:"OFF"	OFF	Procedure No.33	P.13A-403
				A/C switch:"ON"	ON		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa	Code No.P0107,P0108	P.13A-41,P.13A-50
				At altitude of 600 m (1,969 ft)	95 kPa		
				At altitude of 1,200 m (3,937 ft)	88 kPa		
				At altitude of 1,800 m (5,906 ft)	81 kPa		
BATT VOLTAGE	16	power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No.29	P.13A-379

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CRANK SENSOR	22	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P.13A-170
			Engine: idling	Engine coolant temperature is -20° C (-40° F)	1,275 – 1,475 r/min		
				Engine coolant temperature is 0° C (32° F)	1,220 – 1,420 r/min		
				Engine coolant temperature is 20° C (68° F)	1,100 – 1,300 r/min		
				Engine coolant temperature is 40° C (104° F)	930 – 1,130 r/min		
				Engine coolant temperature is 80° C (176° F)	600 – 800 r/min		
CRANK. SIGNAL	18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No.31	P.13A-392
				Engine: cranking	ON		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: "ON"or with engine running	Engine coolant temperature is -20° C (-4° F)	-20° C (-4° F)	Code No.P0115,P0116,P0117	P.13A-66,P.13A-74,P.13A-79
				Engine coolant temperature is 0° C (32° F)	0° C(32° F)		
				Engine coolant temperature is 20° C (68° F)	20° C(68° F)		
				Engine coolant temperature is 40° C(104° F)	40° C (104° F)		
				Engine coolant temperature is 80° C (176° F)	80° C (176° F)		
HO2S BANK1 S1	11	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When at 4000 r/min, engine is suddenly decelerated	200 mV or less → 600 – 1,000 mV (After several seconds have elapsed)	Code No.P0130,P0133,P0134	P.13A-105,P.13A-113,P.13A-115
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		
				2,500 r/min			

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S2	59	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No.P0136,P0139	P.13A-127,P.13A-135
IAC VALVE POS	45	Idle air control (stepper) position *2	• Engine coolant temperature : 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: "P" range • Engine: idling (when A/C switch is "ON."A/C compressor should be operating)	A/C switch: "OFF"	2 – 25 steps	-	-
				A/C switch: "OFF"→"ON"	Increases by 10 – 70 steps		
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20° C (-4° F)	-20° C (-4° F)	Code No.P0111	P.13A-57
				Intake air temperature is 0° C (32° F)	0° C (32° F)		
				Intake air temperature is 20° C (68° F)	20° C (68° F)		
				Intake air temperature is 40° C (104° F)	40° C (104° F)		
				Intake air temperature is 80° C (176° F)	80° C (176° F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IG. TIMING ADV	44	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 -18° BTDC	-	-
				2,500 r/min	22 – 42° BTDC		
INJECTORS B2	41	Injectors[*3]	Engine: cranking	When engine coolant temperature is 0° C (32° F)	21.4 – 32.0 ms	-	-
				When engine coolant temperature is 20° C (68° F)	11.5 – 17.3 ms		
				When engine coolant temperature is 80° C (176° F)	9.8 – 14.6 ms		
		Injectors[*4]	• Engine coolant temperature : 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: "P" range	Engine is idling	1.7 – 2.9 ms		
				2,500 r/min	1.5 – 2.7 ms		
				When engine is suddenly revved	Increases		
MANIFOLD SNSR	95	Manifold differential pressure sensor	Engine: warming up, idling		64 – 78 kPa	Code No.P1400	P.13A-299

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No.P0551	P.13A-282
				Steering wheel turning	ON		
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel tank filler tube cap removal		-3.3 – 3.3 kPa	-	-
TP SENSOR	14	Throttle position sensor	Ignition switch: "ON"	Set to idle position	535 – 735 mV (0 – 1%)	Code No.P0121,P0122,P0123	P.13A-87,P.13A-94,P.13A-99
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	4,500 – 5,500 mV (80 – 100%)		
VAF SENSOR	12	Volume air flow sensor (mass air flow rate) *5	• Engine coolant temperature: 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: "P" range	Engine is idling	12 – 38 HZ (1.7 – 4.2 g/s)	-	-
				2,500 r/min	55 – 95 Hz (7.9 – 12.1 g/s)		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CRANK SENSOR	22*6	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P.13A-170
			Engine: idling	Engine coolant temperature is -20 ° C (-40 ° F)	1,275 – 1,475 r/min		
				Engine coolant temperature is 0 ° C (32 ° F)	1,220 – 1,420 r/min		
				Engine coolant temperature is 20 ° C (68 ° F)	1,100 – 1,300 r/min		
				Engine coolant temperature is 40 ° C (104 ° F)	930 – 1,130 r/min		
				Engine coolant temperature is 80 ° C (176 ° F)	600 – 800 r/min		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21*6	Engine coolant temperature sensor	Ignition switch: "ON"or with engine running	Engine coolant temperature is -20 ° C (-4 ° F)	-20 deg C (-4 deg F)	Code No.P0115,P0116,P0117	P.13A-66,P.13A-74,P.13A-79
				Engine coolant temperature is 0 ° C (32 ° F)	0 deg C(32 deg F)		
				Engine coolant temperature is 20 ° C (68 ° F)	20 deg C(68 deg F)		
				Engine coolant temperature is 40 ° C(104 ° F)	40 deg C (104 deg F)		
				Engine coolant temperature is 80 ° C (176 ° F)	80 deg C (176 deg F)		
ENGINE LOAD	87*6	Calculation load value	• Engine: warming up	Engine is idling	12 – 32%	-	-
				2,500 r/min	10 – 30%		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	A1*6	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When at 4000 r/min, engine is suddenly decelerated	0.2 V or less → 0.6 – 1 V (After several seconds have elapsed)	Code No.P0130,P0133,P0134	P.13A-105,P.13A-113,P.13A-115
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
				2,500 r/min			
HO2S BANK1 S2	A2*6	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No.P0136,P0139	P.13A-127,P.13A-135
IAT SENSOR	13*6	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20 °C (-4 °F)	-20 deg C (-4 deg F)	Code No.P0111	P.13A-57
				Intake air temperature is 0 °C (32 °F)	0 deg C (32 deg F)		
				Intake air temperature is 20 °C (68 °F)	20 deg C (68 deg F)		
				Intake air temperature is 40 °C (104 °F)	40 deg C (104 deg F)		
				Intake air temperature is 80 °C (176 °F)	80 deg C (176 deg F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IG. TIMING ADV	44*6	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 -18 deg	-	-
				2,500 r/min	22 – 42 deg		
LONG TRIM B1	81*6	Long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5%	Code No.P0171,P0172	P.13A-144P.13A-150
SHORT TRIM B1	82*6	Short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		-25 – 16.8%	Code No.P0171,P0172	P.13A-144P.13A-150
SYS. STATUS B1	88*6	Fuel control condition	Engine: warming up	2,500 r/min	Closed loop	-	-
				When engine is suddenly revved	Open circuit – drivecondition		
TP SENSOR	8A*6	Throttle position sensor	Ignition switch: "ON"	Set to idle position	0.535 – 0.735 V (0 – 1%)	Code No.P0121,P0122,P0123	P.13A-87,P.13A-94,P.13A-99
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	4.5 – 5.5 V (80 – 100%)		
VAF SENSOR	12*6	Volume air flow sensor (mass air flow rate) *5	• Engine coolant temperature: 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: "P" range	Engine is idling	1.7 – 4.2 gm/s	-	-
				2,500 r/min	10 – 30 gm/s		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VSS	24*6	Vehicle speed sensor	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	Code No.P0500	P.13A-264

ACTUATOR TEST REFERENCE TABLE

M1131009000079

<table>
<tr><th>MUT-II SCAN TOOL DISPLAY</th><th>ITEM NO.</th><th>INSPECTION ITEM</th><th>DRIVE CONTENTS</th><th colspan="2">INSPECTION REQUIREMENT</th><th>NORMAL CONDITION</th><th>INSPECTION PROCEDURE NO.</th><th>REFERENCE PAGE</th></tr>
<tr><td>EGR SOLENOID</td><td>10</td><td>EGR solenoid</td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch:"ON"</td><td>Clicks when solenoid valve is driven.</td><td>Code No.P0403</td><td>P.13A-188</td></tr>
<tr><td>EVAP PURGE SOL</td><td>08</td><td>Evaporative emission purge solenoid</td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch:"ON"</td><td>Clicks when solenoid valve is driven.</td><td>Code No.P0443</td><td>P.13A-207</td></tr>
<tr><td>EVAP VENT SOL</td><td>29</td><td>Evaporative emission ventilation solenoid</td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch:"ON"</td><td>Clicks when solenoid valve is driven.</td><td>Code No.P0446</td><td>P.13A-214</td></tr>
<tr><td rowspan="2">FUEL PUMP</td><td rowspan="2">07</td><td rowspan="2">Fuel pump</td><td rowspan="2">Fuel pump operates and fuel is recirculated</td><td rowspan="2">• Engine: cranking
• Fuel pump: activated
Inspect according to both the above conditions</td><td>Pinch the return hose with fingers to feel the pulse of the fuel being recirculated</td><td>Pulse is felt</td><td rowspan="2">Procedure No.30</td><td rowspan="2">P.13A-385</td></tr>
<tr><td>Listen near the fuel tank for the sound of fuel pump operation</td><td>Sound of operation is heard</td></tr>
<tr><td>BASIC TIMING</td><td>17*</td><td>Basic ignition timing</td><td>Set to ignition timing adjustment mode</td><td colspan="2">• Engine: idling
• Conect timing light</td><td>5°BTDC</td><td>-</td><td>-</td></tr>
</table>

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
NO. 1 INJECTOR	01	Injectors	Cut fuel to No.1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable)	Code No.P0201, P0202, P0203, P0204	P.13A-154
NO. 2 INJECTOR	02		Cut fuel to No.2 injector				
NO. 3 INJECTOR	03		Cut fuel to No.3 injector				
NO. 4 INJECTOR	04		Cut fuel to No.4 injector				
RADIAT. FAN LO	21	Fan controller	Drive the fan motor	Ignition switch : "ON"	Radiator fan and condenser fan rotate at high speed	Procedure No.28	P.13A-376

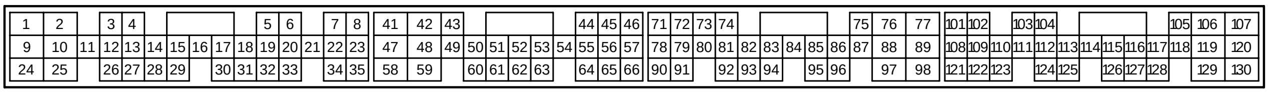
*NOTE: * : Continues for 27 minutes. Can be released by pressing the CLEAR key.*

CHECK AT THE POWERTRAIN CONTROL MODULE (PCM)

M1131009200073

TERMINAL VOLTAGE CHECK CHART

PCM Connector Terminal Arrangement



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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	No.1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 11 – 14 V momentarily drops slightly
9	No.2 injector		
24	No.3 injector		
2	No.4 injector		

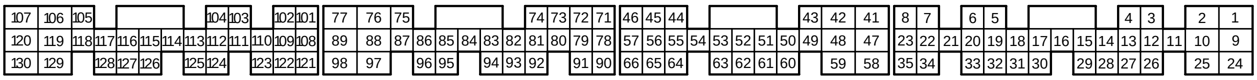
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
14	Stepper motor coil <A1>	• Engine: warming up, idling • A/C switch: OFF → ON • Headlight switch: OFF → ON	B+ ⇔ 1 V or less (changes repeatedly)
28	Stepper motor coil <A2>		
15	Stepper motor coil <B1>		
29	Stepper motor coil <B2>		
6	EGR solenoid	Ignition switch: "ON"	B+
		• Engine: idling • Suddenly depress the accelerator pedal.	From B+ , momentarily drops
20	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF→ ON (A/C compressor is operating)	B+ 1 V or less as A/C clutch cycles
34	Evaporative emission purge solenoid	Ignition switch: "ON"	B+
		Engine: warm up, 3,000 r/min	3 – 13 V
11	Ignition coil – No.1, No.4 (Ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V
12	Ignition coil – No.2, No.3 (Ignition power transistor)		
41	Power supply	Ignition switch: "ON"	B+
47			
19	Volume air flow sensor reset signal	Engine: idling	0 – 1 V
		Engine: 3,000 r/min	6 – 9 V
18	Fan controller	Radiator fan and condenser fan are not operating	0 – 0.3V
		Radiator fan and condenser fan are operating	0.7 V or more
21	Fuel pump relay	Ignition switch: "ON"	B+
		Engine: idling	1 V or less
61	A/C switch 2	Engine: idling Outside air temperature: 25°C or more — when A/C is MAX. COOL condition (when the load by A/C is high)	1 V or less
		Engine: idling Outside air temperature: 25°C or more — when A/C is MAX. HOT condition (when the load by A/C is low)	B+
8	Generator G terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON Rear defogger switch: OFF to ON Stoplight switch: OFF to ON	Voltage rises by 0.2 – 3.5 V

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
22	Check engine/ malfunction indicator lamp	Ignition switch: "LOCK" (OFF) → "ON"		1 V or less → 9 – 13 V (after several seconds have elapsed)
52	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
			When steering wheel is turned	1V or less
49	MFI relay (power supply)	Ignition switch: "OFF"		B+
		Ignition switch: "ON"		1V or less
54	Generator FR terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON		Voltage drops
		Rear defogger switch: OFF to ON Stop light switch: OFF to ON		
83	A/C switch	Engine: idling	Turn the A/C switch OFF	1V or less
			Turn the A/C switch ON (A/C compressor is operating)	B+
26	Heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
		Engine: Revving		B+
35	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
		Carry out the Actuator test to drive the solenoid valve		For approximately Six seconds 1 V or less
43	Engine ignition signal	Engine: 3,000 r/min		0.3 – 3.0 V
3	Heated oxygen sensor heater (front)	Engine: warming up, idling		9 – 11 V
		Engine: Revving		9 – 11 V → B+ (momentarily)
92	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
58	Ignition switch-ST	Engine: cranking		8 V or more
64	Intake air temperature sensor	Ignition switch: "ON"	When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
91	Manifold differential pressure sensor	Engine: idling		0.8 – 2.4 V
		• Engine: idling • Suddenly depress the accelerator pedal		Rises from 0.8 – 2.4 V suddenly

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
73	Heated oxygen sensor (rear)	• Engine: warming up • Revving		0 and 0.6 – 1.0 V alternates
71	Heated oxygen sensor (front)	• Engine: warming, 2,500 r/min (check using a digital type voltmeter)		0 ⇔ 0.8 V (changes repeatedly)
66	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
46	Sensor supplied voltage	Ignition switch: "ON"		4.5 – 5.5 V
98	Ignition switch-IG	Ignition switch: "ON"		B+
44	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V
78	Throttle position sensor	Ignition switch: "ON" (check for smooth voltage increase as throttle is moved from idle position to wide open throttle)	Idle	0.535 – 0.735 V
			Wide open throttle	4.5 – 5.5 V
55	Barometric pressure sensor	Ignition switch: "ON"	When altitude is 0 m (0 ft)	3.7 – 4.3 V
			When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
			When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
			When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
80	Vehicle speed sensor	• Ignition switch: "ON" • Move the vehicle slowly forward		0 ⇔ 8 -12 V (changes repeatedly)
79	Idle position signal	Ignition switch: "ON"	Set throttle valve to idle position	0 – 1 V
			Open throttle slightly	4 V or more
56	Camshaft position sensor	Engine: cranking		0.4 – 3.0 V
		Engine: idling		1.5 – 3.0 V
45	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V
		Engine: idling		1.5 – 2.5 V
65	Volume air flow sensor	Engine: idling		2.2 – 3.2 V
		Engine: 2,500 r/min		

TERMINAL RESISTANCE AND CONTINUITY CHECK

PCM Harness Side Connector Terminal Arrangement



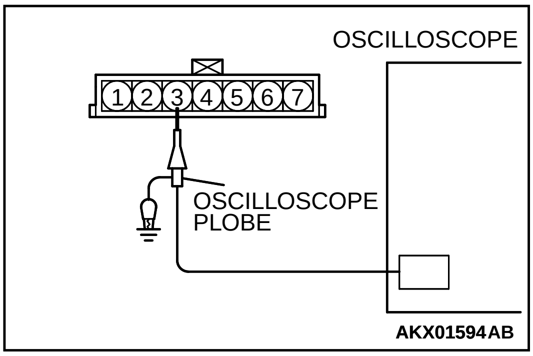
AKX01369 AB

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 41	No.1 injector	13 – 16 Ω [at 20°C (68°F)]
9 – 41	No.2 injector	
24 – 41	No.3 injector	
2 – 41	No.4 injector	
14 – 41	Stepper motor coil (A1)	28 – 33 Ω [at 20°C (68°F)]
28 – 41	Stepper motor coil (A2)	
15 – 41	Stepper motor coil (B1)	
29 – 41	Stepper motor coil (B2)	
6 – 41	EGR solenoid	29 – 35 Ω [at 20°C (68°F)]
34 – 41	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
42 – Body ground	ECM or PCM ground	Continuity (0 Ω)
48 – Body ground	ECM or PCM ground	
26 – 41	Heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
35 – 41	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]
3 – 41	Heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
57 – 64	Intake air temperature sensor	5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
		2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
		1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
		0.30 – 0.42 kΩ [when intake air temperature is 80°C (176°F)]
44 – 57	Engine coolant temperature sensor	5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
		2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
		0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
		0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]

INSPECTION PROCEDURE USING A OSCILLOSCOPE

M1131009300070

VOLUME AIR FLOW SENSOR



Required Special Tool:
MB991709: Test Harness Set

Measurement Method

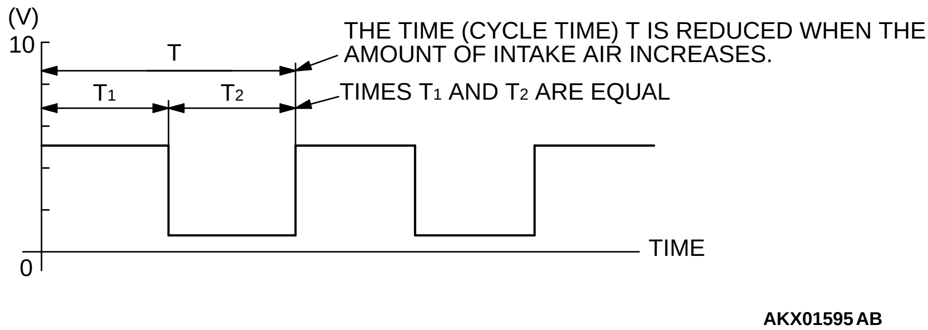
1. Disconnect the volume air flow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to volume air flow sensor connector terminal 3.

Alternate method (Test harness not available)
Connect the oscilloscope probe to PCM terminal 65.

Standard Wave Pattern

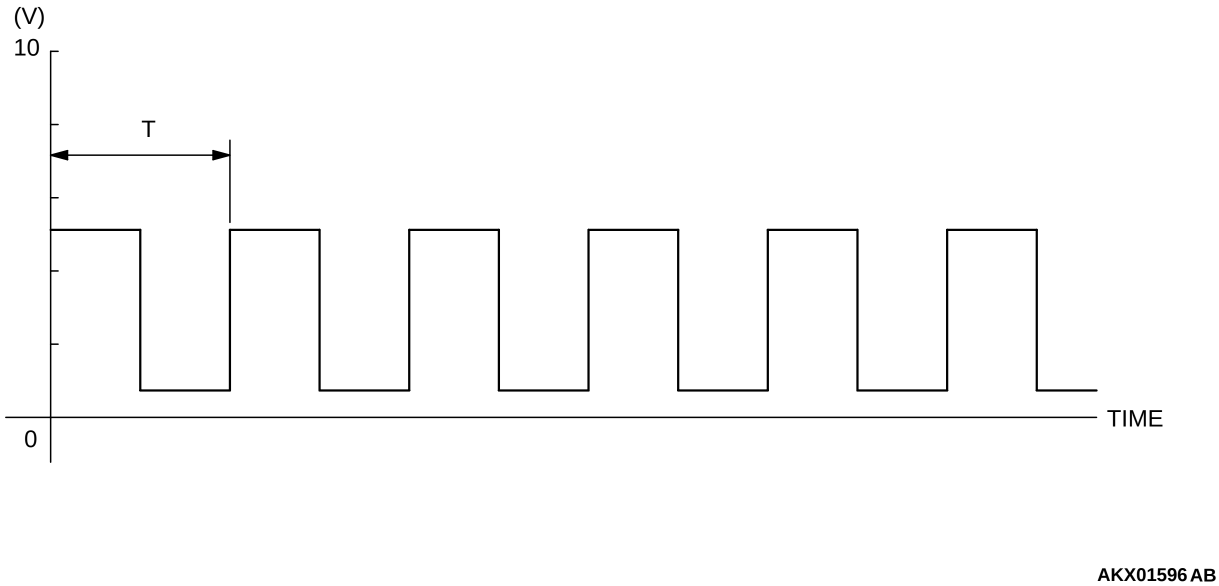
Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Observation conditions
Rev engine, observe T_1 and T_2 remain equal.

Standard wave pattern

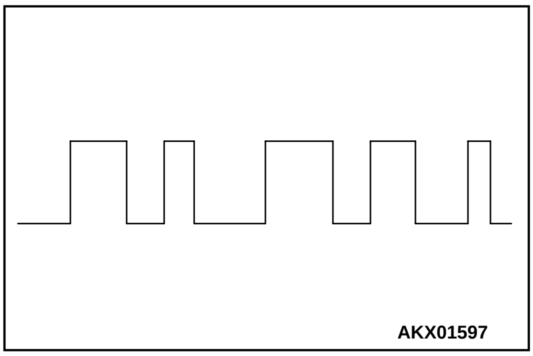


Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns

Example 1



Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.

Example 2

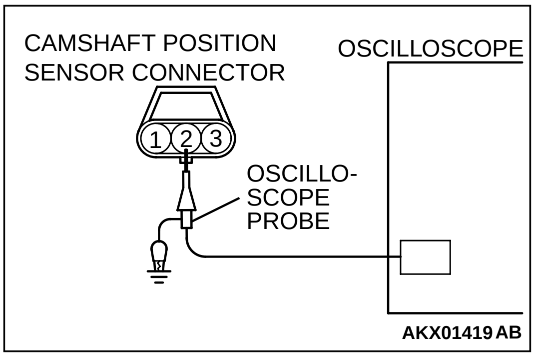
Cause of problem

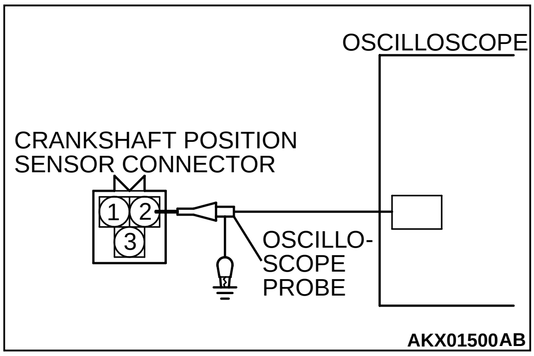
- Damaged rectifier or vortex generation column.

Wave pattern characteristics

- Unstable wave pattern with non-uniform frequency. An ignition leak will distort the wave pattern temporarily, even if the volume air flow sensor is normal.

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR





Required Special Tools:

MB991709: Test Harness Set
MD998478: Test Harness

Measurement Method

1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor connector terminal 2.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal 2 (black clip of special tool).

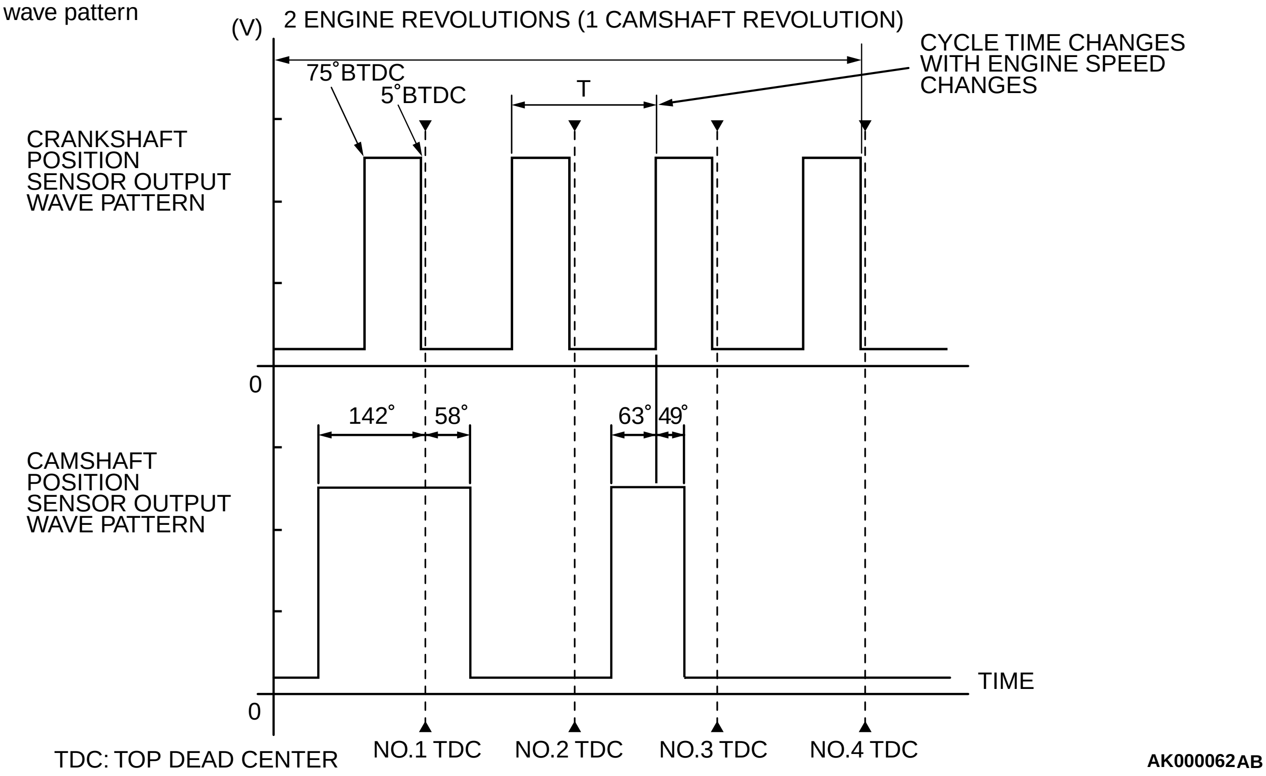
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to PCM terminal 56. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to PCM terminal 45. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

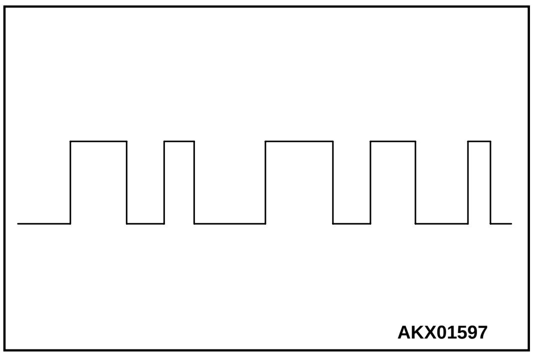
Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

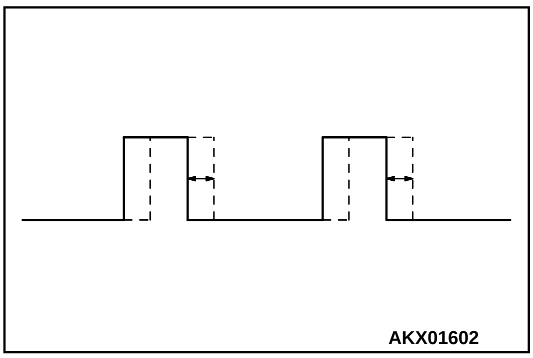
Check that cycle time T becomes shorter when the engine speed increased.



Examples of Abnormal Wave Patterns

Example 1

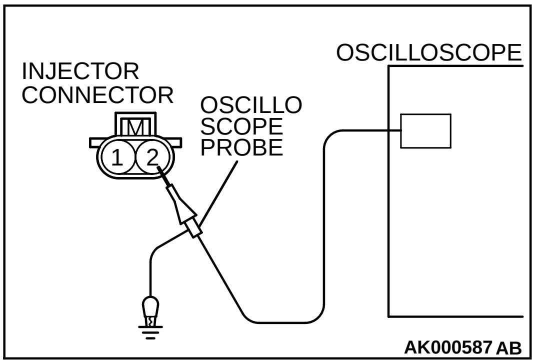
- Cause of problem
  Sensor interface malfunction.
- Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.



Example 2

- Cause of problem
  Loose timing belt.
  Abnormality in sensor disc.
- Wave pattern characteristics
  Wave pattern is displaced to the left or right.

INJECTOR



Required Special Tools:

MD991348: Test Harness Set

Measurement Method

1. Disconnect the injector connector, and connect the test harness special tool MB991348 in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal 2.

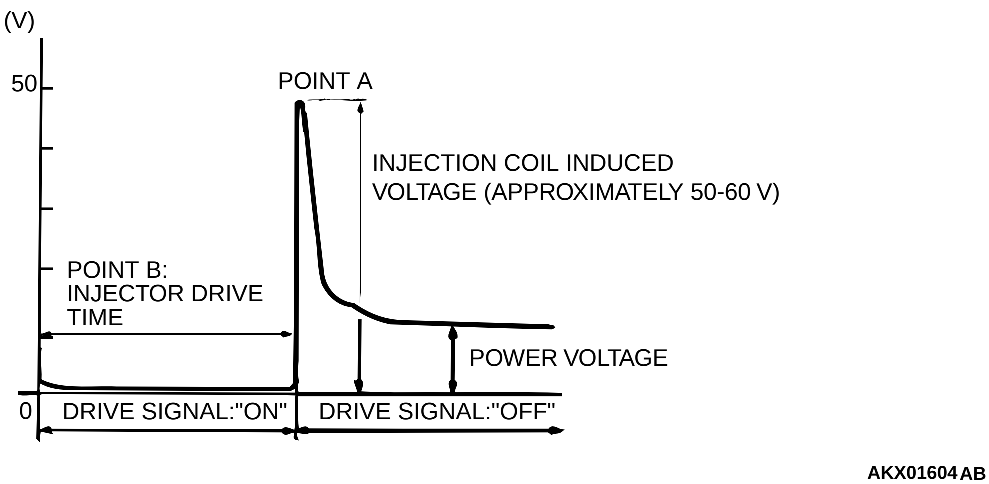
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to PCM terminal 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to PCM terminal 9. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to PCM terminal 24. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to PCM terminal 2. (When checking the number 4 cylinder.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

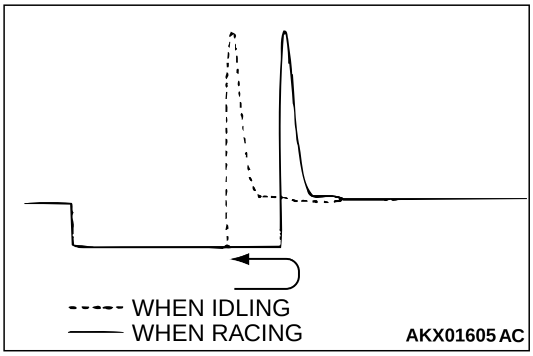
Standard wave pattern



Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

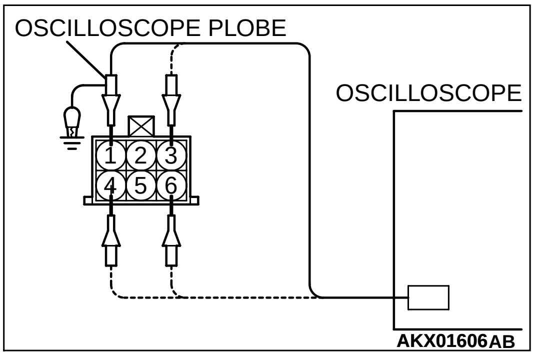
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid



Point B: Injector drive time

1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR)



Required Special Tool:

MB991709: Test Harness Set

Measurement Method

1. Disconnect the idle air control motor connector, and connect the test harness special tool, MB991709 in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the idle air control motor connector terminal 1, terminal 3, terminal 4 and terminal 6, respectively.

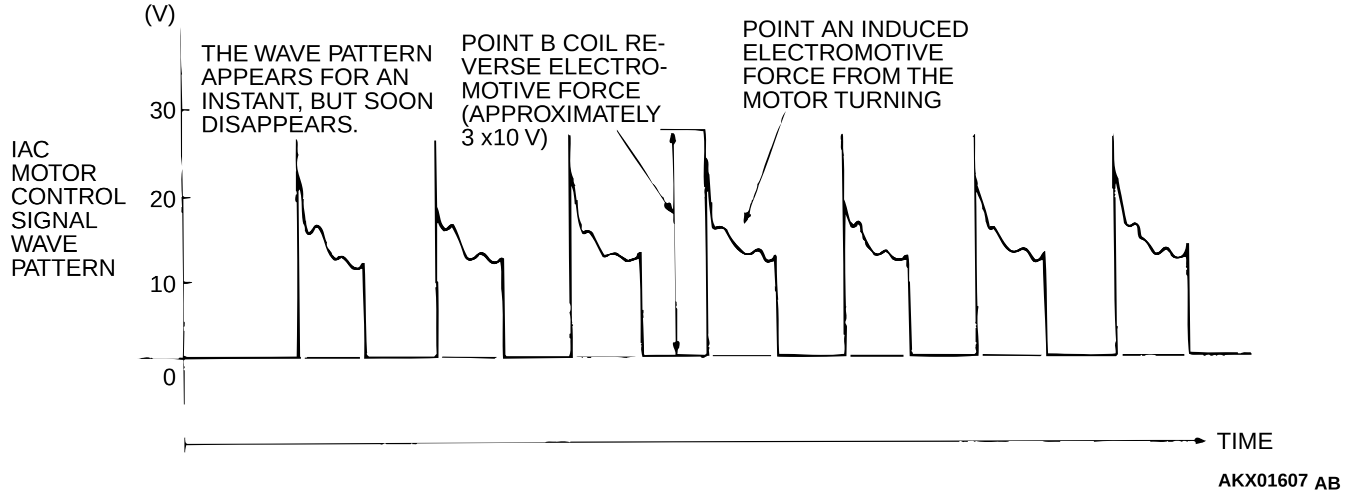
Alternate method (Test harness not available)

Connect the oscilloscope probe to PCM terminals 14, 15, 28 and 29.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from "LOCK" (OFF) to "ON" position (without starting the engine).
	While the engine is idling, turn the A/C switch to "ON."
	Immediately after starting the warm the engine (approximately one minute).

Standard wave pattern



Wave Pattern Observation Points

Check that the standard wave pattern appears when the idle air control motor is operating.

Point A:

Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Induced electromotive force does not appear or is extremely small	Malfunction of motor

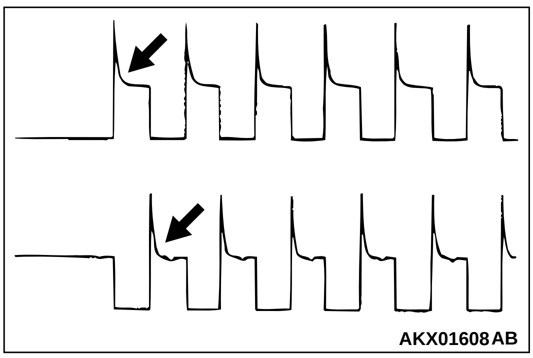
Point B:

Height of coil back electromotive force

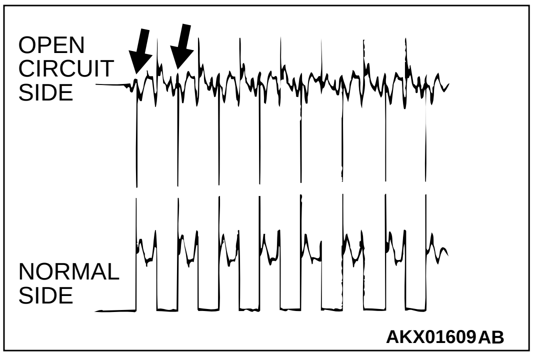
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

Examples of Abnormal Wave Patterns

Example 1



- Cause of problem
  Malfunction of motor. (Motor is not operating.)
- Wave pattern characteristics
  Induced electromotive force from the motor turning does not appear.



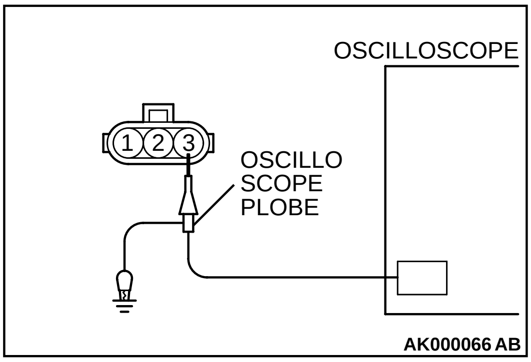
Example 2

- Cause of problem
  Open circuit in the line between the idle air control motor and the PCM.
- Wave pattern characteristics
  Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tool:
MB991348: Test Harness Set

Measurement Method



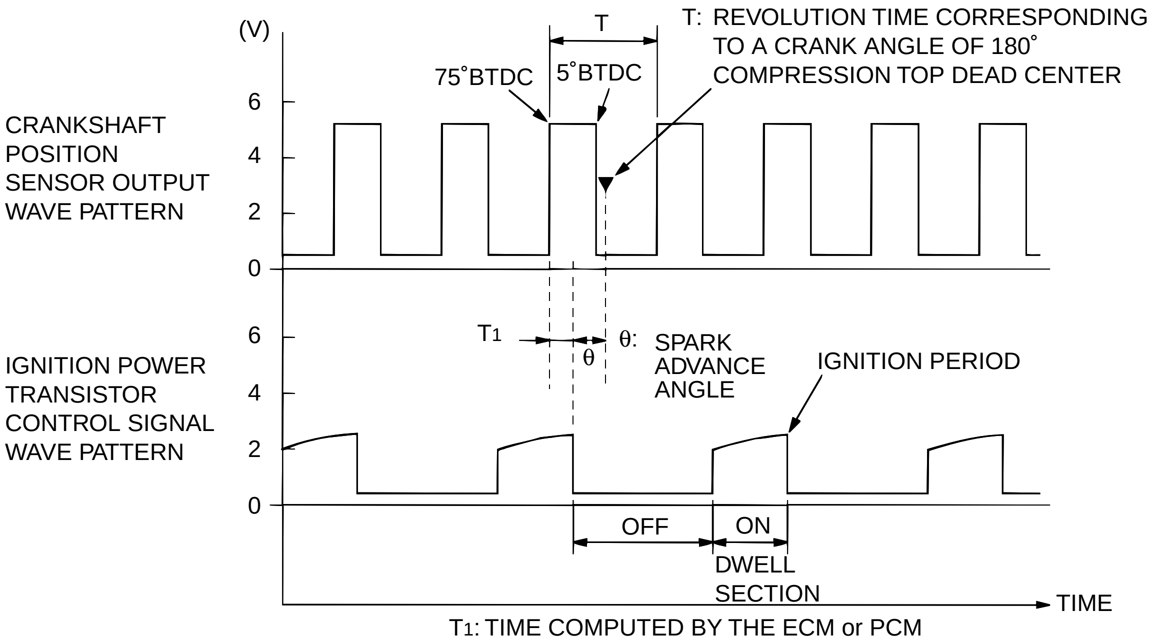
1. Disconnect the ignition coil connector, and connect test harness special tool, MB991348, in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal 3.

Alternate method (Test harness not available)
Connect the oscilloscope probe to PCM terminals 11 (for number 1 – number 4), terminal 12 (for number 2 – number 3) respectively.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern

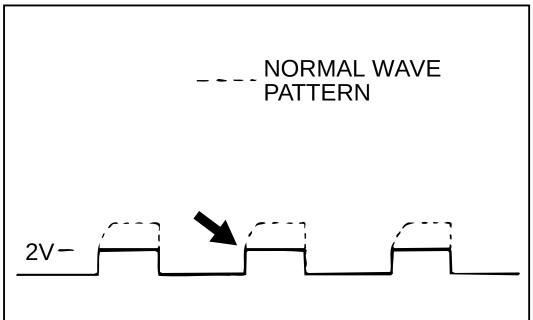


AK000068

Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Rises from approximate 2 volts to approximate 4.5 volts at the top-right	Normal
2-volt rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

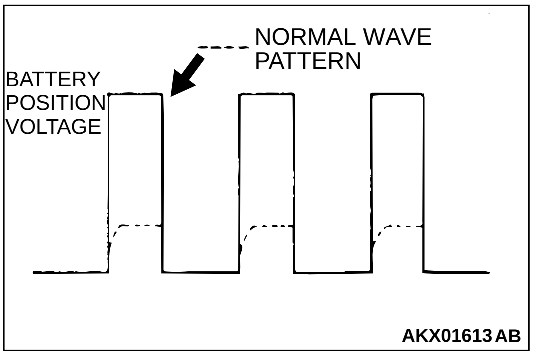


AKX01612 AB

Examples of Abnormal Wave Patterns

Example 1 (Wave pattern during engine cranking)

- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.

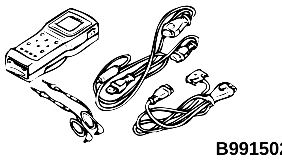
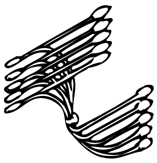
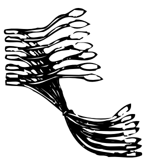
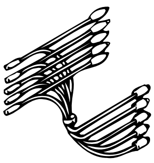
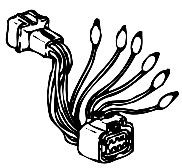


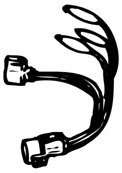
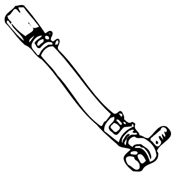
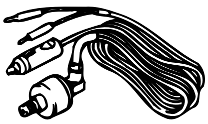
Example 2 (Wave pattern during engine cranking)

- Cause of problem
  Malfunction in ignition power transister
- Wave pattern characteristics
  Power voltage results when the ignition power transistor is ON.

SPECIAL TOOLS

M1131000600085

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
 MB991348	MB991348 Test harness set	MB991348-01	• Adjustment of throttle position sensor • Inspection using an oscilloscope
	MB991709 Test harness set	MB991709-01	• Inspection using an oscilloscope • Inspection of idle air control motor
 MB991658	MB991658 Test harness set	Tool not available	Inspection of heated oxygen sensor
	MD998463 Test harness (6 pin, square)	MD998463-01	Inspection using an oscilloscope

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor • Inspection using an oscilloscope
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an oscilloscope
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	

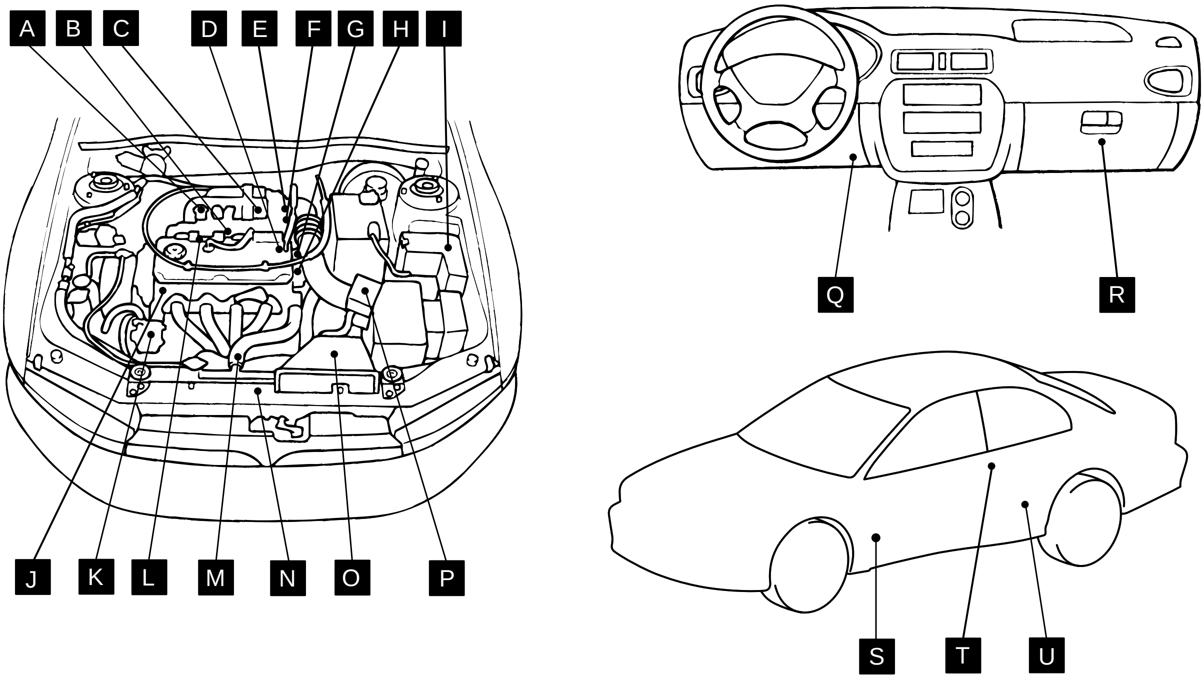
ON-VEHICLE SERVICE

COMPONENT LOCATION

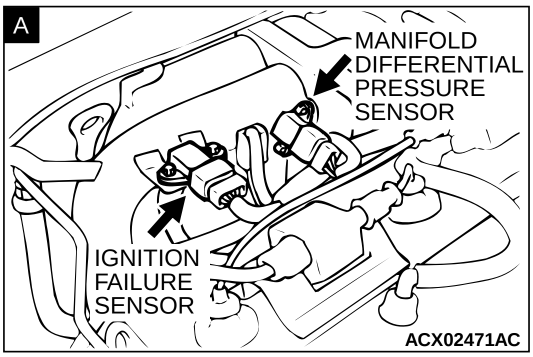
M1131002100086

NAME	SYMBOL	NAME	SYMBOL
Air conditioning compressor clutch relay	I	Idle air control motor	E
Camshaft position sensor	H	Ignition coil	L
Crankshaft position senso	J	Ignition failure sensor	A
Data link connector	Q	Injector	B
EGR solenoid	C	Manifold differential pressure sensor	A
Engine coolant temperature sensor	G	Multiport fuel injection (MFI) relay/fu-el pump relay	I
Engine speed detection connector	I		
Evaporative emission purge sole-noid	C	Park/neutral position switch	O

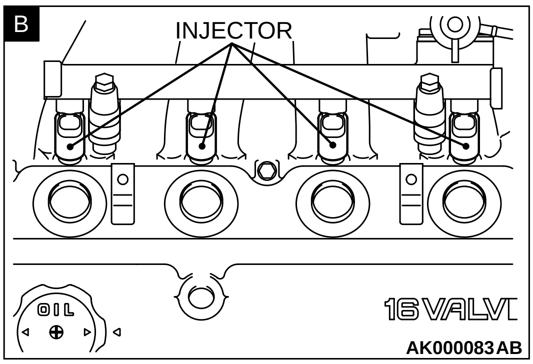
NAME	SYMBOL	NAME	SYMBOL
Evaporative emission ventilation solenoid	U	Powertrain control module (PCM)	R
Fan controller	N	Power steering pressure switch	K
Fuel tank differential pressure sensor	T	Throttle position sensor	F
Heated oxygen sensor (front)	M	Vehicle speed sensor	D
Heated oxygen sensor (rear)	S	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	P



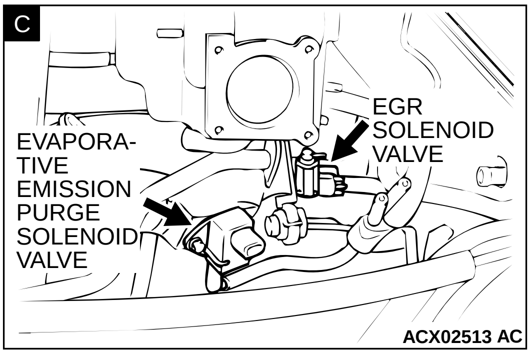
AK000590 AB

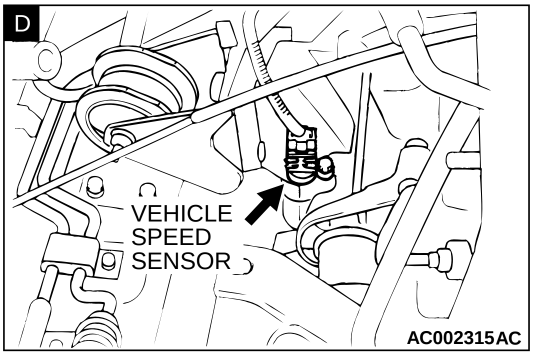


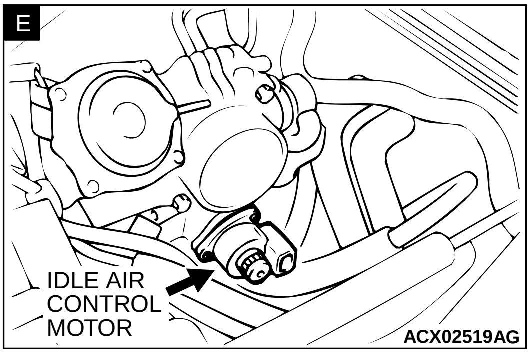
ACX02471AC

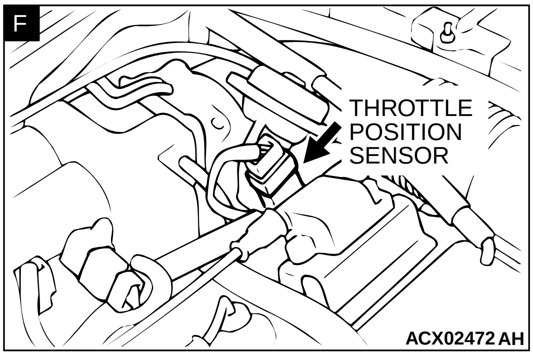


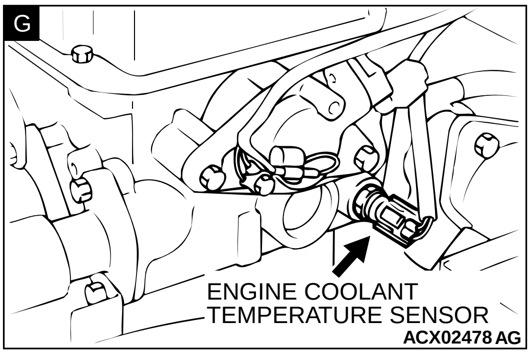
AK000083AB

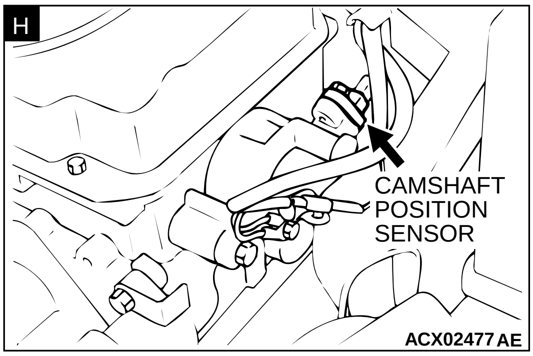

C
EGR SOLENOID VALVE
EVAPORATIVE EMISSION PURGE SOLENOID VALVE
ACX02513 AC

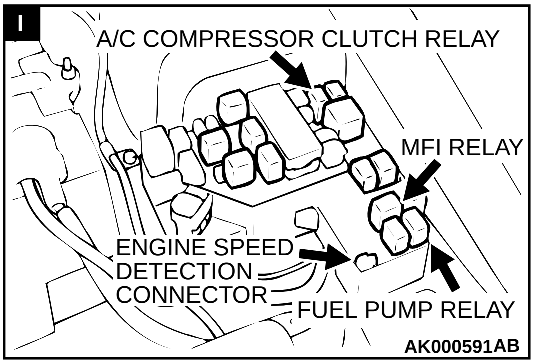

D
VEHICLE SPEED SENSOR
AC002315AC

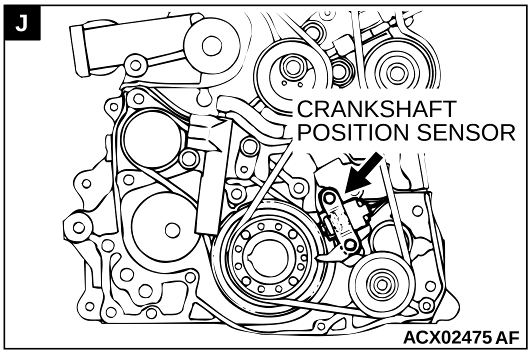

E
IDLE AIR CONTROL MOTOR
ACX02519AG

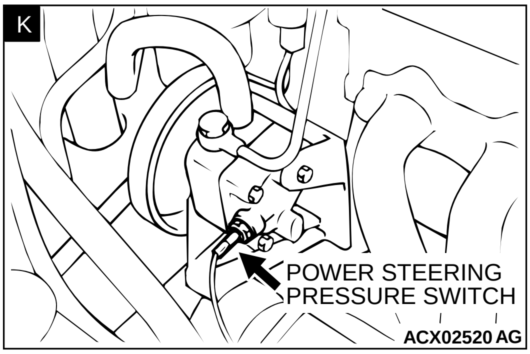

F
THROTTLE POSITION SENSOR
ACX02472 AH

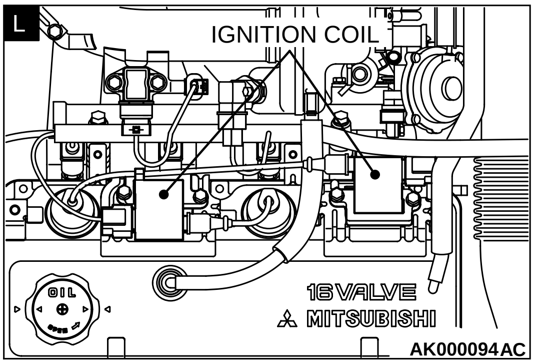

G
ENGINE COOLANT TEMPERATURE SENSOR
ACX02478 AG

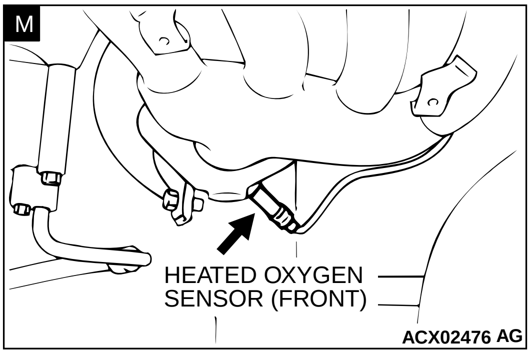

H
CAMSHAFT POSITION SENSOR
ACX02477 AE

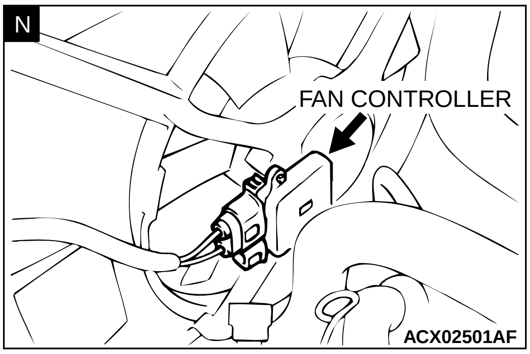

I
A/C COMPRESSOR CLUTCH RELAY
MFI RELAY
ENGINE SPEED DETECTION CONNECTOR
FUEL PUMP RELAY
AK000591AB

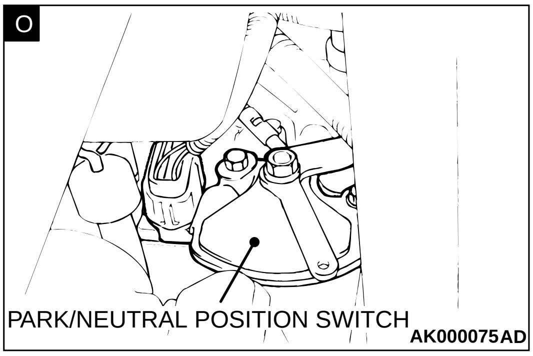

J
CRANKSHAFT POSITION SENSOR
ACX02475 AF

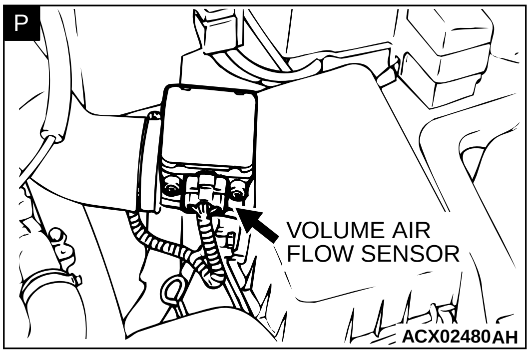

K
POWER STEERING
PRESSURE SWITCH
ACX02520 AG

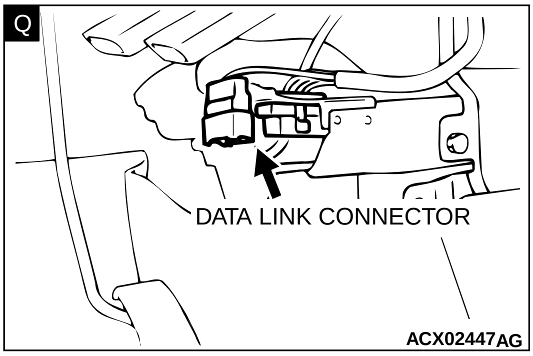

L
IGNITION COIL
OIL
16VALVE
MITSUBISHI
AK000094 AC

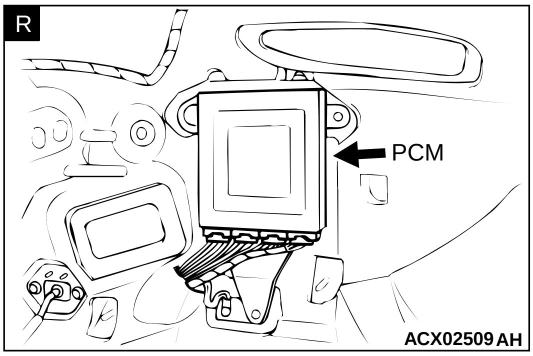

M
HEATED OXYGEN
SENSOR (FRONT)
ACX02476 AG

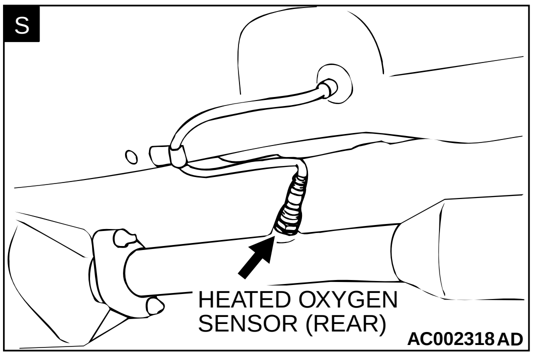

N
FAN CONTROLLER
ACX02501AF

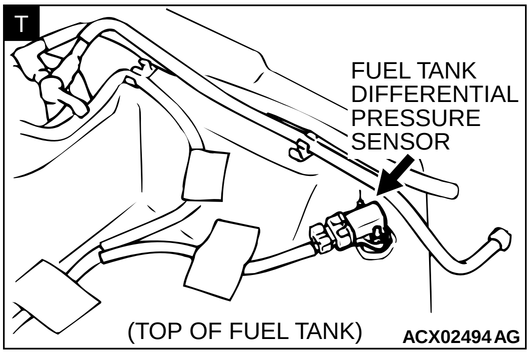

O
PARK/NEUTRAL POSITION SWITCH
AK000075 AD

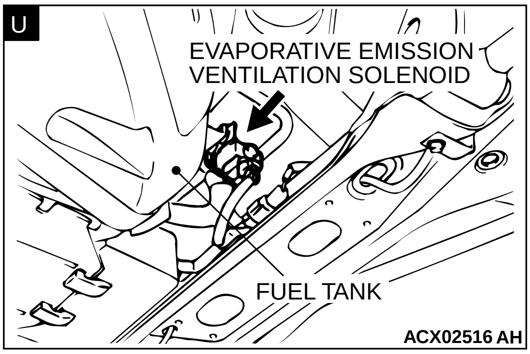

P
VOLUME AIR
FLOW SENSOR
ACX02480 AH


Q
DATA LINK CONNECTOR
ACX02447 AG


R
PCM
ACX02509 AH







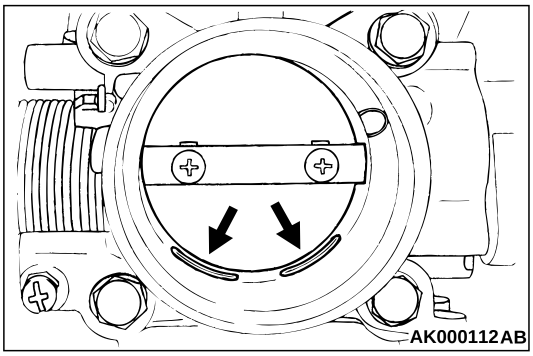
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000053

1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher. Then stop the engine.
2. Remove the air intake hose from the throttle body.

⚠ CAUTION

Do not allow cleaning solvent to enter the bypass passage.



3. Plug the bypass passage inlet (arrow) of the throttle body.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for approximately five minutes.
5. Start the engine, rev it several times and then idle it for about one minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the scan tool to erase any diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-438.)

⚠ *WARNING*

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

NOTE: If the engine hunts while idling after adjustment of the basic idle speed, disconnect the negative cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes after the engine is warmed up.

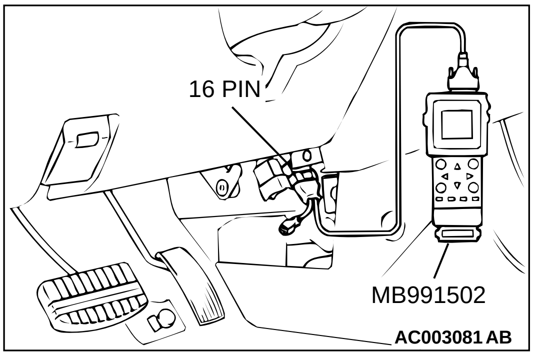
THROTTLE POSITION SENSOR ADJUSTMENT

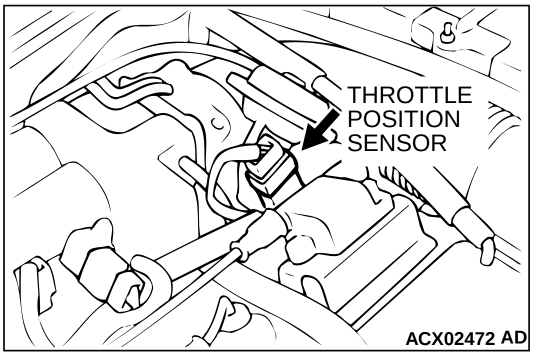
M1131001100061

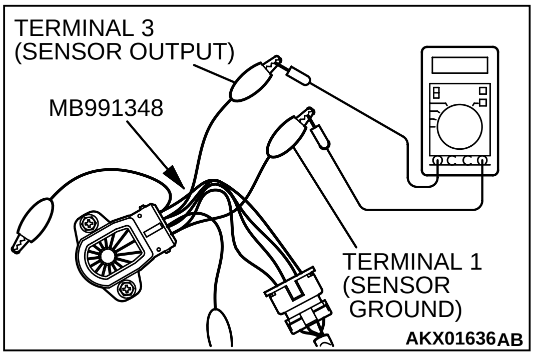
Required Special Tools:
MB991502: Scan Tool (MUT-II)
MB991348: Test Harness Set

⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the scan tool MB991502.

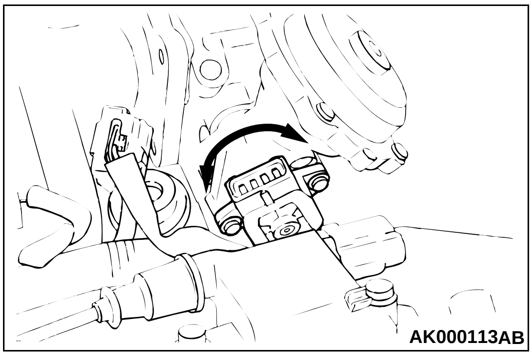






1. Connect scan tool MB991502 to the data link connector. When not using scan tool follow the steps below.
   (1) Disconnect the throttle position sensor connector, and connector the special tool MB991348 in between. (All terminals should be connected.)
   (2) Connect a digital voltmeter between throttle position sensor terminal 3 (sensor output) and terminal 1 (sensor ground).
2. Turn the ignition switch to the "ON" position (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 535 – 735 mV



4. If not within the standard value range, adjust by loosening throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991502. When the scan tool is not used, remove special tool MB991348, and connect the throttle position sensor connector.

BASIC IDLE SPEED ADJUSTMENT

M1131001800082

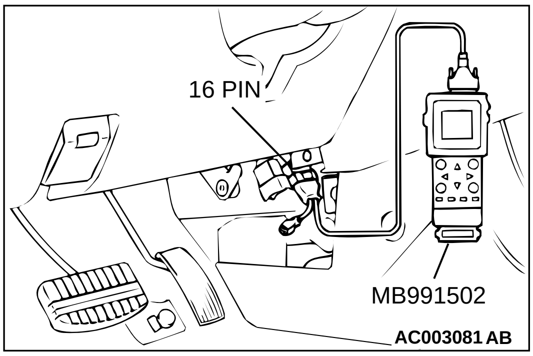
Required Special Tool:
MB991502: Scan Tool (MUT-II)

NOTE: The standard idle speed has been adjusted with the speed adjusting screw (SAS), by the manufacturer, and there should be no need for readjustment.

NOTE: If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads A/C, defogger, etc. are placed on the engine. If this occurs, adjust by the following procedure.

NOTE: The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, compression, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 – 95° C(176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: "P" range



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

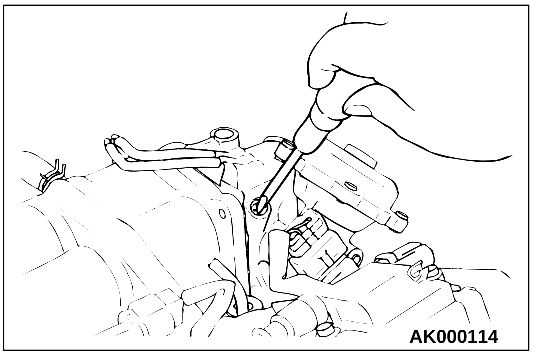
2. Connect scan tool MB991502 to the data link connector (16-pin).

   NOTE: When scan tool MB991502 is connected, the diagnostic test mode control terminal should be grounded.
3. Start the engine and run at idle.
4. Select the item number 30 of the scan tool Actuator test.

   NOTE: Use the scan tool to hold the IAC motor at the basic step to adjust the basic idle speed.
5. Check the idle speed.

   Standard value: 700 ± 50 r/min

   NOTE: The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.



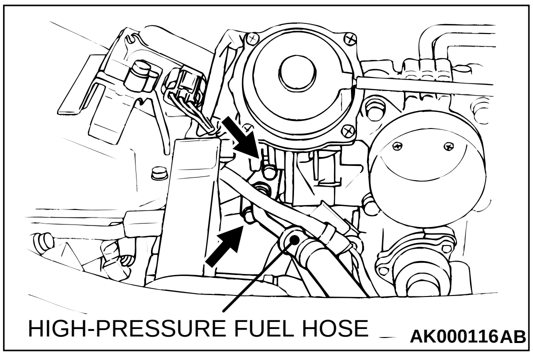
NOTE: If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-436)

6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the scan tool clear key, and release the IAC motor Actuator test mode.
8. Turn the ignition switch to the "LOCK" (OFF) position.

   NOTE: Unless the IAC motor is released, the Actuator test mode will continue for 27 minutes.
9. Disconnect scan tool MB991502.
10. Start the engine again and let it idle for about 10 minutes. Check that the idling condition is normal.

FUEL PRESSURE TEST

M1131001900078



Required Special Tools:

MB991502: Scan Tool (MUT-II)
MB991637: Fuel Pressure Gauge Set
MD998709: Adaptor Hose
MD998742: Hose Adaptor

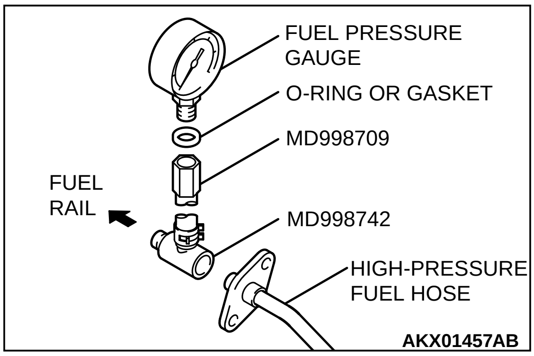
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-442.)

⚠ WARNING

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

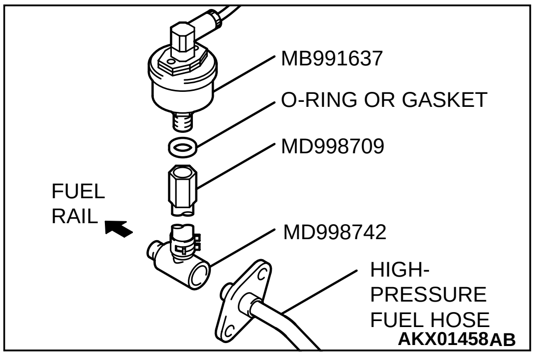
2. Disconnect the high-pressure fuel hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.

<When using the fuel pressure gauge>

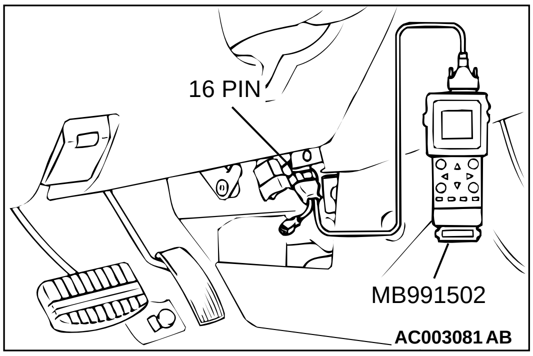


1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Place a suitable O-ring or gasket on assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and high-pressure fuel hose.

<When using the special tool MB991637 (fuel pressure gauge set)>



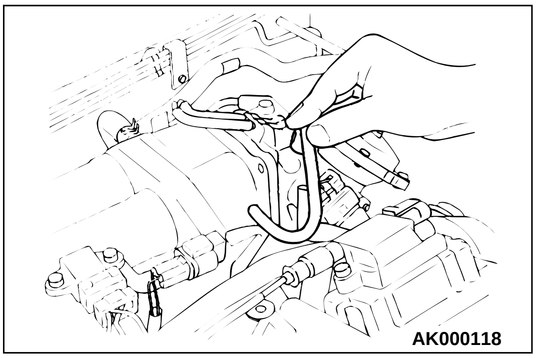
1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Install special tool MB991637 (fuel pressure gauge set) to assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and the high-pressure fuel hose.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

4. Connect scan tool MB991502 to the data link connector.
5. Use the Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.
8. Measure fuel pressure while the engine is running at idle.

   Standard value: Approximately 270 kPa (38 psi) at curb idle



9. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.

   Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle

10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.

    NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.

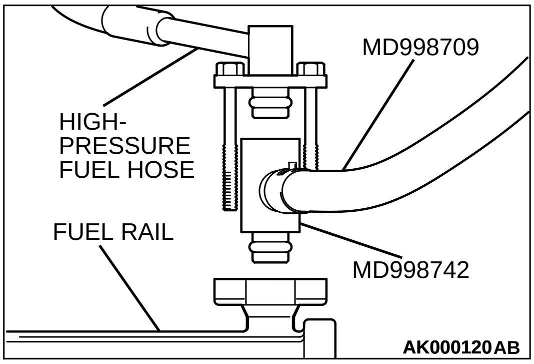
12. If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

13.Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
(1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.
(2) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
(3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump



14.14.Release residual pressure from the fuel pipe line. (Refer to P.13A-442.)

WARNING
Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

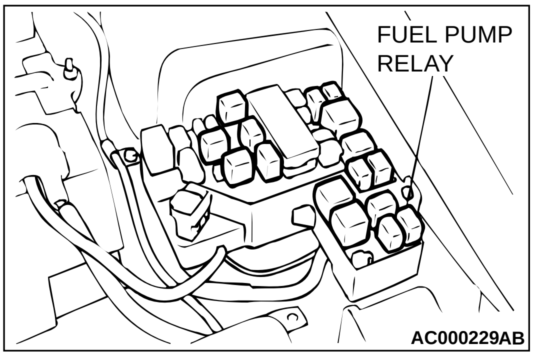
15.Remove the fuel pressure gauge, and special tools MD998709 and MD998742 from the fuel rail.
16.Replace the O-ring at the end of the high-pressure fuel hose with a new one.
17.Fit the high-pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 4.9 ± 1.0 (44 ± 8 in-lb)

18.Check for fuel leaks.
(1) Use scan tool MB991502 to operate the fuel pump.
(2) Check the fuel line for leaks, and repair as needed.
19.Disconnect scan tool MB991502.

FUEL PUMP CONNECTOR DISCONNECTION(HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900105



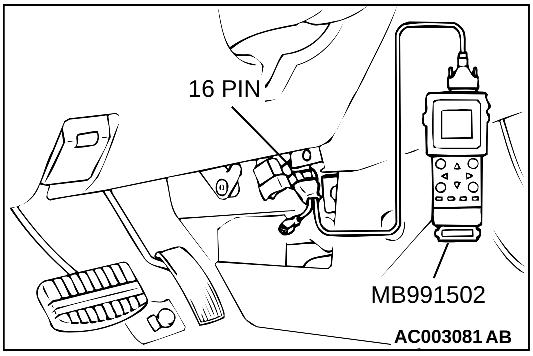
⚠ WARNING

When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

1. Disconnect the fuel pump relay.
2. Start the engine and let it run until it stops naturally. Turn the ignition switch to the "LOCK" (OFF) position.
3. Connect the fuel pump relay.

FUEL PUMP OPERATION CHECK

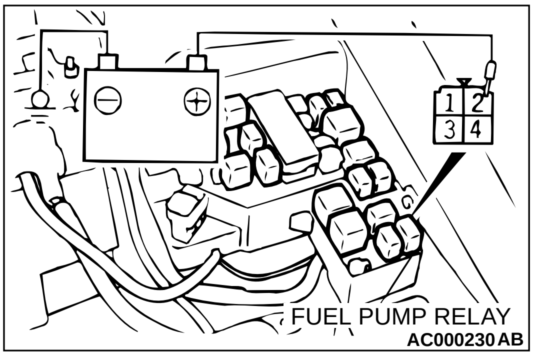
M1131002000090



Required Special Tool:

MB991502: Scan Tool (MUT-II)

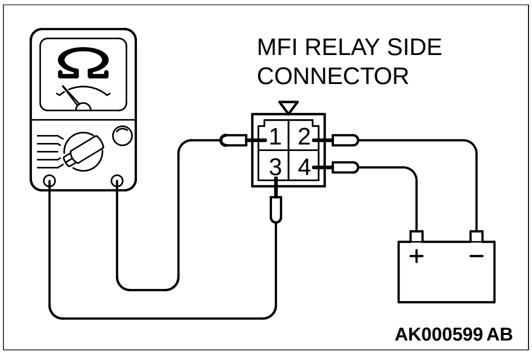
1. Check the operating of the fuel pump by using scan tool MB991502 to force-drive the fuel pump.



2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the fuel pump relay, and apply battery voltage to harness-side connector terminal number 2. Check that an operating sound can be heard from the fuel pump.
   NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.
   (3) Check for fuel pressure by pinching the fuel hose with fingertips.
   (4) Install the fuel pump relay.

MULTIPORT FUEL INJECTION (MFI) RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

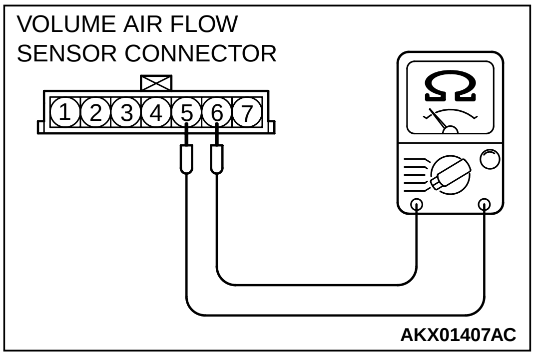
M1131009900083



BATTERY VOTAGE	BATTERY POWER SUPPLY TERMINAL	SPECIFIED CONDITION
Not supplied	-	2-4
Supplied	2-4	1-3

INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002800074

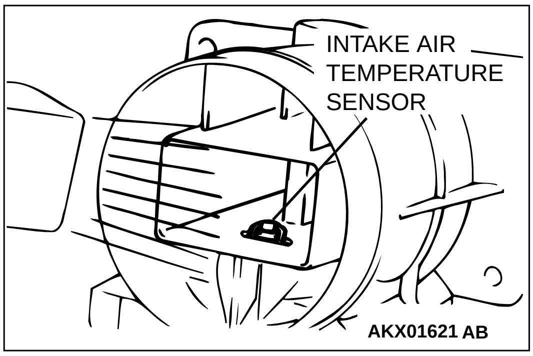


1. Disconnect the volume air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

   Standard value:

   5.3 – 6.7 kΩ [at 0°C (32°F)]
   2.3 – 3.0 kΩ [at 20°C (68°F)]
   1.0 – 1.5 kΩ [at 40°C (104°F)]
   0.30 – 0.42 kΩ [at 80°C (176°F)]

3. If not within specifications, replace the volume air flow sensor.



4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the volume air flow sensor assembly.

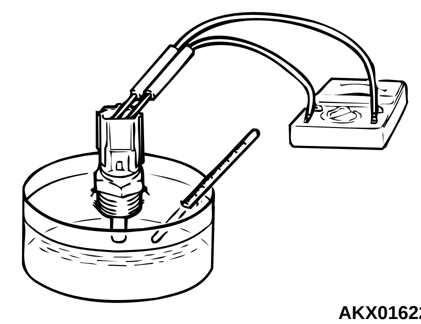
ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100056

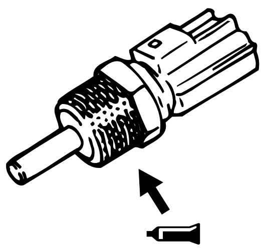
⚠ CAUTION

Be careful not to touch the connector (resin section) with the tool when removing and installing.

1. Drain engine coolant, then remove the engine coolant temperature sensor.



AKX01622



AKX01623 AB

2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

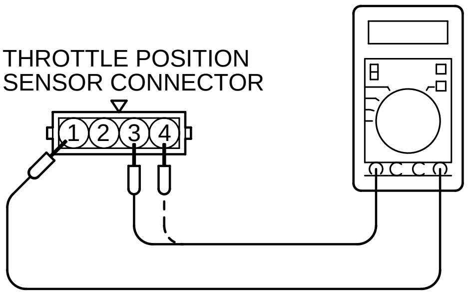
   Standard value:
   5.1 – 6.5 kΩ [at 0°C (32°F)]
   2.1 – 2.7 kΩ [at 20°C (68°F)]
   0.9 – 1.3 kΩ [at 40°C (104°F)]
   0.26 – 0.36 kΩ [at 80°C (176°F)]

3. If resistance deviates from the standard value greatly, replace the sensor.
4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

THROTTLE POSITION SENSOR CHECK

M1131003200053



AKX01413AB

Required Special Tool:

MB991348: Test Harness Set

Checking the Terminal Resistance

1. Disconnect the throttle position sensor connector.
2. Measure resistance between the throttle position sensor side connector terminal 1 and terminal 4.

   Standard value: 3.5 – 6.5 kΩ

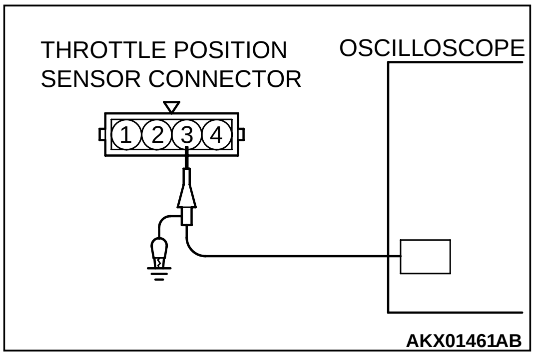
3. Measure resistance between the throttle position sensor side connector terminal 1 and terminal 3.

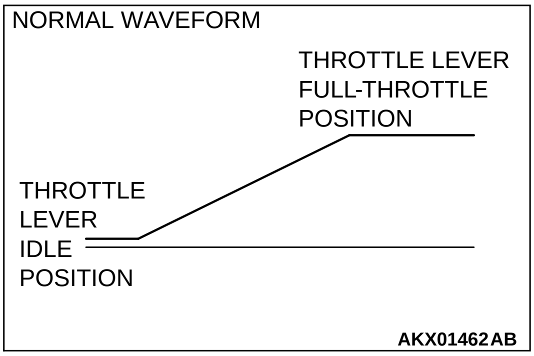
Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

4. If resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-437.)





Check using oscilloscope

1. Disconnect the throttle position sensor connector and connect the test harness special tool (MB991348) in between.(All terminals should be connected.)
2. Connect the oscilloscope probe to the throttle position sensor side connector terminal 3.
3. Turn the ignition switch "ON" position.
4. Slowly move the throttle lever from the idle position to the full-throttle position and check then if the waveform is free from any noise.
5. If any noise is recognized, replace the throttle position sensor.

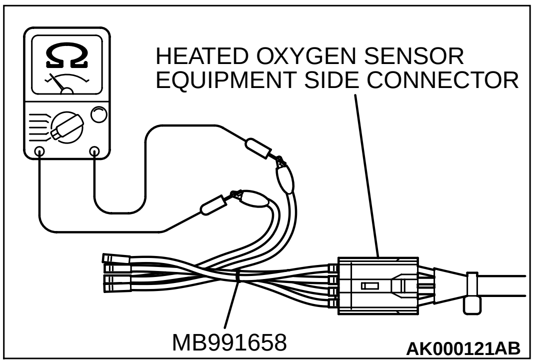
   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to *P.13A-437.**)*

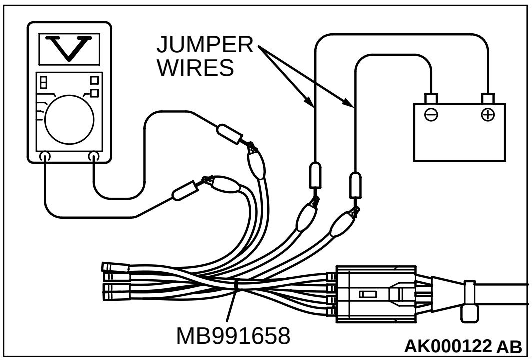
HEATED OXYGEN SENSOR CHECK

M1131005000099

Required Special Tools:
MB991658: Test Harness Set
MD998464: Test Harness

<Heated oxygen sensor (rear)>





1. Using scan tool MB991502, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [11-18 Ω at 20°C (68° F)] between terminal 3 and terminal 4 on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80° C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

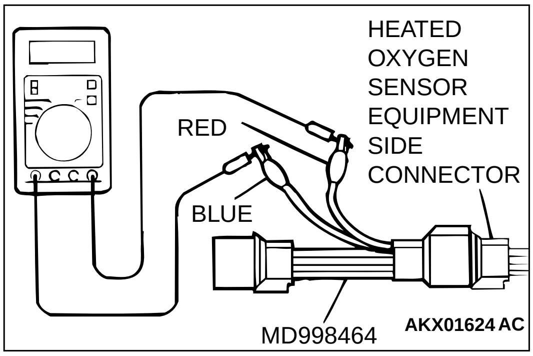
   (5) Use the jumper wires to connect terminal 3 of the heated oxygen sensor connector to the positive battery terminal and terminal 4 to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 1 and terminal 2.
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

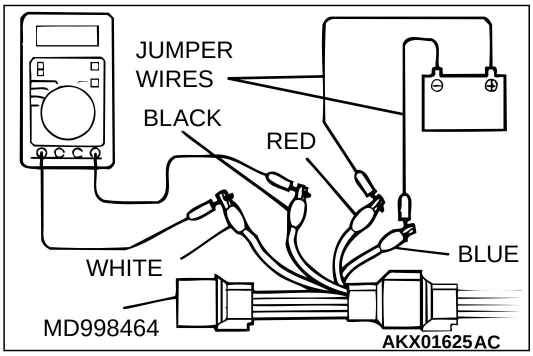
Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0V.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler (P.15-18).





<Heated oxygen sensor (front)>

1. Using the scan tool MB991502, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.

⚠ **CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

   (5) Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0V.

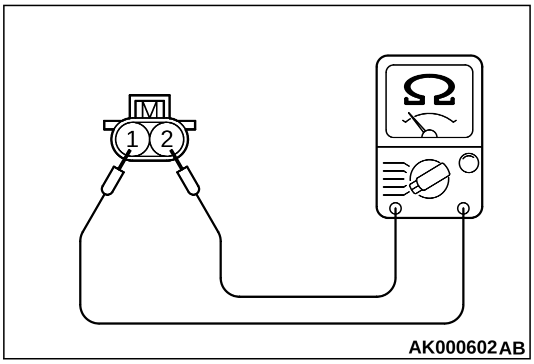
3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler (P.15-18).

INJECTOR CHECK

M1131005200082

Measurement of Resistance between Terminals

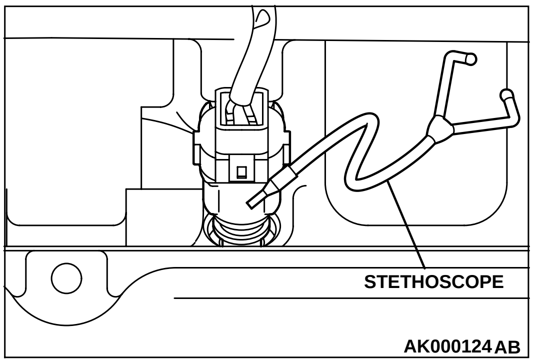


AK000602AB

1. Disconnect the injector intermediate connector.
2. Measure resistance between terminals.

   Standard value: 13 – 16 Ω [at 20°C (68°F)]
3. If not within specification, replace the injector.
4. Install the injector connector

Checking operation sound



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Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking. Check that as the engine speed increases, the frequency of the operating sound also increases.

1. If the injector you are checking is not operating, you may hear the operating sound of the other injectors.
2. If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or powertrain control module (PCM) is suspected.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

M1131005400105

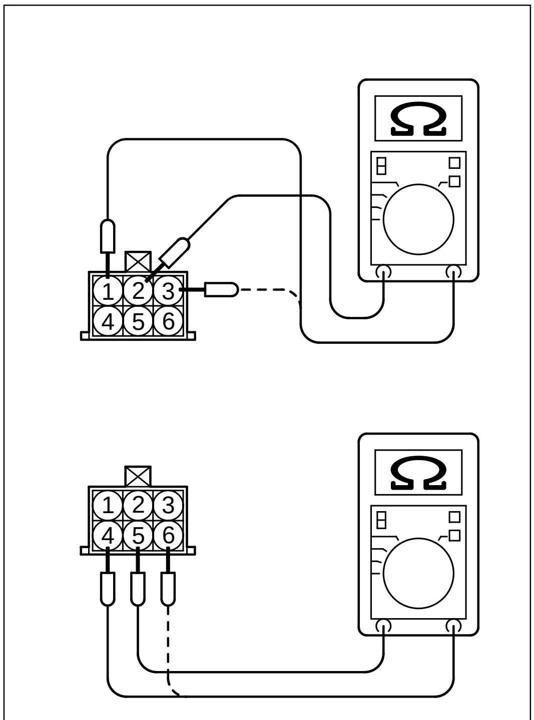
Required Special Tool:
MB991709: Test Harness Set

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) ορ βελοω.

   NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.
2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but without starting the motor).
3. If the operation sound cannot be heard, check the stepper motor's activation circuit. If the circuit is normal, it is probable that there is a malfunction of the stepper motor or powertrain control module (PCM).

Checking the Coil Resistance



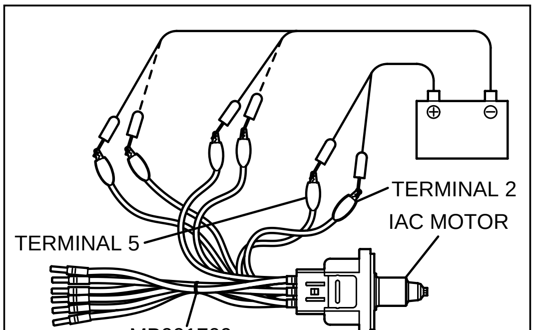
AKX01561AB

1. Disconnect the idle air control motor connector.
2. Measure resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]
3. If resistance is not within the standard value, replace the IAC motor.
4. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]
5. If resistance is not within the standard value, replace the IAC motor.

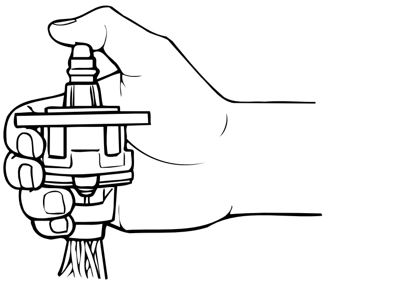
<Operation Check>



AKX01627AB

1. Remove the throttle body.
2. Remove the idle air control motor.
3. Connect special tool MB991709 to the idle air control motor connector.
4. Connect the positive (+) terminal of a power supply (approximately 6 V) to terminal 2 and the terminal 5.
5. Connect the negative (-) terminal of the power supply to each clip as described in the following steps. Then check whether or not the stepper motor vibrates slighly as it operates.
   (1) Connect the negative terminal of the power supply to terminal 1 and terminal 4.
   (2) Connect the negative terminal of the power supply to terminal 3 and terminal 4.

(3) Connect the negative terminal of the power supply to terminal 3 and terminal 6.
(4) Connect the negative terminal of the power supply to terminal 1 and terminal 6.
(5) Connect the negative terminal of the power supply to terminal 1 and terminal 4.
(6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.


AKX01626

6. If vibration is detected during the test, the stepper motor can be considered to be normal.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600079

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check (P.17-86).

EGR SOLENOID CHECK

M1131005700076

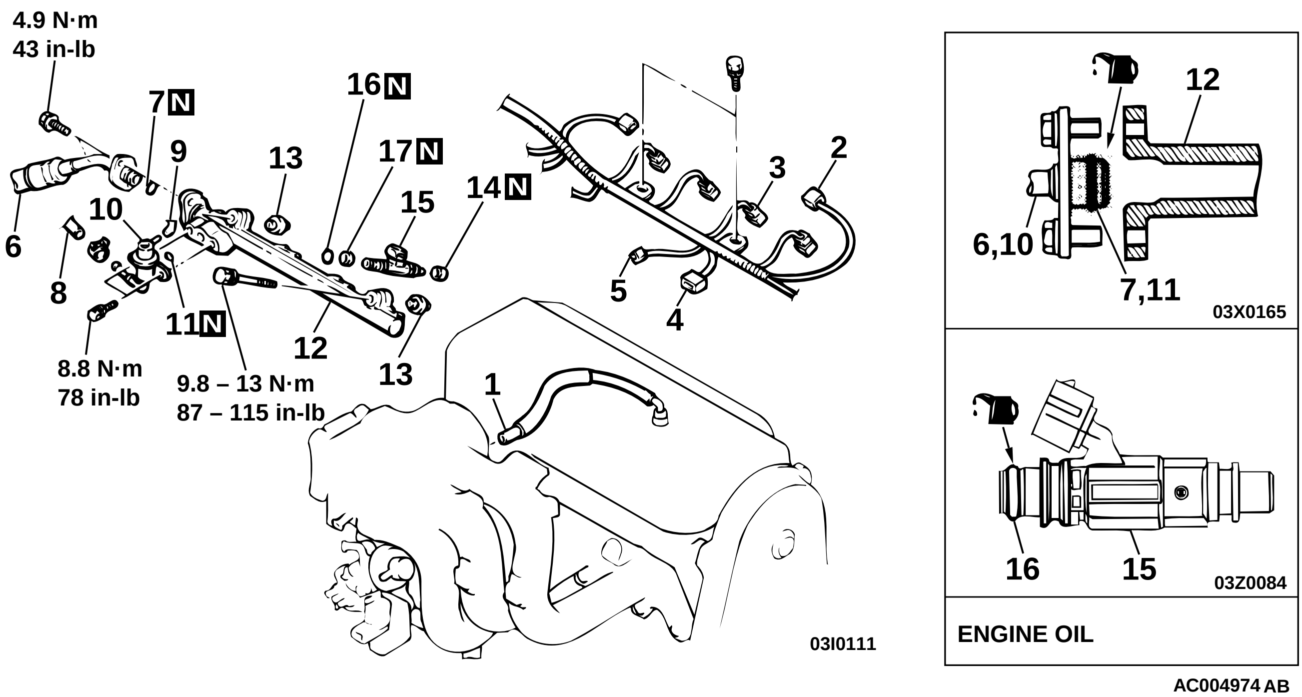
Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System - EGR Solenoid Check (P.17-93).

INJECTOR

REMOVAL AND INSTALLATION

M1131007100081

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention (Refer to P.13A-442.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change)P.00-50.] • Air Cleaner Removal (Refer to GROUP 15, Air CleanerP.15-4.) • Throttle Body Removal (Refer to P.13A-451.)	• Throttle Body Installation (Refer to P.13A-451.) • Air Cleaner Installation (Refer to GROUP 15, Air CleanerP.15-4.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change)P.00-50.] • Fuel Leakage Inspection



REMOVAL STEPS

1. PCV HOSE CONNECTION
2. IGNITION COIL CONNECTOR
3. INJECTOR CONNECTOR
4. IGNITION FAILURE SENSOR CONNECTOR
5. MANIFOLD DIFFERENTIAL PRESSURESENSOR CONNECTOR
6. >>A<< HIGH-PRESSURE FUEL HOSE CONNECTION
7. O-RING

REMOVAL STEPS (Continued)

8. FUEL HOSE CONNECTION
9. VACUUM HOSE CONNECTION
10. >>A<< FUEL PRESSURE REGULATOR
11. O-RING
12. <<A>> FUEL RAIL
13. INSULATORS
14. INSULATORS
15. <<A>> >>A<< INJECTORS
16. O-RINGS
17. GROMMETS

REMOVAL SERVICE POINT

<<A>>FUEL RAIL/INJECTORS REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINT

>>A<<INJECTORS/FUEL PRESSURE REGULATOR/HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Do not let the engine oil get into the fuel rail will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector. To the right and left to install to the fuel rail. Repeat for fuel pressure regulator and high-pressure fuel hose.
   Be careful not to damage the O-ring. After installing, check that the item turns smoothly.

3. If it dose not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.
4. Tighten the fuel pressure regulator and high-pressure fuel hose to the specified torque.

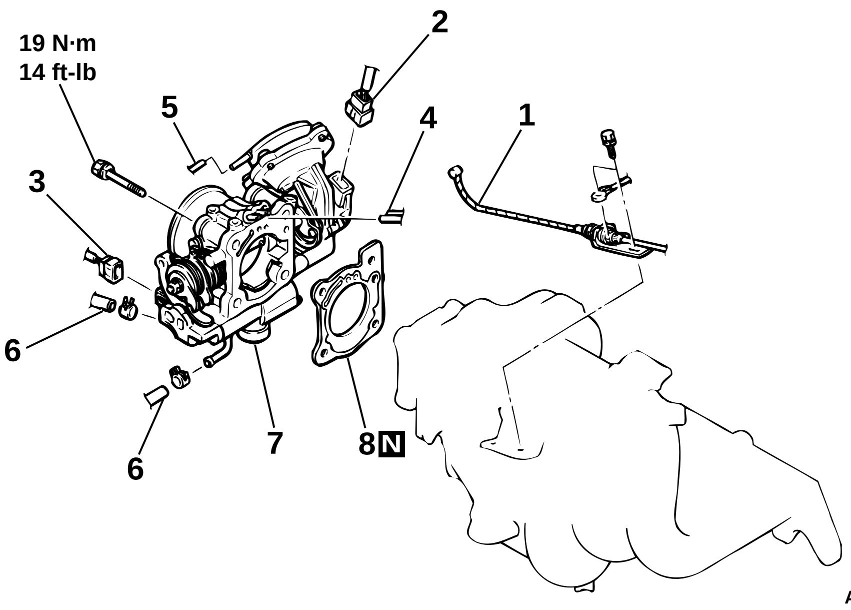
Tightening torque:
8.8 N·m (78 in-lb) <Fuel pressure regulator>
4.9 N·m (43 in-lb) <High-pressure fuel hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1131007700094

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change)P.00-50.] • Air Cleaner Removal (Refer to GROUP 15, Air CleanerP.15-4.)	• Air Cleaner Installation (Refer to GROUP 15, Air CleanerP.15-4.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change)P.00-50.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and AdjustmentP.17-4.)



REMOVAL STEPS
1. ACCELERATOR CABLE CONNECTION
2. THROTTLE POSITION SENSOR CONNECTOR
3. IDLE AIR CONTROL MOTOR CONNECTOR
4. VACUUM HOSE CONNECTION

REMOVAL STEPS (Continued)
5. VACUUM HOSE CONNECTION <VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM>
6. WATER HOSE CONNECTION
7. THROTTLE BODY

>>A<< 8. THROTTLE BODY GASKET

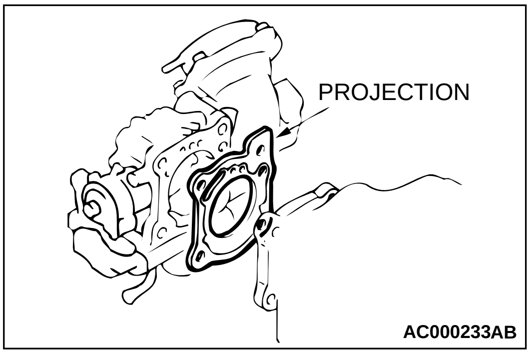
INSTALLATION SERVICE POINT

>>A<<THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

Poor idling etc. may result if the throttle body gasket is installed incorrectly.

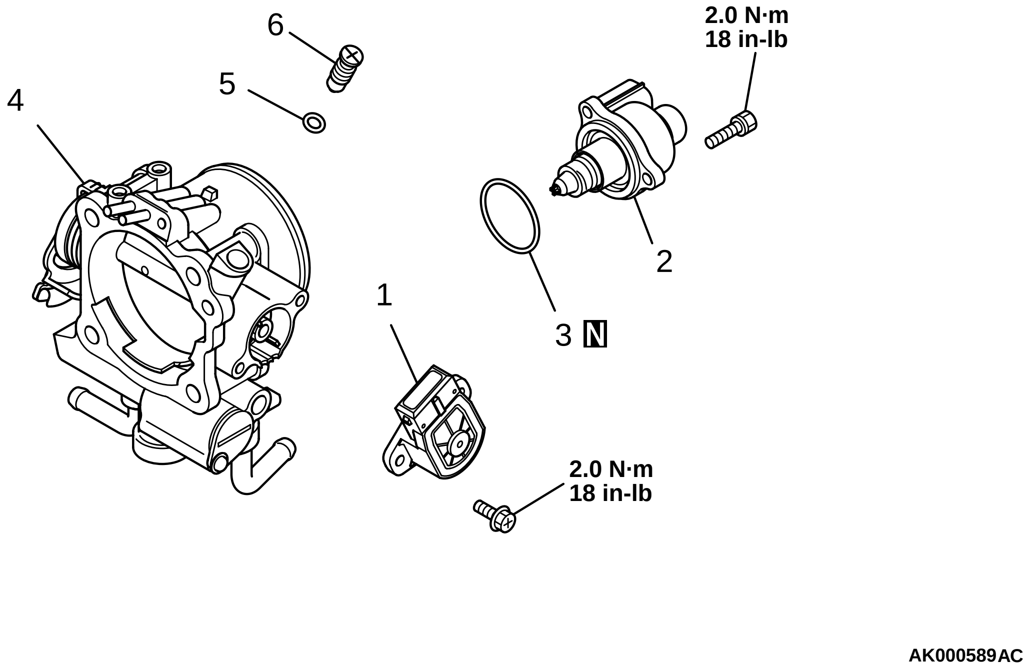
Install the throttle body gasket as shown in the illustration.



DISASSEMBLY AND ASSEMBLY

M1131009700120

<VEHICLES WITHOUT AUTO-CRUSE CONTROL SYSTEM>



REMOVAL STEPS

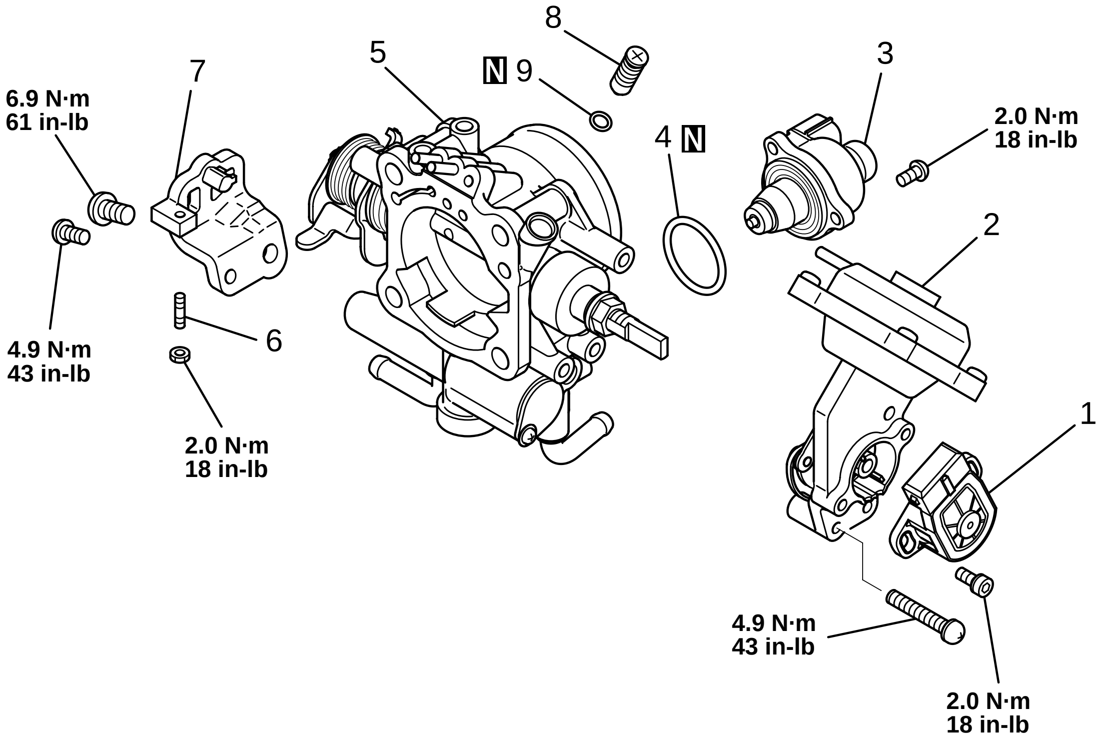
<<A>> >>A<< 1. THROTTLE POSITION SENSOR
2. IDLE AIR CONTROL MOTOR
3. O-RING
<<B>> 4. THROTTLE BODY

REMOVAL STEPS (Continued)

5. SPEED ADJUSTING SCREW
6. O-RING

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFOM SPEED ADJUSTING SCREW ADJUSTMENT.

<VEHICLES WITH AUTO-CRUSE CONTROL SYSTEM>



REMOVAL STEPS

<<A>> >>A<< 1. THROTTLE POSITION SENSOR
2. LEVER ASSEMBLY
3. IDLE AIR CONTROL MOTOR
4. O-RING
<<B>> 5. THROTTLE BODY
6. THROTTLE SPEED ADJUSTING SCREW
7. BRACKET

REMOVAL STEPS (Continued)

8. SPEED ADJUSTING SCREW
9. O-RING

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFOM SPEED ADJUSTING SCREW ADJUSTMENT.

DISASSEMBLY SERVICE POINTS

<<A>> THROTTLE POSITION SENSOR DISASSEBLY

1. Do not disassemble the sensor and motor.
2. Do not clean the sensor and motor by dipping them into cleaning solvent. Clean them with shop towel.

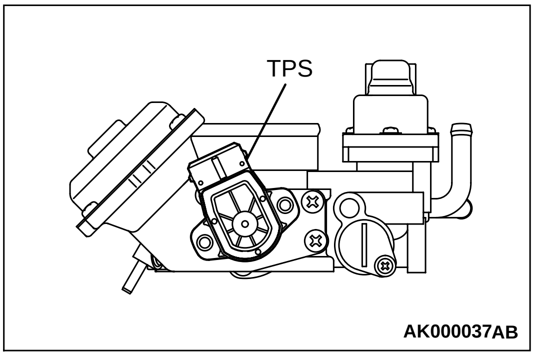
<<B>> THROTTLE BODY DISASSEMBLY

1. Do not disassemble the throttle body.

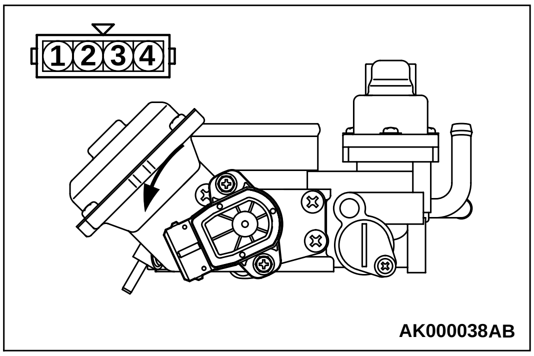
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.

ASSEMBLY SERVICE POINTS

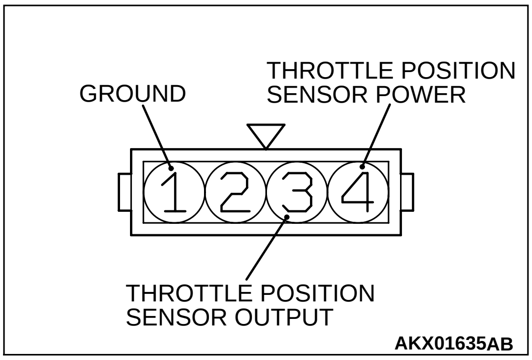
>>A<< THROTTLE POSITION SENSOR (TPS) INSTALLATION



1. Install the throttle position sensor to the throttle body as shown in the illustration.



2. Turn the throttle position sensor 90 degrees counterclockwise to set it, and tighten the screws.



3. Connect an ohmmeter between terminals 1 (ground) and 3 (output), or between terminals 3 (output) and 4 (power). Then, make sure that the resistance changes smoothly when the throttle valve is slowly moved to the fully open position.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600108

ITEM	SPECIFICATION
Fuel pressure regulator	8.8 N·m (78 in-lb)
Fuel rail mounting bolt	9.8 – 13 N·m (87 – 115 in-lb)
High-pressure fuel hose	4.9 N·m (43 in-lb)
Idle air control motor	2.0 N·m (18 in-lb)
Lever assembly	4.9 N·m (44 in-lb)

ITEM	SPECIFICATION
Throttle body bracket M6	4.9 N·m (44 in-lb)
Throttle body bracket M8	6.9 N·m (61 in-lb)
Throttle body mounting bolt	19 N·m (14 ft-lb)
Throttle position sensor	2.0 N·m (18 in-lb)
Throttle speed adjusting screw mounting nut	2.0 N·m (18 in-lb)

GENERAL SPECIFICATIONS

M1131000200076

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	54 (2.1)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (stepper motor type by-pass air control system with the air volume limiter)
Powertrain control module (PCM)	Identification model No.	E2T76482 <California>
		E2T76483 <Federal>
Sensors	Volume air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Park/neutral position switch	Contact switch type
	Camshaft position sensor	Electromagnetic resistance element type
	Crankshaft position sensor	Hall element type
	Power steering pressure switch	Contact switch type
	Manifold differential pressure sensor	Semiconductor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH240
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

M1131000300051

ITEMS		STANDARD VALUE
Throttle position sensor adjusting voltage mV		535 – 735
Basic idle speed r/min		700 ± 50
Fuel pressure kPa (psi)	Vacuum hose disconnected	330 – 350 (47 – 50) at curb idle
	Vacuum hose connected	Approximately 270 (38) at curb idle
Intake air temperature sensor resistance kΩ	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	80°C (176°F)	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	0°C (32°F)	5.1 – 6.5
	20°C (86°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		3.5 – 6.5
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 – 8.0
	<Rear>	11 – 18
Injector coil resistance Ω		13 – 16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω		28 – 33 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500022

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731or equivalent