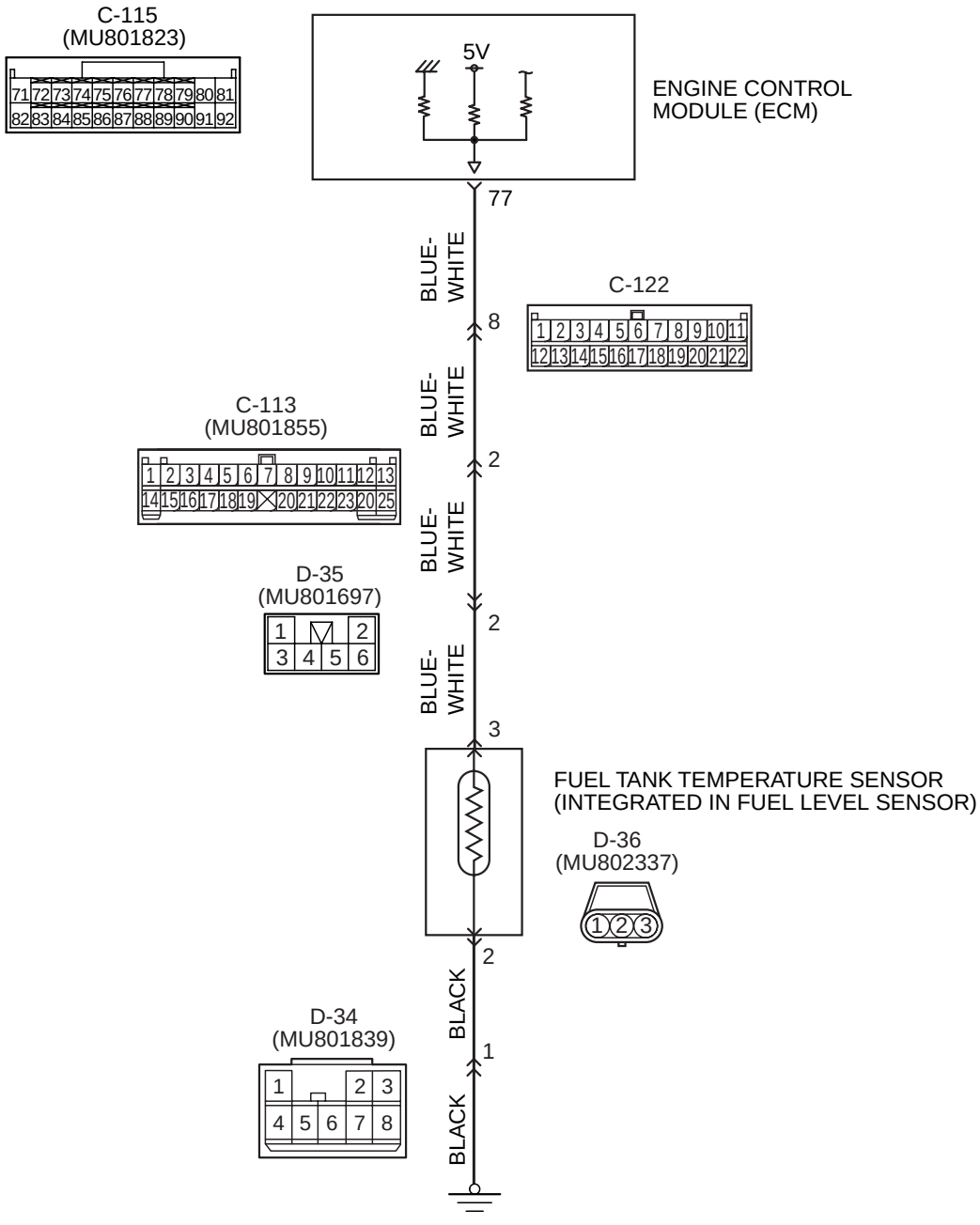
DTC P0181: FUEL TANK TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

Fuel Tank Temperature Sensor Circuit



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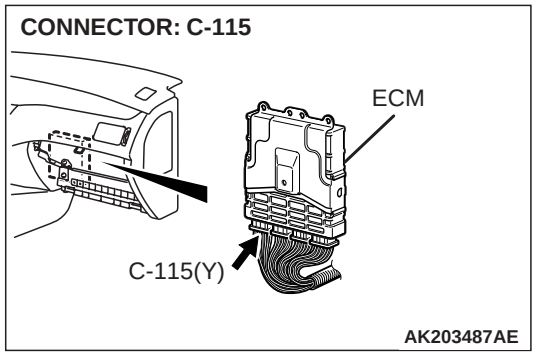

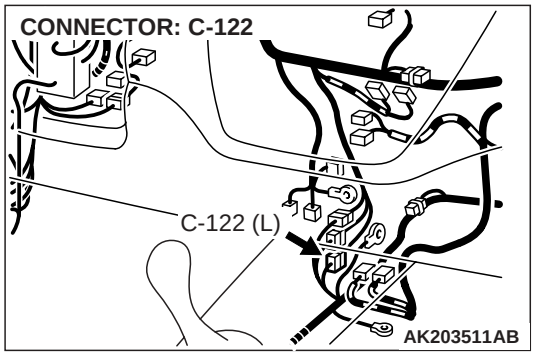

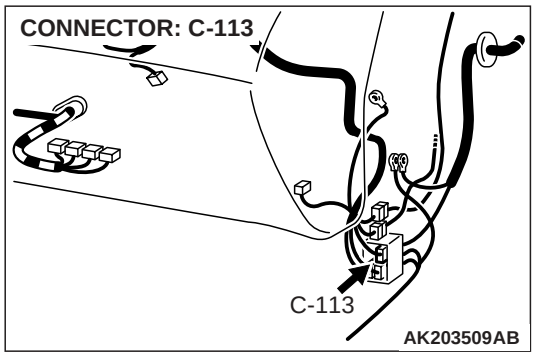

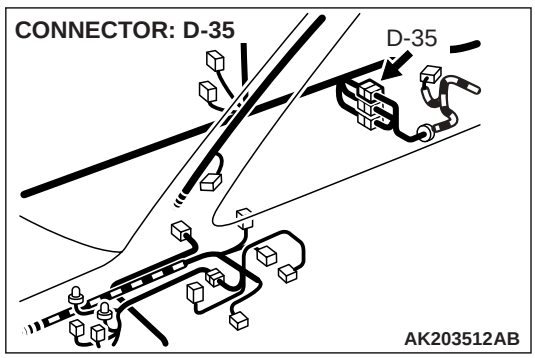

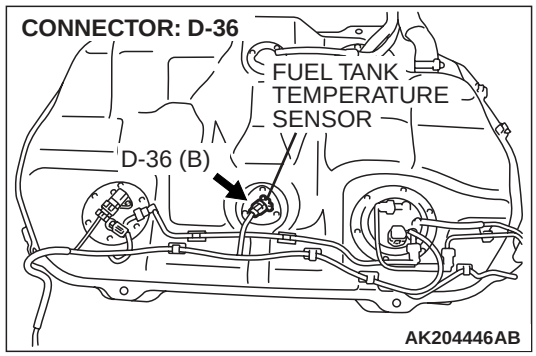

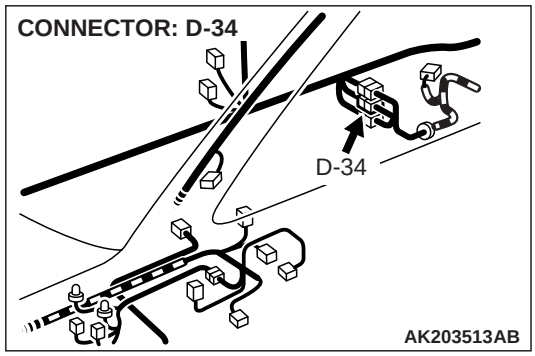

CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The engine coolant temperature is between – 10°C (14°F) and 36°C (96.8°F) when the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Maximum vehicle speed is higher than 30 km/h (17 mph) after the starting sequence has been completed.

Judgement Criteria

- The fuel tank temperature – engine coolant temperature is 15° C (27° F) or more when the engine is started.

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

- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, harness damage, or loose connector.
- ECM failed.

NOTE: A diagnostic trouble code (DTC) could be output if the engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel tank temperature was high). Because this is not a failure, the DTC must be erased.
Make sure to test drive the vehicle in accordance with the drive cycle pattern in order to verify that a DTC will not be output.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

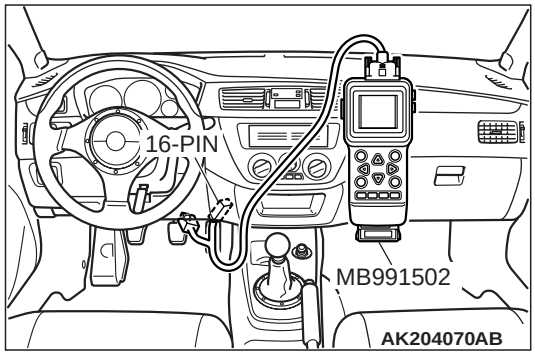
STEP 1. Using scan tool MB991502 or MB991958, check data list item 4A: Fuel Tank Temperature Sensor.

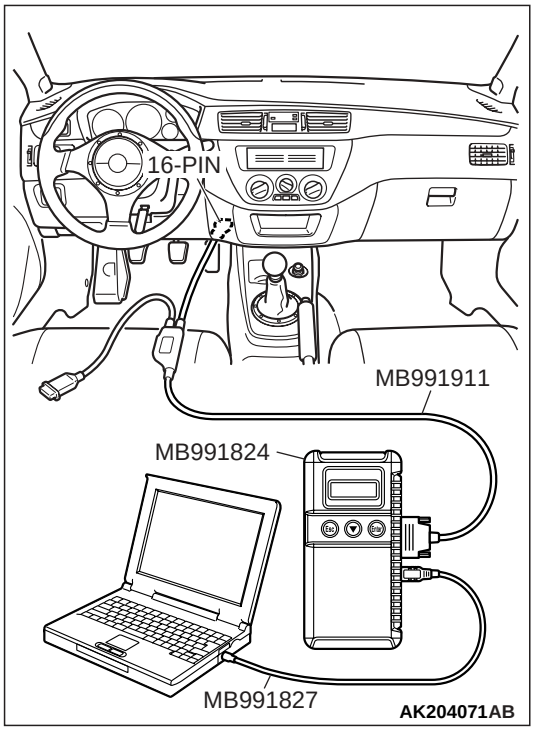
⚠ CAUTION
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

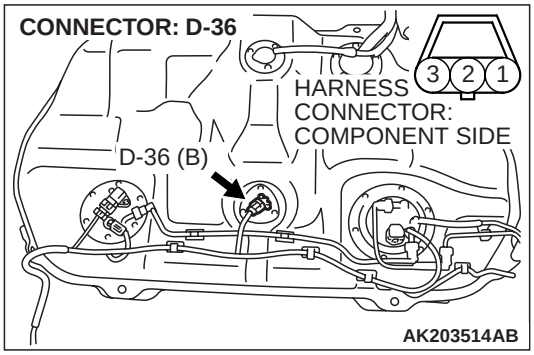
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
  - With the engine cool, the fuel tank temperature should be approximately the same as ambient air temperature.
(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.00-6.
NO : Go to Step 2.





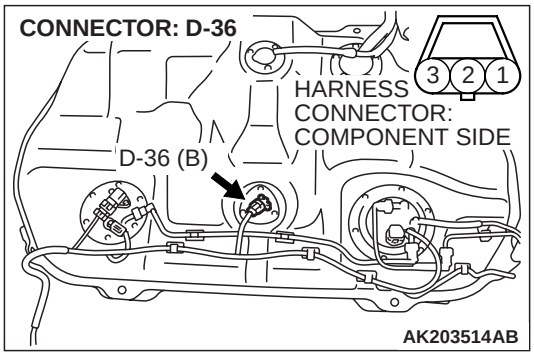


STEP 2. Check harness connector D-36 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

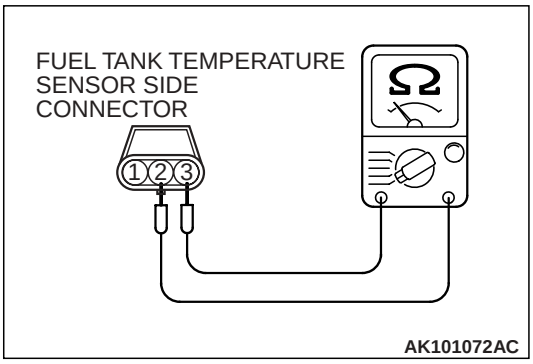
YES : Go to Step 3.

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



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-36.



(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel tank temperature sensor.

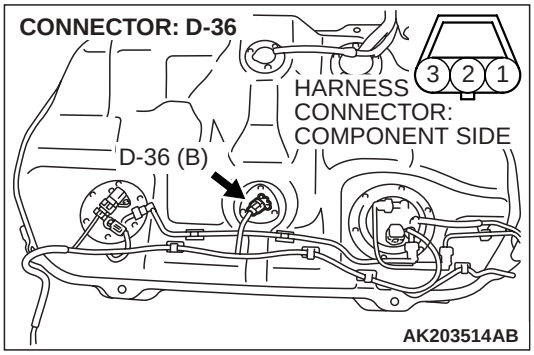
Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance between 0.5 and 12.0 kΩ?

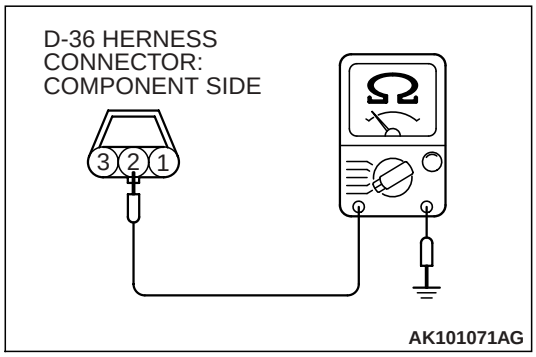
YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 12.

STEP 4. Check for continuity at fuel tank temperature sensor harness side connector D-36.



(1) Disconnect connector D-36 and measure at the harness side.



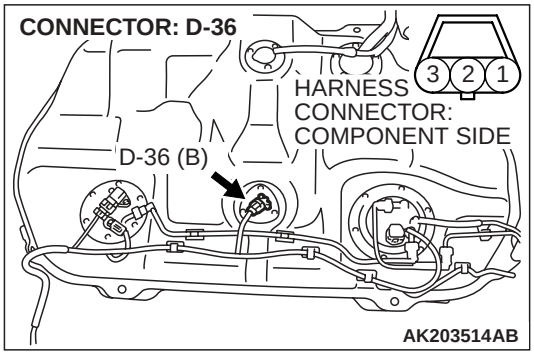
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 5.

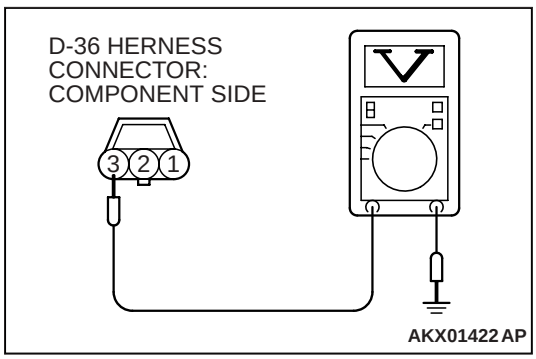
NO : Check connector D-34 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fuel tank temperature sensor connector D-36 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 12.

STEP 5. Measure the sensor supply voltage at fuel tank temperature sensor harness side connector D-36.



(1) Disconnect connector D-36 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure between 4.5 and 4.9 volts.

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

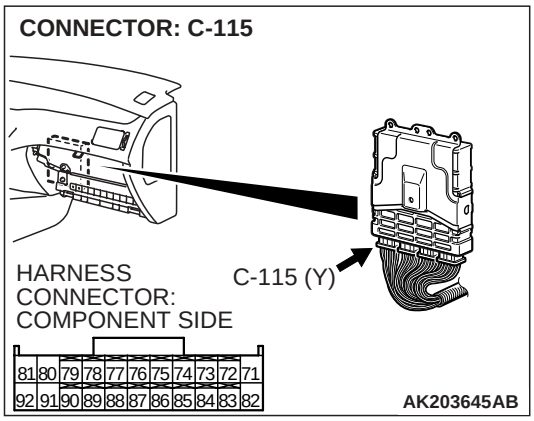
Q: Is the measured voltage between 4.5 and 4.9 volts?

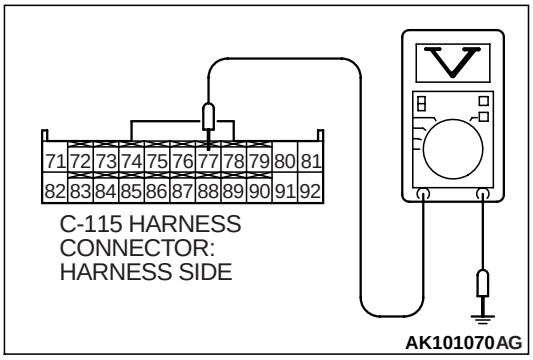
YES : Go to Step 6.

NO : Go to Step 10.

STEP 6. Measure the sensor supply voltage at ECM connector C-115 by backprobing.

(1) Do not disconnect the ECM connector C-115.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 77 and ground by backprobing.
- When fuel tank temperature is 0°C (32°F), voltage should be between 2.7 and 3.1 volts.
- When fuel tank temperature is 20°C (68°F), voltage should be between 2.1 and 2.5 volts.
- When fuel tank temperature is 40°C (104°F), voltage should be between 1.6 and 2.0 volts.
- When fuel tank temperature is 80°C (176°F), voltage should be between 0.8 and 1.2 volts.

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

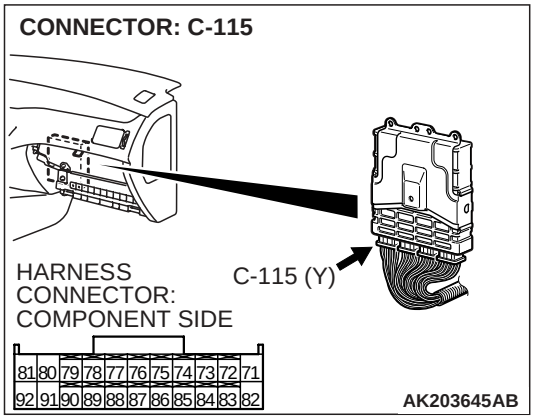
Q: Is the measured voltage within the specified range?

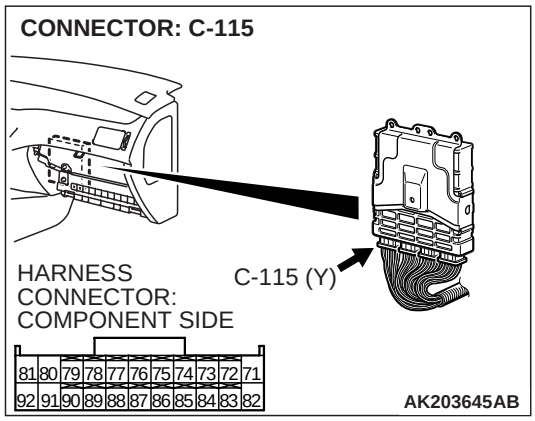
YES : Go to Step 7.
NO : Go to Step 8.

STEP 7. Check harness connector C-115 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector C-113, C-122 and D-35 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between fuel tank pressure sensor connector D-36 (terminal No. 3) and ECM connector C-115 (terminal No. 77) because of open circuit. 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.



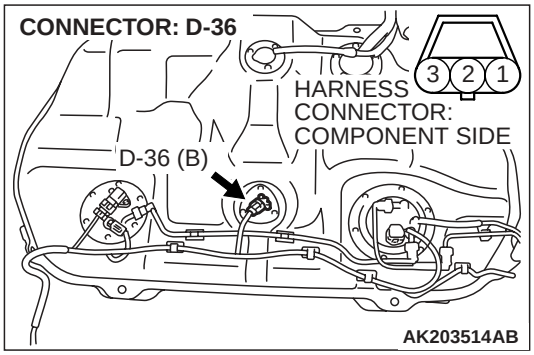


STEP 8. Check harness connector C-115 at ECM for damage.

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 go to Step 12.

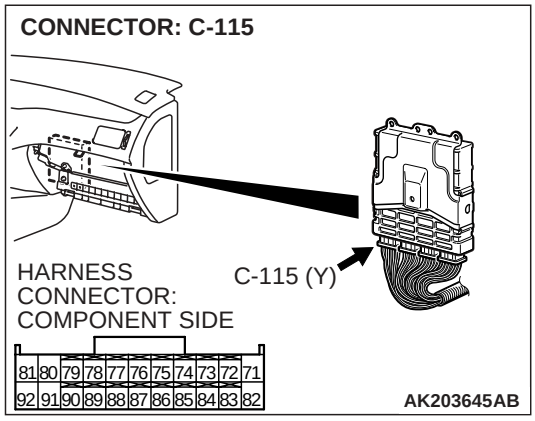


STEP 9. Check for short circuit to ground between fuel tank temperature sensor connector D-36 (terminal No. 3) and ECM connector C-115 (terminal No. 77).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.

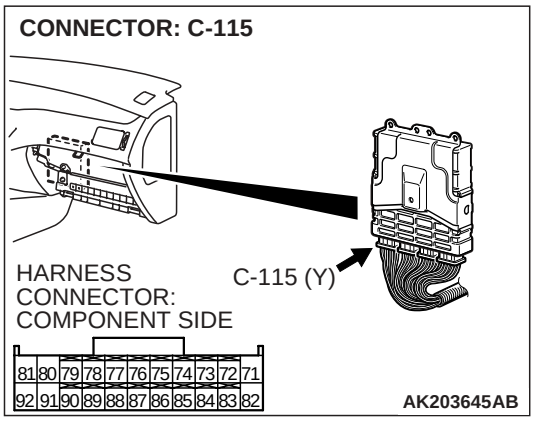


STEP 10. Check harness connector C-115 at ECM for damage.

Q: Is the harness 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.



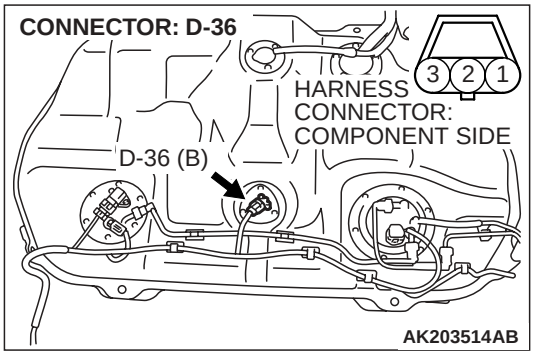
STEP 11. Check for harness damage between fuel tank temperature sensor connector D-36 (terminal No. 3) and ECM connector C-115 (terminal No. 77).

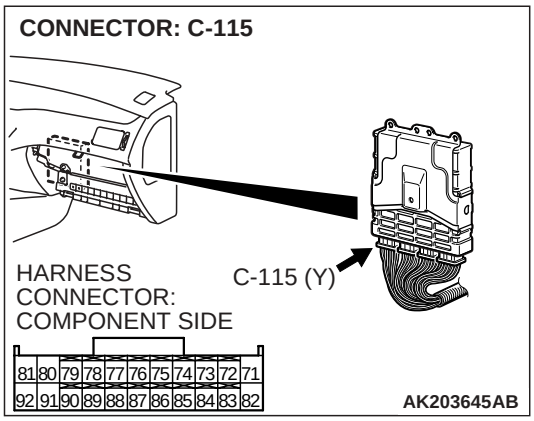
NOTE: Check harness after checking intermediate connector C-113, C-122 and D-35. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.





STEP 12. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.

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

Q: Is DTC P0181 set?

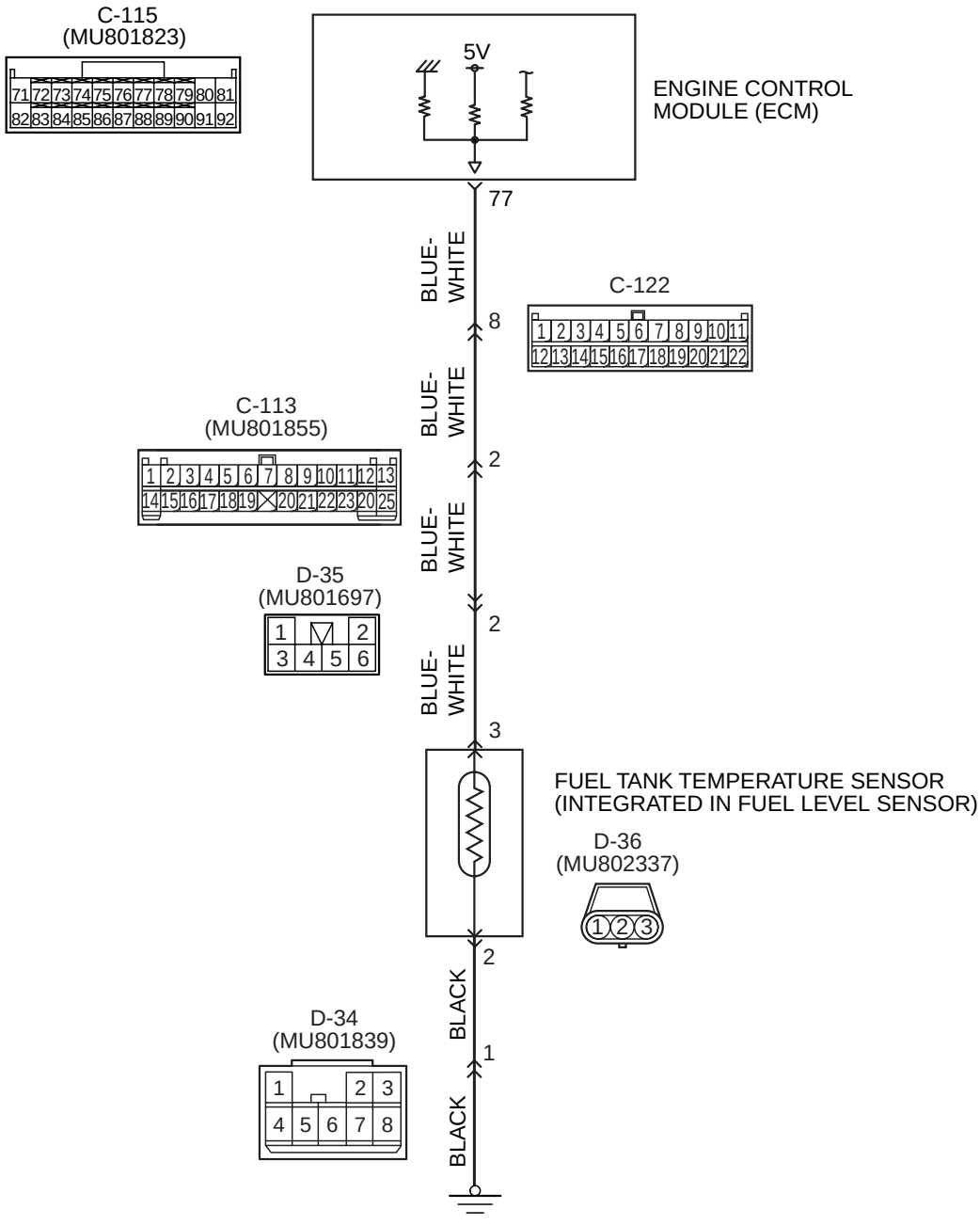
YES : Repeat the troubleshooting.

NO : The procedure is complete.

TSB Revision

DTC P0182: FUEL TANK TEMPERATURE SENSOR CIRCUIT LOW INPUT

Fuel Tank Temperature Sensor Circuit



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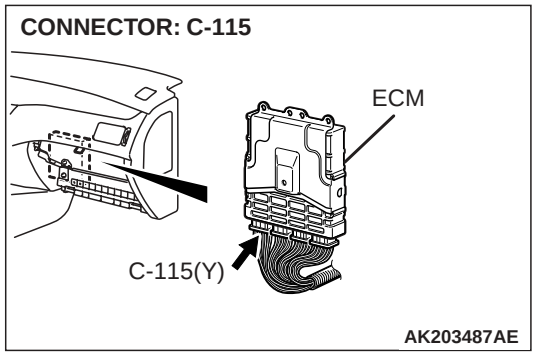
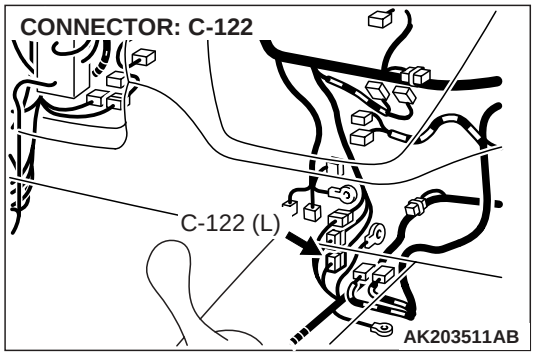
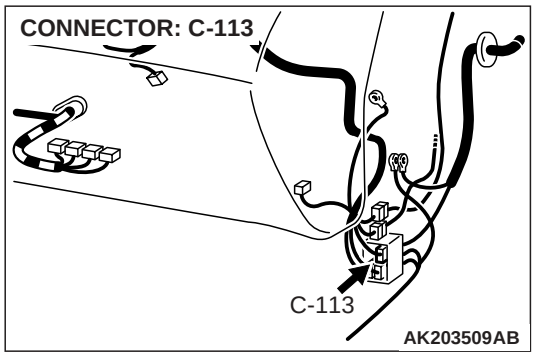
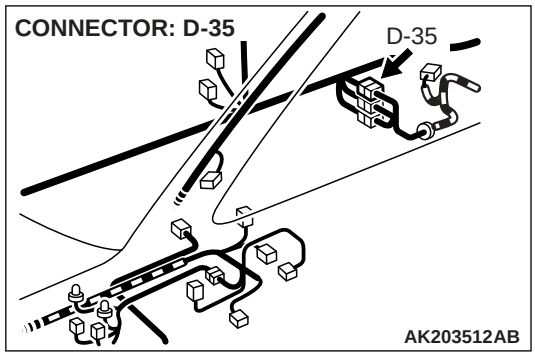
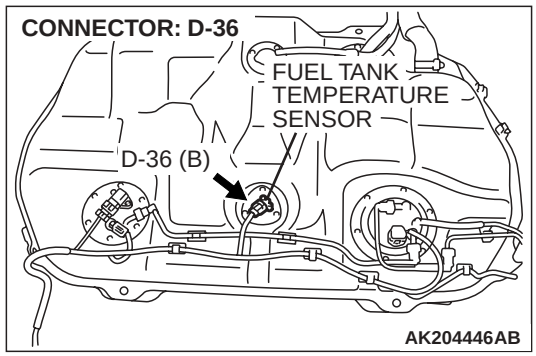
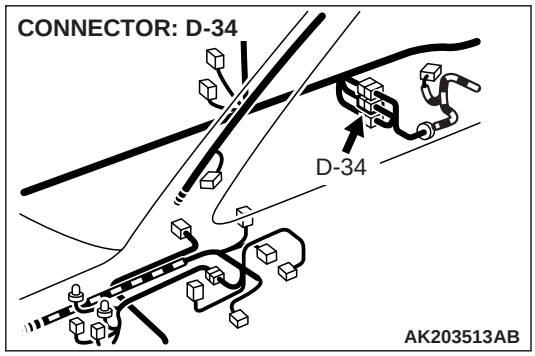












CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- Fuel tank temperature sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

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

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit, or loose connector.
- ECM failed.

TSB Revision

DIAGNOSIS

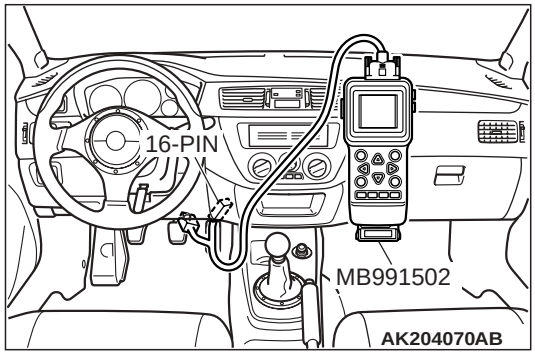
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

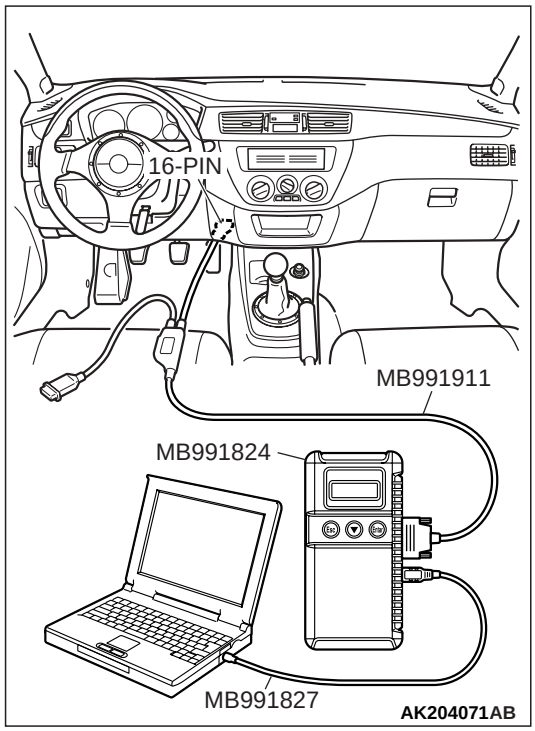
STEP 1. Using scan tool MB991502 or MB991958, check data list item 4A: Fuel Tank Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.



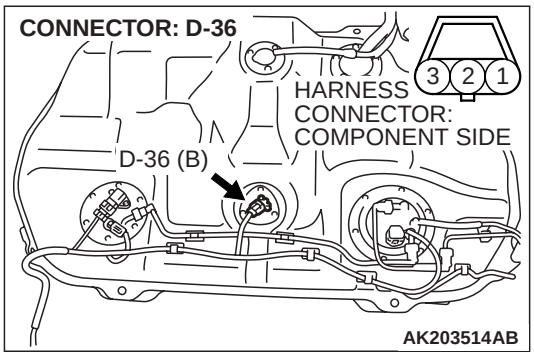
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
  - With the engine cool, the fuel tank temperature should be approximately the same as ambient air temperature.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

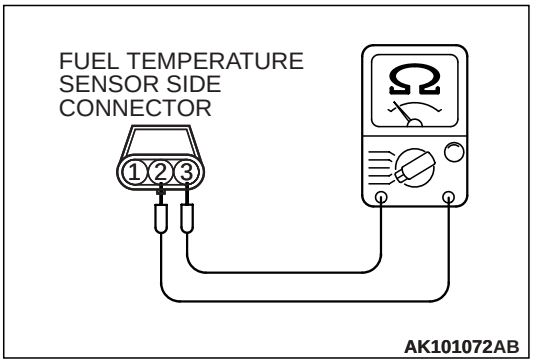
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-36.



(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kΩ

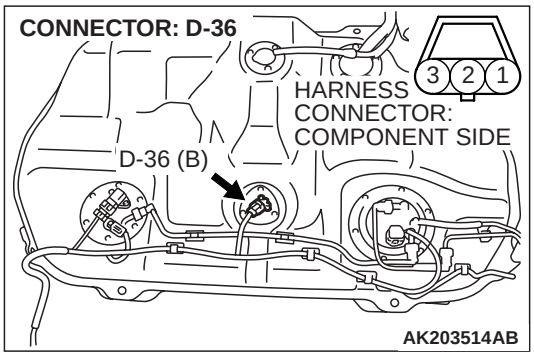
Q: Is the resistance between 0.5 and 12.0 kΩ?

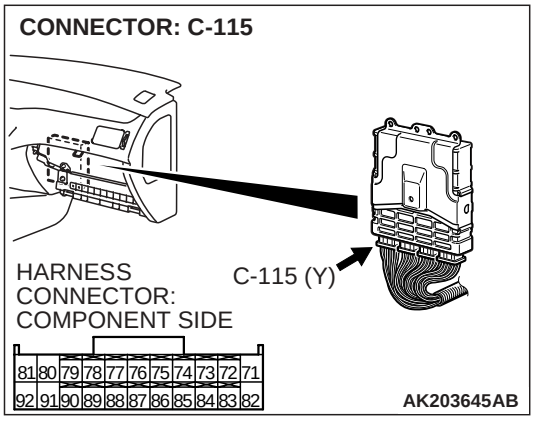
YES : Go to Step 3.
NO : Replace the fuel tank temperature sensor. Then go to Step 5.

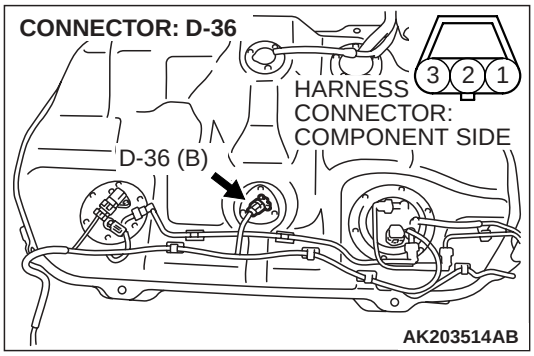
STEP 3. Check harness connector D-36 at the fuel tank temperature sensor and harness connector C-115 at ECM for damage.

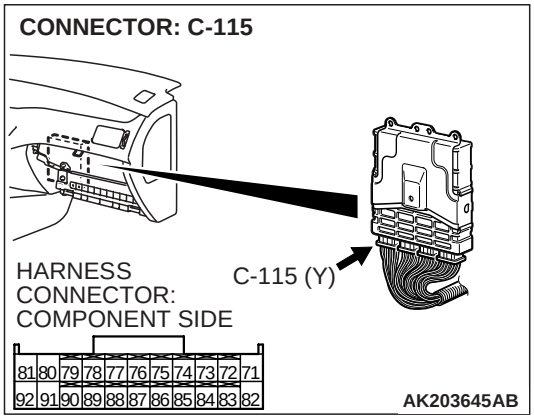
Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.









STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector D-36 and ECM connector C-115.

NOTE: Check harness after checking intermediate connectors C-113, C-122 and D-35. If the intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 5.
NO : Repair it. Then go to Step 5.

STEP 5. Perform the OBD-II drive cycle.

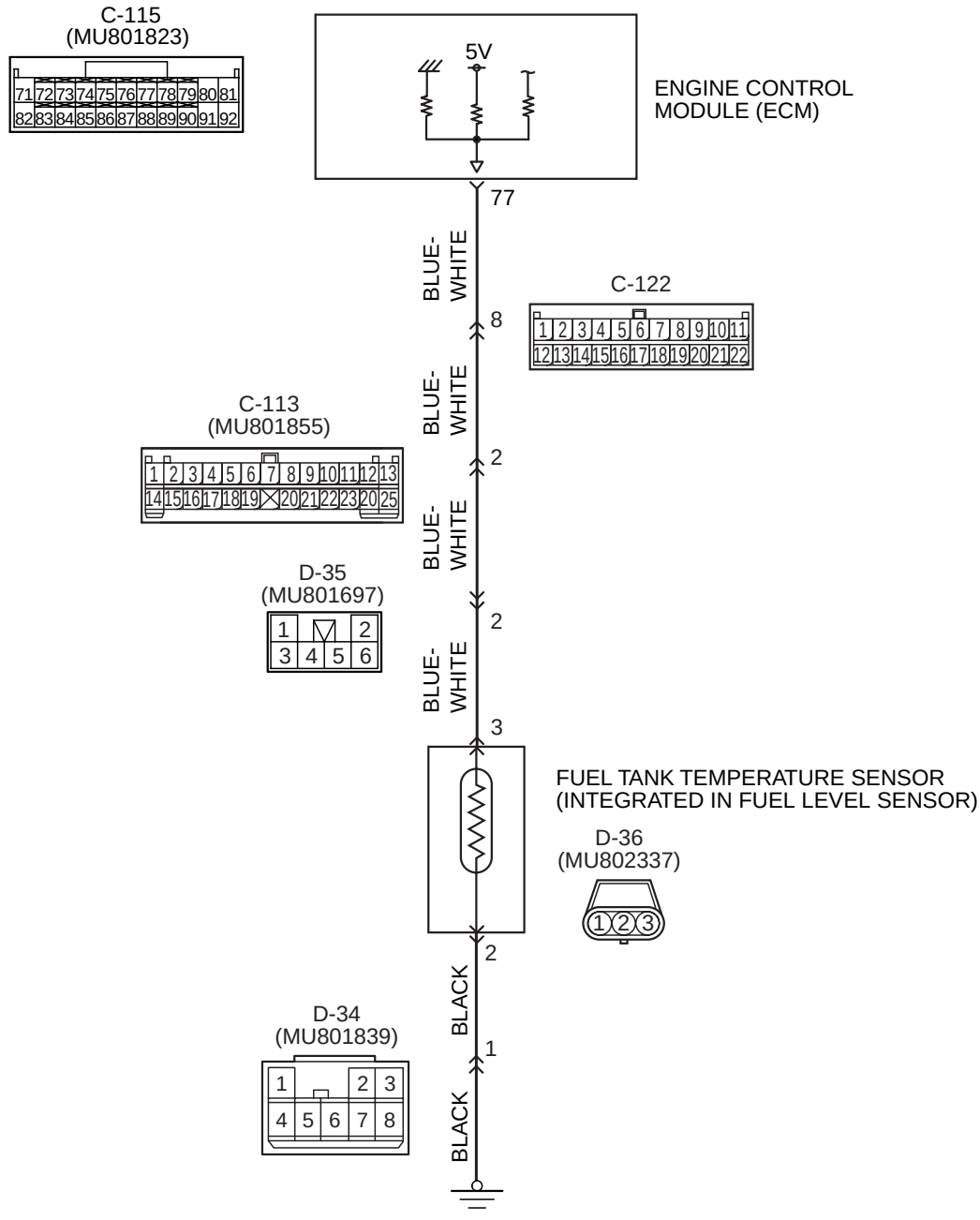
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0182 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0183: FUEL TANK TEMPERATURE SENSOR CIRCUIT HIGH INPUT

Fuel Tank Temperature Sensor Circuit



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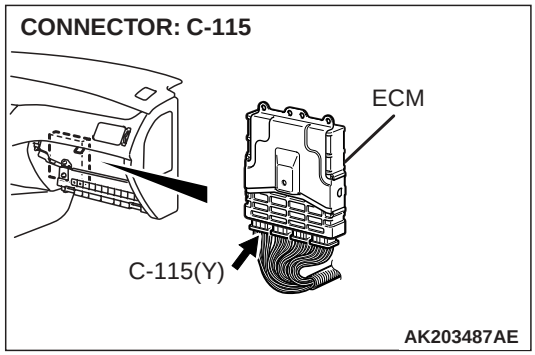

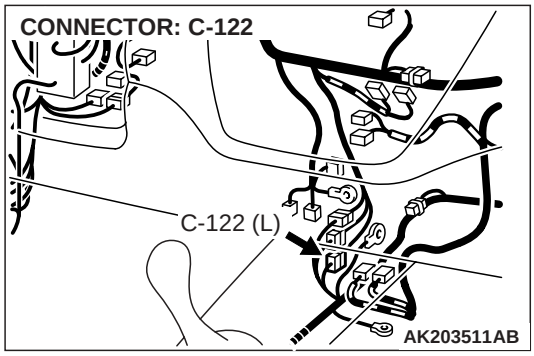

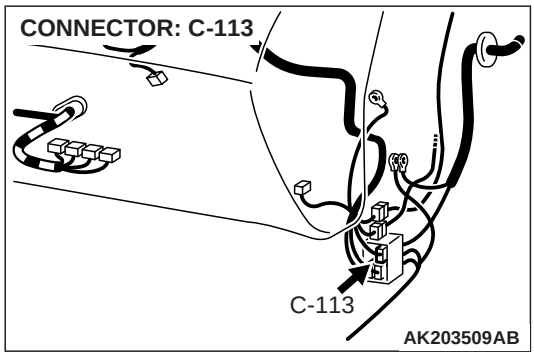

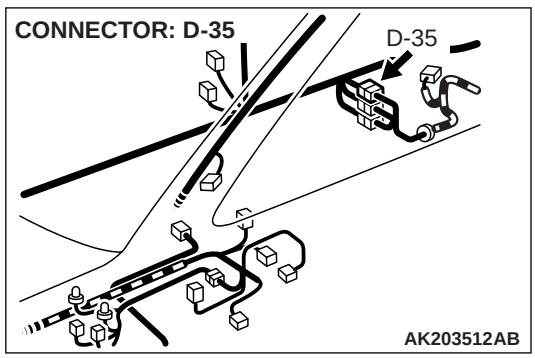

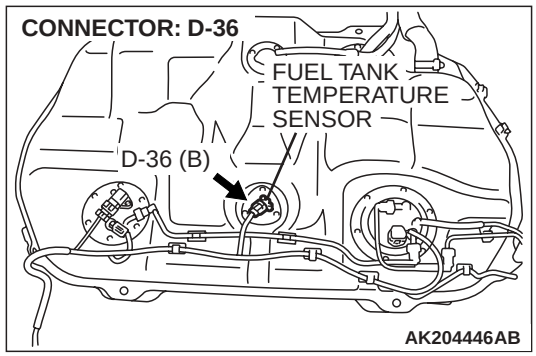

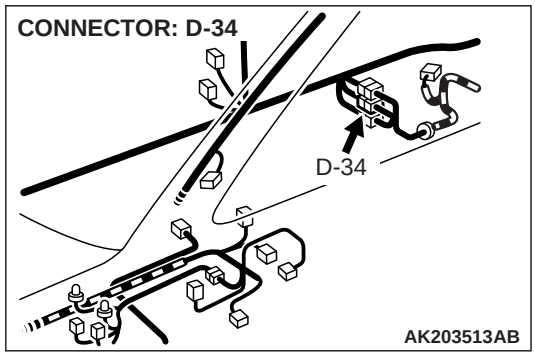

CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- Fuel tank temperature sensor 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:)

- Fuel tank temperature sensor failed.
- Open fuel tank temperature sensor circuit, harness damage, or connector damage.
- ECM failed.

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DIAGNOSIS

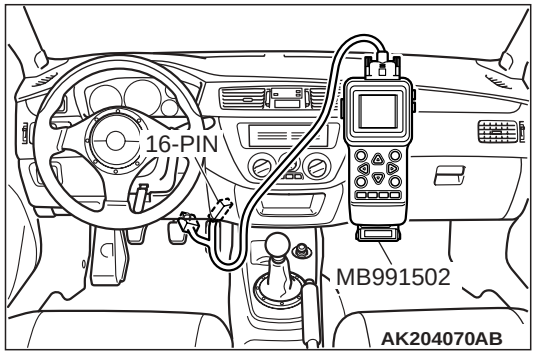
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

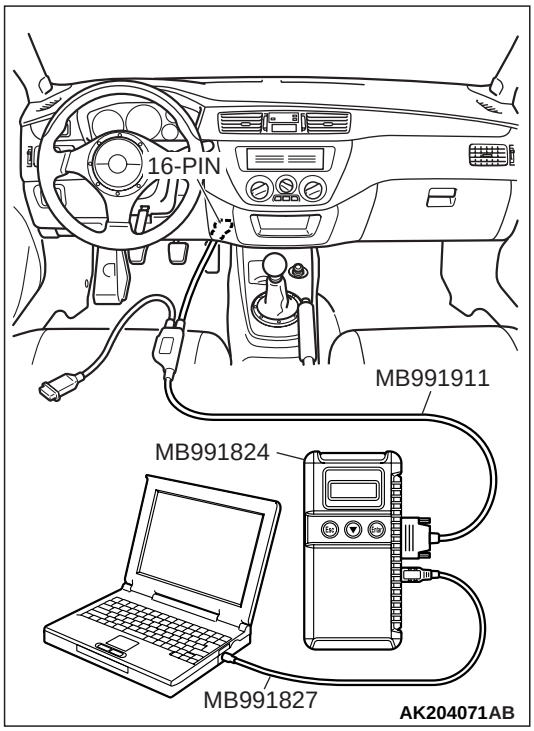
STEP 1. Using scan tool MB991502 or MB991958, check data list item 4A: Fuel Tank Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.



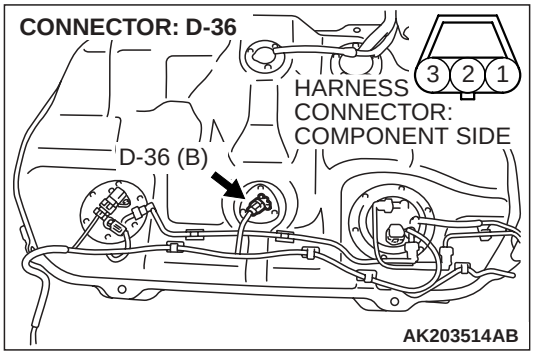
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
  - With the engine cool, the fuel tank temperature should be approximately the same as ambient air temperature.
(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.00-6.

NO : Go to Step 2.

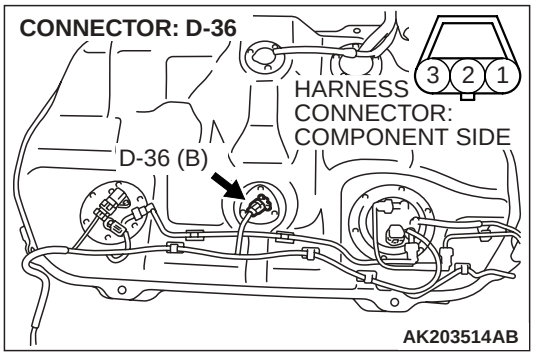


STEP 2. Check harness connector D-36 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

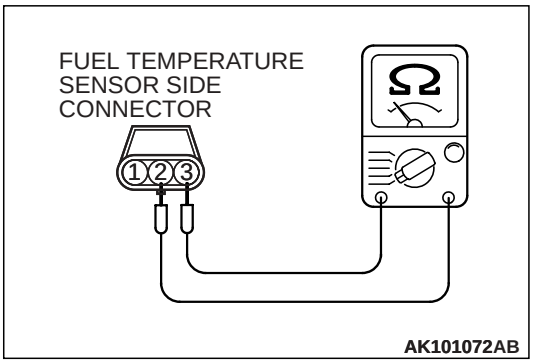
YES : Go to Step 3.

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



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-36.



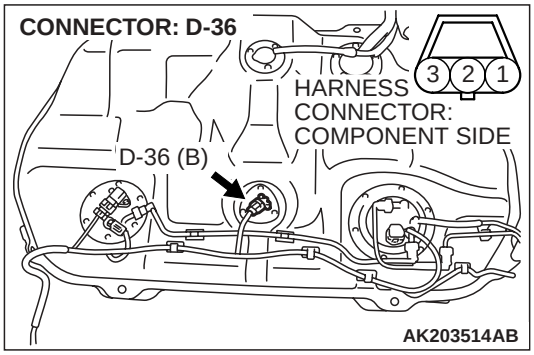
(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance between 0.5 and 12.0 kΩ?

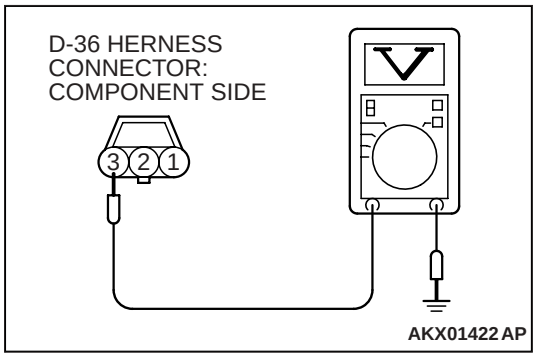
YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 11.



STEP 4. Measure the sensor supply voltage at fuel tank temperature sensor harness side connector D-36.

(1) Disconnect connector D-36 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure between 4.5 and 4.9 volts

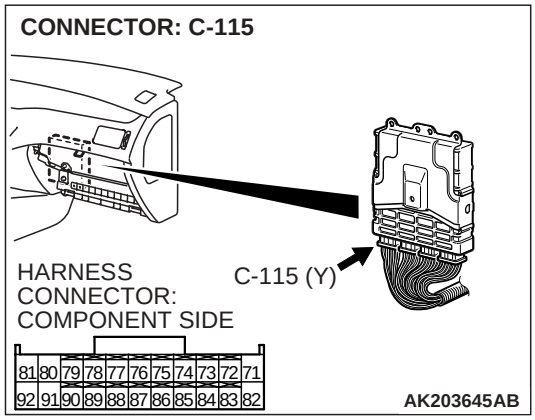
(4) Turn the ignition switch to the "LOCK" (OFF) position.

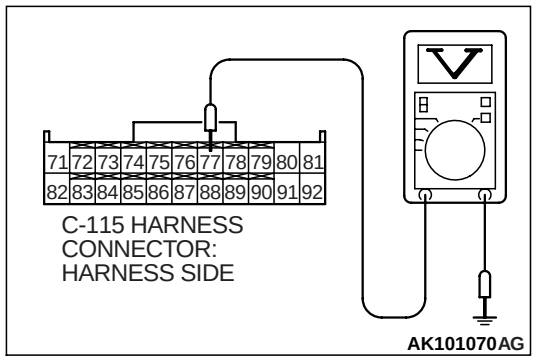
Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Measure the sensor supply voltage at ECM connector C-115 by backprobing.

(1) Do not disconnect the ECM connector C-115.
(2) Disconnect the fuel tank temperature sensor connector D-10.
(3) Turn the ignition switch to the "ON" position.



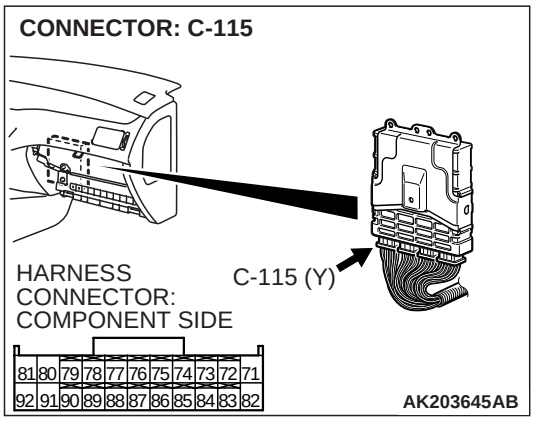


(4) Measure the voltage between terminal No. 77 and ground by backprobing.
- Voltage should measure between 4.5 and 4.9 volts.

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

Q: Is the measured voltage between 4.5 and 4.9 volts?

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

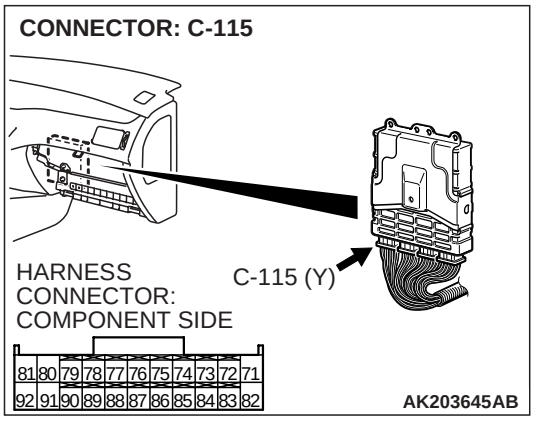


STEP 6. Check harness connector C-115 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Check connector C-113, C-122 and D-35 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector are in good condition, repair the harness wire between fuel tank temperature sensor connector D-36 (terminal No. 3) and ECM connector C-115 (terminal No. 77) because of open circuit. 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.

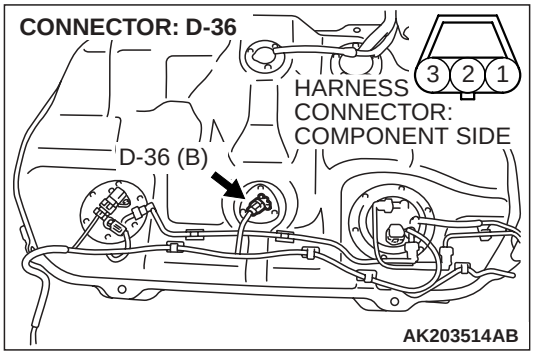


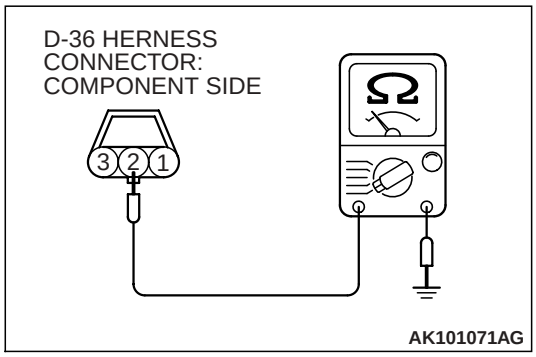
STEP 7. Check harness connector C-115 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM. 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 8. Check for continuity at fuel tank temperature sensor harness side connector D-36.

(1) Disconnect connector D-36 and measure at the harness side.

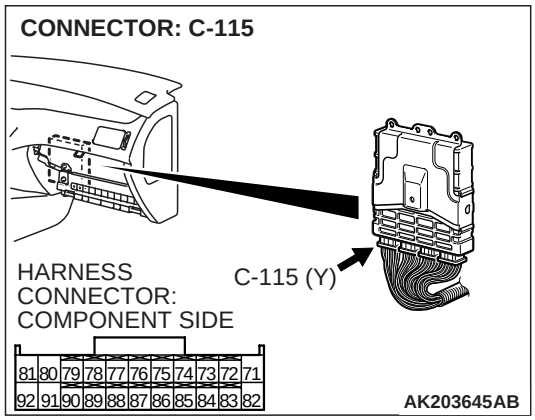
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 9.

NO : Check connector D-34 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 fuel tank temperature sensor connector D-36 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 11.

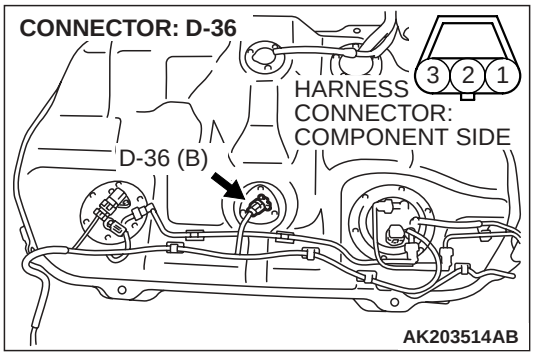


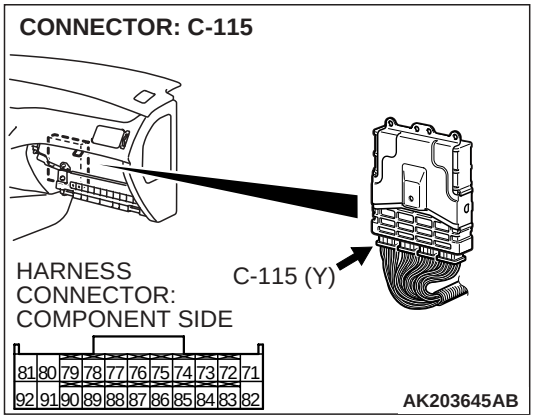
STEP 9. Check harness connector C-115 at ECM for damage.

Q: Is the harness 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 open circuit and harness damage between fuel tank temperature sensor connector D-36 and ECM connector C-115.

NOTE: Check harness after checking intermediate connectors C-113, C-122 and D-35. If the intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

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

STEP 11. Perform the OBD-II drive cycle.

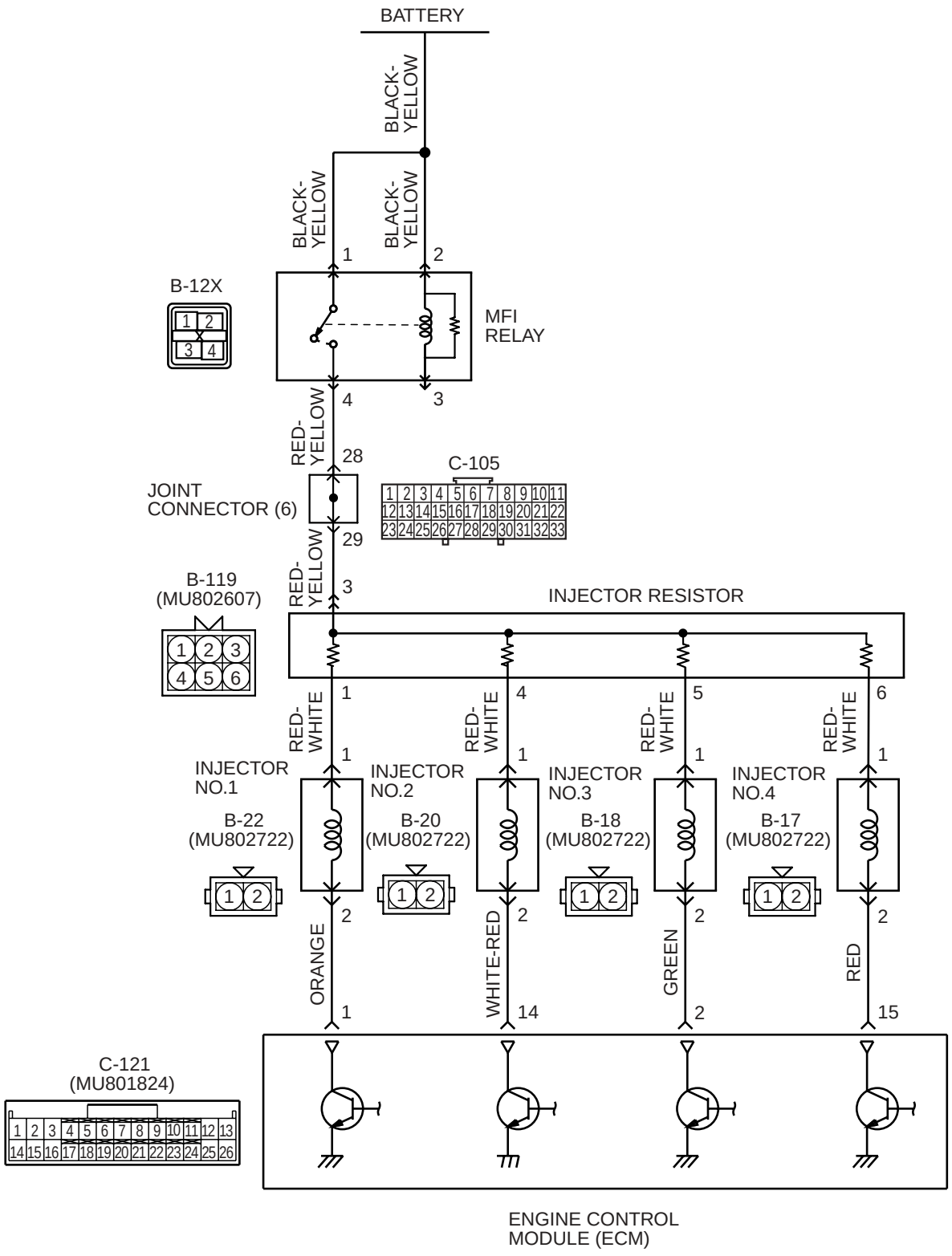
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0183 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0201: INJECTOR CIRCUIT – CYLINDER 1, DTC P0202: INJECTOR CIRCUIT – CYLINDER 2, DTC P0203: INJECTOR CIRCUIT – CYLINDER 3, DTC P0204: INJECTOR CIRCUIT – CYLINDER 4

Injector Circuit



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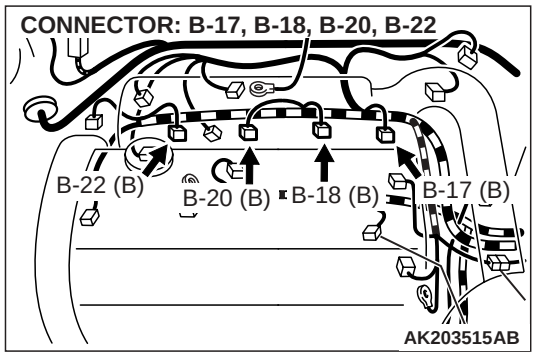
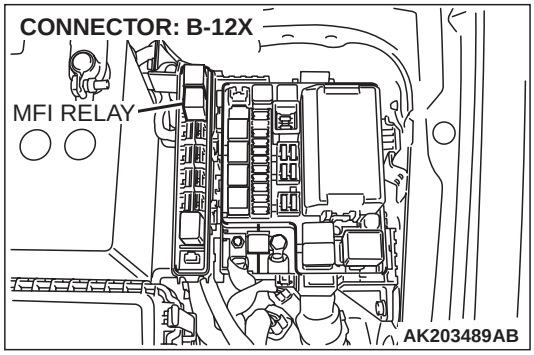
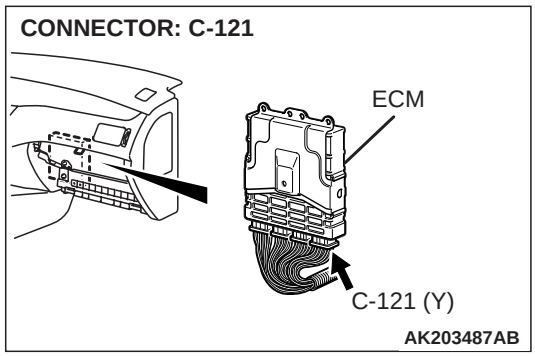
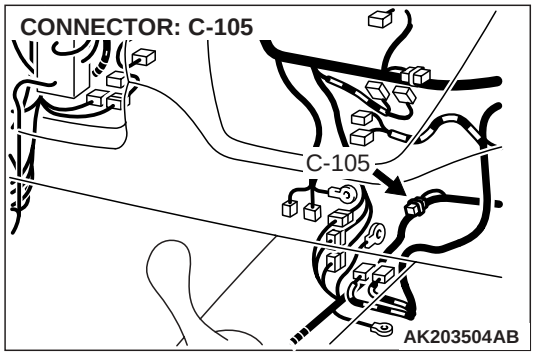
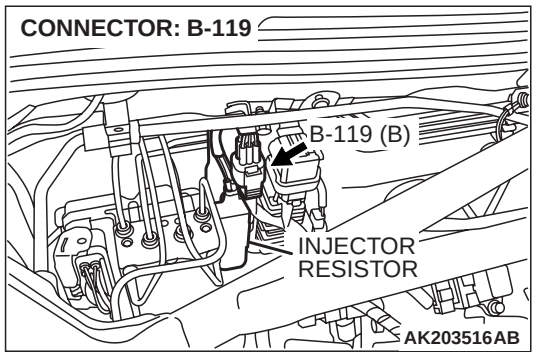










CIRCUIT OPERATION

- The power for the injector is supplied by the No. 4 terminal of the MFI relay via an injector resistor.
- The ECM controls the injector by turning the power transistor in the ECM "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 ECM.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM 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:)

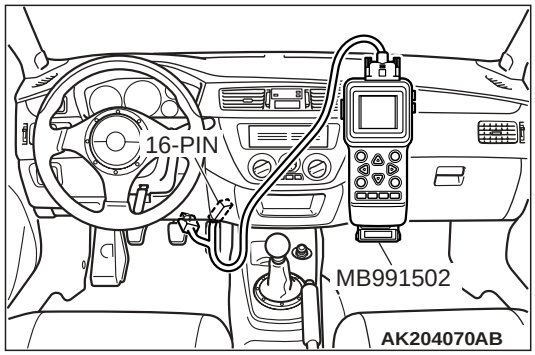
- Injector failed.
- Injector resistor failed.
- Open or shorted injector circuit, harness damage, or loose connector.
- ECM failed.

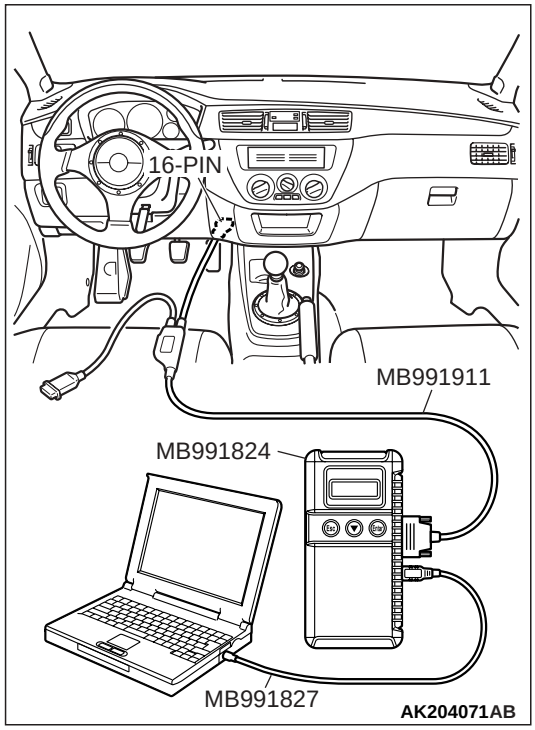
DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991348: Test Harness Set

STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 01, 02, 03, 04: Injectors.





⚠ CAUTION

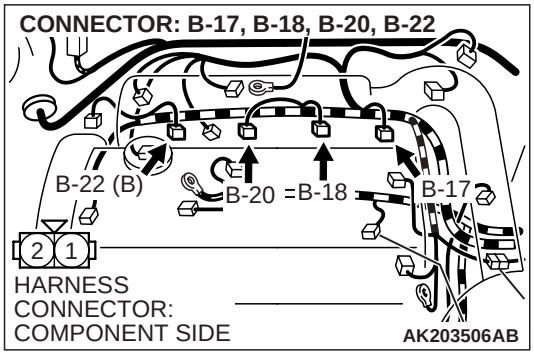
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the actuator testing mode for item 01, 02, 03, 04 Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - The idle should become slightly rougher.
(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.00-6.

NO : Go to Step 2.

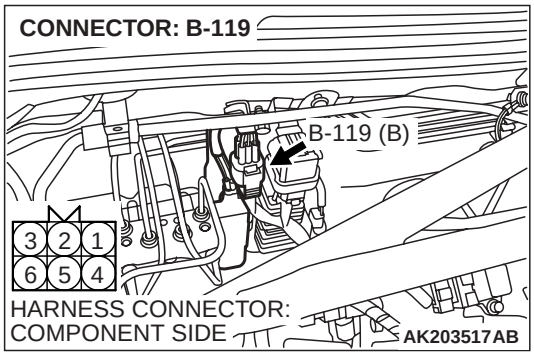


STEP 2. Check the harness connector at injector for damage.

a. Check connector B-22 at No. 1 cylinder.
b. Check connector B-20 at No. 2 cylinder.
c. Check connector B-18 at No. 3 cylinder.
d. Check connector B-17 at No. 4 cylinder.

Q: Is the connector in good condition?

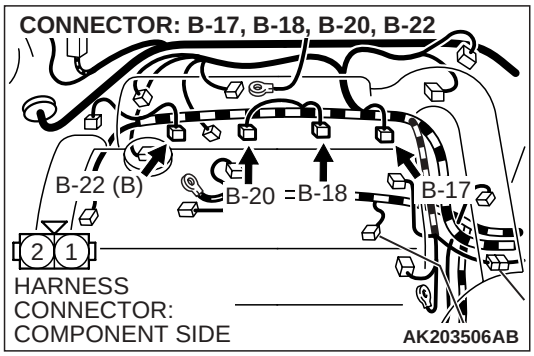
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 3. Check harness connector B-119 at injector resistor for damage.

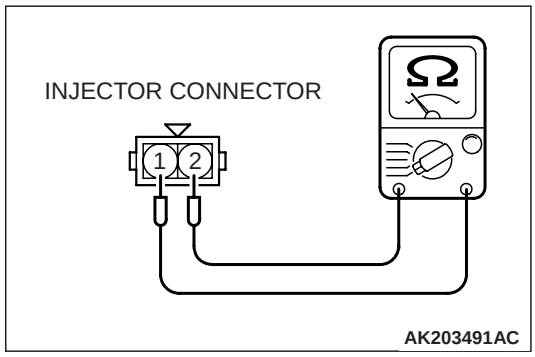
Q: Is the harness connector in good condition?

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



STEP 4. Check the injector.

(1) Disconnect the injector connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <No.3 cylinder> or B-17 <No.4 cylinder>.

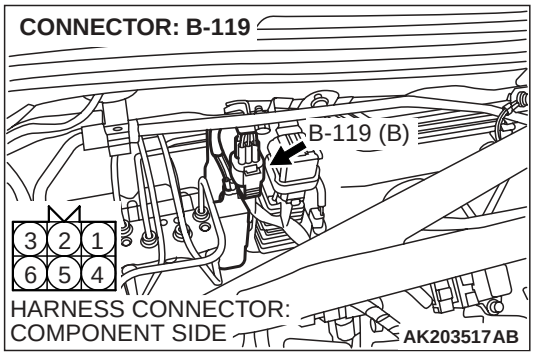


(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 2 – 3 ohms [at 20°C (68°F)]

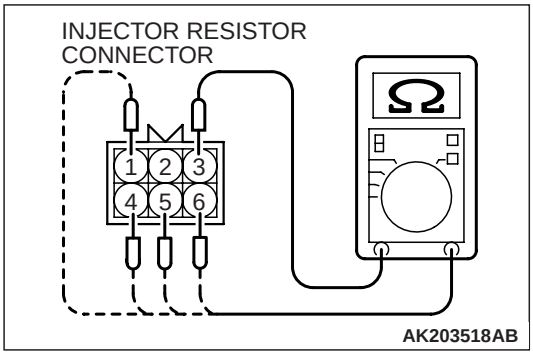
Q: Is the resistance between 2 and 3 ohms [at 20°C (68°F)]?

YES : Go to Step 5.
NO : Replace the injector. Then go to Step 14.



STEP 5. Check the injector resistor.

(1) Disconnect the injector resistor connector B-119.



(2) Measure the resistance between the terminals in the connector of the injector resistor.

Standard value:

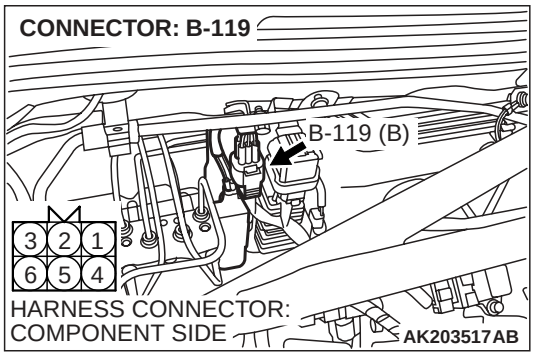
Measured terminals	Resistance
1 – 3	5.8 – 6.2 ohms [at 20°C (68°F)]
4 – 3	
5 – 3	
6 – 3	

Q: Is the resistance between 5.8 and 6.2 ohms [at 20°C (68°F)] ?

YES : Go to Step 6.

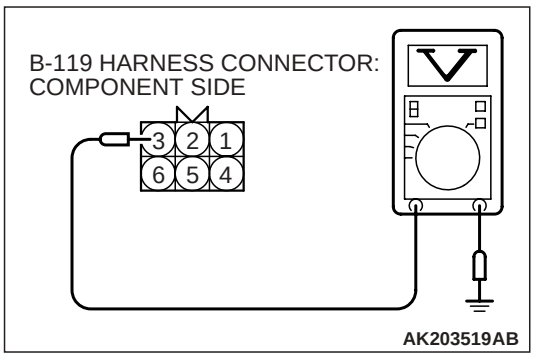
NO : Replace the injector resistor. Then go to Step 14.

STEP 6. Measure the power supply voltage at injector resistor.



(1) Disconnect the connector B-119 and measure the harness side.

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



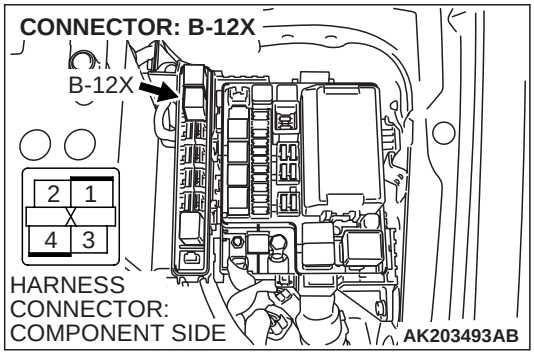
(3) Measure the voltage between terminal No.3 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 7.

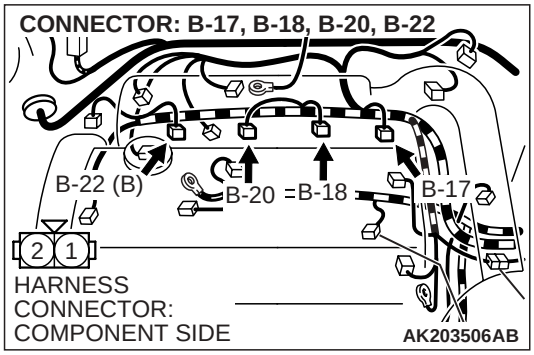


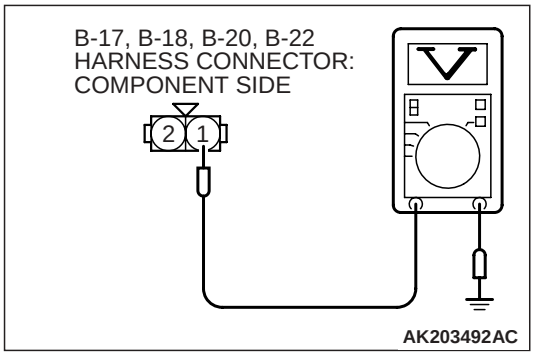
STEP 7. Check connector B-12X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Check harness connector C-105 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between MFI relay connector B-12X (terminal No.4) and injector resistor connector B-119 (terminal No.3) 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 8. Measure the power supply voltage at injector connector.

(1) Disconnect connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <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 No. 1 and ground.
- Voltage should measure battery positive voltage.

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

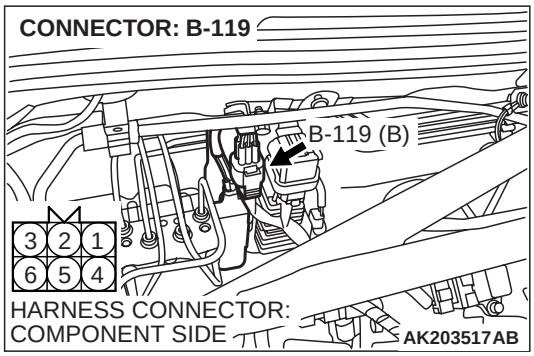
Q: Is battery positive voltage (approximately 12 volts) present?

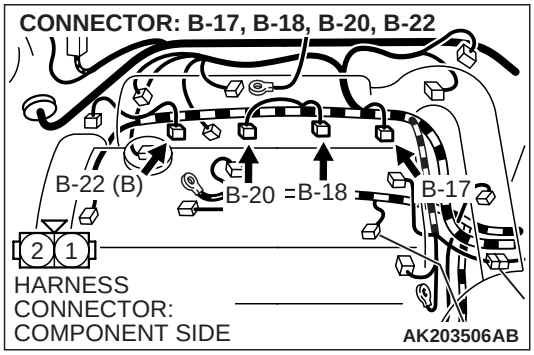
YES : Go to Step 9.

NO : Repair harness wire between injector resistor connector and injector connector because of open circuit or short circuit to ground.

a. Repair harness wire between injector resistor connector B-119 (terminal No. 1) and injector connector B-22 (terminal No. 1) when checking No. 1 cylinder.
b. Repair harness wire between injector resistor connector B-119 (terminal No. 4) and injector connector B-20 (terminal No. 1) when checking No. 2 cylinder.
c. Repair harness wire between injector resistor connector B-119 (terminal No. 5) and injector connector B-18 (terminal No. 1) when checking No. 3 cylinder.
d. Repair harness wire between injector resistor connector B-119 (terminal No. 6) and injector connector B-17 (terminal No. 1) when checking No. 4 cylinder.

Then go to Step 14.



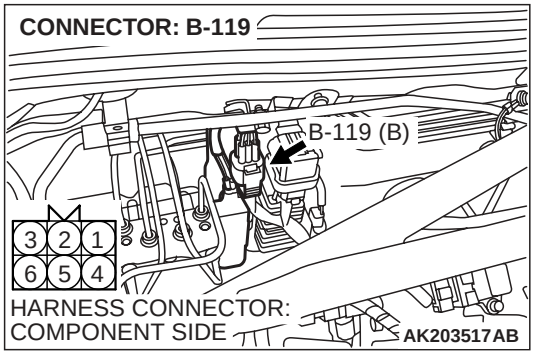


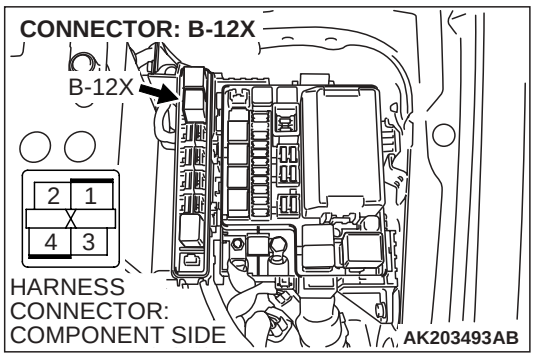
STEP 9. Check for harness damage between injector resistor connector and injector connector.

a. Check the harness wire between injector resistor connector B-119 (terminal No. 1) and injector connector B-22 (terminal No. 1) at No.1 cylinder.
b. Check the harness wire between injector resistor connector B-119 (terminal No. 4) and injector connector B-20 (terminal No. 1) at No.2 cylinder.
c. Check the harness wire between injector resistor connector B-119 (terminal No. 5) and injector connector B-18 (terminal No. 1) at No.3 cylinder.
d. Check the harness wire between injector resistor connector B-119 (terminal No. 6) and injector connector B-17 (terminal No. 1) at No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 14.



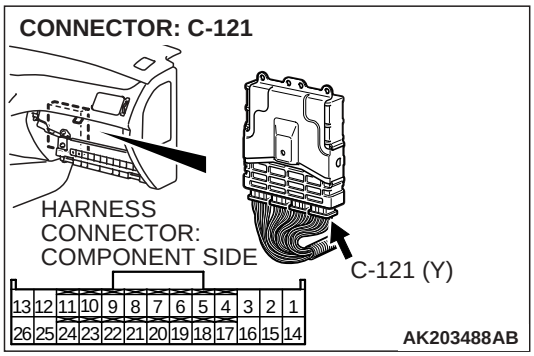


STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and injector resistor connector B-119 (terminal No. 3).

NOTE: Check harness after checking intermediate connector C-105. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 14.

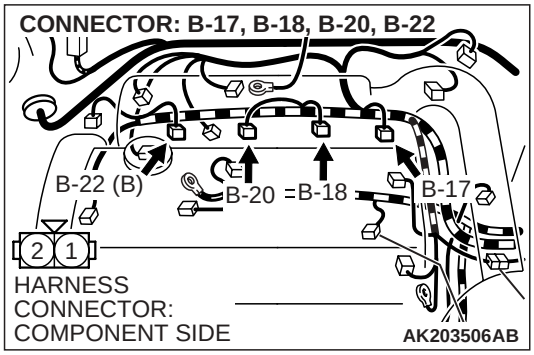


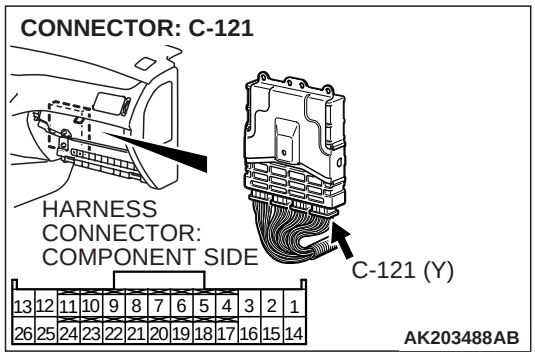
STEP 11. Check harness connector C-121 at ECM for damage.

Q: Is the harness 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 14.





STEP 12. Check for open circuit and short circuit to ground and harness damage between injector connector and ECM connector.

a. Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) at No.1 cylinder.

b. Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) at No.2 cylinder.

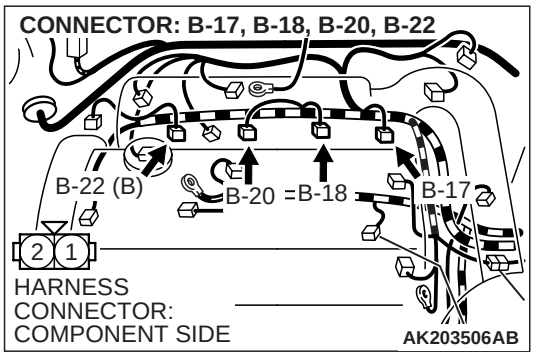
c. Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) at No.3 cylinder.

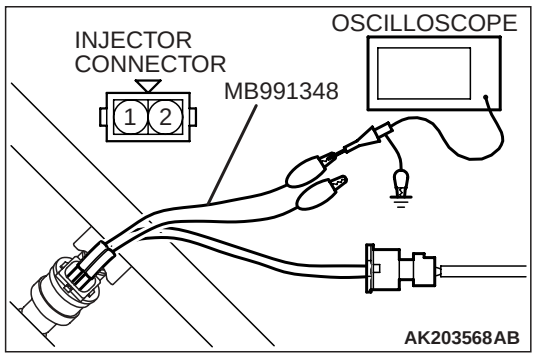
d. Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) at No.4 cylinder.

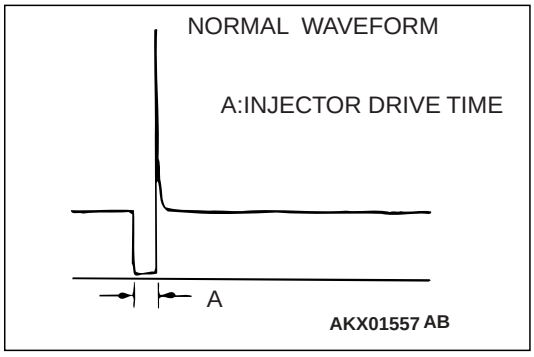
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.







STEP 13. Using the oscilloscope, check the injector.

(1) Disconnect the injector connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <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 No. 2.

NOTE: When measuring with the ECM side connector, connect an oscilloscope probe to the each of the following terminals.

- *ECM terminal No. 1 when checking No. 1 cylinder.*
- *ECM terminal No. 14 when checking No. 2 cylinder.*
- *ECM terminal No. 2 when checking No. 3 cylinder.*
- *ECM terminal No. 15 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.00-6.

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

STEP 14. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.

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

Q: Are DTC P0201, P0202, P0203 and P0204 sets?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0234: TURBOCHARGER WASTEGATE SYSTEM MALFUNCTION

TECHNICAL DESCRIPTION

- The ECM checks that the engine is not over-charged by always monitoring intake air volume.
- The ECM protects the engine by shutting off fuel when an overcharged condition is detected.

DTC SET CONDITIONS

Check Condition, Judgment Criteria

- Volumetric efficiency of 210 – 230% for 1 second.

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

- Turbocharger wastegate actuator failed.
- Charging pressure control system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check the intake charge pressure.

Refer to GROUP 15, On-vehicle Service – Turbocharger Supercharging pressure check.

Q: Are there any abnormalities?

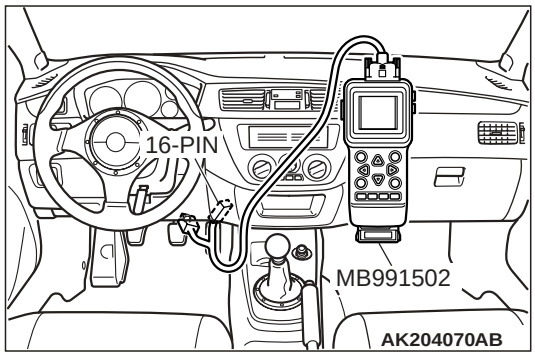
YES : Repair or replace it. Then go to Step 3.
NO : Go to Step 2.

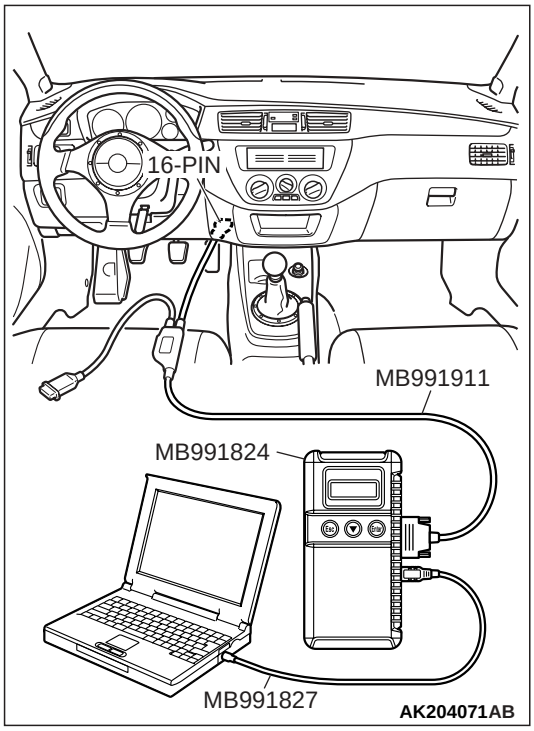
STEP 2. Check the charge pressure control system.

Refer to GROUP 15, On-vehicle intake charge pressure control system check.

Q: Are there any abnormalities?

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





STEP 3. Using scan tool MB991502 or MB991958, read the diagnostic trouble code DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.

⚠ CAUTION

Do a test drive with two passengers in the vehicle and where full throttle acceleration can be safety mode.

(2) Drive at wide-open-throttle in the 2nd gear at a minimum engine speed of 3,500 rpm.

(3) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

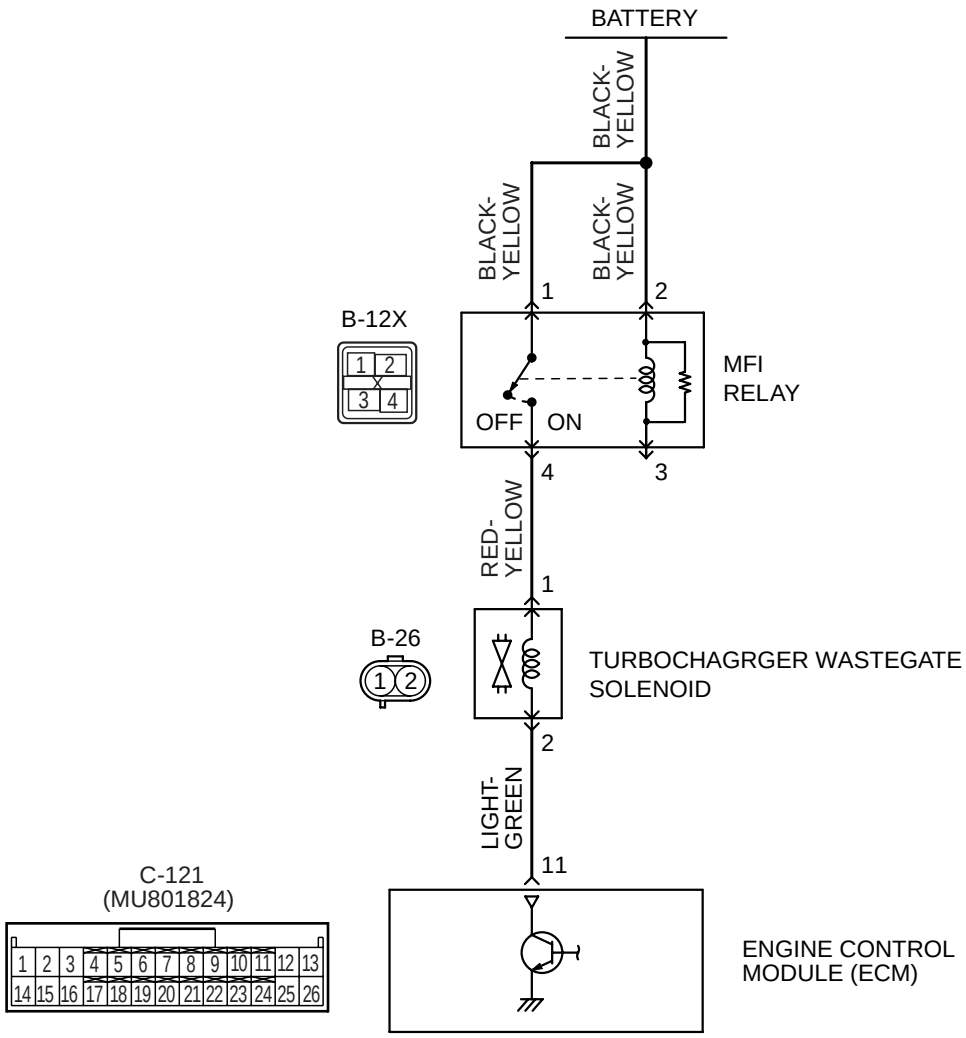
Q: Is the DTC P1103 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0243: TURBOCHARGER WESTEGATE SOLENOID CIRCUIT

Turbocharger Westegate Solenoid Circuit



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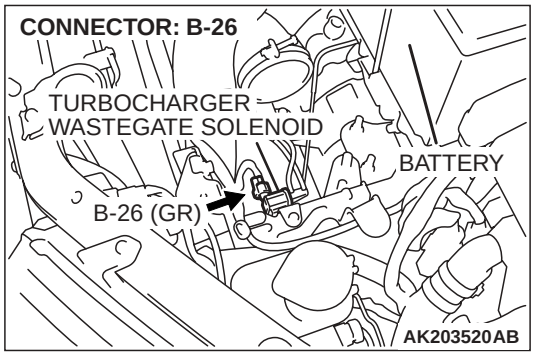
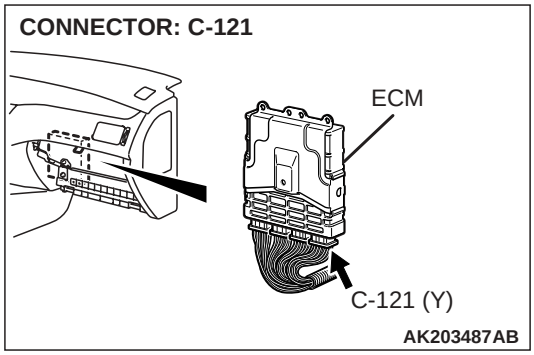
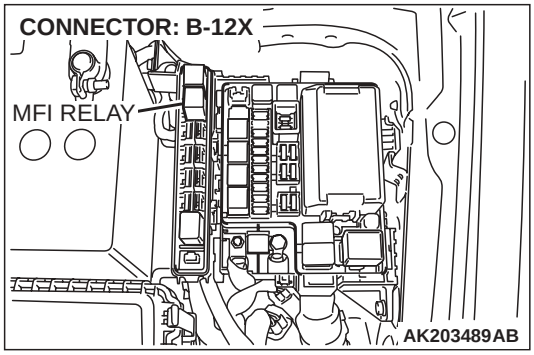




TSB Revision



CIRCUIT OPERATION

- The turbocharger westegate solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM controls the turbocharger westegate solenoid ground by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the turbocharger westegate solenoid drive circuit, ECM measures the surge voltage of the turbocharger westegate solenoid coil.
- The ECM drives the turbocharger westegate solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 volts or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The turbocharger westegate solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- Turbocharger westegate solenoid is ON.
- Fuel pressure solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The turbocharger westegate solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the turbocharger westegate solenoid is turned OFF.

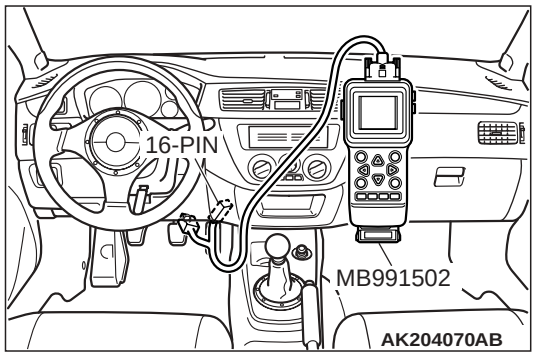
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

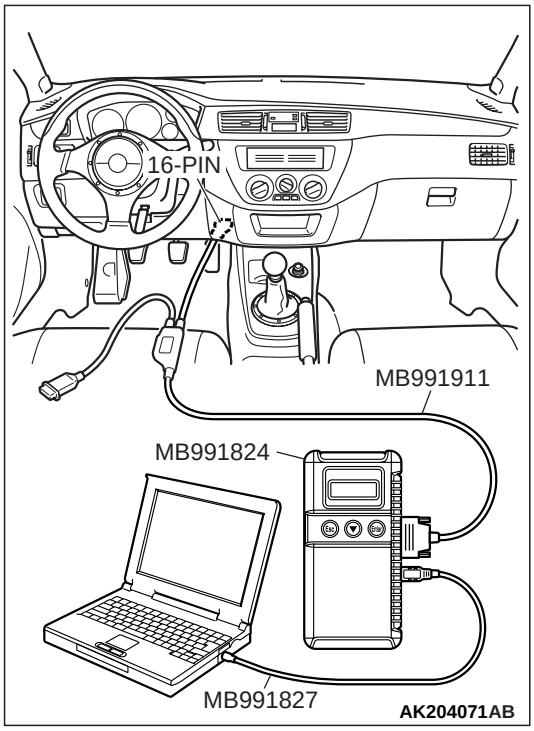
- Turbocharger westegate solenoid failed.
- Open or shorted turbocharger westegate solenoid circuit, or loose connector.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B





STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 10: turbocharger westegate solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

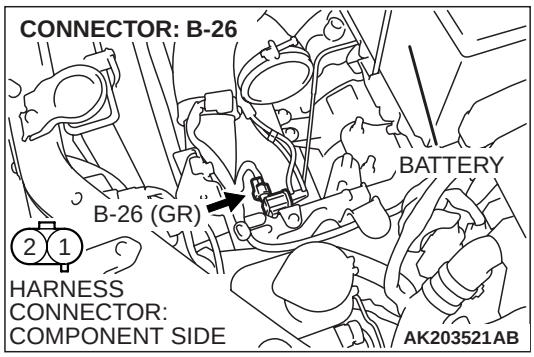
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for item 12, turbocharger westegate solenoid.
- An operation sound should be heard and vibration should be felt when the turbocharger westegate 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.00-6.

NO : Go to Step 2.

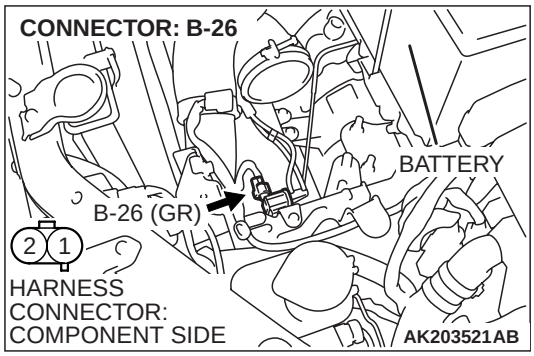


STEP 2. Check connector B-26 at the turbocharger westegate solenoid for damage.

Q: Is the connector in good condition?

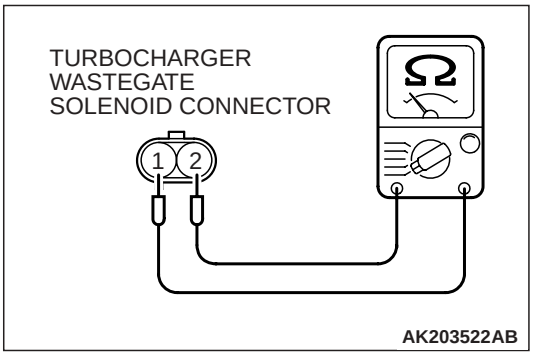
YES : Go to Step 3.

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



STEP 3 Check the turbocharger westegate solenoid.

(1) Disconnect the turbocharger westegate solenoid connector B-26.



(2) Measure the resistance between turbocharger westegate solenoid side connector terminal No. 1 and No. 2.

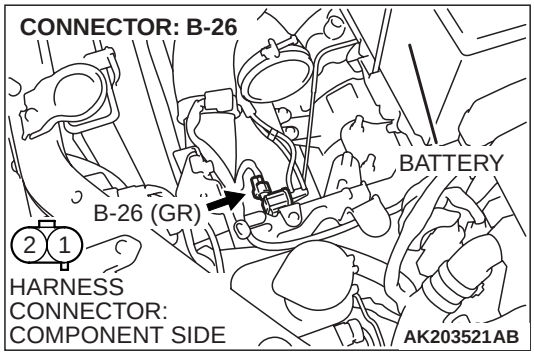
Standard value: 29 – 35 ohms [at 20°C (68°F)]

Q: Is the resistance between 29 and 35 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

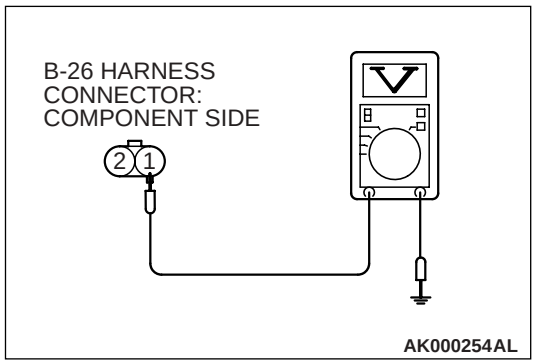
NO : Replace the turbocharger westegate solenoid. Then go to Step 12.

STEP 4. Measure the power supply voltage at turbocharger westegate solenoid harness side connector B-26.



(1) Disconnect connector B-26 and measure at the harness side.

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



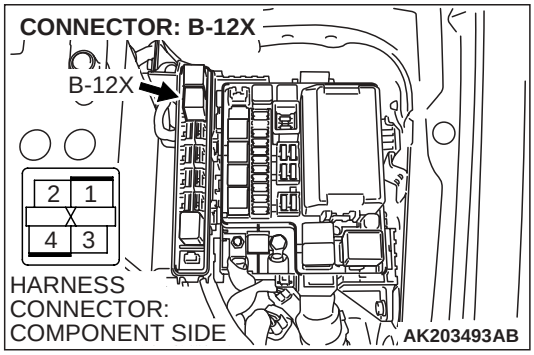
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

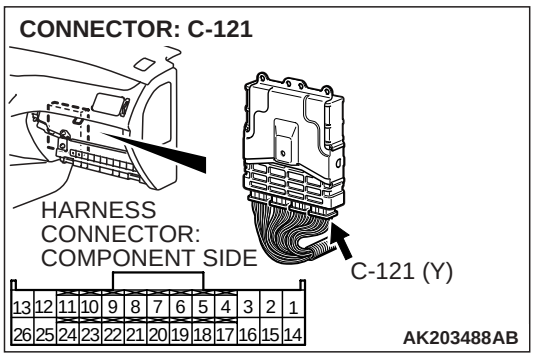
NO : Go to Step 5.



STEP 5. Check connector B-12X at MFI relay for damage.
Q: Is the connector in good condition?

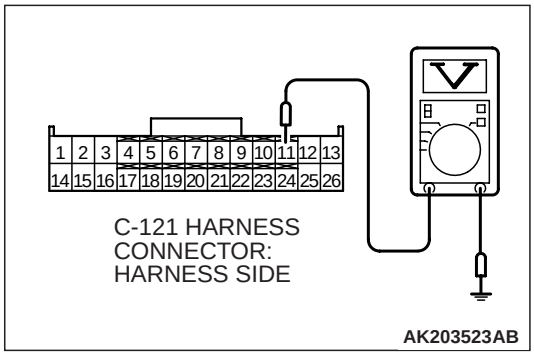
YES : Repair harness wire between MFI relay connector B-12X (terminal No. 4) and turbocharger westegate solenoid connector B-26 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

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



STEP 6. Measure the power supply voltage at ECM connector C-121 by backprobing.

(1) Do not disconnect connector C-121.
(2) Turn the ignition switch to the "ON" position.

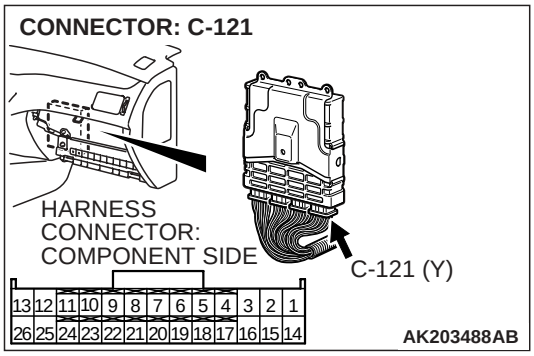


(3) Measure the voltage between terminal No. 11 and ground by backprobing.
- Voltage should measure battery positive voltage.

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

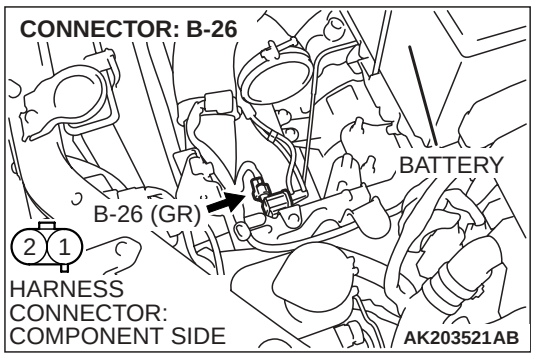
Q: Is battery positive voltage (approximately 12 volts) present?

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



STEP 7. Check connector C-121 at ECM 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.

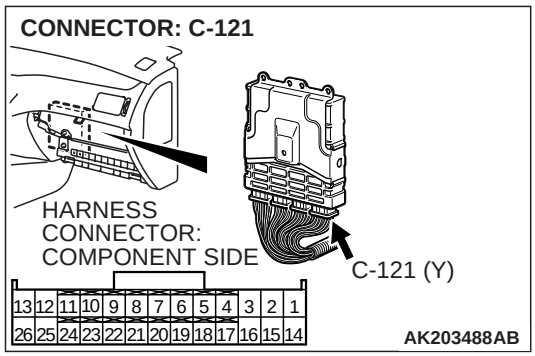


STEP 8. Check for open circuit and short circuit to ground between turbocharger westegate solenoid connector B-26 (terminal No. 2) and ECM connector C-121 (terminal No. 11).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.

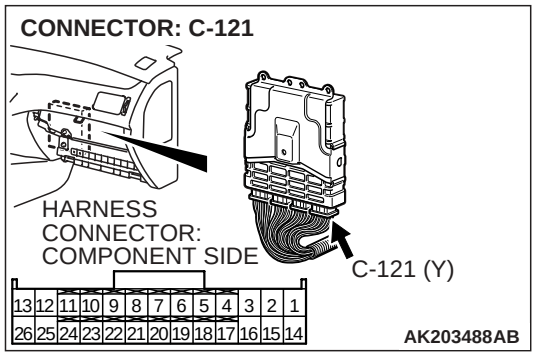


STEP 9. Check connector C-121 at ECM for damage.

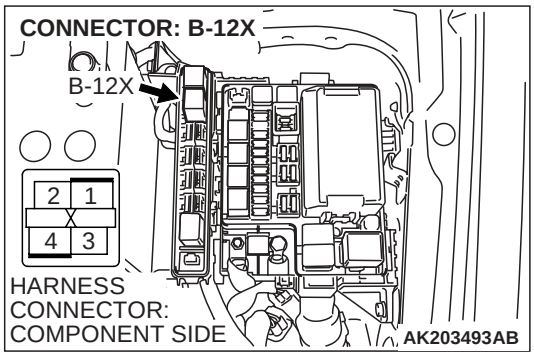
Q: Is the connector in good condition?

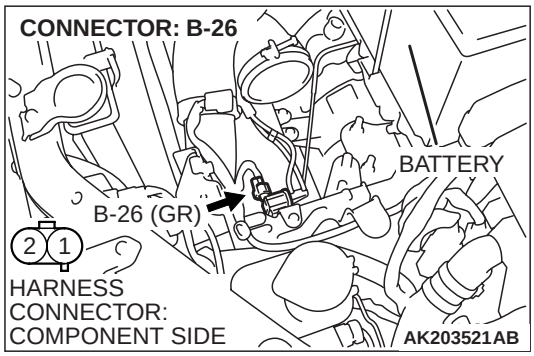
YES : Go to Step 10.

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

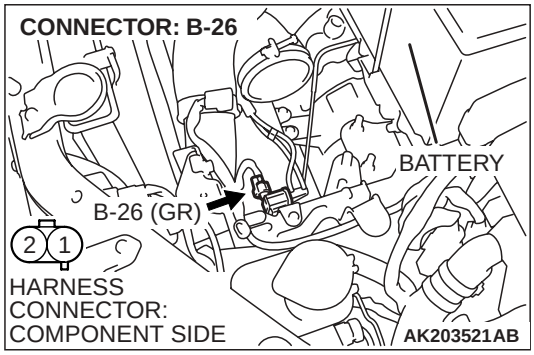


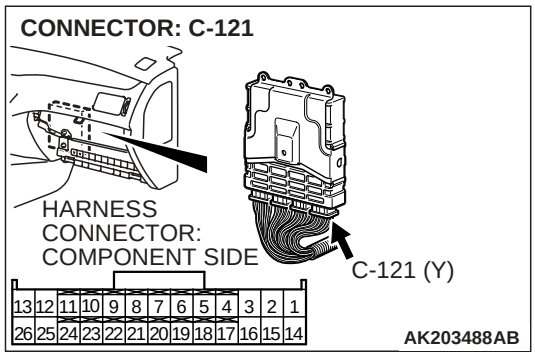
STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and turbocharger westegate solenoid connector B-26 (terminal No. 1).
Q: Is the harness wire in good condition?
YES : Go to Step 11.
NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between turbocharger westegate solenoid connector B-26 (terminal No. 2) and ECM connector C-121 (terminal No. 11).
Q: Is the harness wire in good condition?
YES : Replace the ECM. Then go to Step 12.
NO : Repair it. Then go to Step 12.





STEP 12. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0243 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0300: RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

Random Misfire Circuit

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-267.

CIRCUIT OPERATION

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-267.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 7,000 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).
- Volumetric efficiency is between 15 and 160 percent.
- 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.
- The throttle deviation is –0.059 volt/10 ms to +0.059 volt/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)].

or

- Misfire has occurred in 15 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.
- ECM failed.

DIAGNOSIS

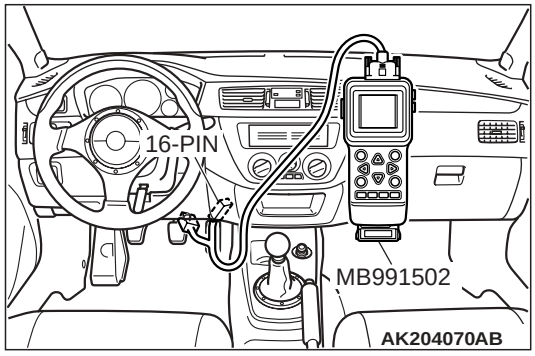
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

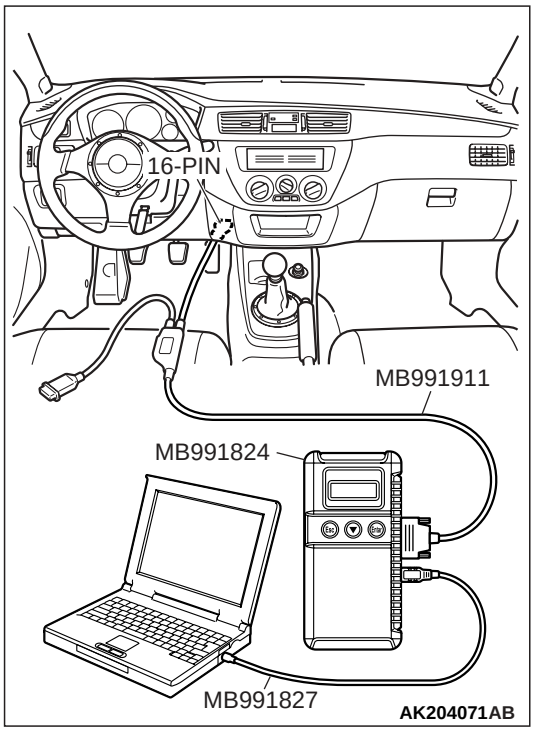
STEP 1. Using scan tool MB991502 or MB991958, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

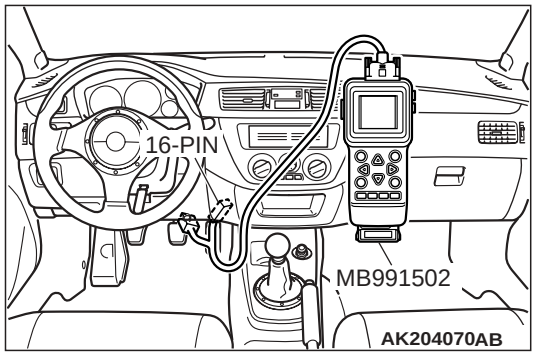


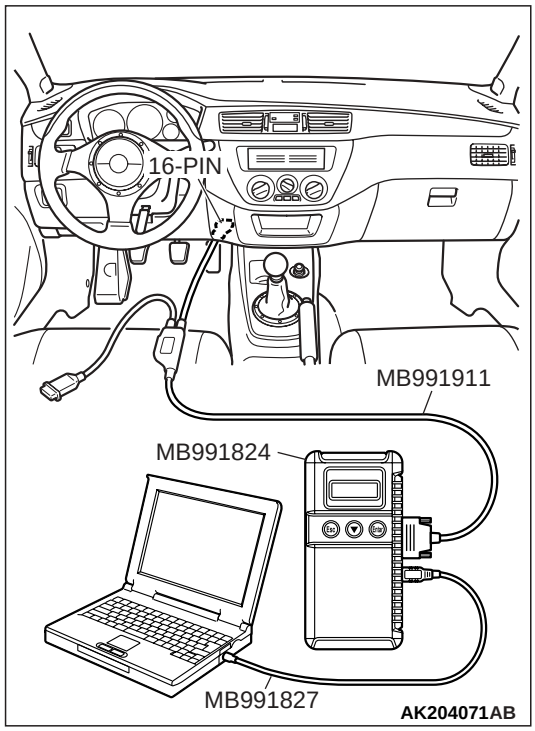
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 22, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed 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-302.





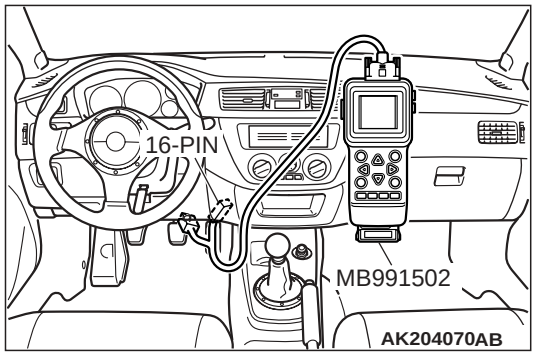
STEP 2. Using scan tool MB991502 or MB991958, check data list item 81: Long-Term Fuel Trim (trim).

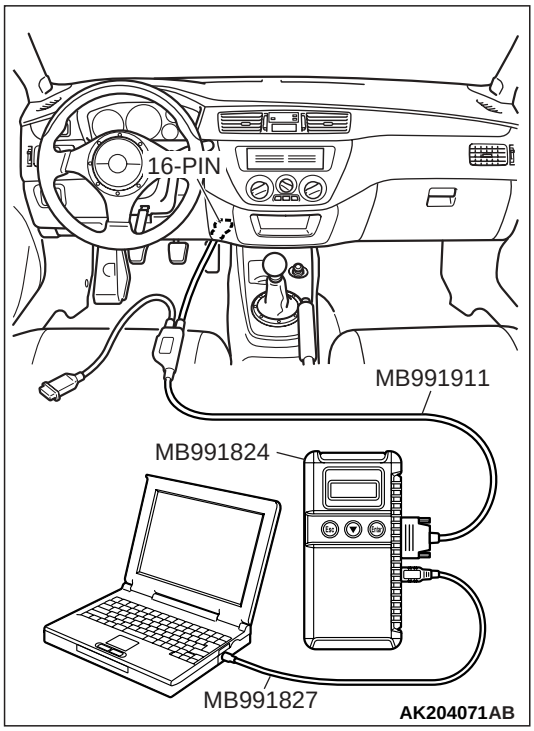
(1) Start the engine and run at idle.
(2) Set scan tool MB991502 or MB991958 to the data reading mode for item 81, Long-Term Fuel Trim (trim).
- The fuel trim should be between –12.5 and +12.5 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(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-232, DTC P0172 – System too Rich P.13A-240.





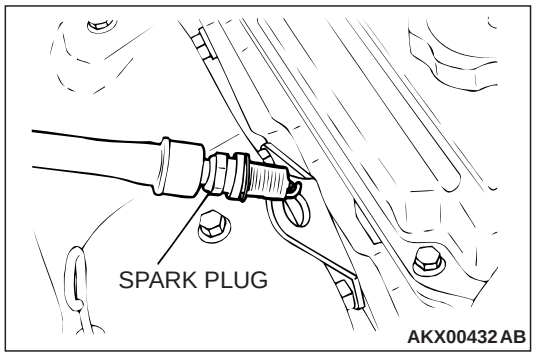
STEP 3. Using scan tool MB991502 or MB991958, check data list item 82: Short-Term Fuel Trim (trim).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 or MB991958 to the data reading mode for item 82, Short-Term Fuel Trim (trim).
- The fuel trim should be between –20 and +20 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-232, DTC P0172 – System too Rich P.13A-240.

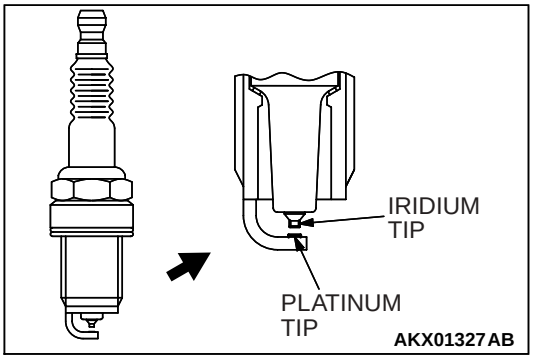


STEP 4. Check the ignition coil spark.

(1) Check each ignition coil spark.
(2) Remove the intake manifold.
(3) Remove the spark plug and connect to the spark plug cable.
(4) 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

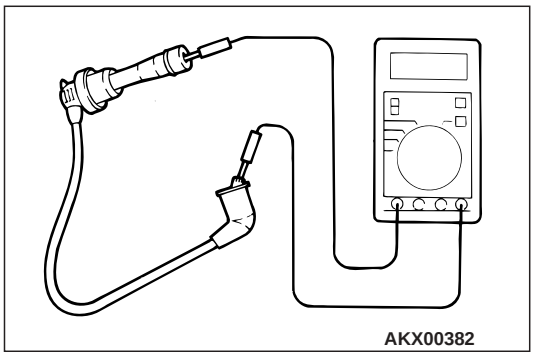
Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

(1) Check the plug gap and replace if the limit is exceeded.

Standard value: 0.6 – 0.7 mm (0.024 – 0.028 inch)
Limit: 0.75 mm (0.030 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.



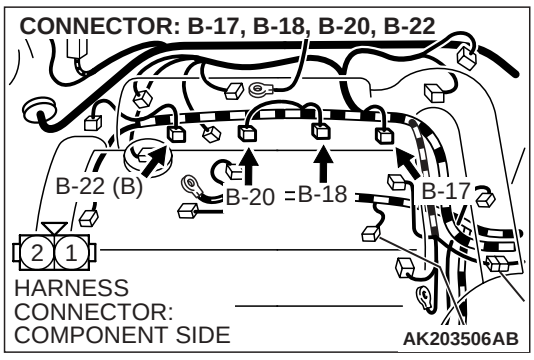
STEP 6. Check the spark plug cable.

(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 19 kΩ

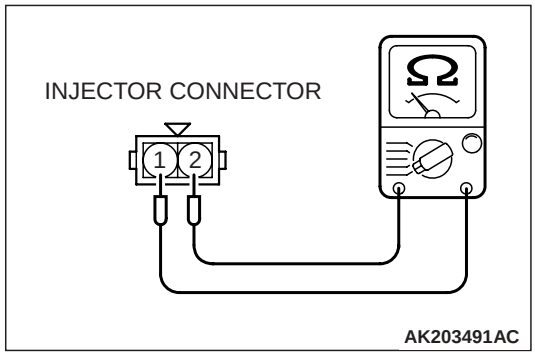
Q: Is the measured resistance less than 19 kΩ?

YES : Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Ignition Circuit System P.13A-695.
NO : Replace the faulty spark plug cable. Then go to Step 13.



STEP 7. Check the injector.

(1) Disconnect the injector connector.

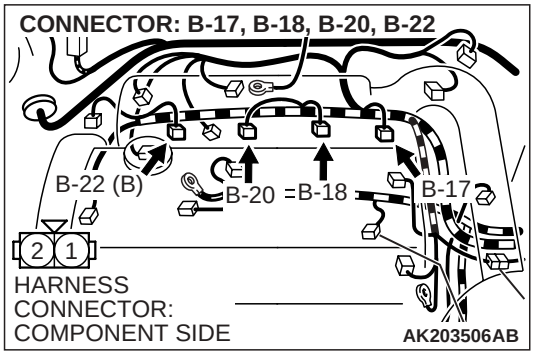


(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 2 – 3 ohms [at 20°C (68°F)]

Q: Is the resistance between 2 and 3 ohms [at 20°C (68°F)]?

YES : Go to Step 8.
NO : Replace the faulty injector. Then go to Step 13.

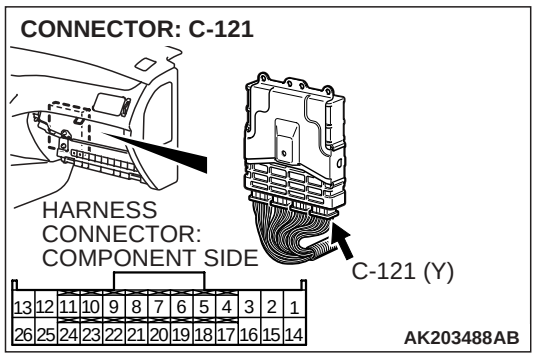


STEP 8. Check connectors B-17, B-18, B-20, B-22 at injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty injector connector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

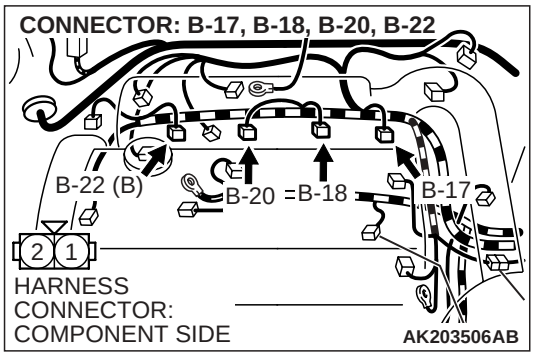


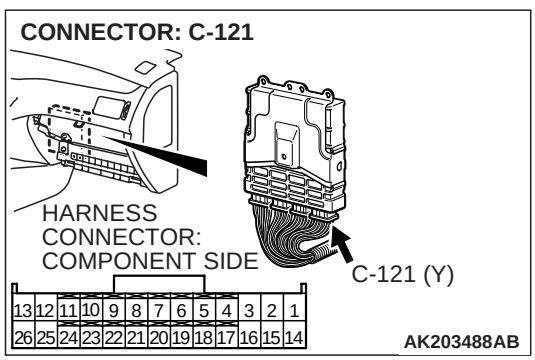
STEP 9. Check connector C-121 at ECM for damage.

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 ECM connector.

a. Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) at No.1 cylinder.

b. Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) at No.2 cylinder.

c. Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) at No.3 cylinder.

d. Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) at No.4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

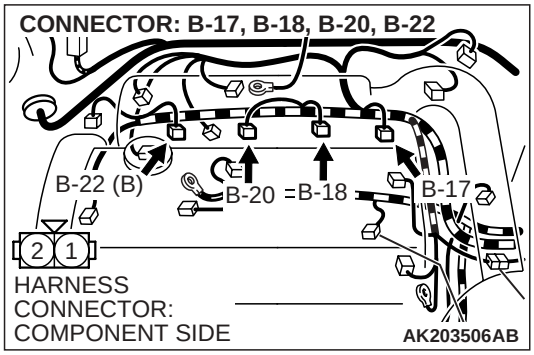
NO : Repair it. Then go to Step 13.

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 : Repair or replace it. Then go to Step 13.
NO : Go to Step 12.



STEP 12. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the ECM. Then go to Step 13.
NO : The procedure is complete.

STEP 13. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Repeat the troubleshooting.
NO : The procedure 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, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-267.

CIRCUIT OPERATION

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-267.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 7,000 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).
- Volumetric efficiency is at between 15 and 160 percent.
- 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.
- The throttle deviation is –0.059 volt/10ms to +0.059 volt/10ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1,742°F)].

or

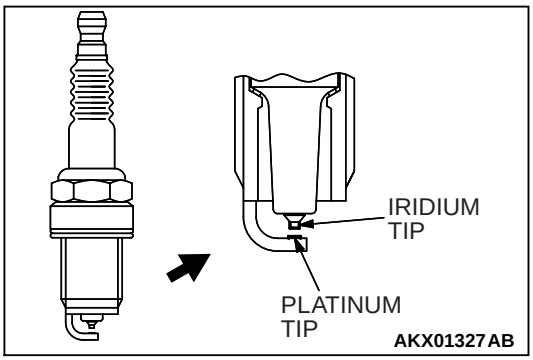
- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

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

- Ignition system related part(s) failed.
- Low compression pressure.
- Injector failed.
- ECM failed.

DIAGNOSIS

STEP 1. Check the spark plugs.



⚠ CAUTION

Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and 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.

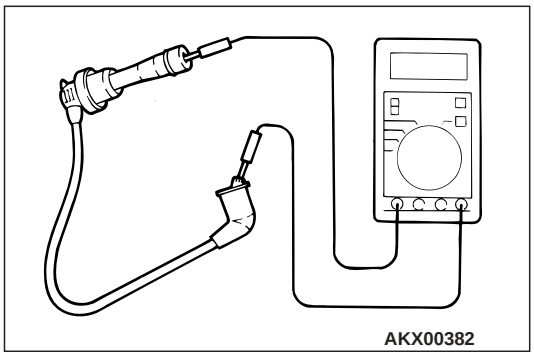
(1) For the right bank cylinder, remove the intake manifold.
(2) Check the plug gap and replace if the limit is exceeded.

Standard value: 0.6 – 0.7 mm (0.024 – 0.028 inch)
Limit: 0.75 mm (0.030 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.

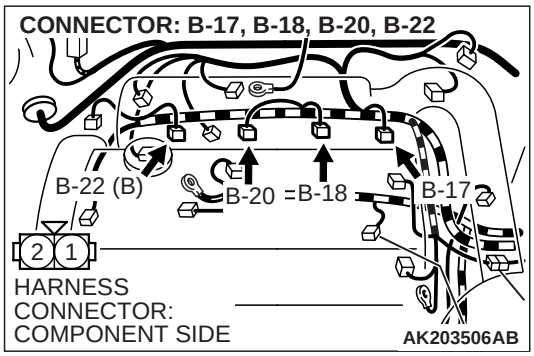


(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 19 kΩ

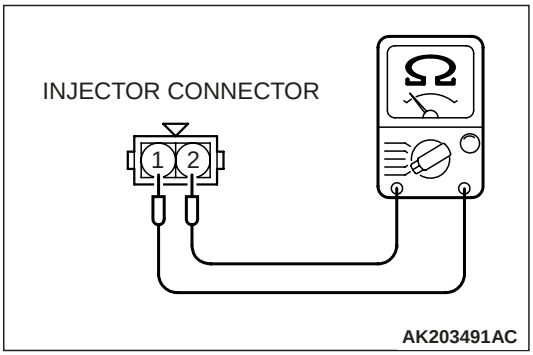
Q: Is the measured resistance less than 19 kΩ?

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-20 <No. 2 cylinder>, B-18 <No. 3 cylinder>, B-17 <No. 4 cylinder>.



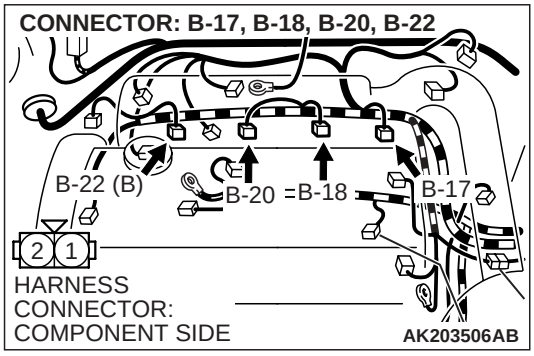
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 2 – 3 ohms [at 20°C (68°F)]

Q: Is the resistance between 2 and 3 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

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



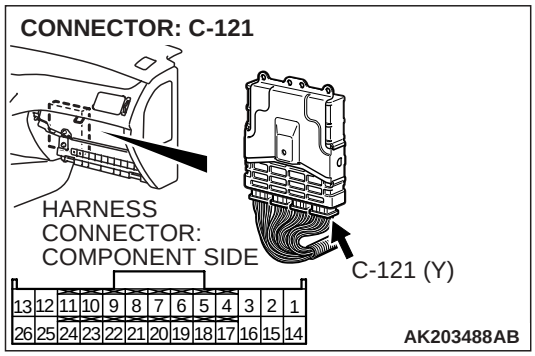
STEP 4. Check connector at injector for damage.

a. Check connector B-22 at No. 1 cylinder.
b. Check connector B-20 at No. 2 cylinder.
c. Check connector B-18 at No. 3 cylinder.
d. Check connector B-17 at 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.

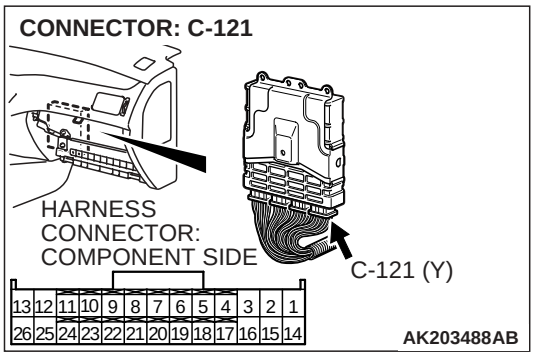


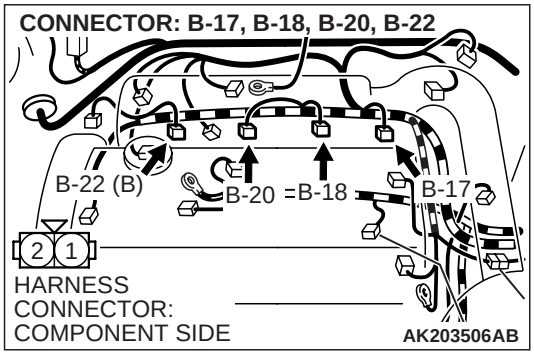
STEP 5. Check connector C-121 at ECM for damage.

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 ECM connector.

a. Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) at No.1 cylinder.
b. Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) at No.2 cylinder.
c. Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) at No.3 cylinder.
d. Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) at No.4 cylinder.

Q: Is the harness wire in good condition?

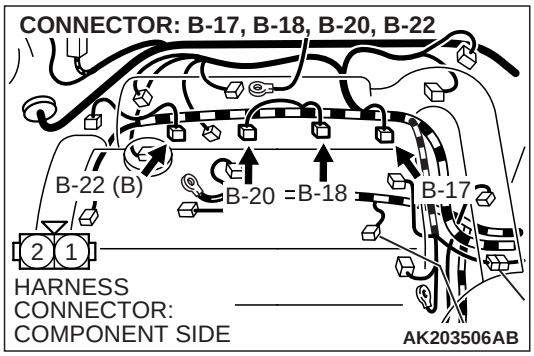
YES : Go to Step 7.
NO : Repair it. Then go to Step 9.

STEP 7. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-14.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 9.
NO : Go to Step 8.



STEP 8. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(3) Check the diagnostic trouble code (DTC).

Q: Are DTC P0301, P0302, P0303 and P0304 sets?

YES : Replace the ECM. Then go to Step 9.
NO : The procedure is complete.

STEP 9. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

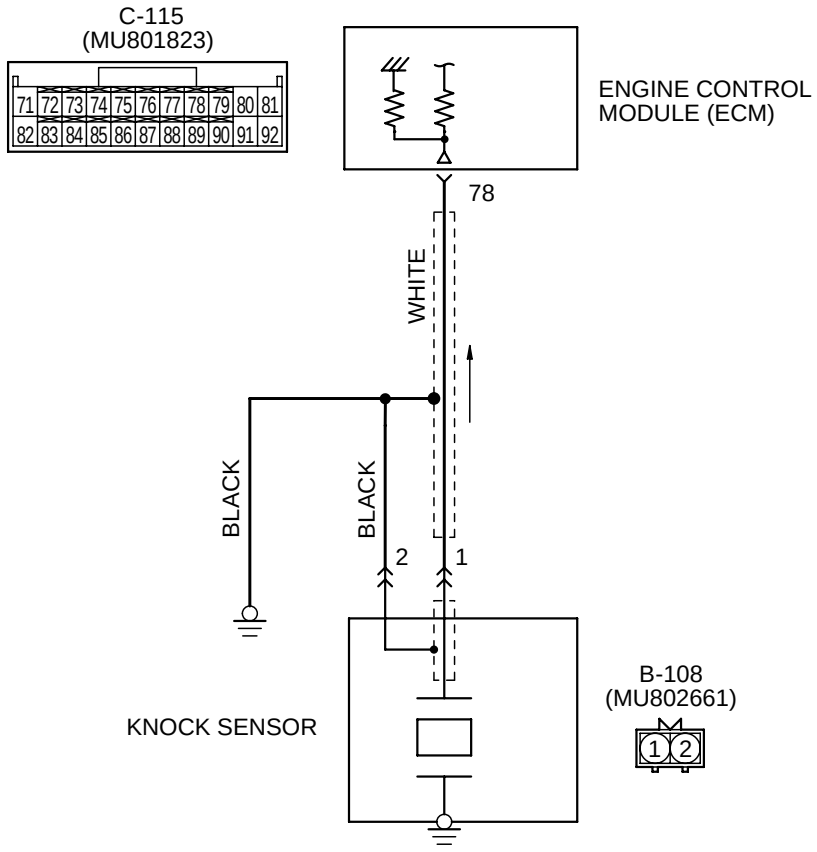
Q: Are DTC P0301, P0302, P0303 and P0304 sets?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

TSB Revision

DTC P0325: KNOCK SENSOR CIRCUIT

Knock Sensor Circuit



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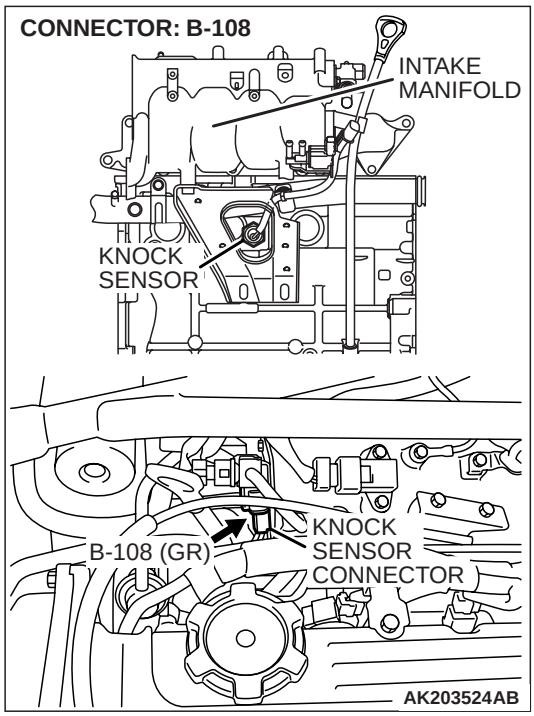
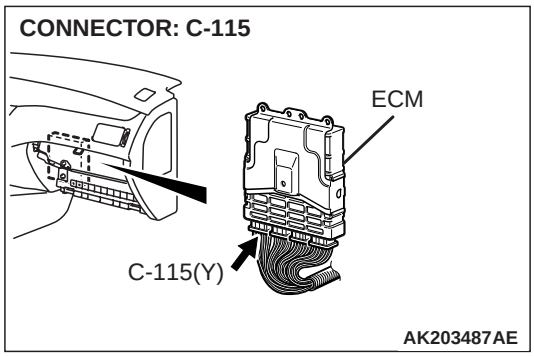




TSB Revision

CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the ECM (terminal No. 78).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- Two seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 2,500 r/min.

Judgment Criteria

- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

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

- Knock sensor failed.
- Open or shorted knock sensor circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

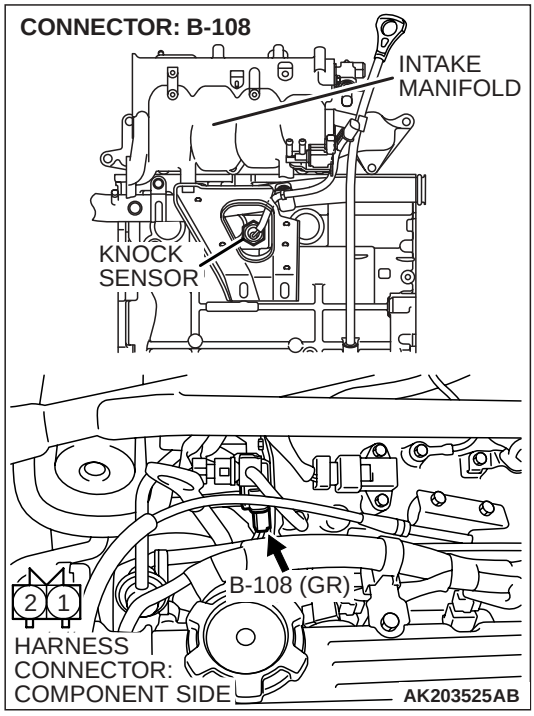
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check connector B-108 at the knock sensor for damage.

Q: Is the connector in good condition?

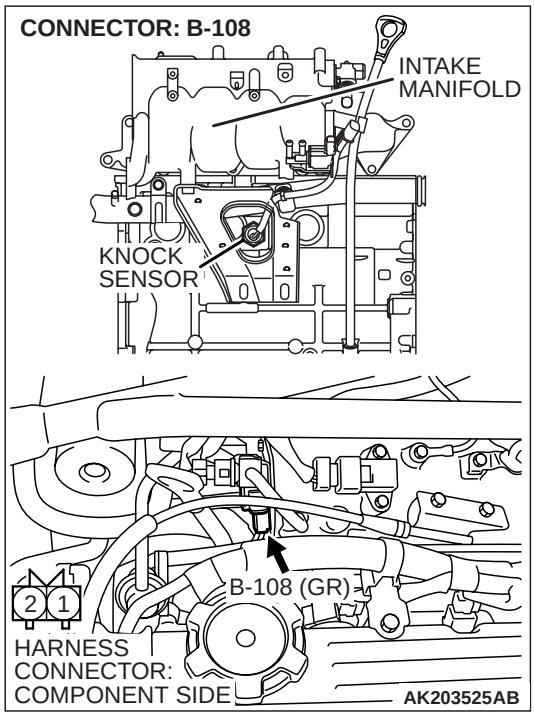
YES : Go to Step 2.

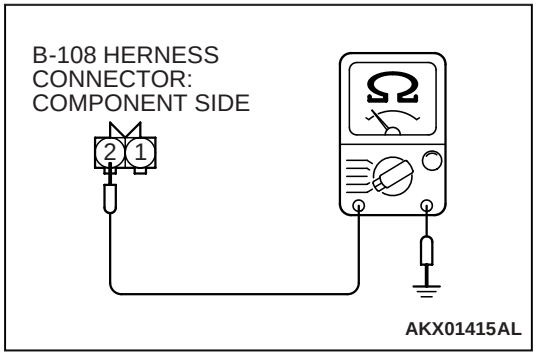
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 2. Check for continuity at knock sensor harness side connector B-108.

(1) Disconnect connector B-108 and measure at the harness side.





(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 3.

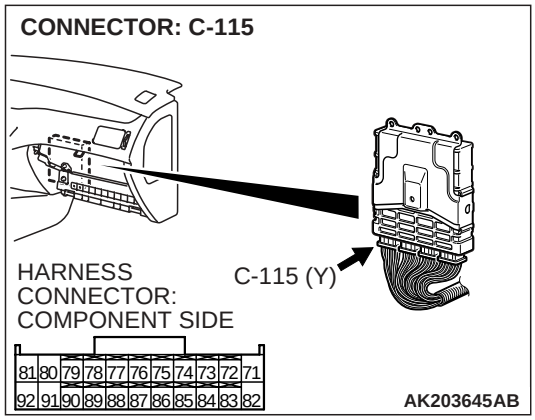
NO : Repair harness wire between knock sensor connector B-108 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 6.

STEP 3. Check connector C-115 at ECM 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 6.

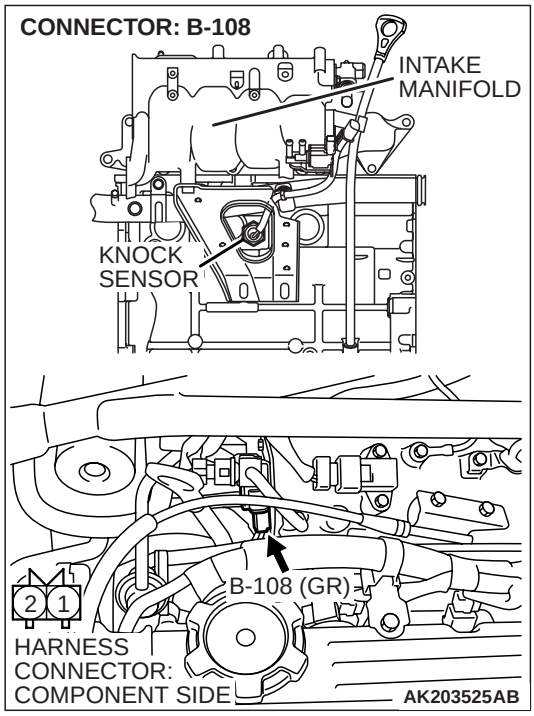


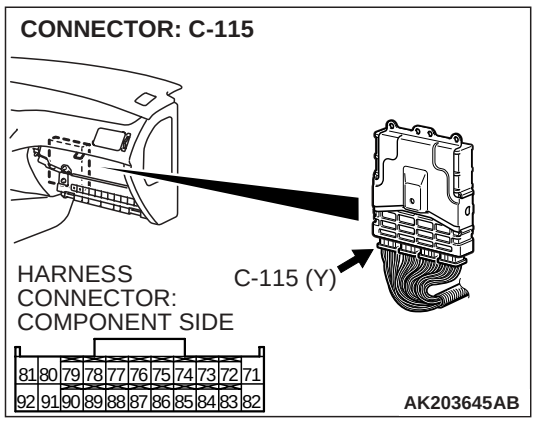
STEP 4. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-108 (terminal No. 1) and ECM connector C-115 (terminal No. 78).

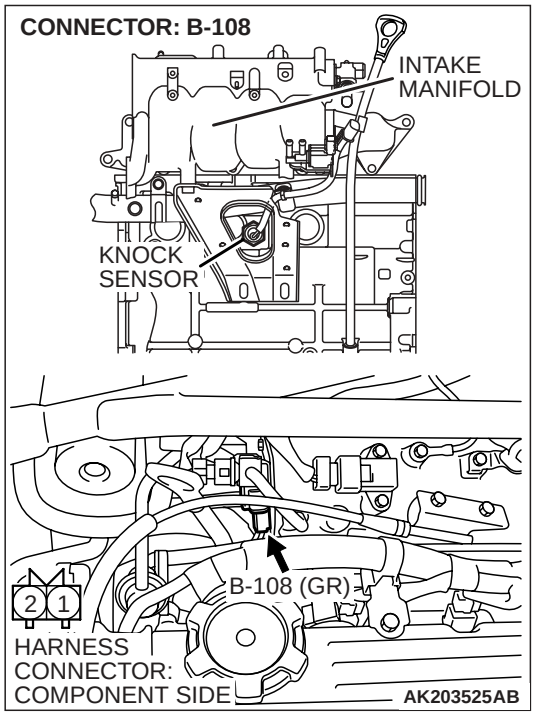
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.







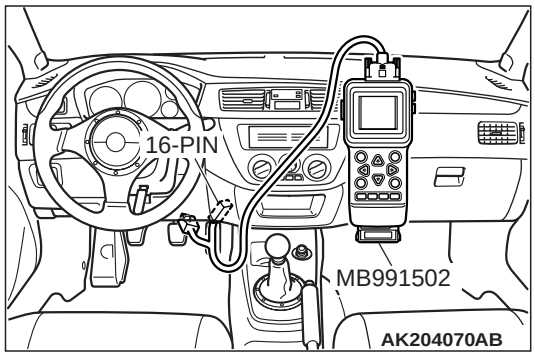
STEP 5. Check the knock sensor.

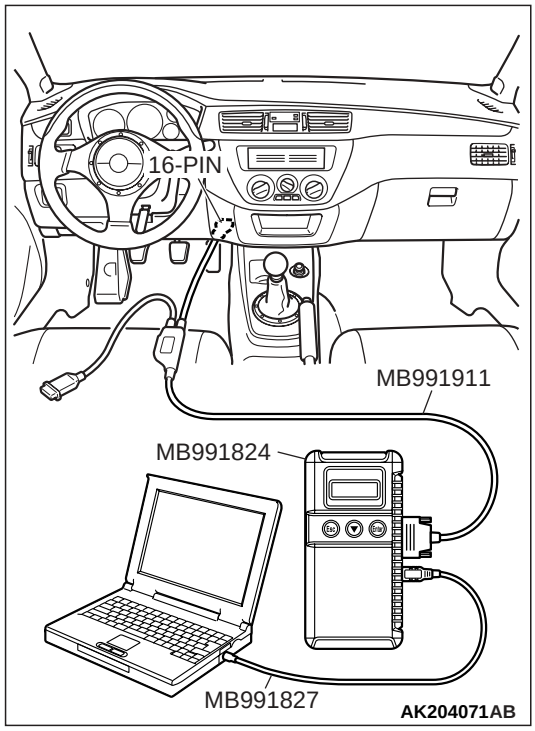
(1) Disconnect the knock sensor connector B-108.
(2) Start the engine and run at idle.
(3) Measure the voltage between knock sensor side connector terminal No. 1 (output) and No. 2 (ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

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

Q: Is the sensor operating properly?

YES : Replace the ECM. Then go to Step 6.
NO : Replace the knock sensor. Then go to Step 6.





STEP 6. Using scan tool MB991502 or MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 2, 000 – 5, 000r/min
- Engine load : 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

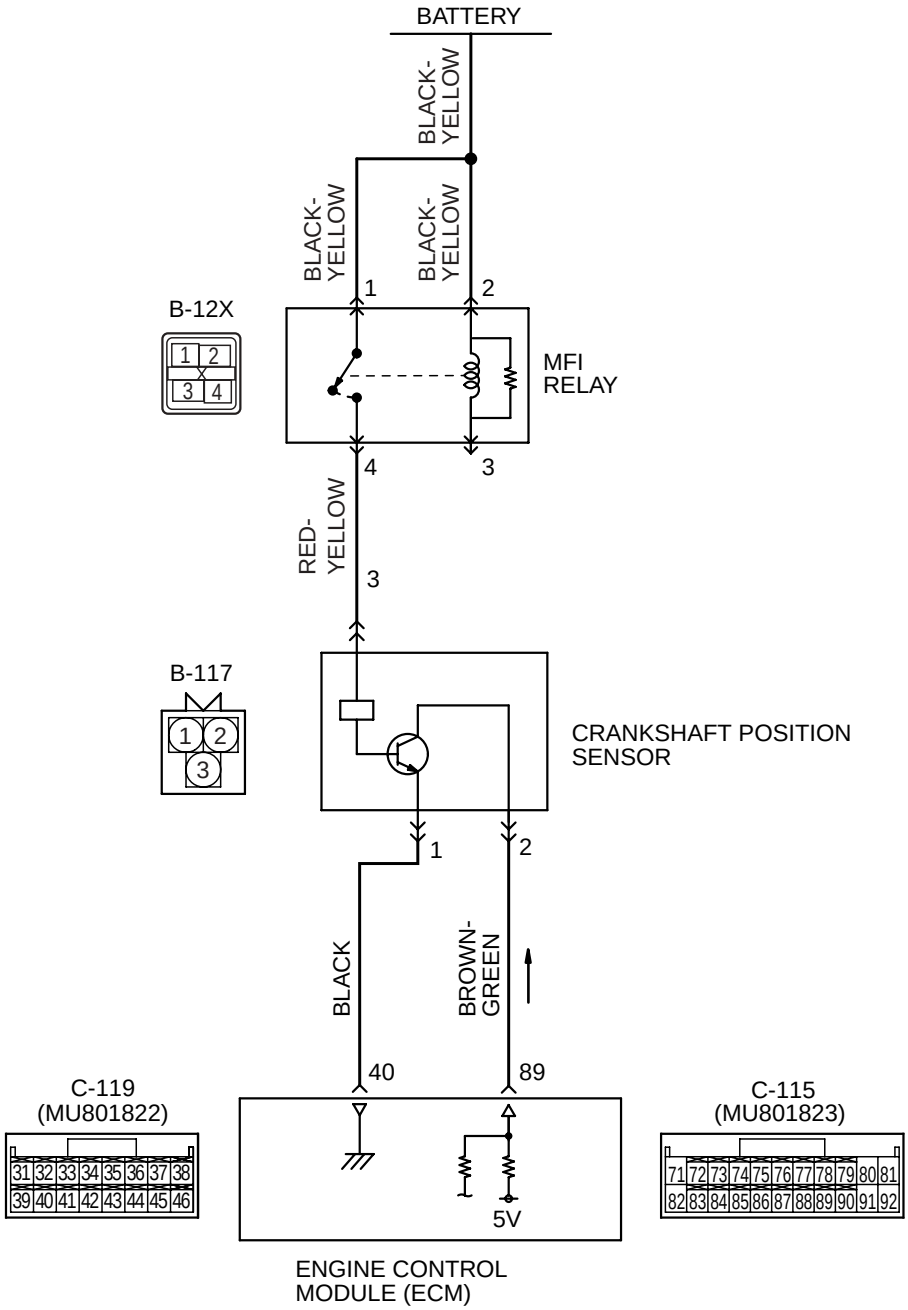
(5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0325 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0335: CRANKSHAFT POSITION SENSOR CIRCUIT

Crankshaft Position Sensor Circuit



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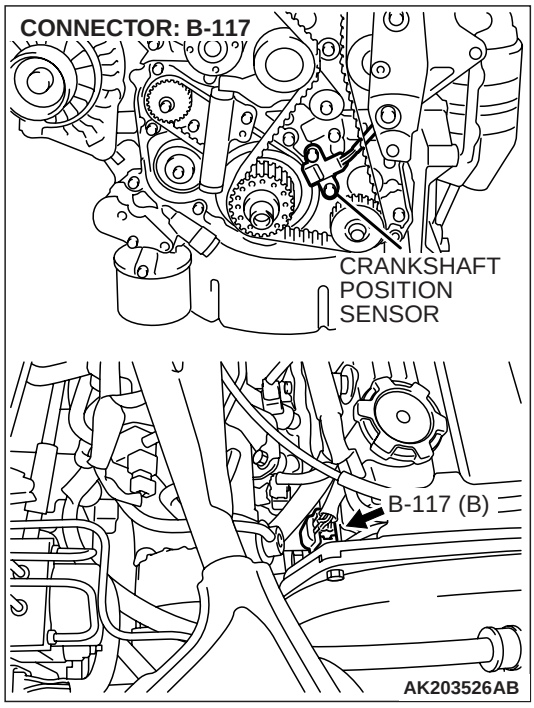
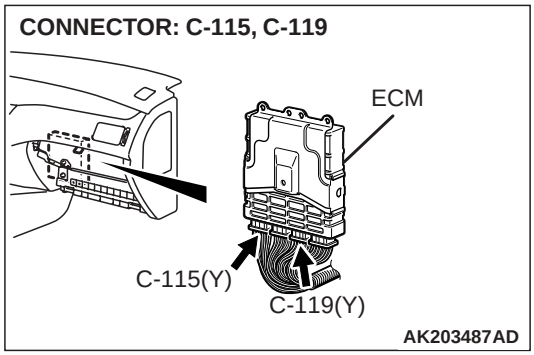
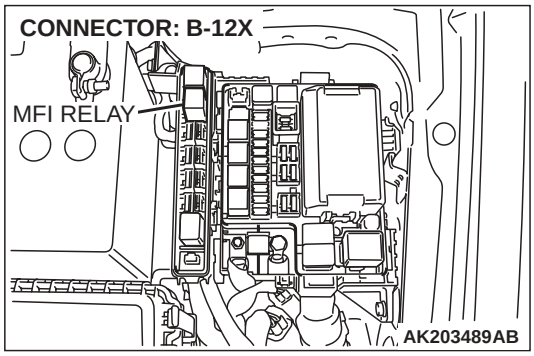






CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the crankshaft position sensor is grounded with ECM (terminal No. 40).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the ECM (terminal No. 89). 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 ECM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM 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:)

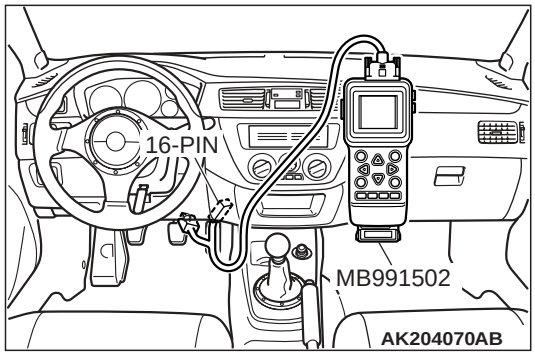
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or connector damage.
- ECM failed.

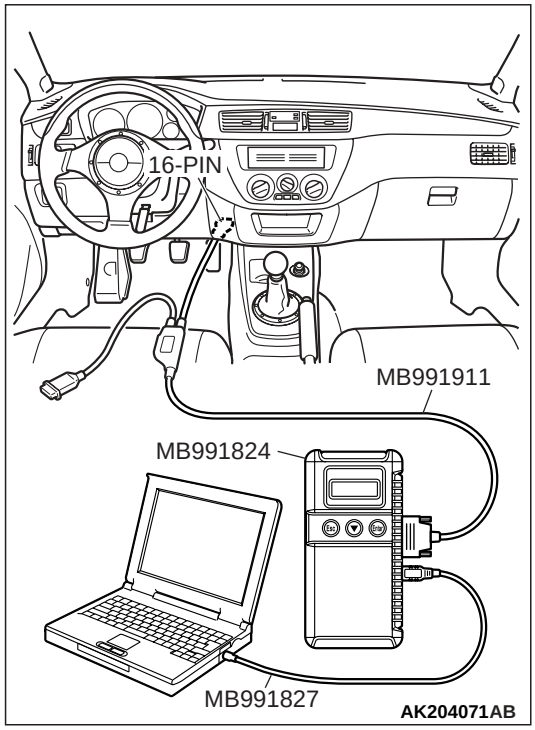
DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MD998478: Test Harmess (3 pin, triangle)

STEP 1. Using scan tool MB991502 or MB991958, check data list item 22: Crankshaft Position Sensor.





⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 22, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

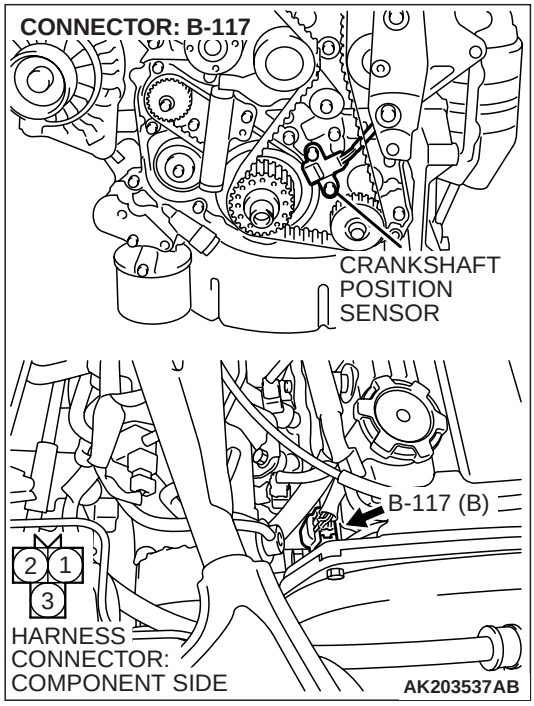
Q: Is the sensor operating properly?

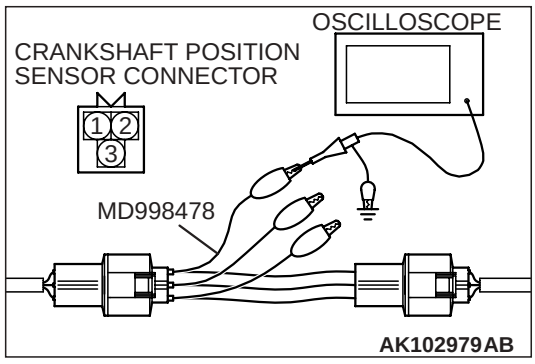
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor intermediate connector B-117, and connect test harness special tool (MD998478) in between.

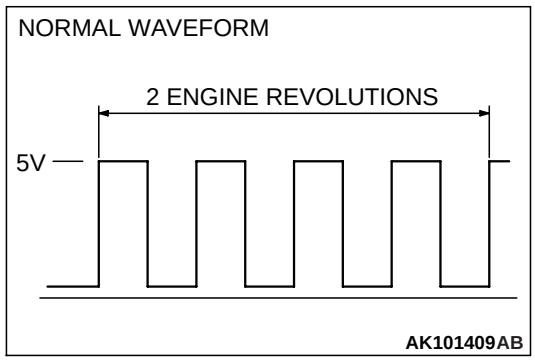




(2) Connect the oscilloscope probe to the crankshaft position sensor side connector terminal No. 2.

NOTE: Connect the oscilloscope probe to terminal No. 89 by backprobing when measuring with the ECM connector.

(3) Start the engine and run at idle.

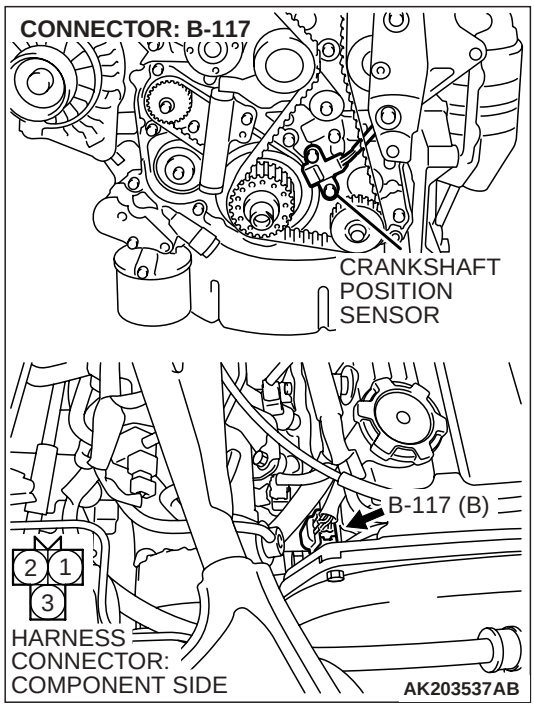


(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(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.

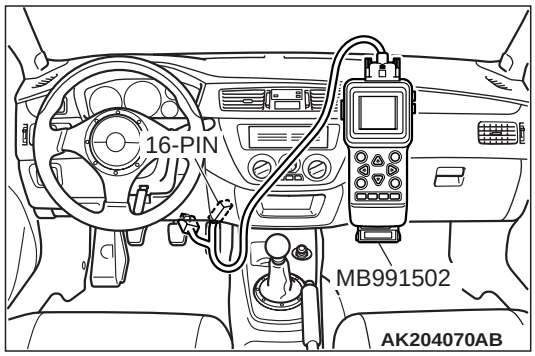


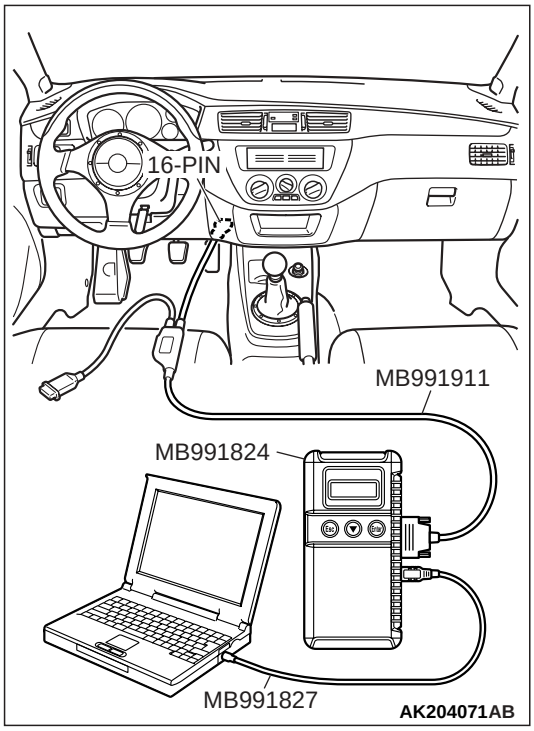
STEP 3. Check harness connector B-117 at the crankshaft position sensor for damage.

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 go to Step 21.





STEP 4. Using scan tool MB991502 or MB991958, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

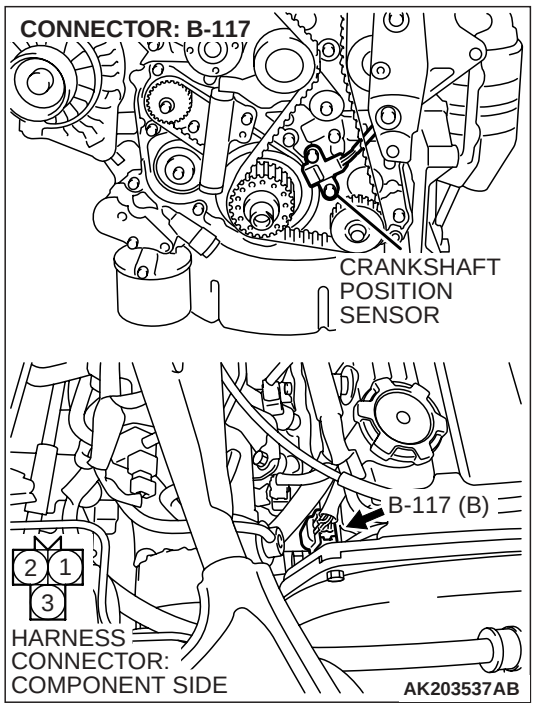
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(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.00-6.

NO : Replace the ECM. Then go to Step 21.



STEP 5. Check harness connector B-117 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

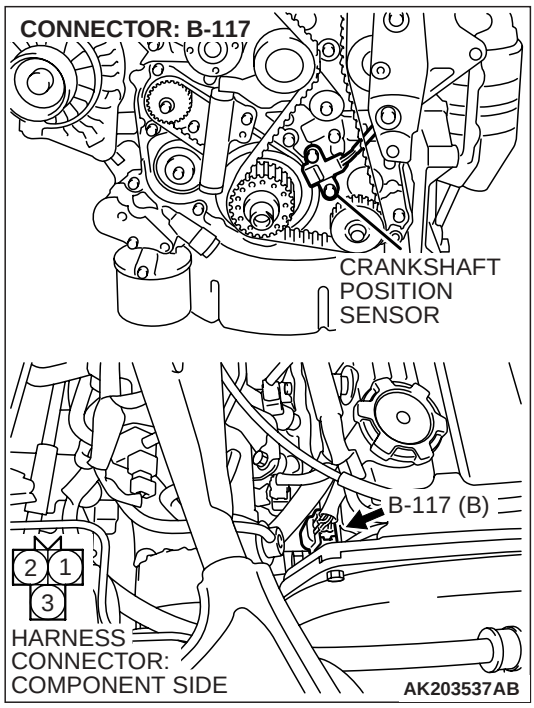
YES : Go to Step 6.

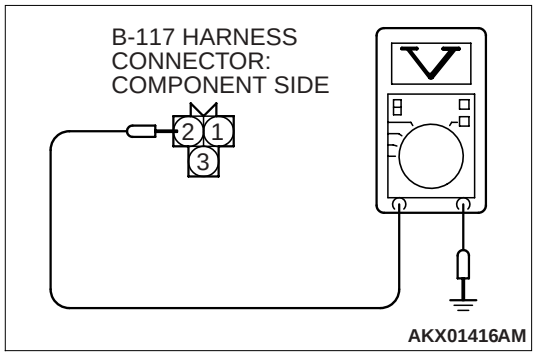
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-117.

(1) Disconnect connector B-117 and measure at the harness side.

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





(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should measure between 4.8 and 5.2 volts.

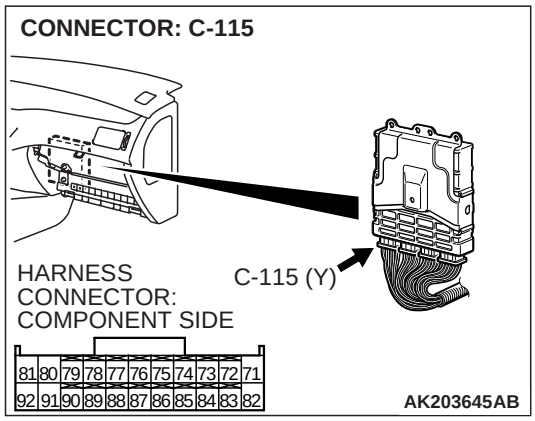
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.8 and 5.2 volts?

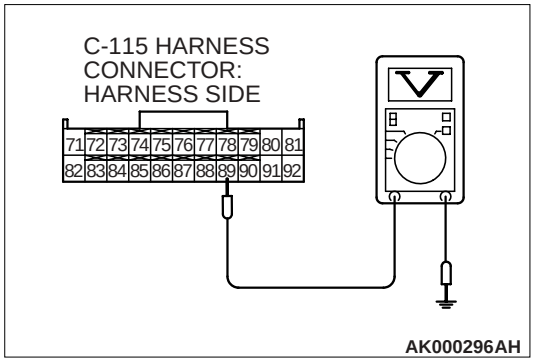
YES : Go to Step 11.

NO : Go to Step 7.

STEP 7. Measure the sensor supply voltage at ECM connector C-115 by backprobing.



(1) Do not disconnect the ECM connector C-115.
(2) Disconnect the crankshaft position sensor connector B-117.
(3) Turn the ignition switch to the "ON" position.



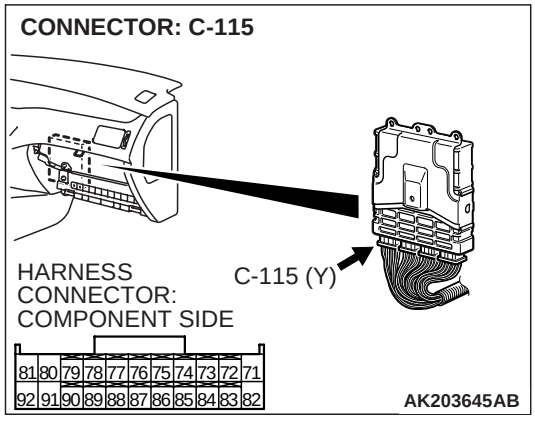
(4) Measure the voltage between terminal No. 89 and ground by backprobing.
- Voltage should measure between 4.8 and 5.2 volts.

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

Q: Is the measured voltage between 4.8 and 5.2 volts?

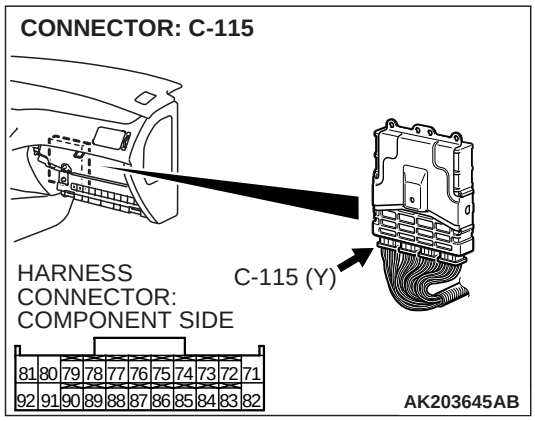
YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Check harness connector C-115 at ECM for damage.



Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor connector B-117 (terminal No. 2) and ECM connector C-115 (terminal No. 89) because of open circuit. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

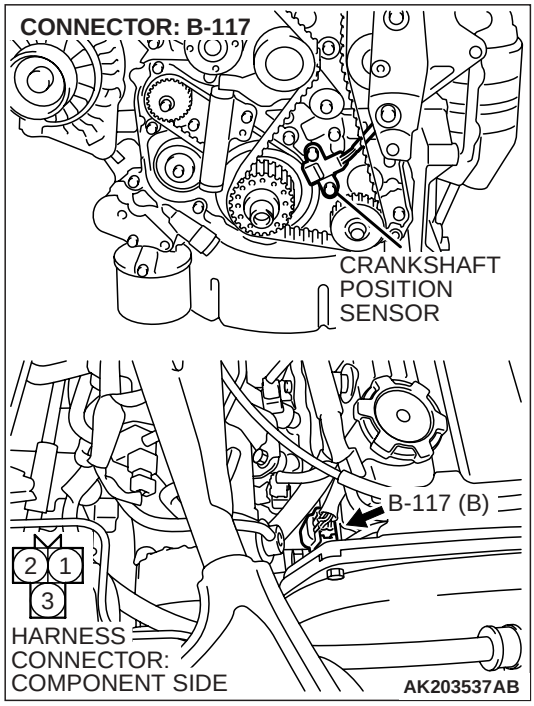


STEP 9. Check harness connector C-115 at ECM for damage.

Q: Is the harness 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 21.

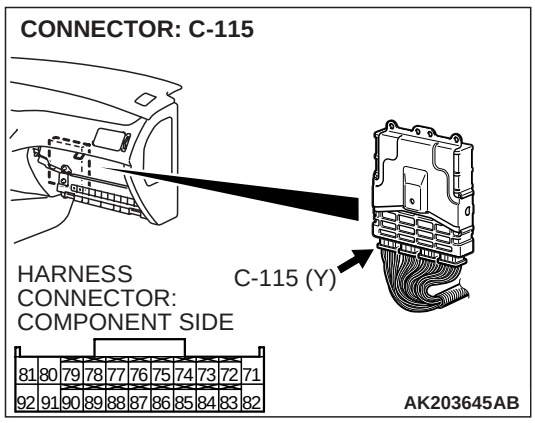


STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-117 (terminal No. 2) and ECM connector C-115 (terminal No. 89).

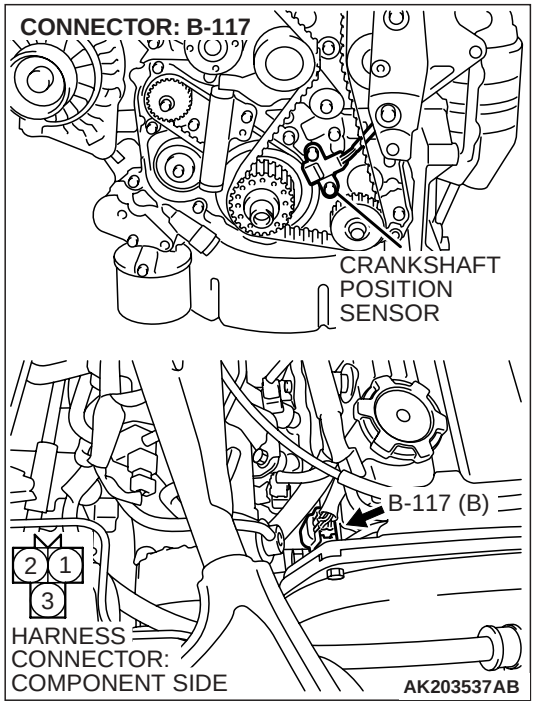
Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 21.

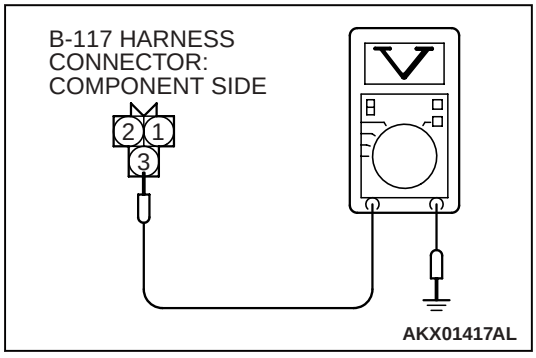
NO : Repair it. Then go to Step 21.



STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-117.



(1) Disconnect connector B-117 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



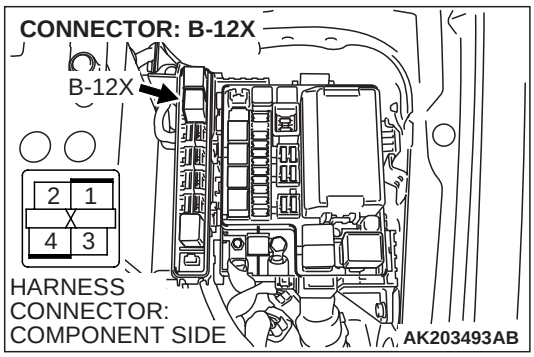
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 13.
NO : Go to Step 12.

STEP 12. Check harness connector B-12X at MFI relay for damage.

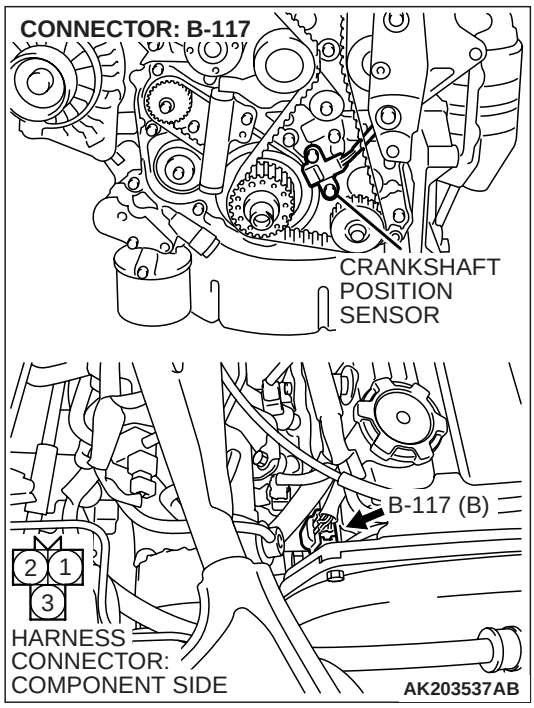


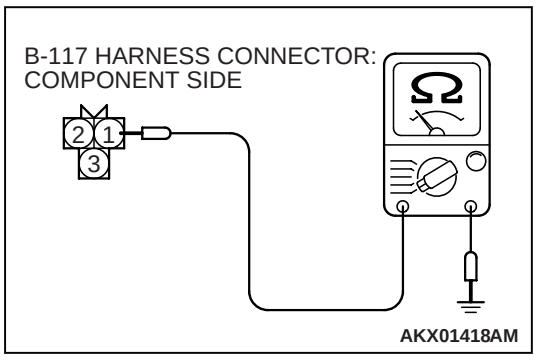
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-12X (terminal No. 4) and crankshaft position sensor connector B-117 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

STEP 13. Check for continuity at crankshaft position sensor harness side connector B-117.

(1) Disconnect connector B-117 and measure at the harness side.





(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

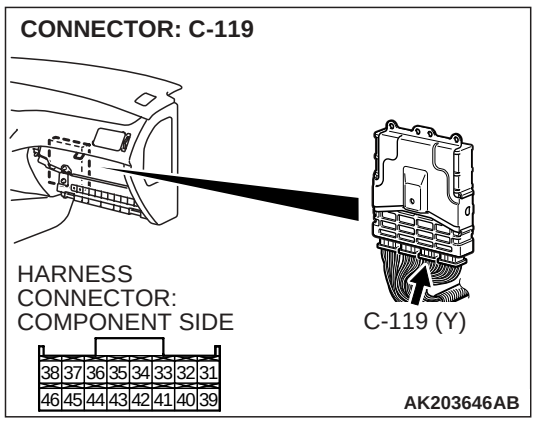
Q: Does continuity exist?

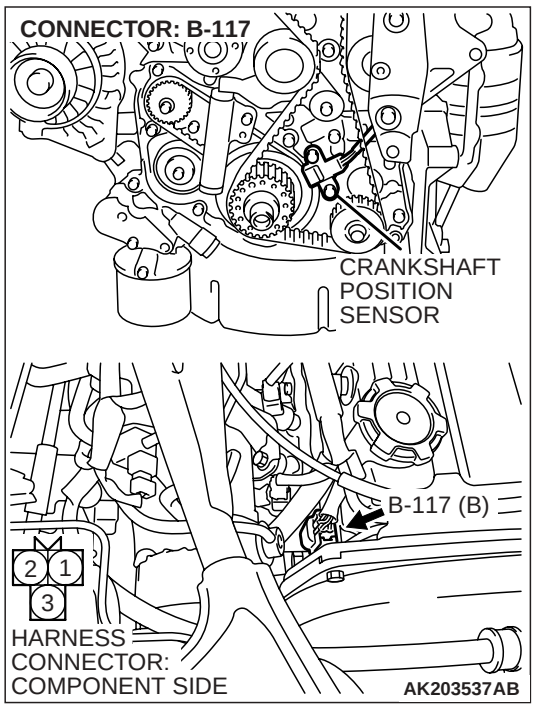
YES : Go to Step 16.
NO : Go to Step 14.

STEP 14. Check harness connector C-119 at ECM 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 21.



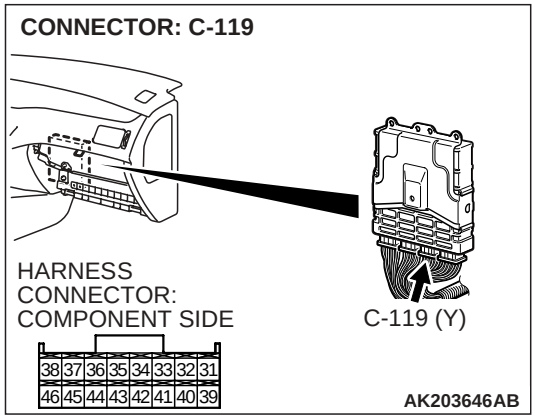


STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-117 (terminal No. 1) and ECM connector C-119 (terminal No. 40).

Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 21.

NO : Repair it. Then go to Step 21.

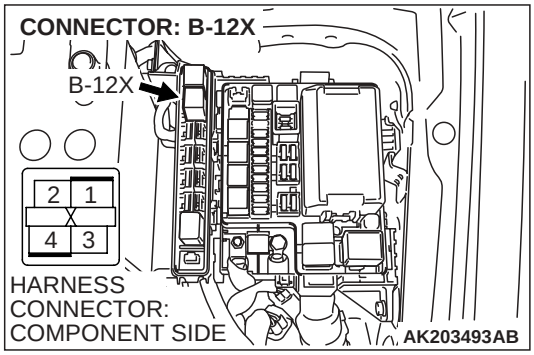


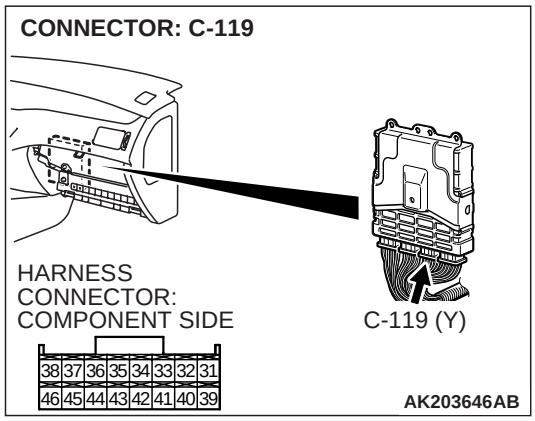
STEP 16. Check harness connector B-12X at the MFI relay for damage.

Q: Is the harness 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 21.



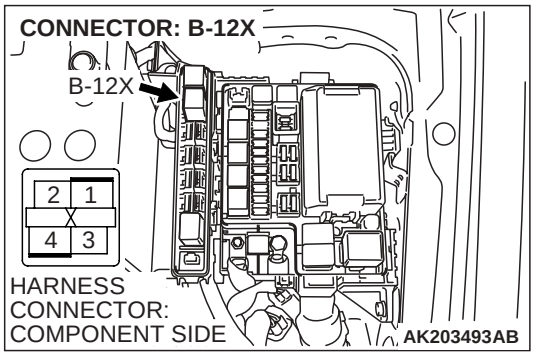


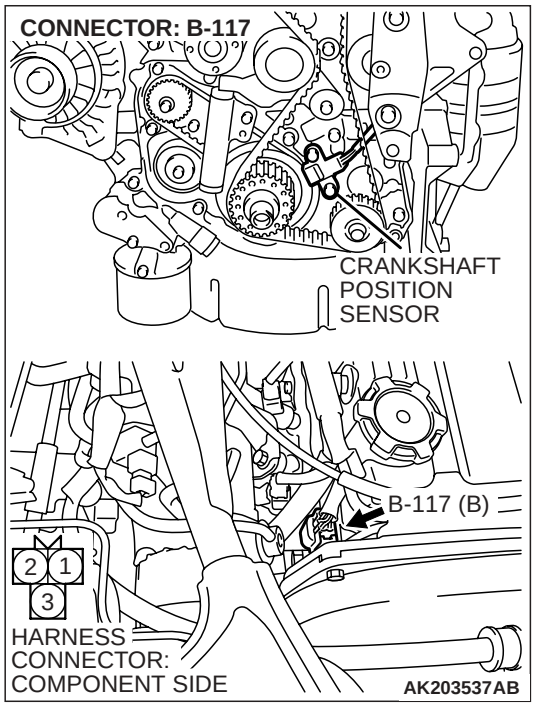
STEP 17. Check harness connector C-115 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



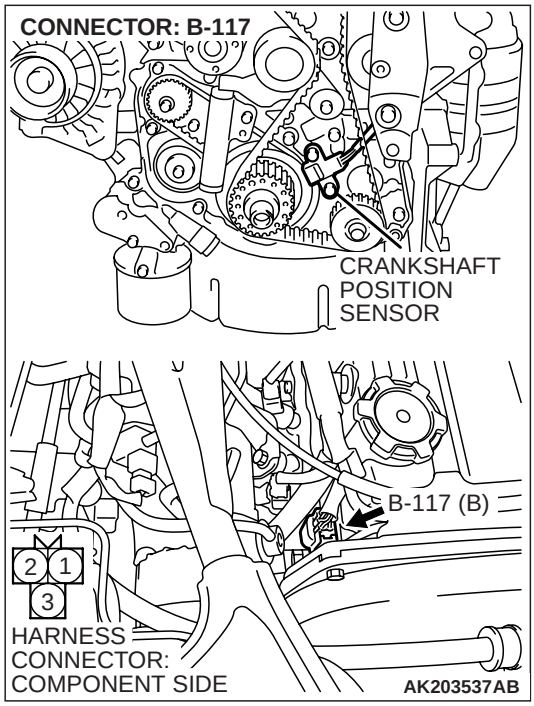


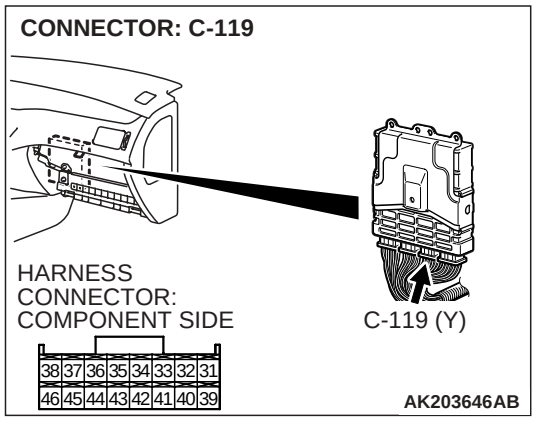
STEP 18. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and crankshaft position sensor connector B-117 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 21.





STEP 19. Check for harness damage between crankshaft position sensor connector B-117 (terminal No. 2) and ECM connector C-115 (terminal No. 89).

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 21.

STEP 20. Check the crankshaft sensing blade.

Q: Is the crankshaft sensing blade in a good condition?

YES : Replace the crankshaft position sensor. Then go to Step 21.

NO : Replace it. Then go to Step 21.

STEP 21. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.

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

Q: Is DTC P0335 set?

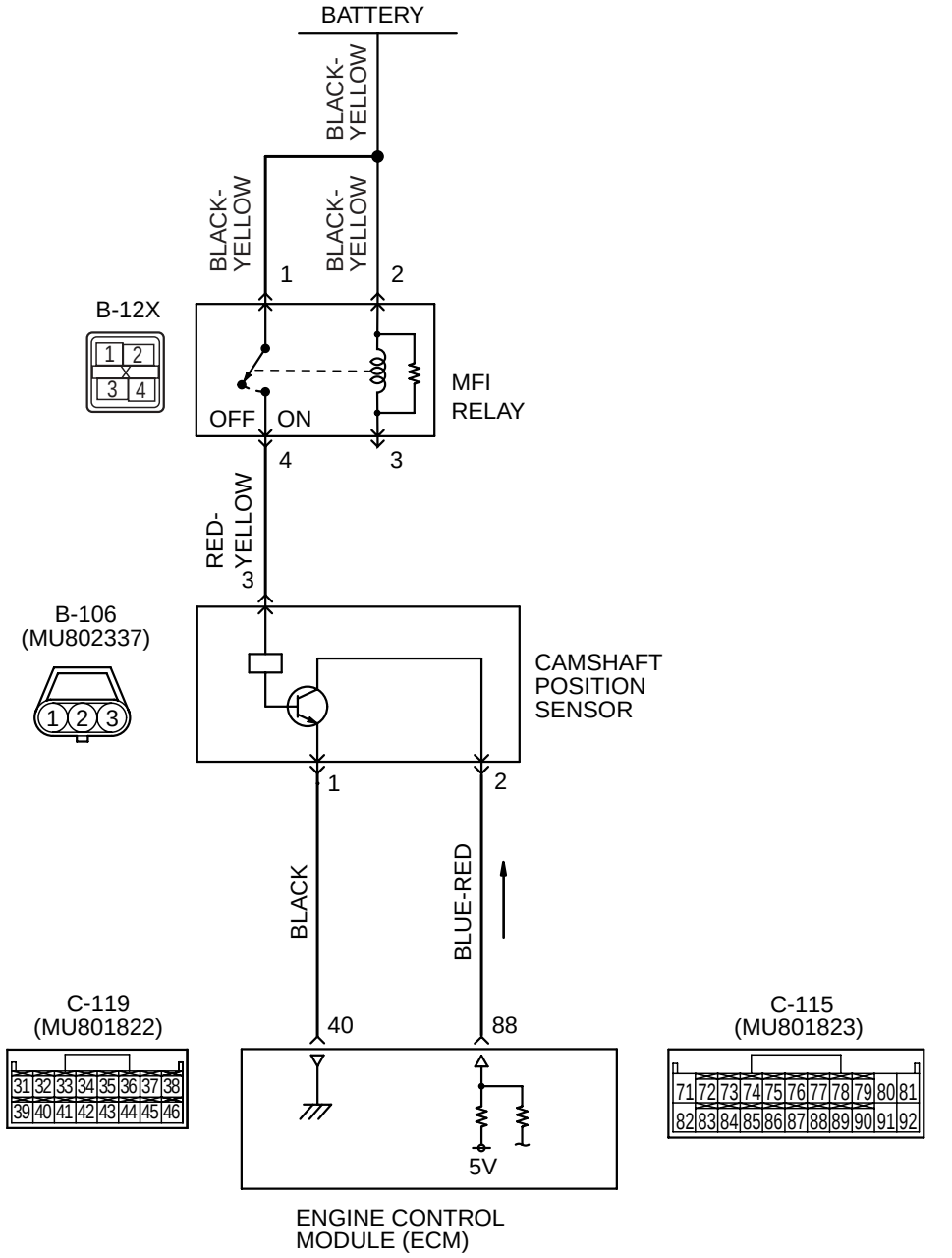
YES : Repeat the troubleshooting.

NO : The procedure is complete.

TSB Revision

DTC P0340: CAMSHAFT POSITION SENSOR CIRCUIT

Camshaft Position Sensor Circuit



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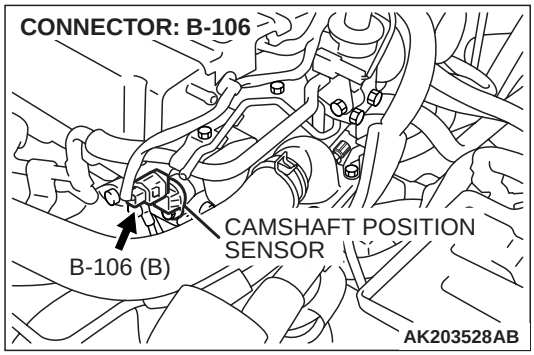
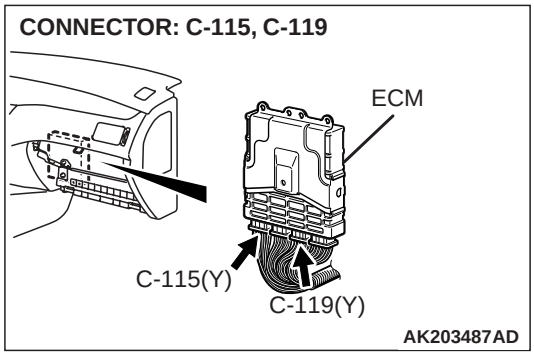
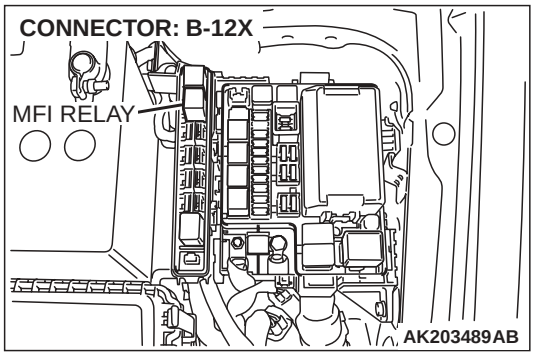






CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the camshaft position sensor is grounded with ECM (terminal No. 40).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the ECM (terminal No. 88). 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 ECM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM 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.

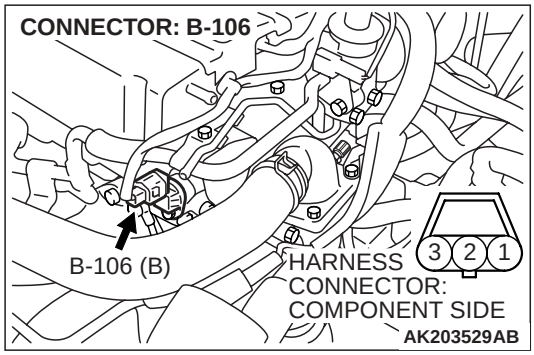
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, harness damage, or connector damage.
- ECM failed.

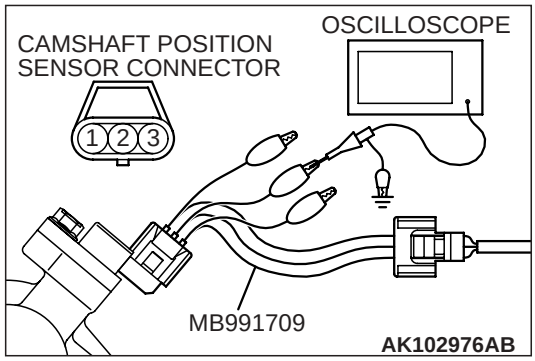
DIAGNOSIS

Required Special Tool:
- MB991709: Test Harness Set

STEP 1. Using the oscilloscope, check the camshaft position sensor.



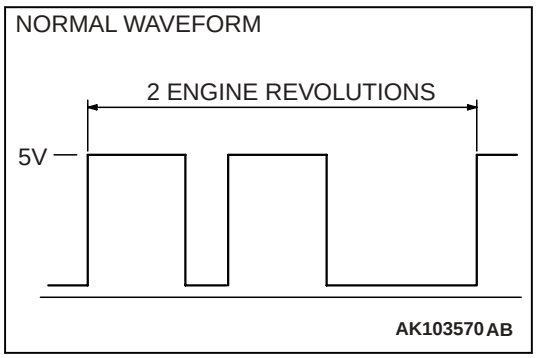
(1) Disconnect the camshaft position sensor connector B-106, and connect test harness special tool (MB991709) in between. (All terminals should be connected.)



(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal No. 2.

NOTE: When measuring with the ECM side connector, connect an oscilloscope probe to terminal No. 88.

(3) Start the engine and run at idle.



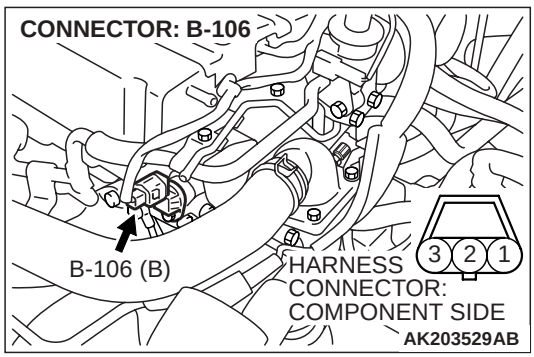
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(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 harness connector B-106 at camshaft position sensor for damage.



Q: Is the harness 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 20.

STEP 3. Retest the system.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

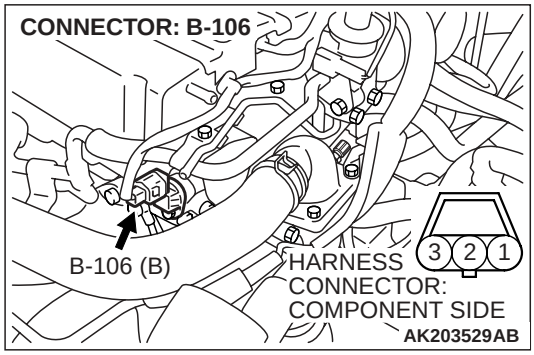
Q: Is DTC P0340 set?

YES : Replace the ECM. Then go to Step 20.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 4. Check harness connector B-106 at camshaft position sensor for damage.

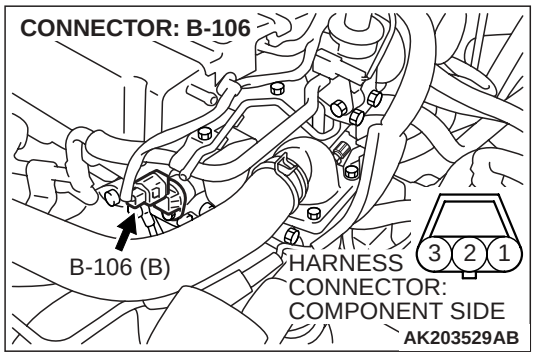
Q: Is the harness connector in good condition?

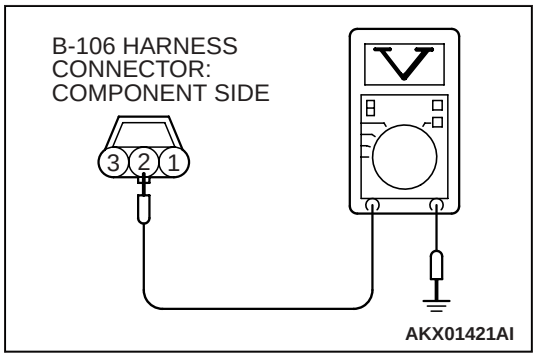
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 5. Measure the sensor supply voltage at camshaft position sensor connector B-106.

(1) Disconnect connector B-106 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.





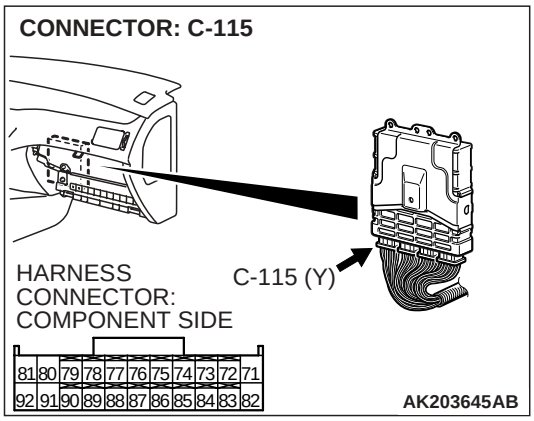
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should measure between 4.8 and 5.2 volts.

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

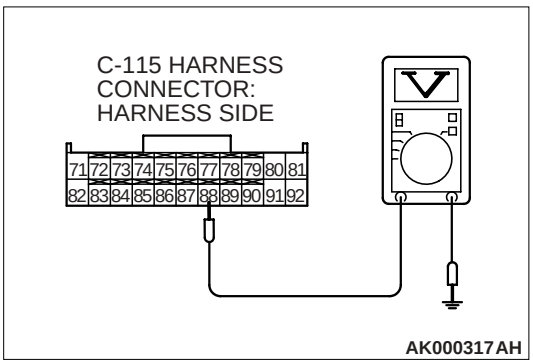
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 10.
NO : Go to Step 6.

STEP 6. Measure the sensor supply voltage at ECM connector C-115 by backprobing.



(1) Do not disconnect the ECM connector C-115.
(2) Disconnect the camshaft position sensor connector B-106.
(3) Turn the ignition switch to the "ON" position.



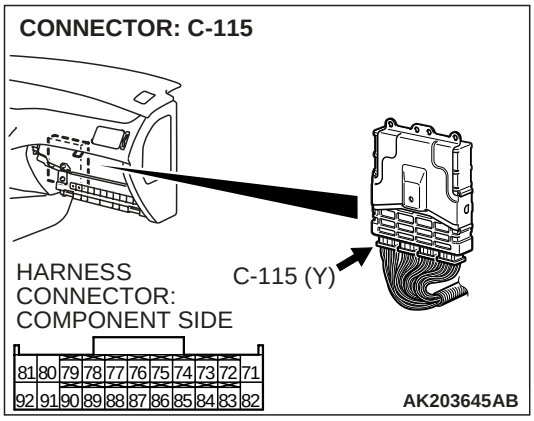
(4) Measure the voltage between terminal No. 88 and ground by backprobing.
- Voltage should measure between 4.8 and 5.2 volts.

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

Q: Is the measured voltage between 4.8 and 5.2 volts?

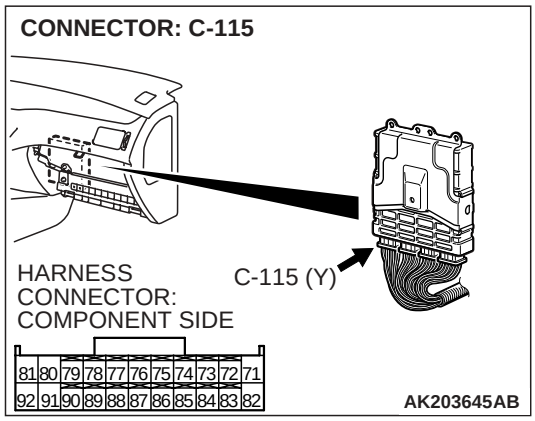
YES : Go to Step 7.
NO : Go to Step 8.

STEP 7. Check harness connector C-115 at ECM for damage.



Q: Is the harness connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88) because of open circuit. 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.

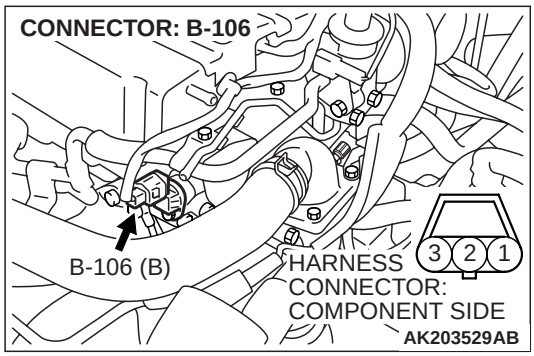


STEP 8. Check harness connector C-115 at ECM for damage.

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 go to Step 20.

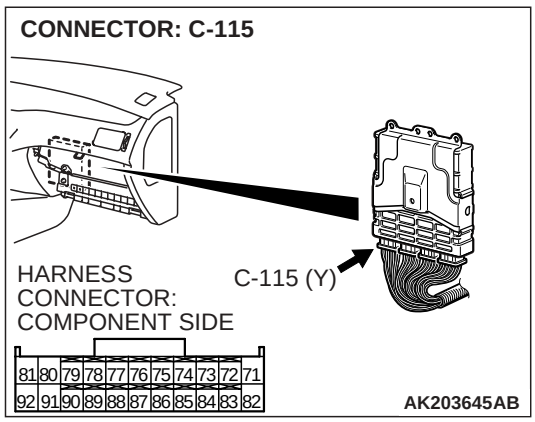


STEP 9. Check for short circuit to ground between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88).

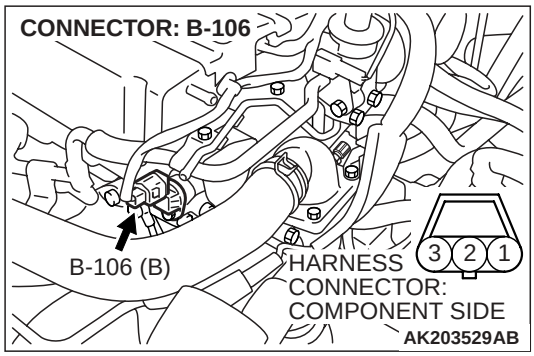
Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 20.

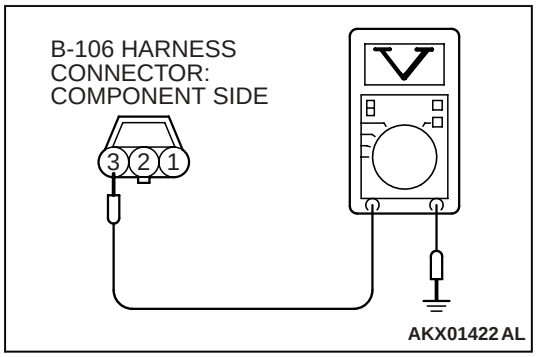
NO : Repair it. Then go to Step 20.



STEP 10. Measure the power supply voltage at camshaft position sensor connector B-106.



(1) Disconnect connector B-106 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



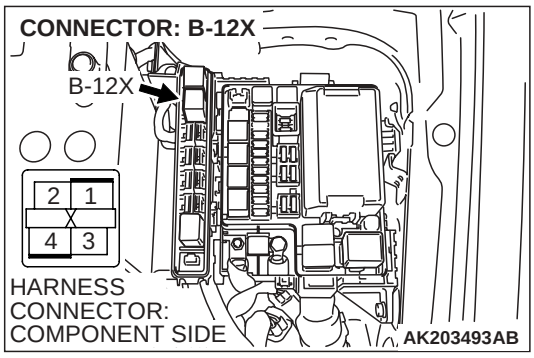
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

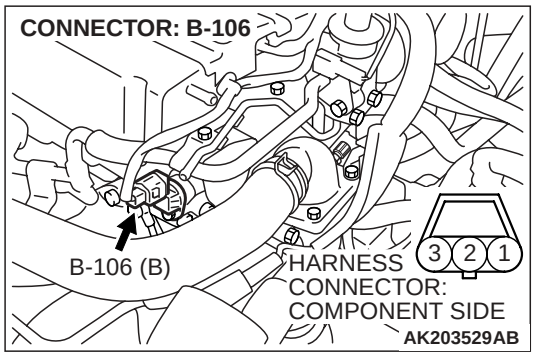
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector B-12X at MFI relay for damage.



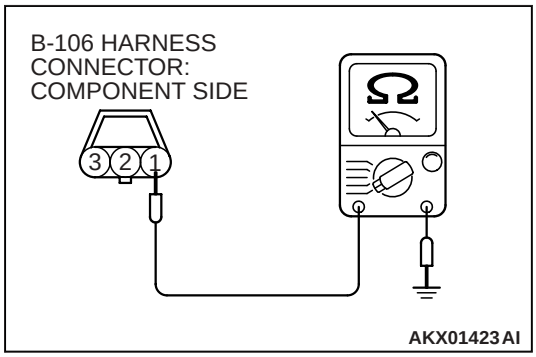
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-12X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 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 12. Check for continuity at camshaft position sensor connector B-106.

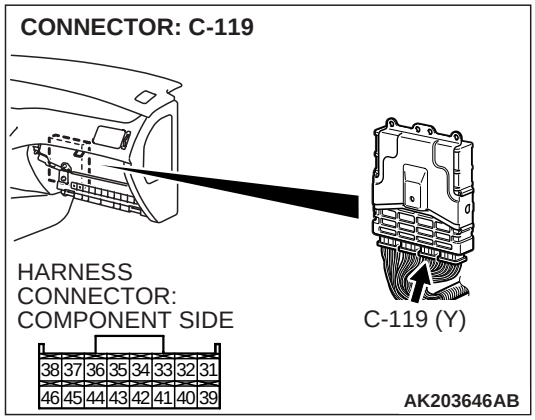
(1) Disconnect connector B-106 and measure at the harness side.



(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

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



STEP 13. Check harness connector C-119 at ECM for damage.

Q: Is the harness connector in good condition?

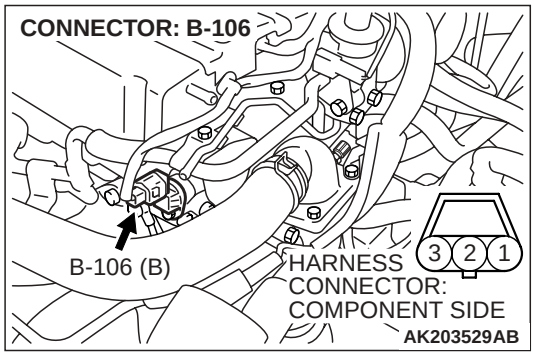
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

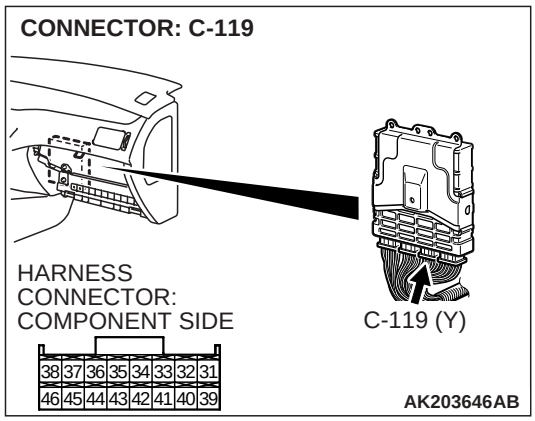
STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-106 (terminal No. 1) and ECM connector C-119 (terminal No. 40).

Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 20.

NO : Repair it. Then go to Step 20.



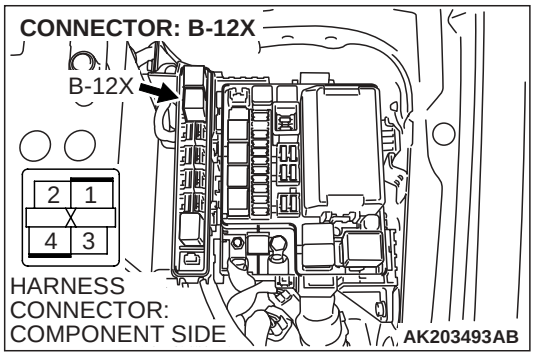


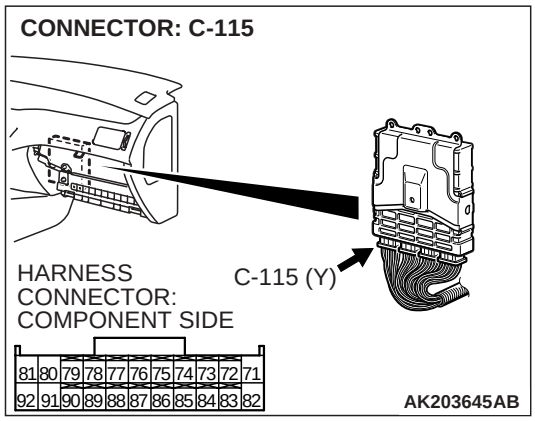
STEP 15. Check harness connector B-12X at the MFI relay for damage.

Q: Is the harness 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.



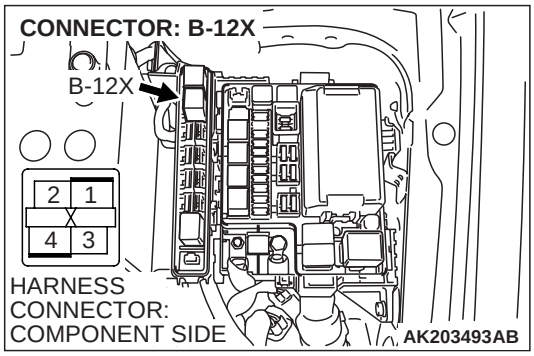


STEP 16. Check harness connector C-115 at ECM for damage.

Q: Is the harness 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 20.

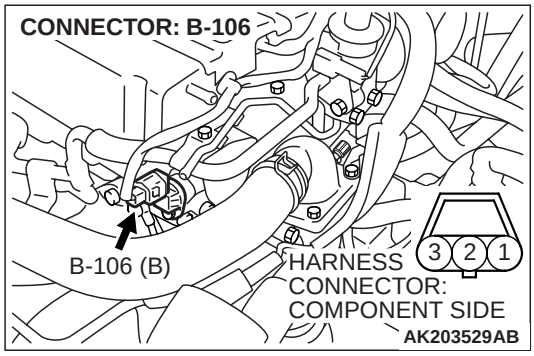


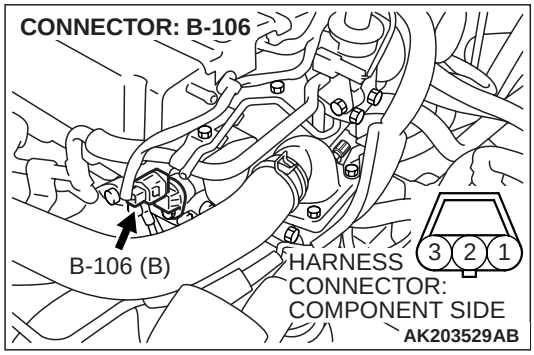
STEP 17. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3).

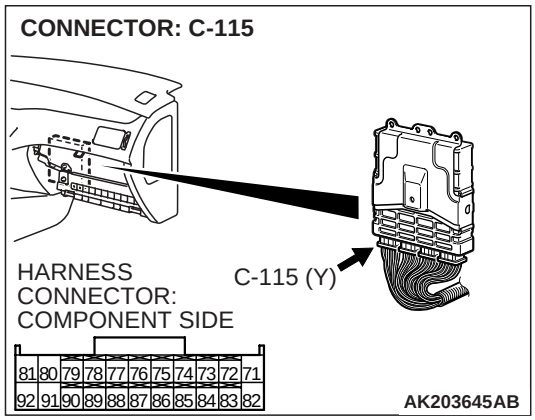
Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.







STEP 18. Check for harness damage between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88).

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 camshaft position sensing cylinder.

Q: Is the camshaft position sensing cylinder in a good condition?

YES : Replace the camshaft position sensor. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 20. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.

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

Q: Is DTC P0340 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0401: EXHAUST GAS RECIRCULATION FLOW INSUFFICIENT DETECTED

TECHNICAL DESCRIPTION

- When the EGR vacuum regulator solenoid valve switches from "OFF" to "ON" while the engine is running, EGR gas flows.
- The ECM checks how the EGR gas flow signal changes.

DTC SET CONDITIONS

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,000 and 2,000 r/min.
- Intake air temperature is higher than 0°C (32°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 1.5 km/h (0.9 mph) or more.
- At least 90 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.
- While fuel is being shut off.
- The ECM monitors for this condition for 3 cycles of 2 seconds each during the drive cycle.

Judgement Criteria

- The intake manifold pressure fluctuation width is lower than 3.5 kPa (0.50 psi). When the EGR vacuum regulator solenoid valve is turned ON.

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 vacuum regulator solenoid valve failed.
- Open or shorted EGR vacuum regulator solenoid valve circuit, or loose connector.
- Manifold differential pressure sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

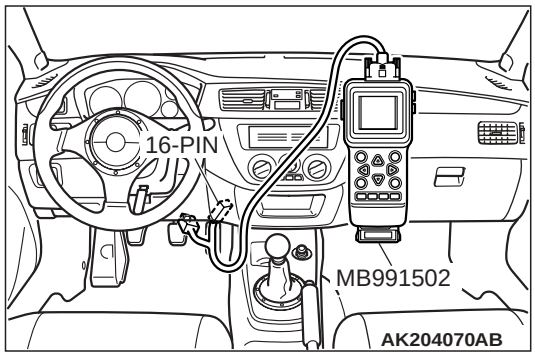
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

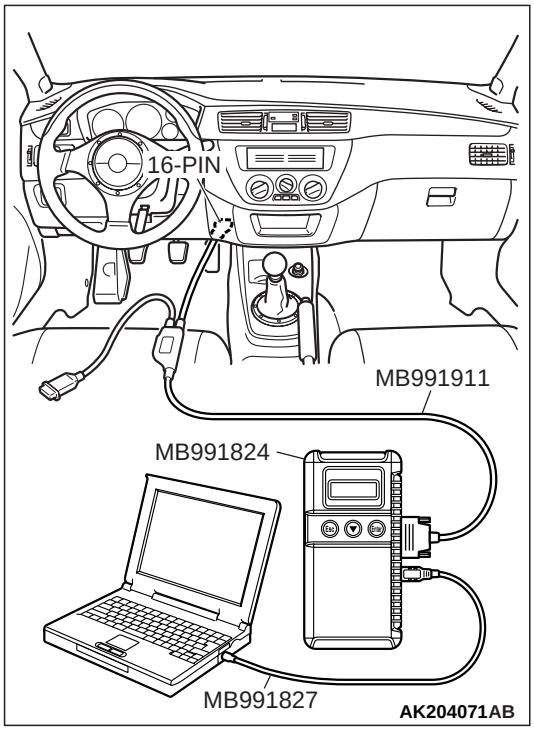
STEP 1. Check the EGR system.

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR System Check P.17-17.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 3.
NO : Go to Step 2.





STEP 2. Using scan tool MB991502 or MB991958, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- Should be between 54 – 68 kPa (15.9 – 20.0 in.Hg) 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-530.

STEP 3. Perform the OBD-II drive cycle.

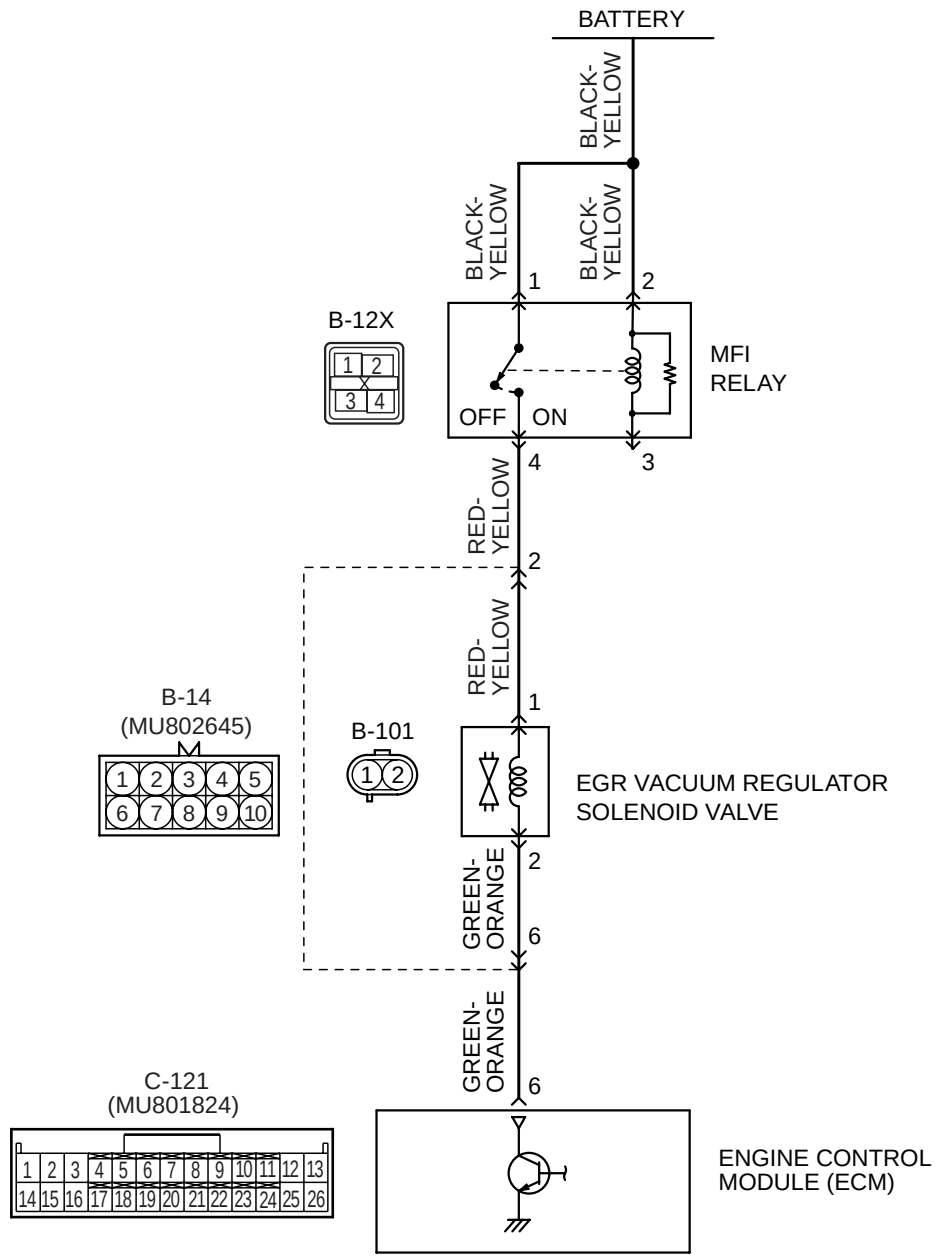
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0401 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0403: EXHAUST GAS RECIRCULATION CONTROL CIRCUIT

EGR Vacuum Regulator Valve Circuit



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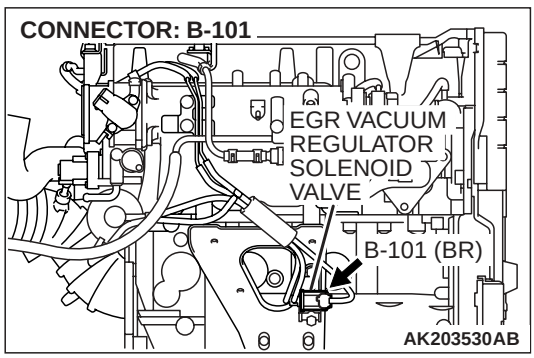
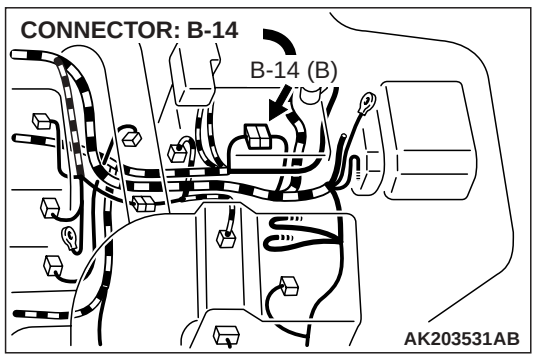
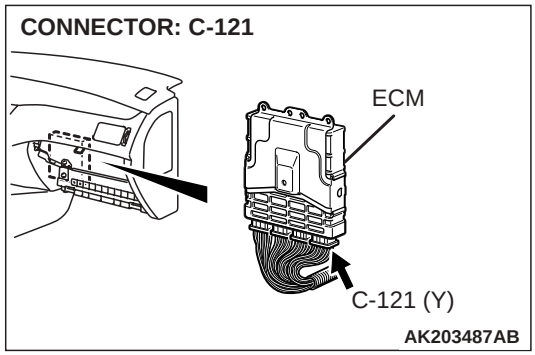
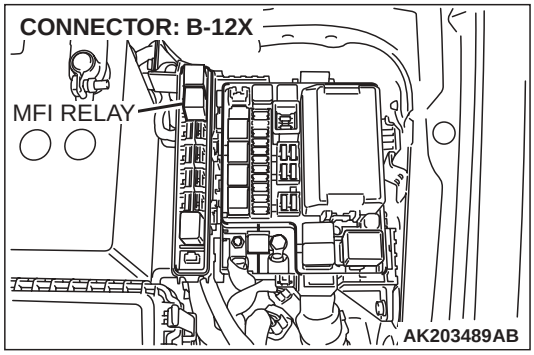




TSB Revision





CIRCUIT OPERATION

- The EGR vacuum regulator solenoid valve power is supplied from the MFI relay (terminal No. 4).
- The ECM controls the EGR vacuum regulator solenoid valve ground by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR vacuum regulator solenoid valve drive circuit, ECM measures the surge voltage of the EGR vacuum regulator solenoid valve coil.
- The ECM drives the EGR vacuum regulator solenoid valve. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 volts or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The EGR vacuum regulator solenoid valve coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the EGR vacuum regulator solenoid valve is between 10 and 90 percent.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The EGR vacuum regulator solenoid valve coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the EGR vacuum regulator solenoid valve is turned OFF.

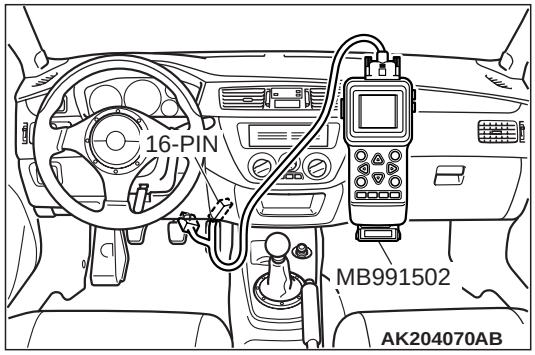
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

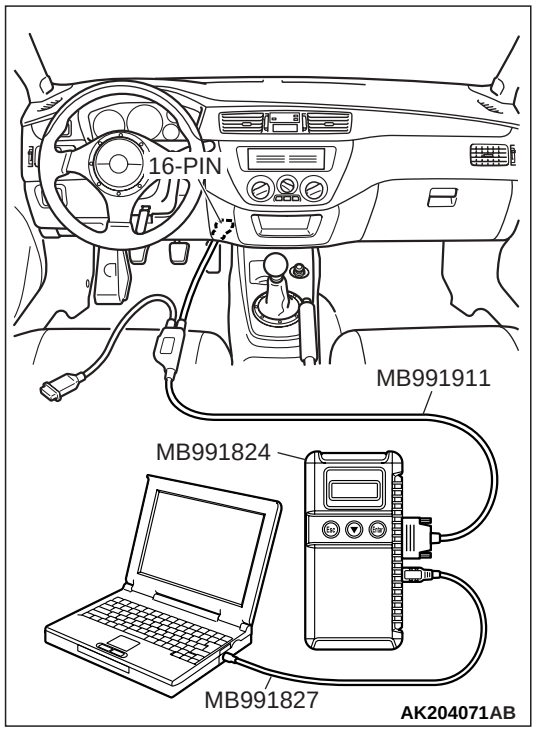
- EGR vacuum regulator solenoid valve failed.
- Open or shorted EGR vacuum regulator solenoid valve circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B





STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 10: EGR vacuum regulator solenoid valve.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

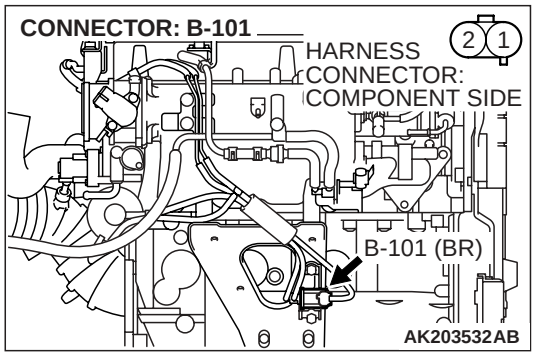
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for item 10, EGR vacuum regulator solenoid valve.
- An operation sound should be heard and vibration should be felt when the EGR vacuum regulator solenoid valve 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.00-6.

NO : Go to Step 2.

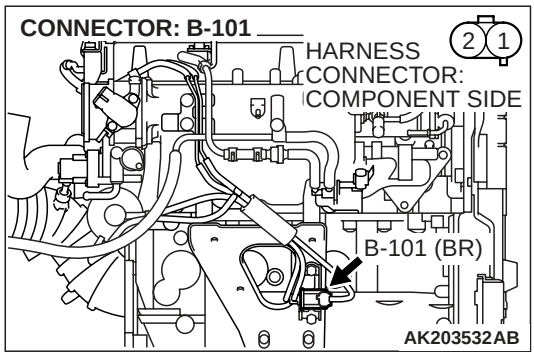


STEP 2. Check harness connector B-101 at the EGR vacuum regulator solenoid valve for damage.

Q: Is the harness connector in good condition?

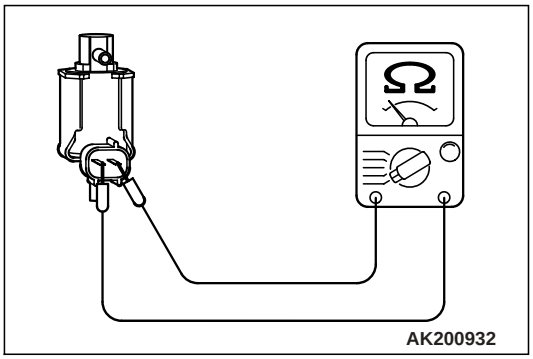
YES : Go to Step 3.

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 vacuum regulator solenoid valve.

(1) Disconnect the EGR vacuum regulator solenoid valve connector B-101.



(2) Measure the resistance between EGR vacuum regulator solenoid valve side connector terminal No. 1 and No. 2.

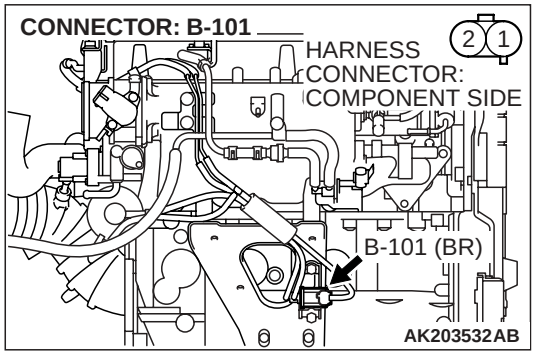
Standard value: 29 – 35 ohms [at 20°C (68°F)]

Q: Is the resistance between 29 and 35 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

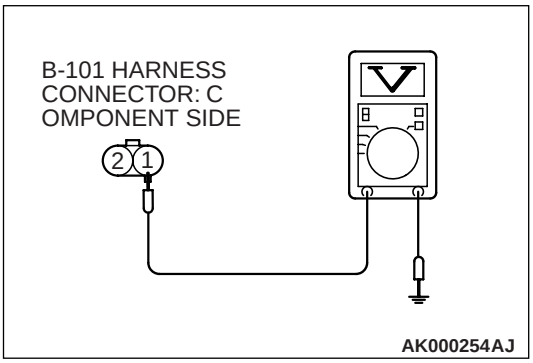
NO : Replace the EGR vacuum regulator solenoid valve. Then go to Step 12.

STEP 4. Measure the power supply voltage at EGR vacuum regulator solenoid valve harness side connector B-101.



(1) Disconnect connector B-101 and measure at the harness side.

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



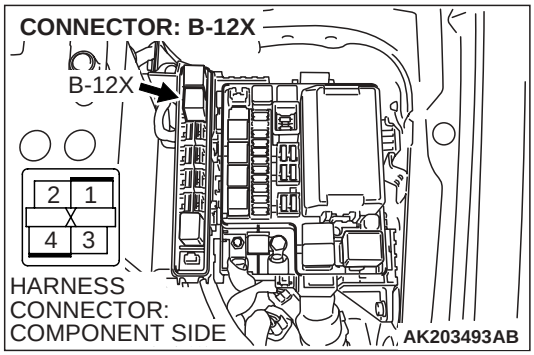
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Go to Step 5.



STEP 5. Check harness connector B-12X at MFI relay for damage.

Q: Is the harness connector in good condition?

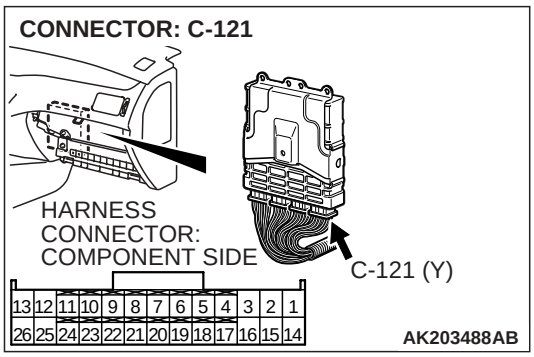
YES : Check connector B-14 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector B-12X (terminal No. 4) and EGR vacuum regulator solenoid valve connector B-101 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

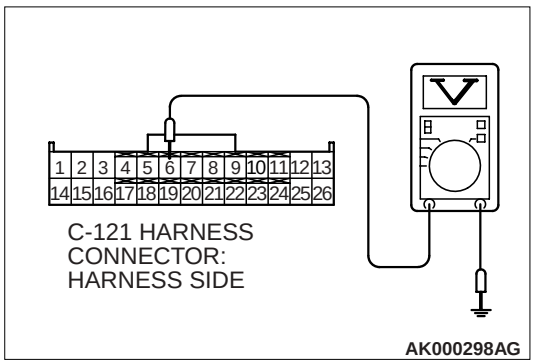
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Measure the power supply voltage at ECM connector C-121 by backprobing.

(1) Do not disconnect connector C-121.

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





(3) Measure the voltage between terminal No. 6 and ground by backprobing.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

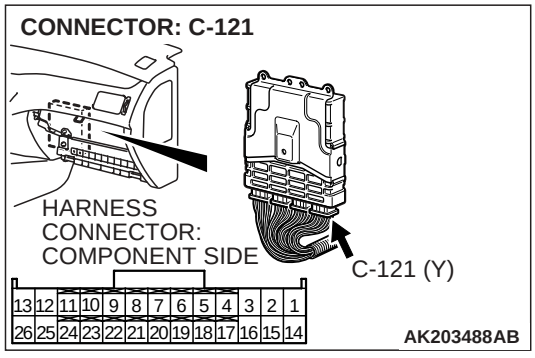
NO : Go to Step 7.

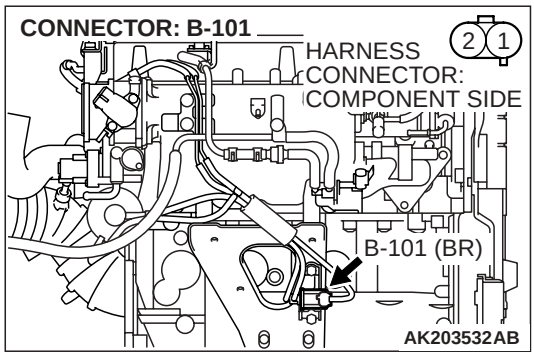
STEP 7. Check harness connector C-121 at ECM for damage.

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 12.



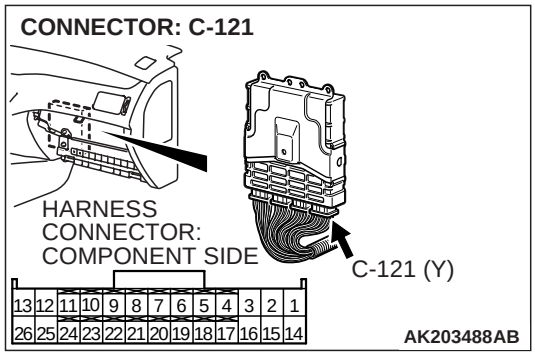


STEP 8. Check for open circuit and short circuit to ground between EGR vacuum regulator solenoid valve connector B-101 (terminal No. 2) and ECM connector C-121 (terminal No. 6).

NOTE: Check harness after checking intermediate connector B-14. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

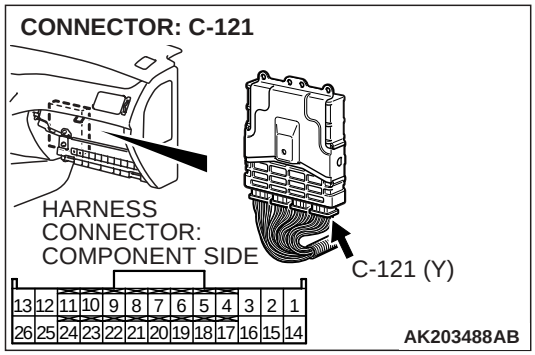
YES : Replace the ECM. Then go to Step 12.
NO : Repair it. Then go to Step 12.



STEP 9. Check harness connector C-121 at ECM for damage.

Q: Is the harness 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.

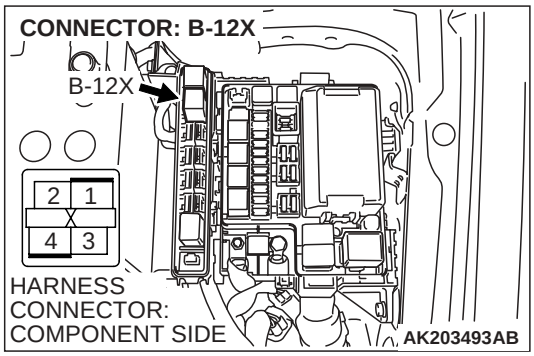


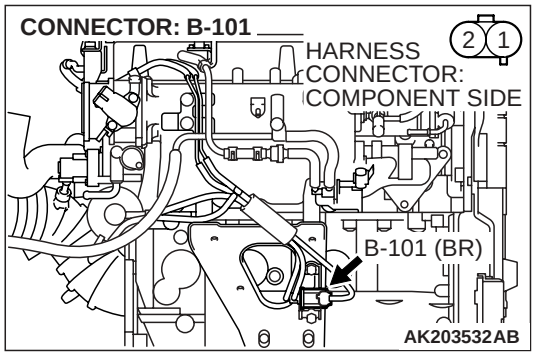
STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and EGR vacuum regulator solenoid valve connector B-101 (terminal No. 1).

NOTE: Check harness after checking intermediate connector B-14. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

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



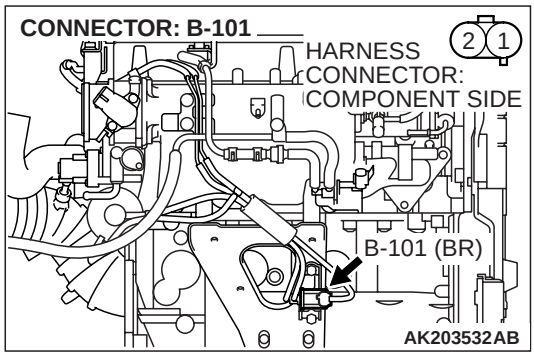


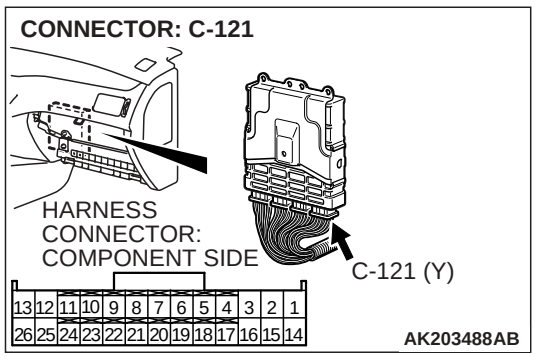
STEP 11. Check for harness damage between EGR vacuum regulator solenoid valve connector B-101 (terminal No. 2) and ECM connector C-121 (terminal No. 6).

NOTE: Check harness after checking intermediate connector B-14. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Replace the ECM. Then go to Step 12.
NO : Repair it. Then go to Step 12.





STEP 12. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

YES : Repeat the troubleshooting.
NO : The procedure 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 ECM compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,500 r/min.
- The throttle valve is open.
- Volume airflow sensor output frequency is between 94 and 200 Hz.
- More than 3 seconds have elased after the above-mentioned three conditions have been met.
- 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 ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 10,000 Hz.

Judgment Criteria

- The heated oxygen sensor (rear) signal frequency divided by heated oxygen sensor (front) signal frequency = 0.15 or more.

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

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

DIAGNOSIS

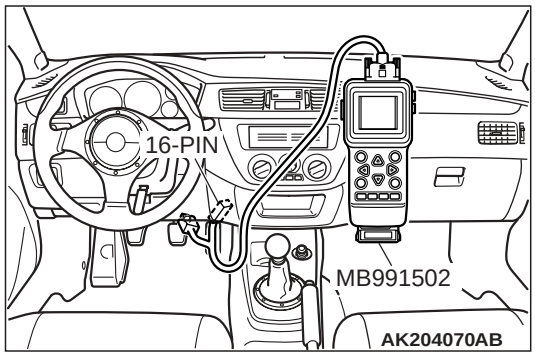
Required Special Tools:

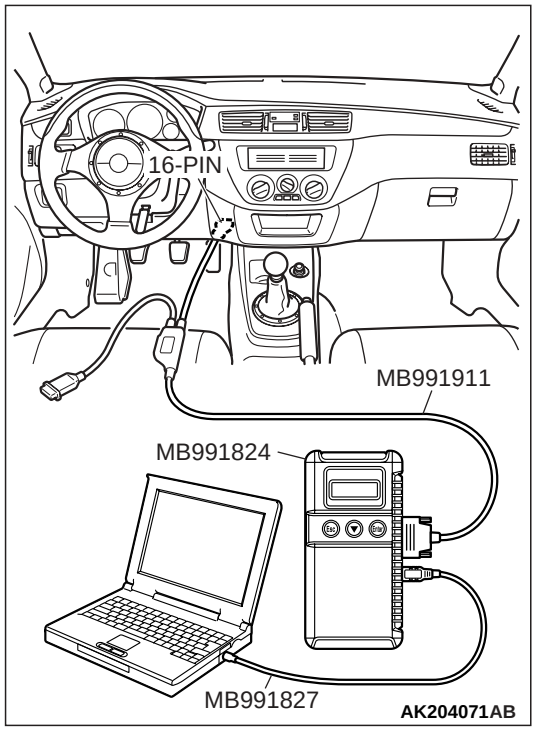
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check for exhaust leaks.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.
NO : Go to Step 2.





STEP 2. Using scan tool MB991502 or MB991958, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

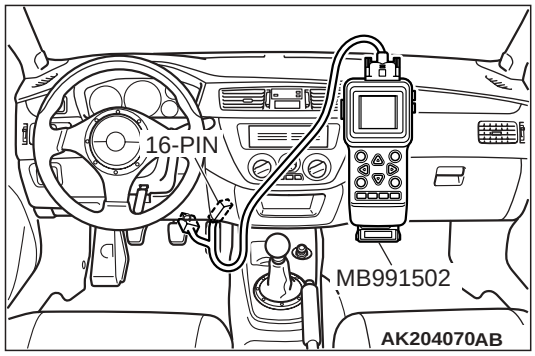
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

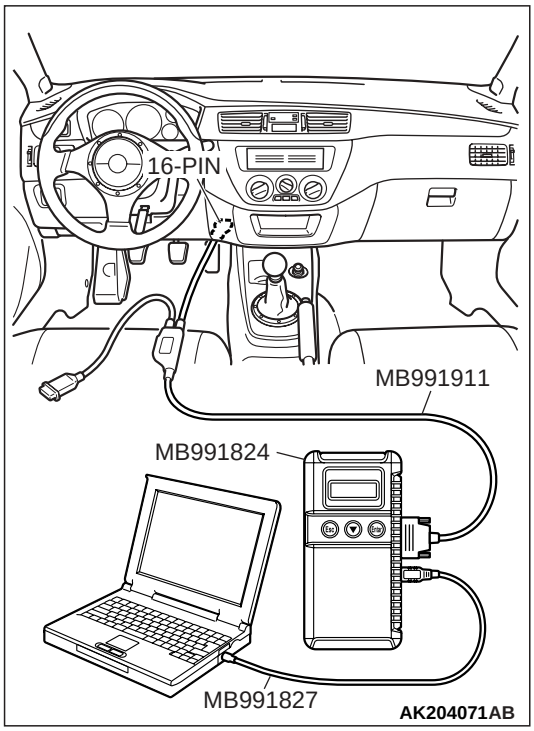
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to, DTC P0136 – Heated Oxygen Sensor Circuit (sensor 2) P.13A-201, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-211, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-216, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-220.





STEP 3. Using scan tool MB991502 or MB991958, check data list item 11: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.

(2) Set scan tool MB991502 or MB991958 to the data reading mode for item 11, Heated Oxygen Sensor (front).

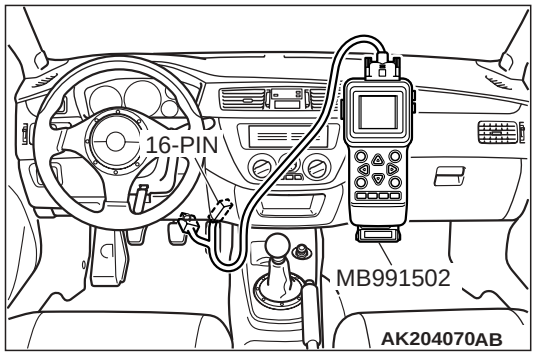
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.

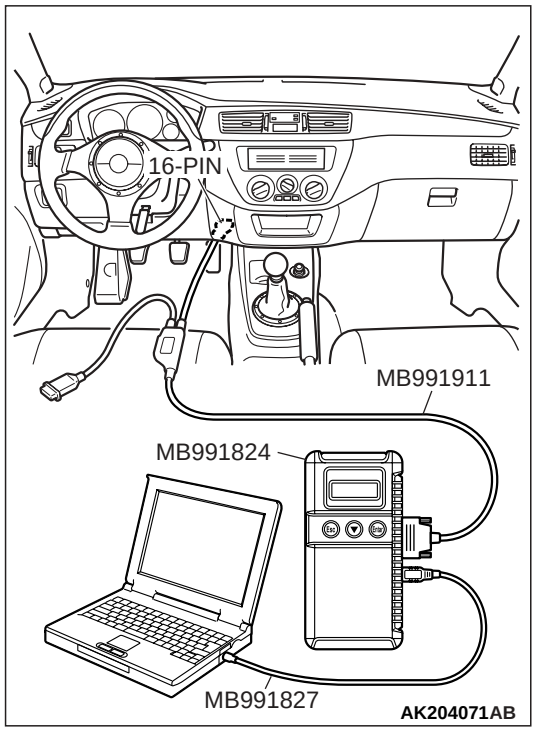
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to, DTC P0130 – Heated Oxygen Sensor Circuit (sensor 1) P.13A-156, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (sensor 1) P.13A-170, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (sensor 1) P.13A-176, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (sensor 1) P.13A-180, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) P.13A-185.





STEP 4. Using scan tool MB991502 or MB991958, check data list item 11: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 or MB991958 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. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Replace the catalytic converter. Then go to Step 6.
NO : The procedure is complete.

STEP 6. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Replace the ECM. Then go to Step 7.
NO : The procedure is complete.

STEP 7. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0420: 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 ECM compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,500 r/min.
- The throttle valve is open.
- Volume airflow sensor output frequency is between 94 and 200 Hz.
- More than 3 seconds have elased after the above-mentioned three conditions have been met.
- 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 ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 10,000 Hz.

Judgment Criteria

- The heated oxygen sensor (rear) signal frequency divided by heated oxygen sensor (front) signal frequency = 0.15 or more.

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

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

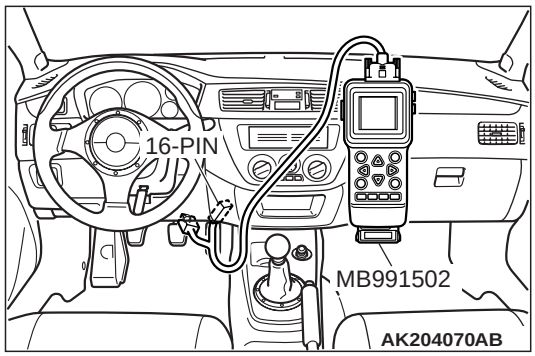
STEP 1. Check for exhaust leaks.

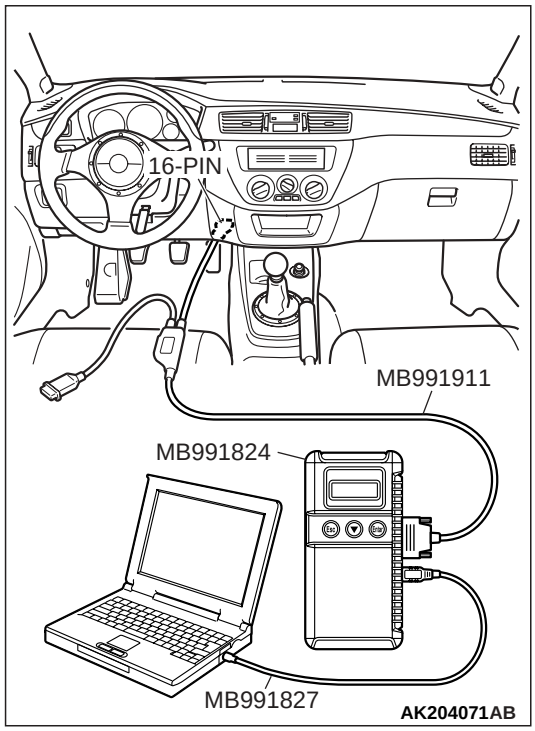
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502 or MB991958, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

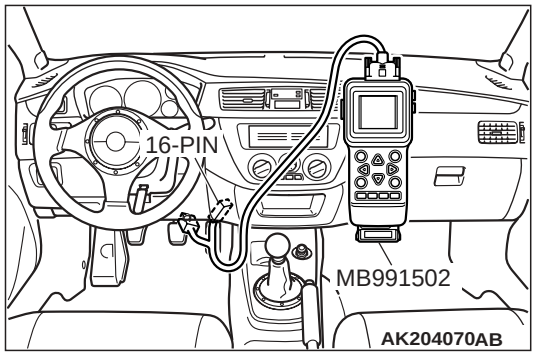


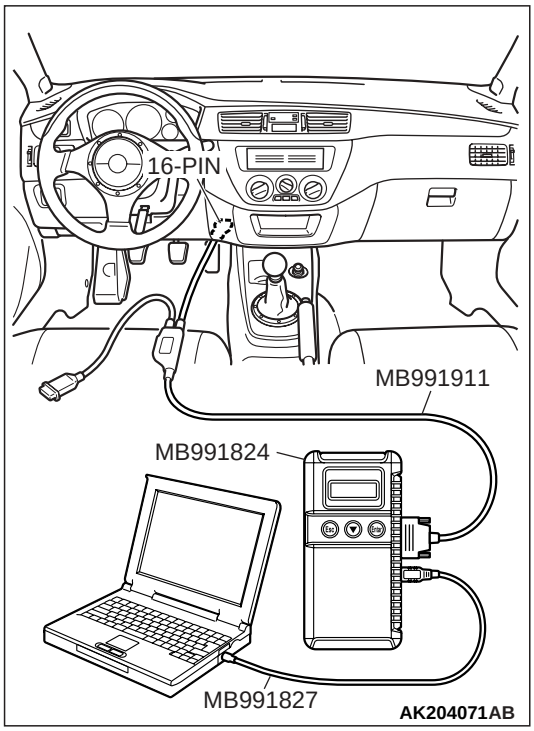


(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 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 – Heated Oxygen Sensor Circuit (sensor 2) P.13A-201, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-211, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-216, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-220.





STEP 3. Using scan tool MB991502 or MB991958, check data list item 11: Heated Oxygen Sensor (front).

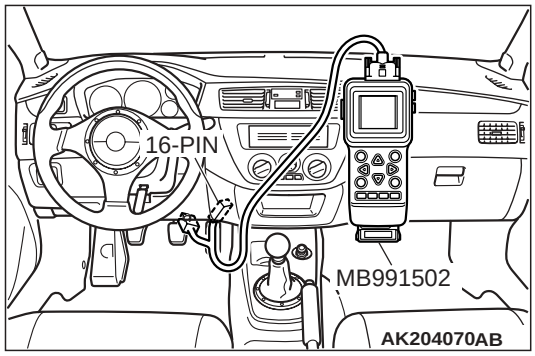
(1) Start the engine and run at idle.
(2) Set scan tool MB991502 or MB991958 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.

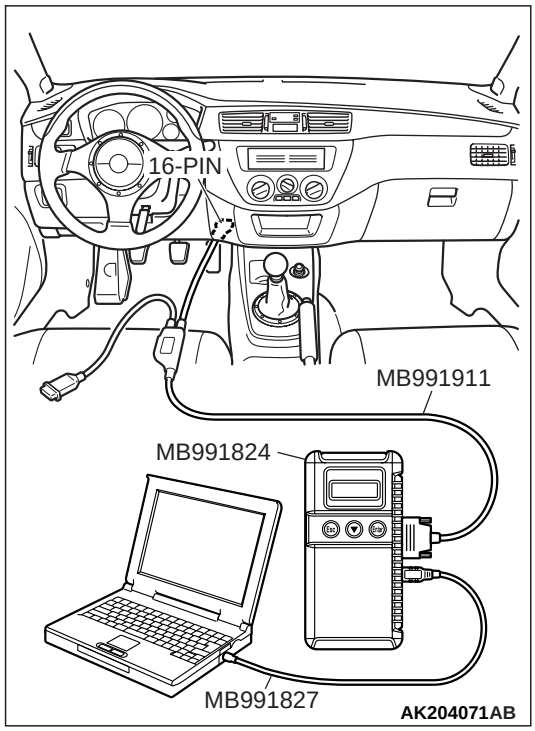
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to, DTC P0130 – Heated Oxygen Sensor Circuit (sensor 1) P.13A-156, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (sensor 1) P.13A-170, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (sensor 1) P.13A-176, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (sensor 1) P.13A-180, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) P.13A-185.





STEP 4. Using scan tool MB991502 or MB991958, check data list item 11: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 or MB991958 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. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0420 set?

YES : Replace the catalytic converter. Then go to Step 6.
NO : The procedure is complete.

STEP 6. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.

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

Q: Is DTC P0420 set?

YES : Replace the ECM. Then go to Step 7.

NO : The procedure is complete.

STEP 7. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor P.13A-6.

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

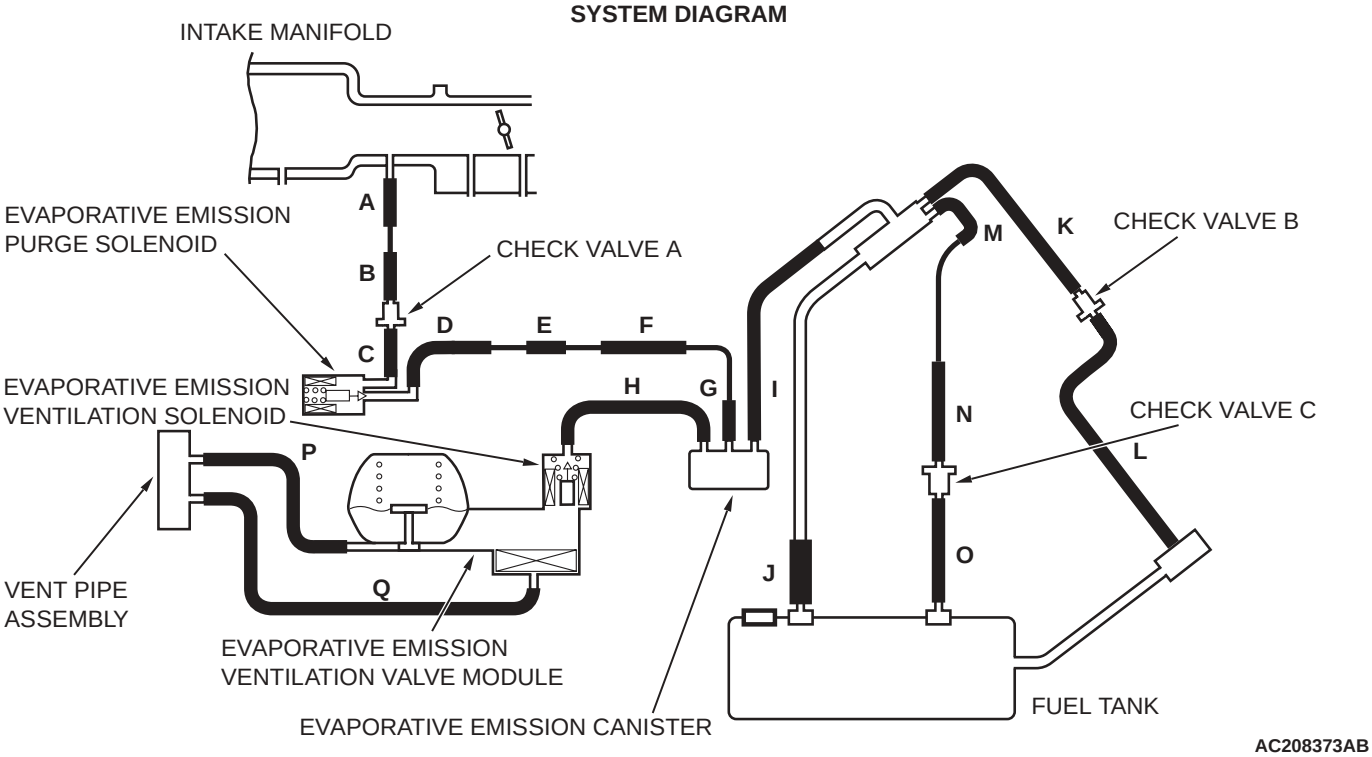
Q: Is DTC P0420 set?

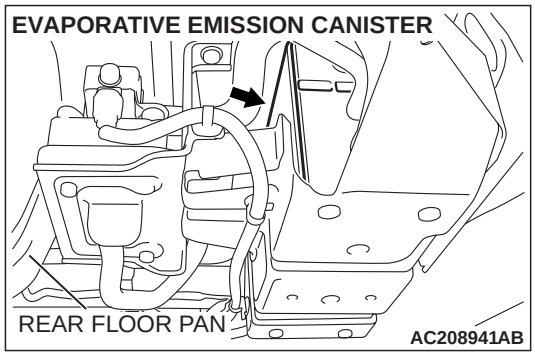
YES : Repeat the troubleshooting.

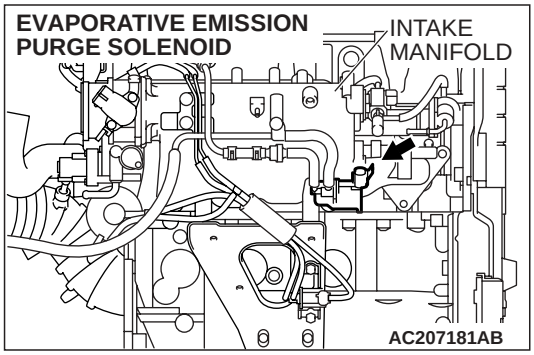
NO : The procedure is complete.

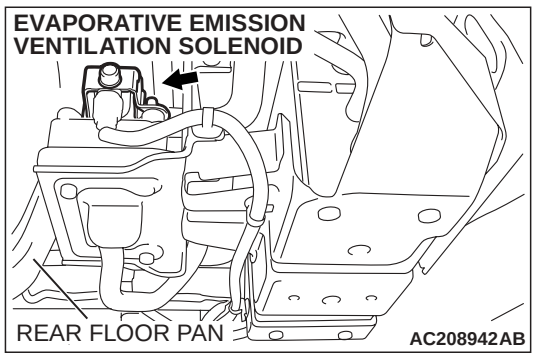
DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

SYSTEM DIAGRAM









TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DTC SET CONDITIONS

Remaining fuel amount is 15 – 40 percent of capacity (fuel level sensor output signal voltage is 1.4 – 2.4 volts).

Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature is 36°C (97°F) or less when the engine is started.

Check Conditions B: For Test to Run

- Fuel temperature is less than 36°C (97°F), and with in 800 seconds have elapsed since the engine was started.
- Engine coolant temperature is greater than 60°C (140°F).
- Power steering pressure switch: "OFF"
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.
- Vehicle speed is greater than or equal to 20 km/h (12.4 mph).

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- The pressure fluctuation is less than 647 Pa (0.094 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 75 – 125 seconds.

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.
- ECM monitors for this condition once during drive cycle.

TSB Revision

DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent of capacity (fuel level sensor output voltage is 2.4 – 3.7 volts).

Check Conditions A: At Start up

- Intake air temperature is less than 36°C (97°F) when the engine is started.
- The engine coolant temperature is less than 36°C (97°F) when the engine is started.

Check Conditions B: For Test to Run

- The fuel temperature is less than 36°C (97°F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10°C (14 °F).
- Engine coolant temperature is greater than 20°C (68°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 1.96 kPa (0.285 psi) 128 seconds after the purge and ventilation solenoids were closed.
- ECM monitors for this condition once during drive cycle.

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

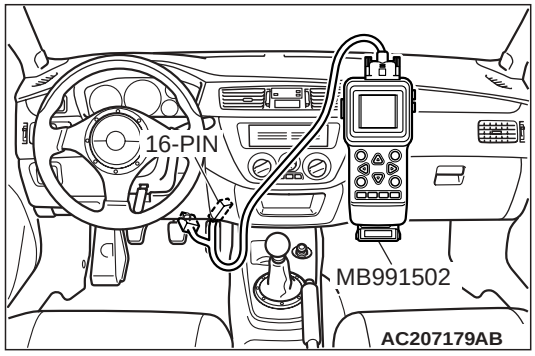
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is leaking.
- Fuel tank, purge line or vapor line seal is leaking.
- Evaporative emission ventilation solenoid does not seal.
- Evaporative emission purge solenoid does not seal.

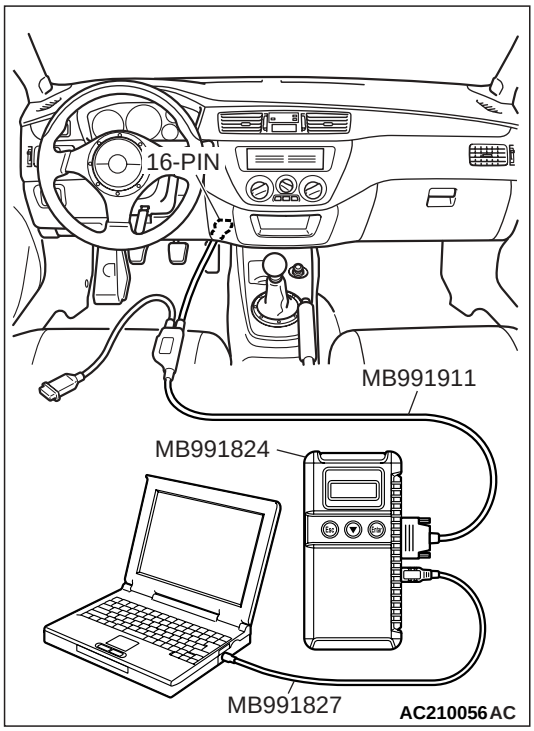
DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Using scan tool MB991502 or MB991958, check the evaporative emission system monitor test.





⚠ CAUTION

- **To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the neutral position.**

(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502 or MB991958.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 or MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502 or MB991958.

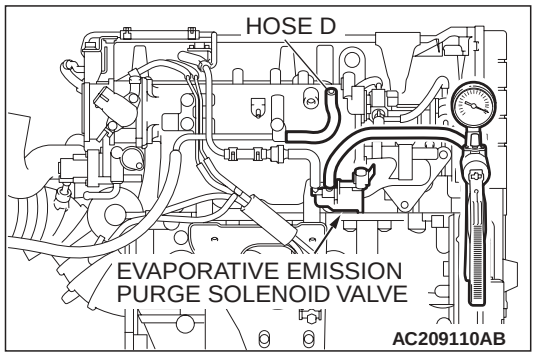
Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991502 or MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-25. If no other DTC's have been set, go to Step 2.

NO : If "Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991502 or MB991958, the evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to turn on. Return the vehicle to the customer.

NO : If "Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991502 or MB991958, the EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

TSB Revision

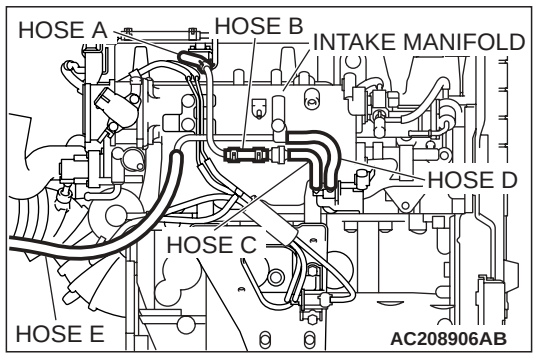


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose D from the evaporative emission purge solenoid and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(2) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(3) Disconnect the hand vacuum pump, and connect hose D to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Go to Step 16.

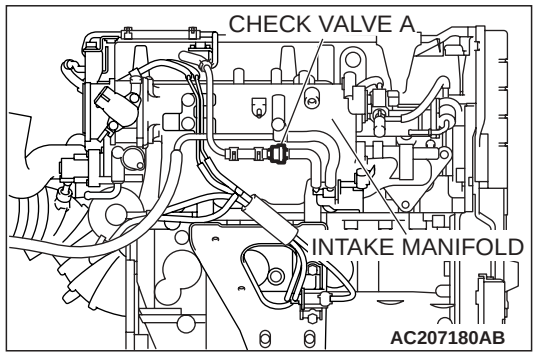


STEP 3. Check for leaks in evaporative emission system hoses A through E.

Use a hand vacuum pump to test each hose from hose A to hose E.

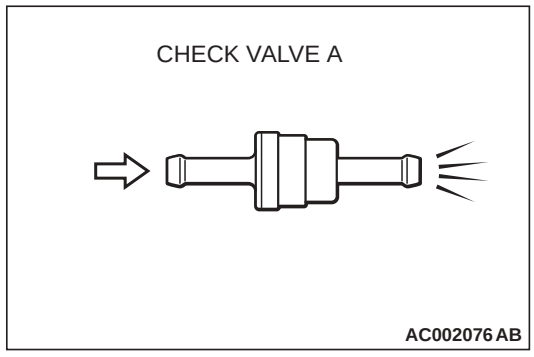
Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace any damaged hose. Go to Step 16.



STEP 4. Test check valve A.

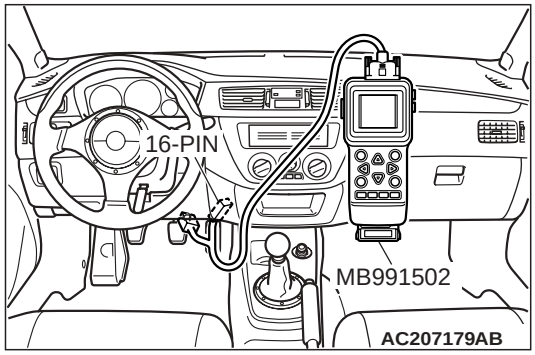
(1) Check valve A is a one-way check valve.

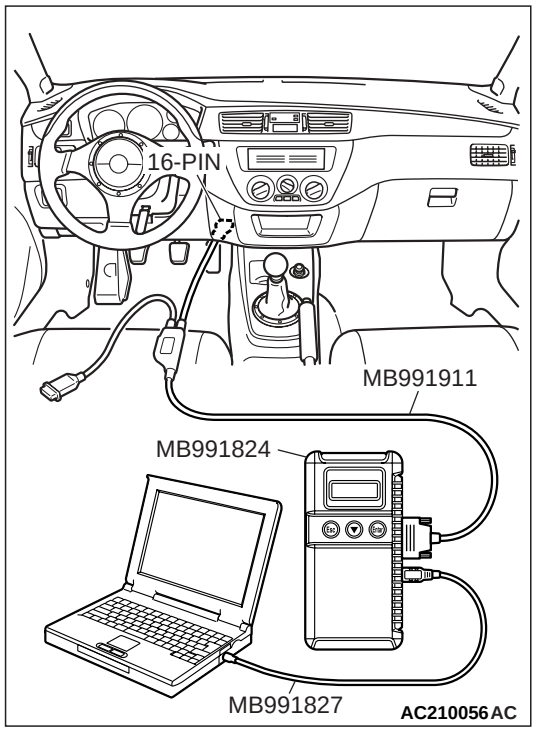


(2) Check valve A should allow air to flow in only one direction.

Q: Does check valve A allow air to pass in one direction only?

YES : Go to Step 5.
NO : Replace check valve A. Go to Step 16.



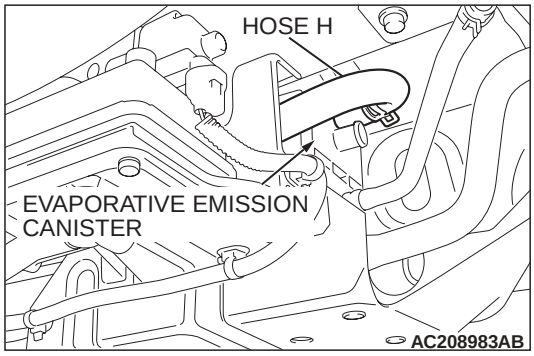


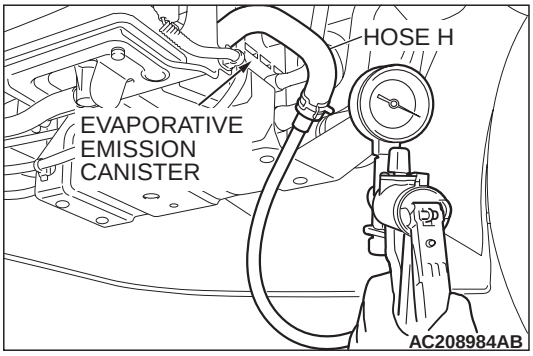
STEP 5. Check the evaporative emission ventilation solenoid and hose H using scan tool MB991502 or MB991958.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.



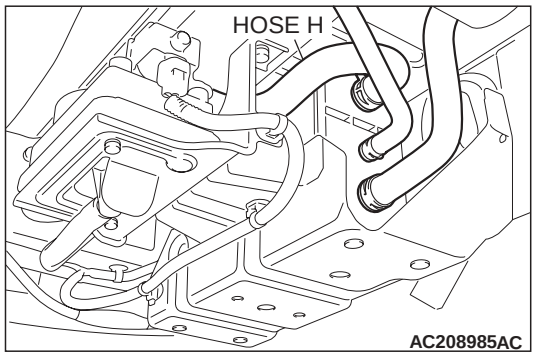


(2) Disconnect hose H from the evaporative emission canister side, and connect a hand vacuum pump.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 or MB991958 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.
(5) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502 or MB991958.
(6) Disconnect the hand vacuum pump, and connect hose H to the evaporative emission canister.

Q: Did the evaporative emission ventilation solenoid hold vacuum?

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

STEP 6. Check for leaks in evaporative emission system hose H.

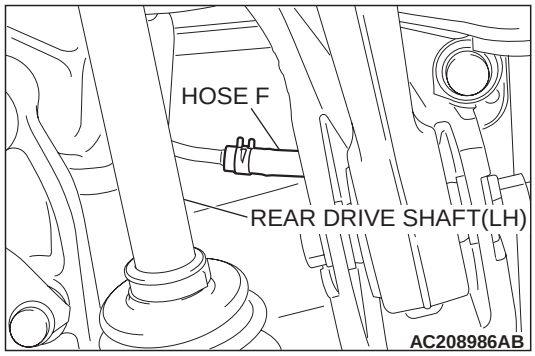


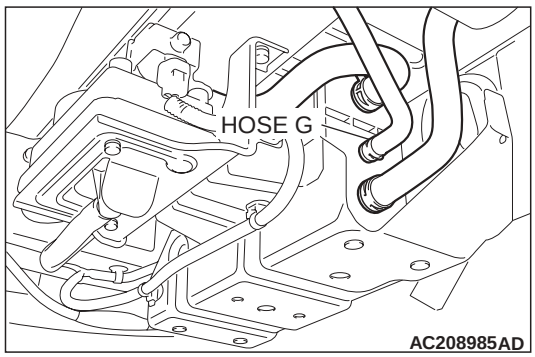
Use a hand vacuum pump to test each hose from hose H.

Q: Are the hoses in good condition?

YES : Replace the evaporative emission ventilation solenoid. Go to Step 16.
NO : Replace hose H. Go to Step 16.

STEP 7. Check for leaks in evaporative emission system hoses F and G.





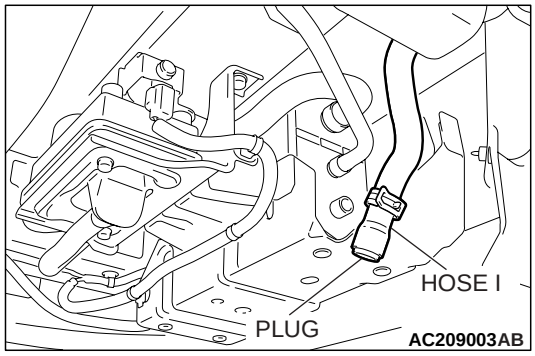
Use a hand vacuum pump to test each hose from hose hose F to hose G.

Q: Are the hoses in good condition?

YES : Go to Step 8.

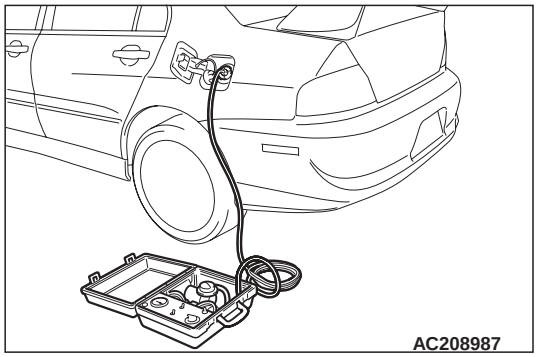
NO : Replace the damaged hose. Go to Step 16.

STEP 8. Pressure test the evaporative emission system lines from hoses I to O.



(1) Disconnect hose I from the canister, and plug hose I securely.

(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 the evaporative emission system pressure pump to the fuel tank filler tube.

(4) Pressure test the system to determine whether any leaks are present.

NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(5) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(6) Connect hose I to the canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 15.

NO : Go to Step 9.

TSB Revision

STEP 9. Check for leaks in evaporative emission system hoses I, K, L and M.

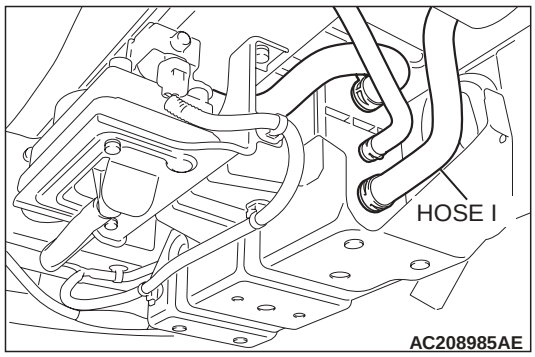
(1) Remove the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank P.13B-14).

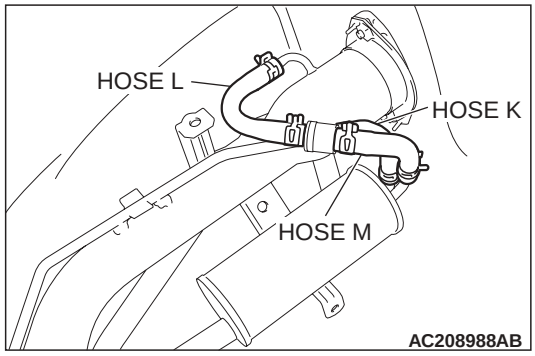
(2) Perform a leakage test with a hand vacuum pump on each hose I, K, L and M.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

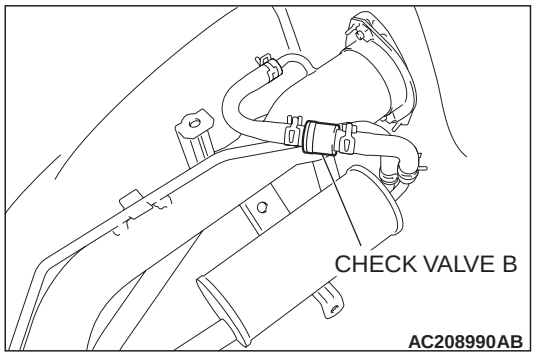
NO : Replace any damaged hose, and reinstall the fuel tank filler tube protector. Refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 16.





STEP 10. Test check valve B.

(1) Check valve B is a one-way check valve.

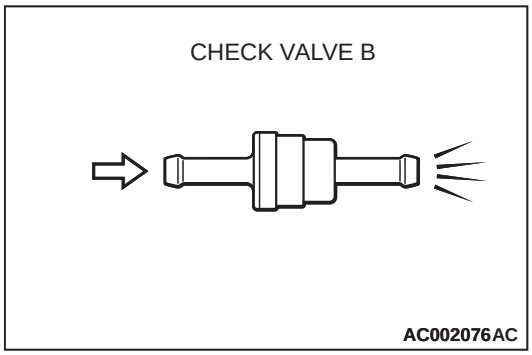


(2) Check valve B should allow air to flow in only one direction.

Q: Does check valve B allow air to pass in one direction only?

YES : Go to Step 11.

NO : Replace check valve B, and reinstall the fuel tank filler tube protector. Refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 16.



STEP 11. Check for leaks in evaporative emission system hoses J, N and O.

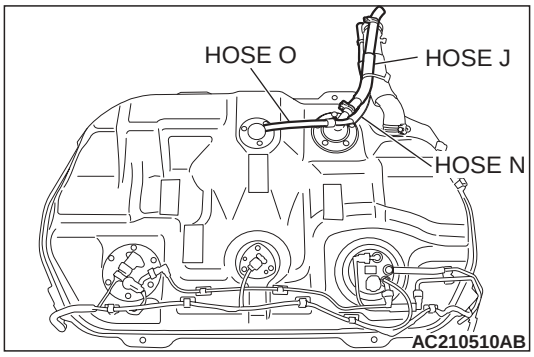
(1) Remove the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-14).

(2) Perform a leakage test with a hand vacuum pump on each hose J, N and O.

Q: Do the hoses hold vacuum?

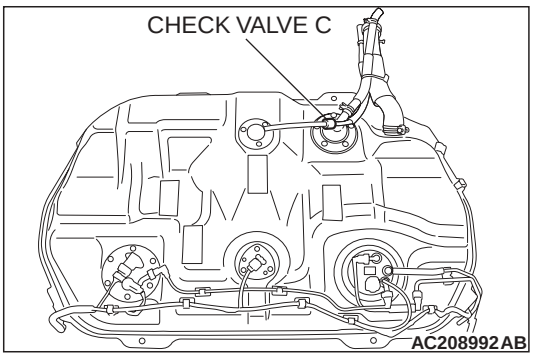
YES : Go to Step 12.

NO : Replace any damaged hose, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 16.



STEP 12. Test check valve C.

(1) Check valve C is a one-way check valve.

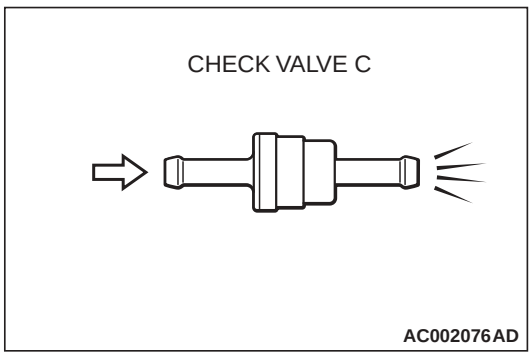


(2) Check valve C should allow air to flow in only one direction.

Q: Does check valve C allow air to pass in one direction only?

YES : Go to Step 13.

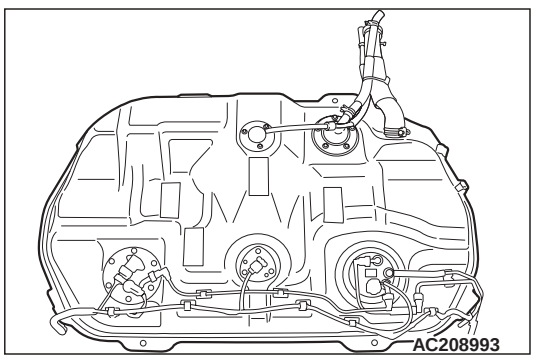
NO : Replace check valve C, and reinstall the fuel tank and the fuel tank filler tube protector. Refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 16 .

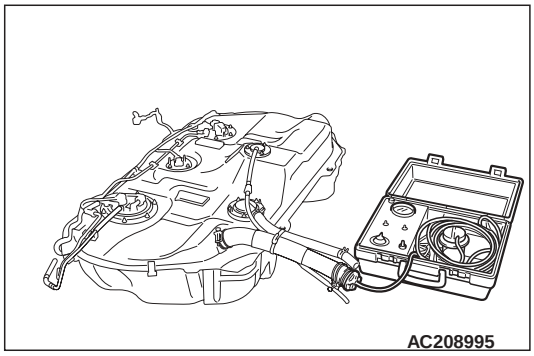


STEP 13. Check for leaks in the fuel tank.

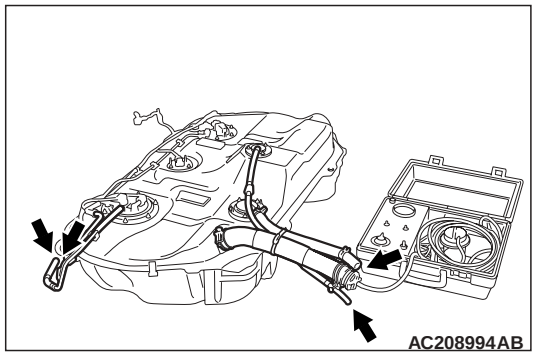
(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump assembly and the differential pressure sensor installation in the fuel tank.





(2) Connect an evaporative emission system pressure pump (Miller number 6872A) to the filler hose.



(3) Plug the hose shown in the illustration.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

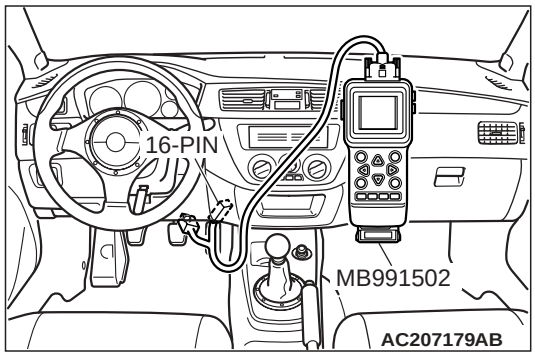
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

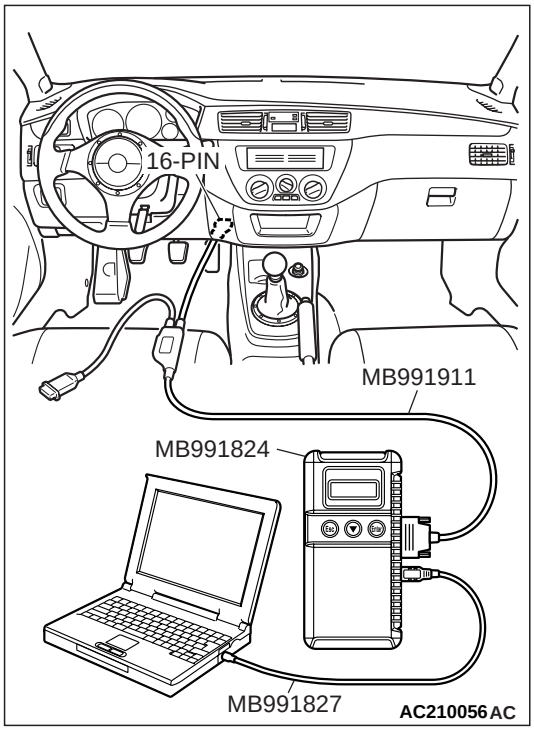
Q: Is any leaks found?

YES : When there is a leak from the attachment points of the fuel pump assembly, fuel tank differential pressure sensor, leveling valve or fuel tank rollover valve, reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Go to Step 16.

YES : When there is a leak from the fuel tank, replace the fuel tank. Refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 16.

NO : When there is no leak, reinstall the fuel tank, refer to GROUP 13B, Fuel Tank P.13B-14. Go to Step 14.





STEP 14. Using scan tool MB991502 or MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.**
- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the neutral position.**

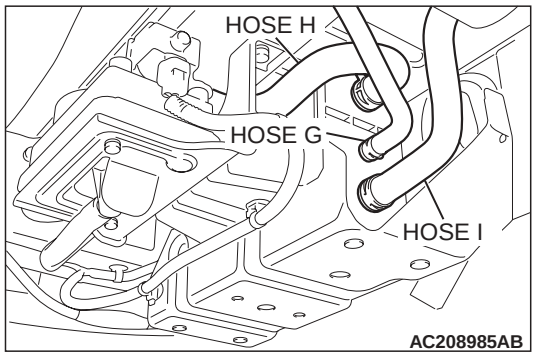
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502 or MB991958.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During the test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 or MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502 or MB991958.

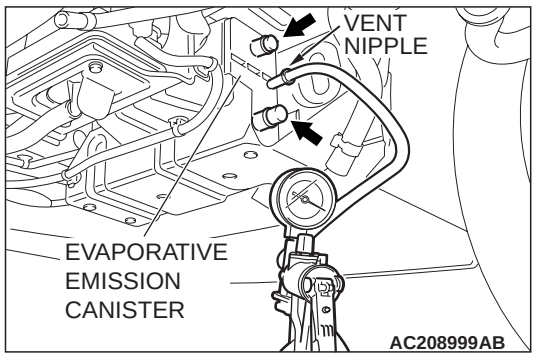
Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991502 or MB991958?

YES : Replace the ECM. Go to Step 16.

NO : If "Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991502 or MB991958, the evaporative emission system is working properly at this time. Go to Step 16 .

NO : If "Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991502 or MB991958, the EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14.





STEP 15. Check for leaks in the evaporative emission canister.

(1) Disconnect hoses G, H and I from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose G, and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump, and connect hoses G, H and I to the canister.

Q: Does the evaporative emission canister hold vacuum?

YES : Go to Step 14.
NO : Replace the evaporative emission canister. Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-21. Go to Step 16 .

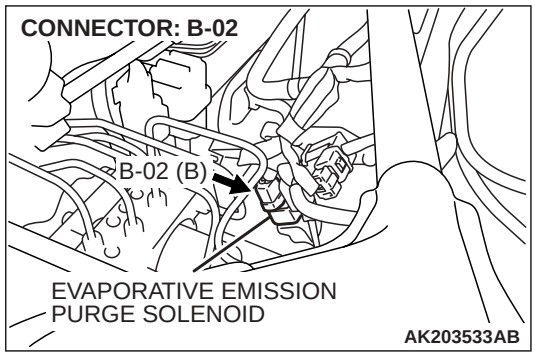
STEP 16. Perform the OBD-II drive cycle.

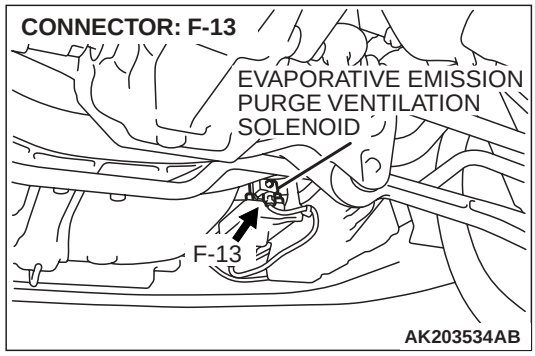
(1) Confirm the repair by performing the appropriate drive cycle. Refer to Diagnostic Function – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission System Leak Monitor P.13A-6.
(2) Read the diagnostic trouble code (DTC).

Q: Is DTC P0442 set?

YES : Return to Step 1.
NO : The procedure is complete.

DTC P0441: EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW





TECHNICAL DESCRIPTION

- ECM detects stuck open condition of evaporative emission purge solenoid valve and stuck closed condition of evaporative emission ventilation solenoid by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid is judged after 20 seconds from end of monitoring leak of evaporative emission system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DTC SET CONDITIONS

Check Conditions

- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Engine is running.
- 20 seconds have elapsed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgment Criteria

- The pressure in the fuel tank is –2 kPa (–0.59 in.Hg) or less for 0.1 second.

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

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tanl differential pressure sensor sircuit related part(s) failed.

DIAGNOSIS

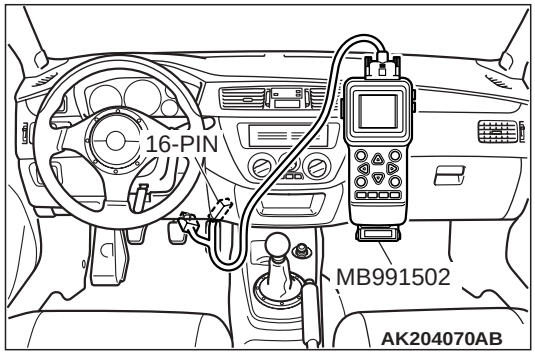
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Using scan tool MB991502 or MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

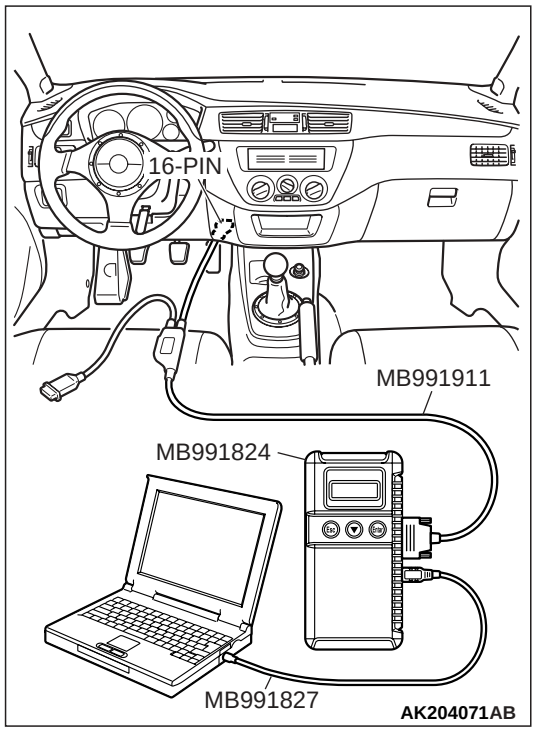


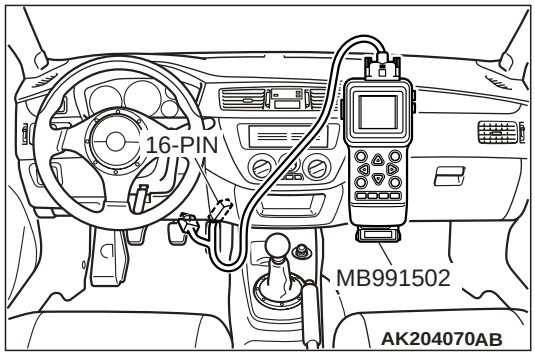
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

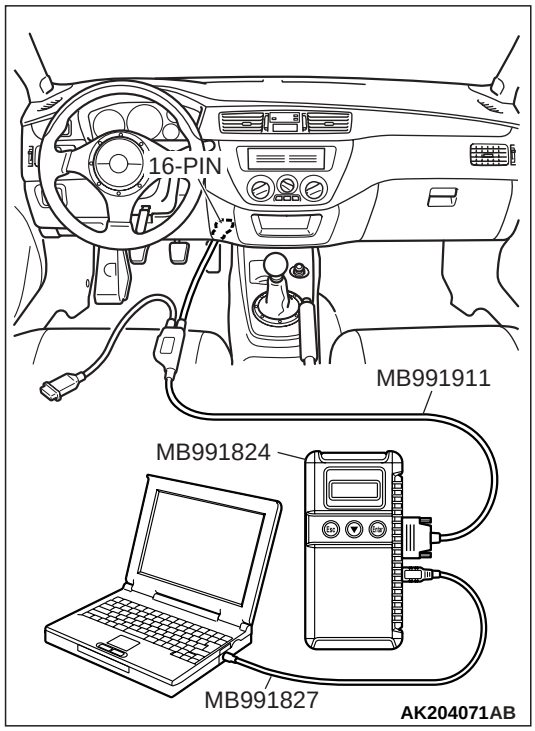
Q: Is DTC P0451 set?

YES : Refer to, DTC P0451 - Evaporative Emission System Pressure Sensor Range/Performance P.13A-380.

NO : Go to Step 2.







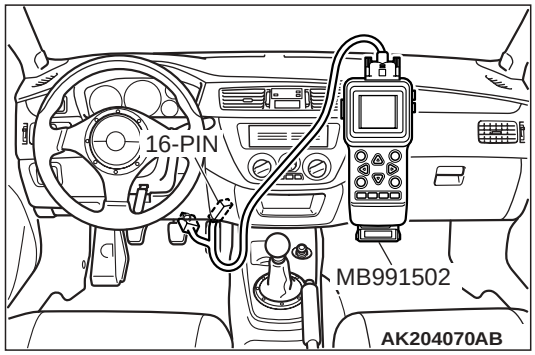
STEP 2. Using scan tool MB991502 or MB991958, check data list item 73: Fuel Tank Differential Pressure Sensor.

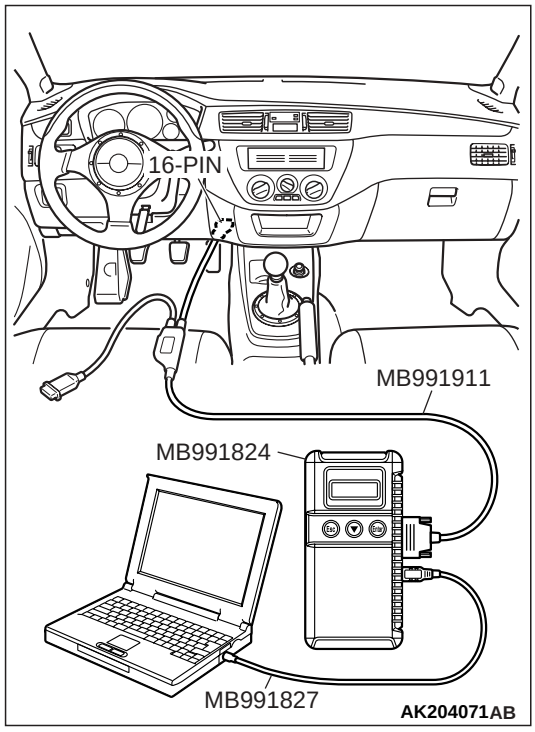
(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be –3.3 to 3.3 kPa (–0.97 – 0.97 in.Hg).

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

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 to 0.97 inHg)?

YES : Go to Step 3.
NO : Refer to, DTC P0451 - Evaporative Emission System Pressure Sensor Range/Performance P.13A-380.





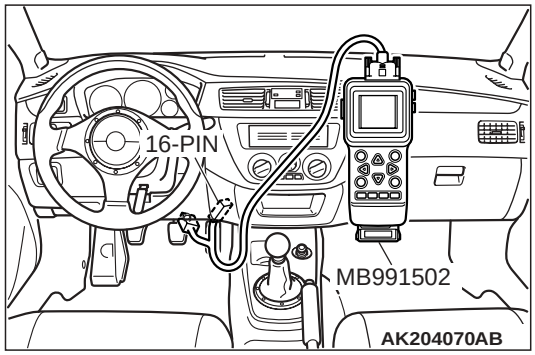
STEP 3. Using scan tool MB991502 or MB991958, check actuator test item 08: Evaporative Emission Purge Solenoid.

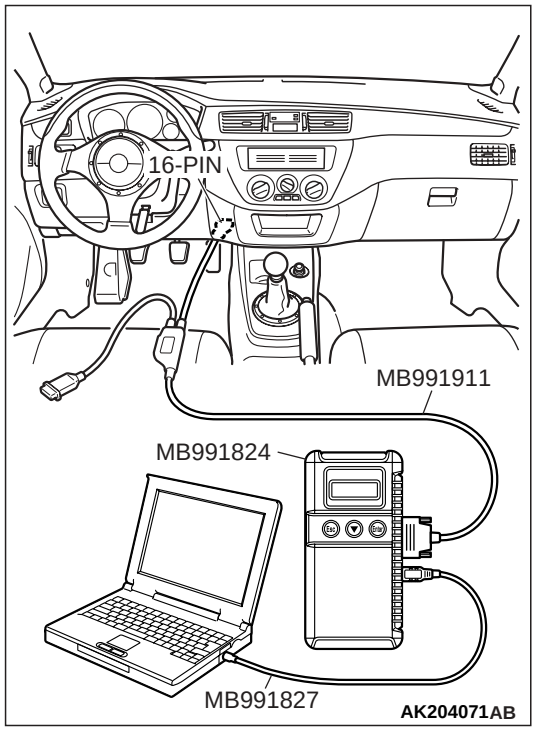
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 or MB991958 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.





STEP 4. Using scan tool MB991502 or MB991958, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 or MB991958 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.

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

Q: Is the solenoid operating properly?

YES : Repair or replace the vent hose and air filter. Then go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 5.

STEP 5 Perform the OBD-II drive cycle.

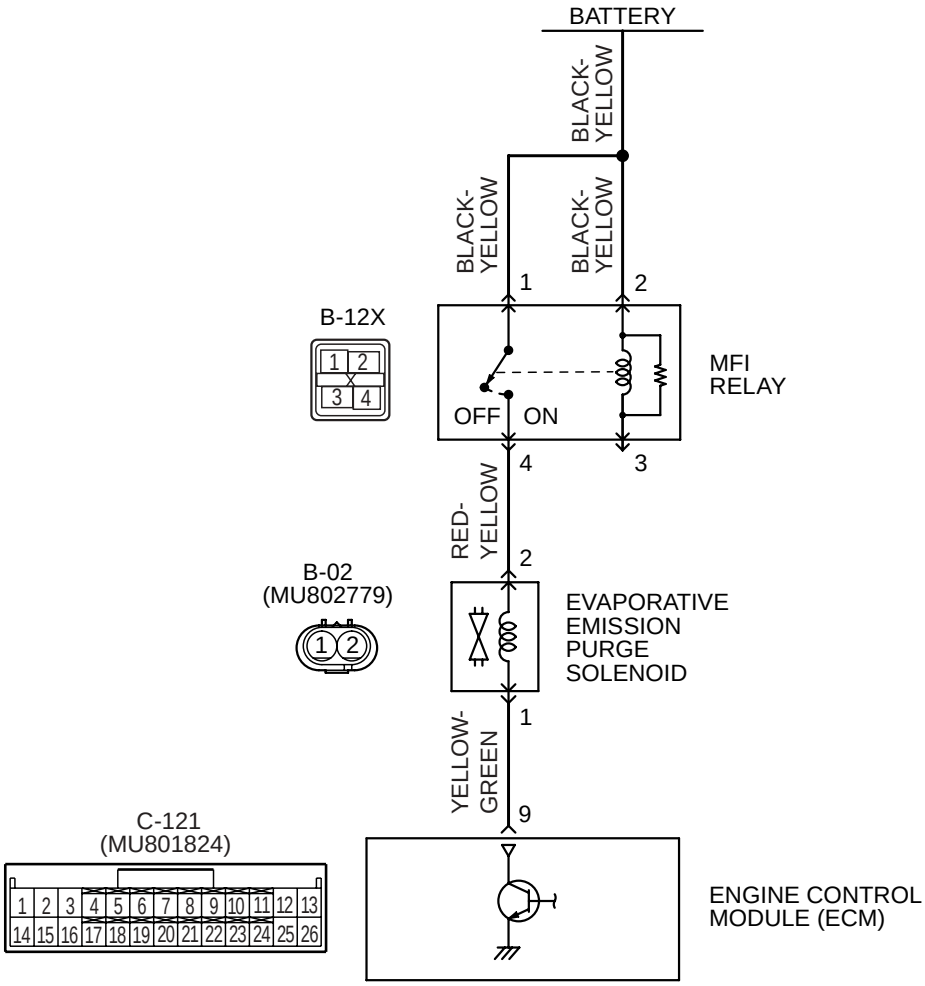
(1) Carry out a test drive with the drive cycle pattern. (Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission System Leak Monitor P.13A-6.)
(2) Read the diagnostic trouble code.

Q: Is DTC P0441 set?

YES : Go to Step 1.
NO : The procedure is complete.

DTC P0443: EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT

Evaporative Emission Purge Solenoid Circuit



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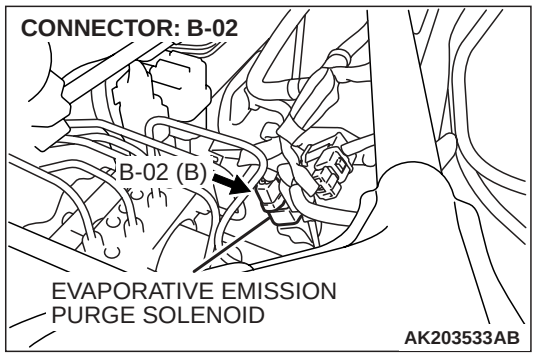

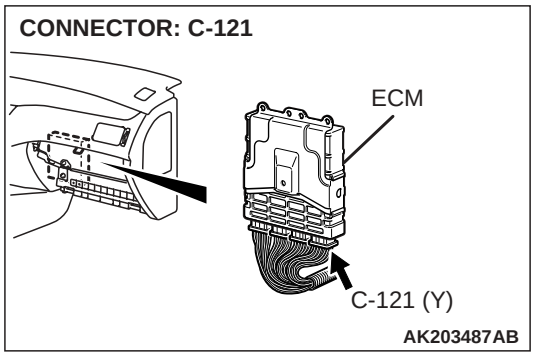

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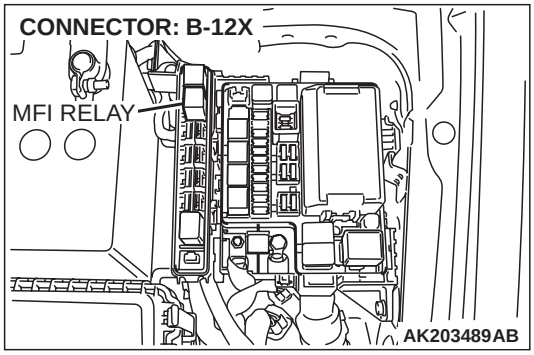


CIRCUIT OPERATION
- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION
- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, ECM measures the surge voltage of the evaporative emission purge solenoid coil.
- The ECM drives the evaporative emission purge solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 volts or more.

DTC SET CONDITIONS

Check Conditions
- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

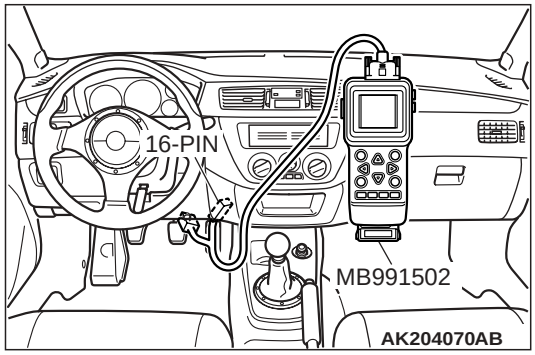
Check Conditions
- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- ON duty cycle of the EGR vacuum regulator solenoid valve is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

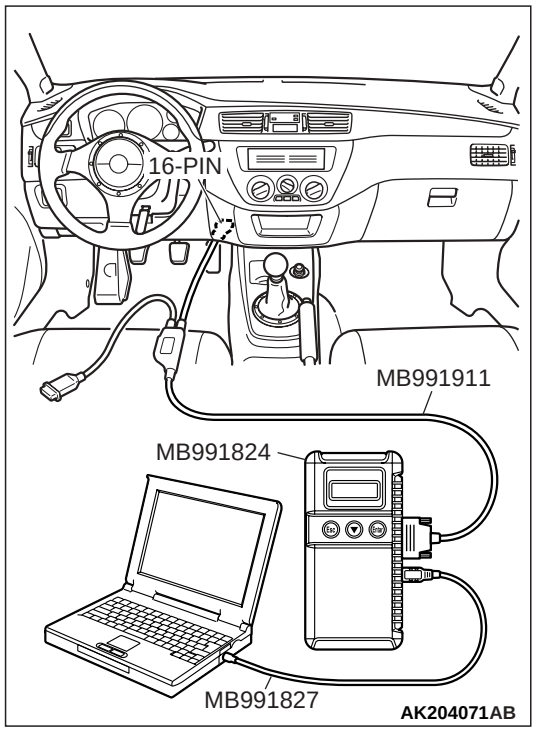
Judgment Criteria
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned OFF.

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, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B





STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 08: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

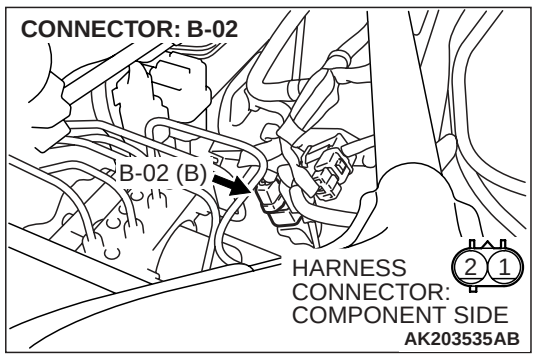
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt 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.00-6.

NO : Go to Step 2.

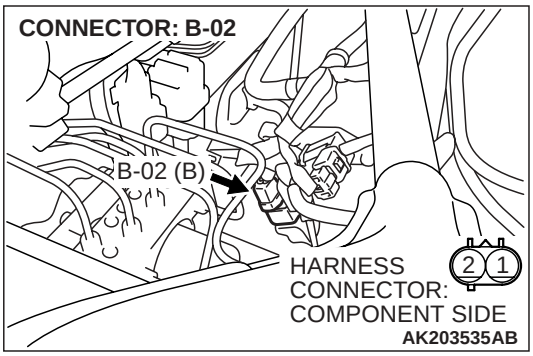


STEP 2. Check harness connector B-02 at the evaporative emission purge solenoid for damage.

Q: Is the harness connector in good condition?

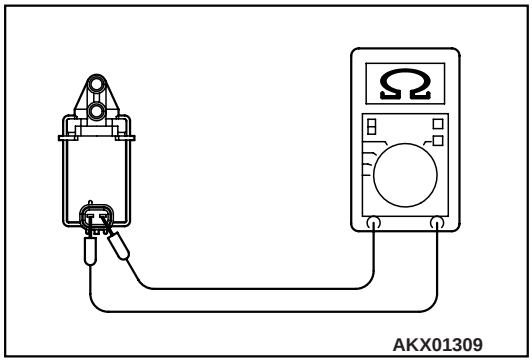
YES : Go to Step 3.

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-02.



(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

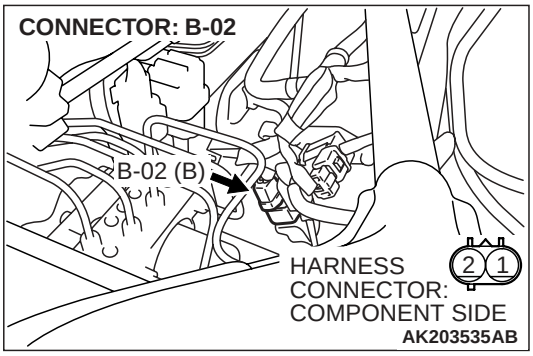
Standard value: 30 – 34 ohms [at 20°C (68°F)]

Q: Is the resistance between 30 and 34 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

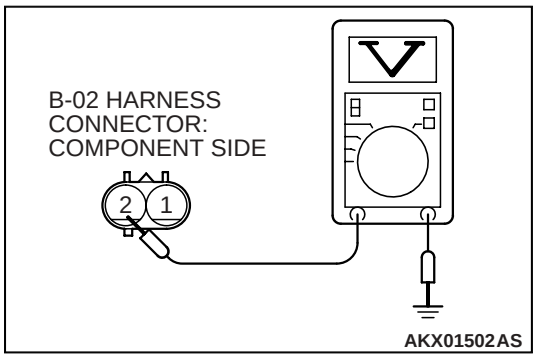
NO : Replace the evaporative emission purge solenoid. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-02.



(1) Disconnect connector B-02 and measure at the harness side.

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



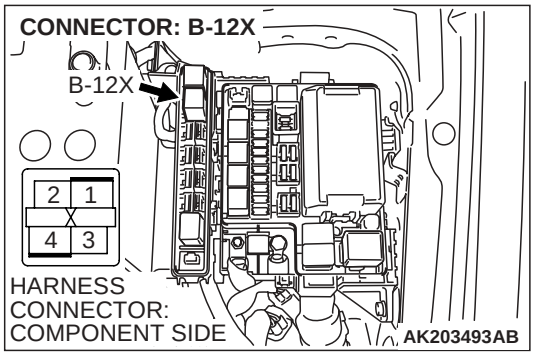
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Go to Step 5.

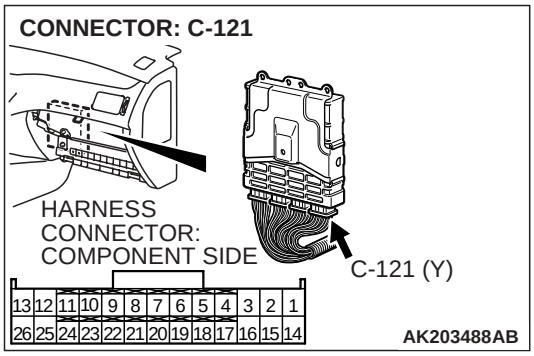


STEP 5. Check harness connector B-12X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-12X (terminal No. 4) and evaporative emission purge solenoid connector B-02 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

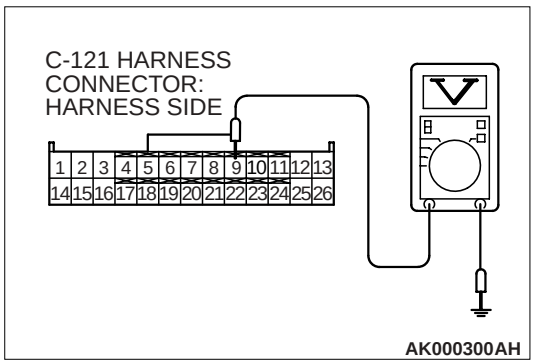
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 6. Measure the power supply voltage at ECM connector C-12 by backprobing.

(1) Do not disconnect connector C-121.

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



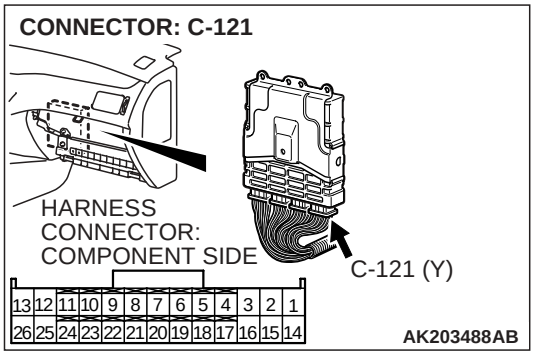
(3) Measure the voltage between terminal No. 9 and ground by backprobing.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

NO : Go to Step 7.



STEP 7. Check harness connector C-121 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

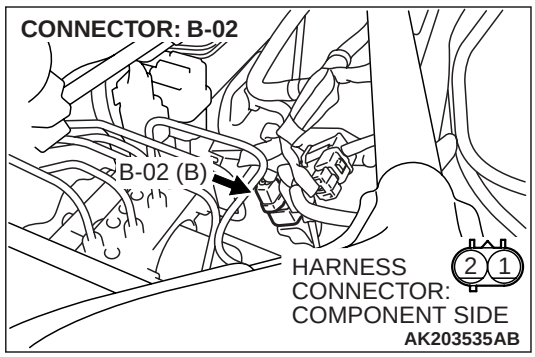
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

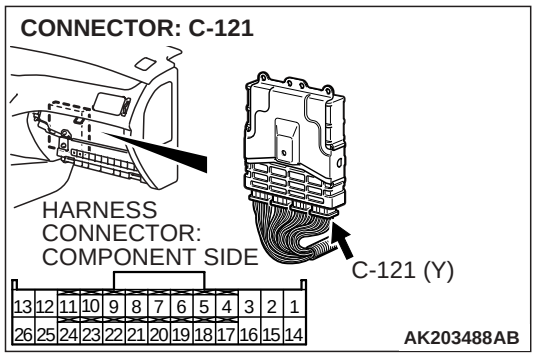
STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-02 (terminal No. 1) and ECM connector C-121 (terminal No. 9).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.



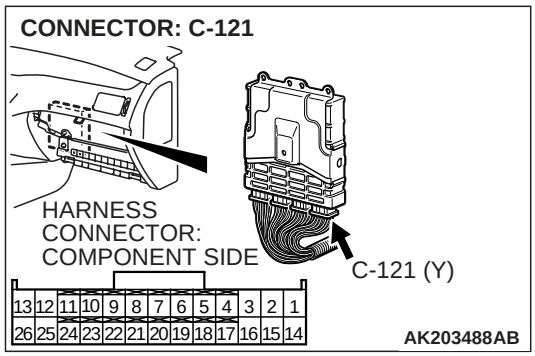


STEP 9. Check harness connector C-121 at ECM for damage.

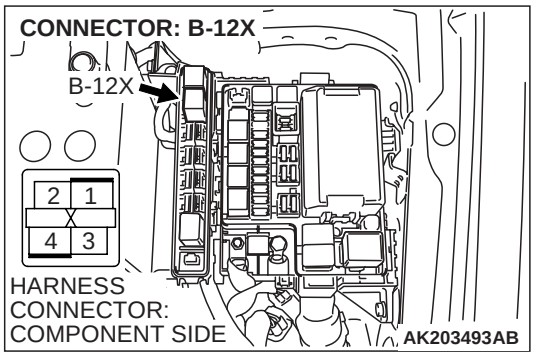
Q: Is the harness connector in good condition?

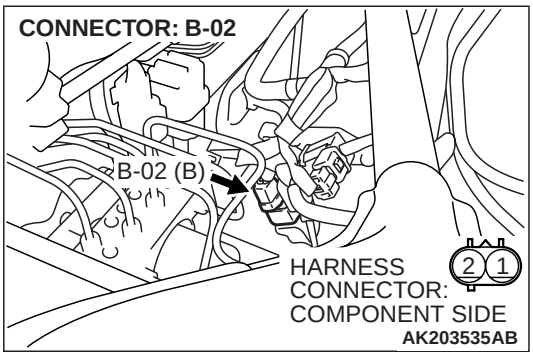
YES : Go to Step 10.

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

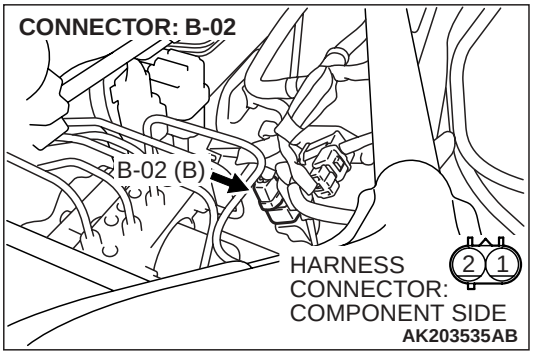


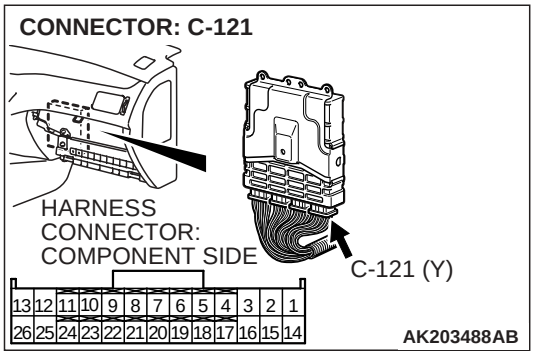
STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and evaporative emission purge solenoid connector B-02 (terminal No. 2).
Q: Is the harness wire in good condition?
YES : Go to Step 11.
NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-02 (terminal No. 1) and ECM connector C-121 (terminal No. 9).
Q: Is the harness wire in good condition?
YES : Replace the ECM. Then go to Step 12.
NO : Repair it. Then go to Step 12.





STEP 12. Perform the OBD-II drive cycle.

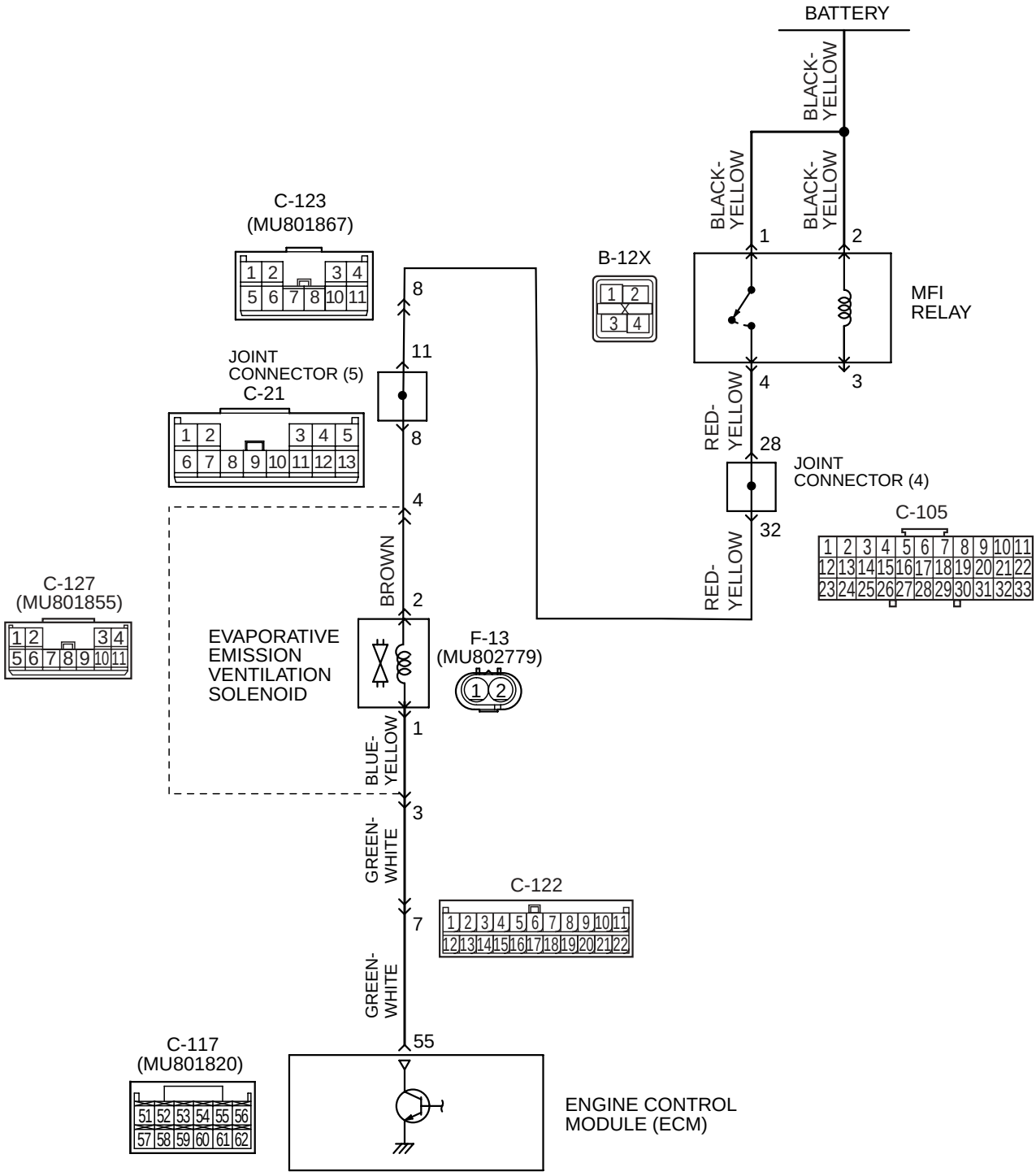
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0443 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0446: EVAPORATIVE EMISSION SYSTEM VENT CONTROL CIRCUIT

Evaporative Emission Ventilation Solenoid Circuit



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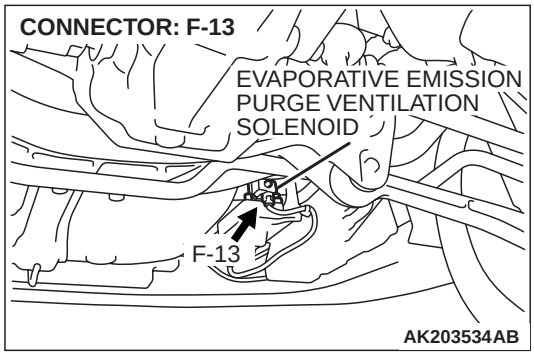

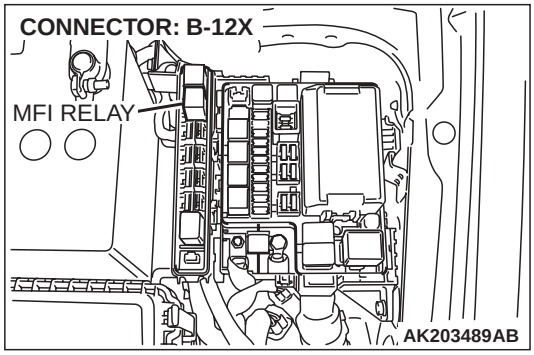

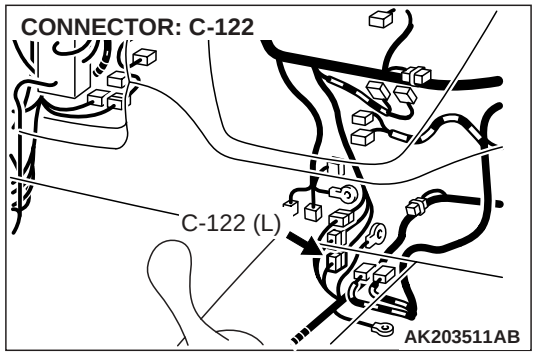

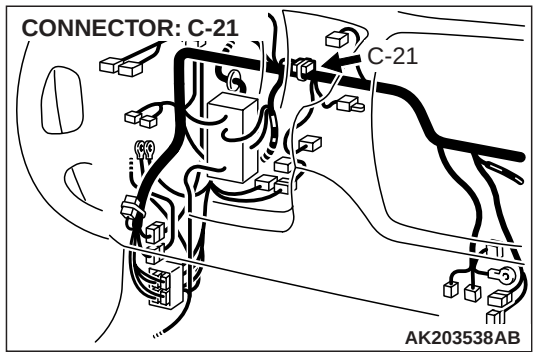

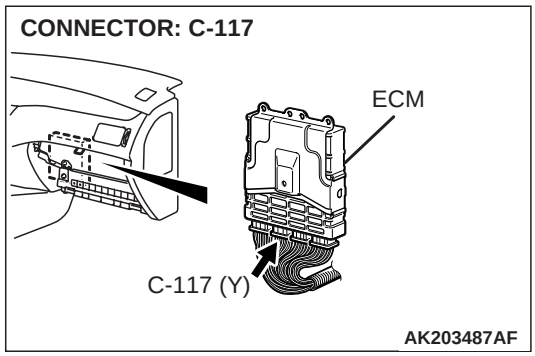

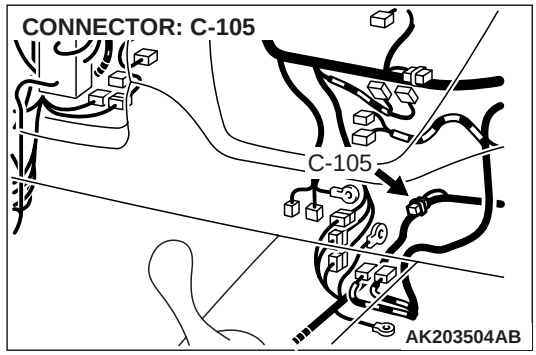

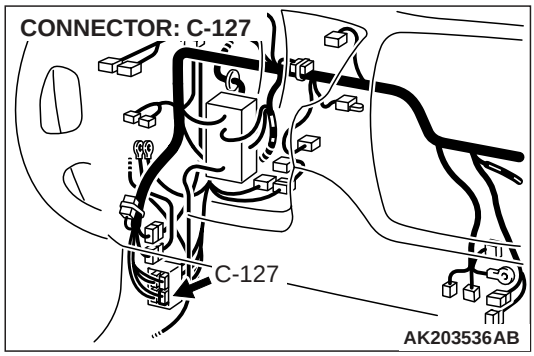

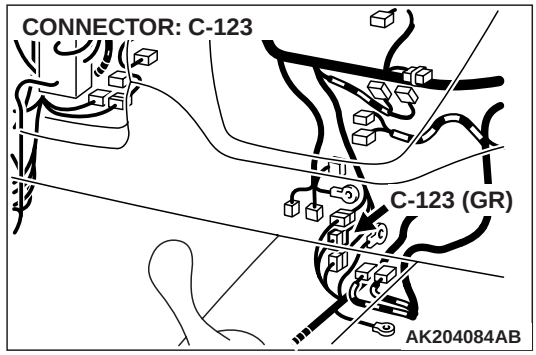

CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 V or more.

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DTC SET CONDITIONS

Check Conditions
- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

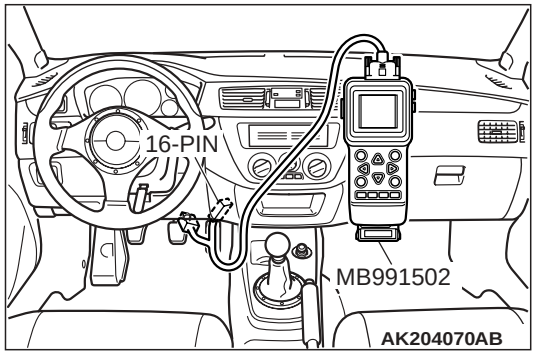
Check Conditions
- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- ON duty cycle of the EGR vacuum regulator solenoid valve is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

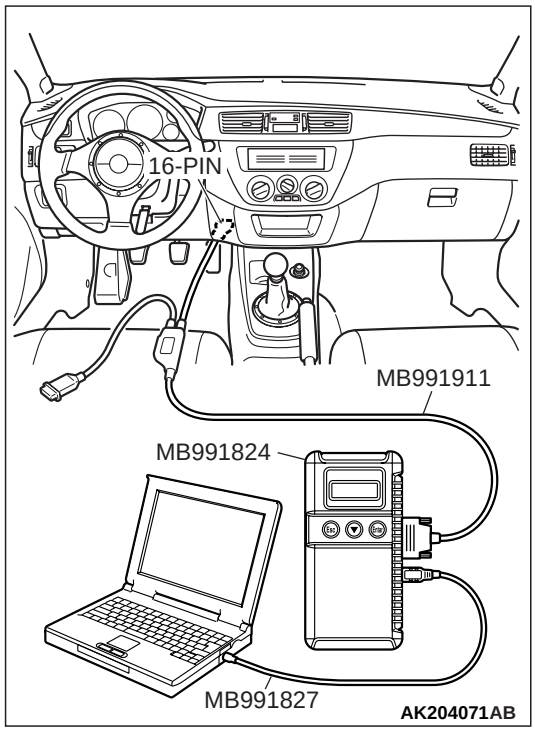
Judgment Criteria
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission ventilation solenoid is turned OFF.

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, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B





STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

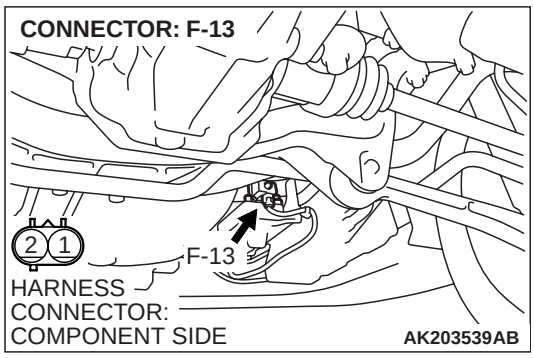
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should 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.00-6.

NO : Go to Step 2.



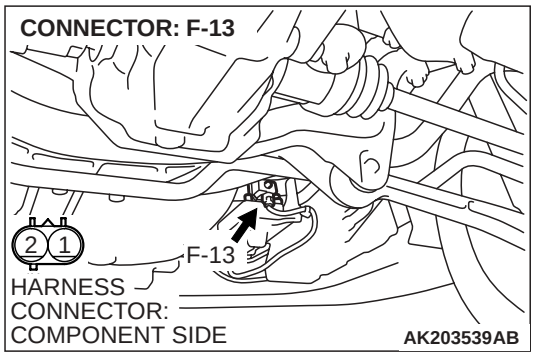
STEP 2. Check harness connector F-13 at the evaporative emission ventilation solenoid for damage.

Q: Is the harness connector in good condition?

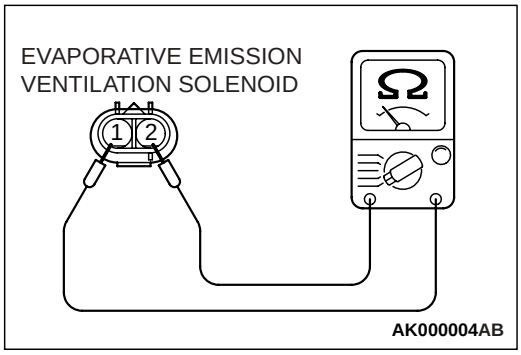
YES : Go to Step 3.

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 F-13.



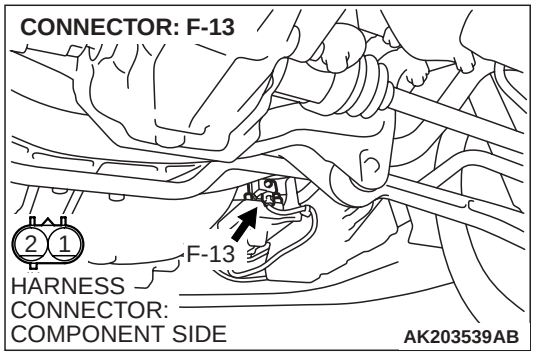
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

Standard value: 17 – 21 ohms [at 20°C (68°F)]

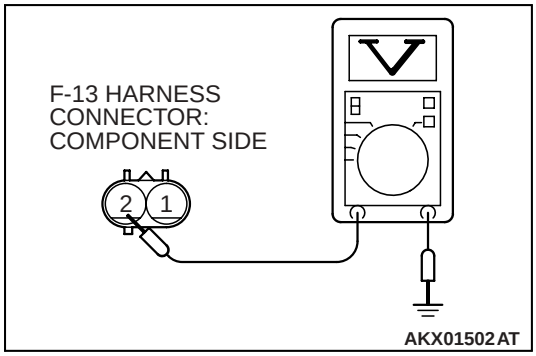
Q: Is the resistance between 17 and 21 ohms [at 20°C (68°F)]?

YES : Go to Step 4.
NO : Replace it. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-13.



(1) Disconnect connector F-13 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

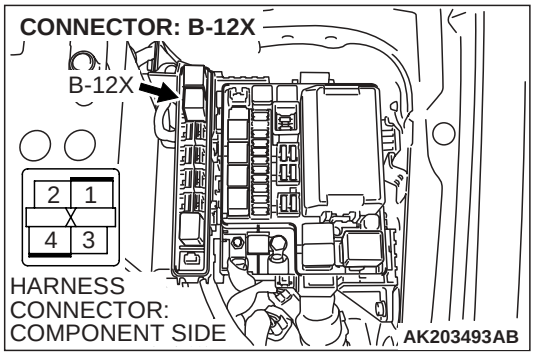


(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Go to Step 5.

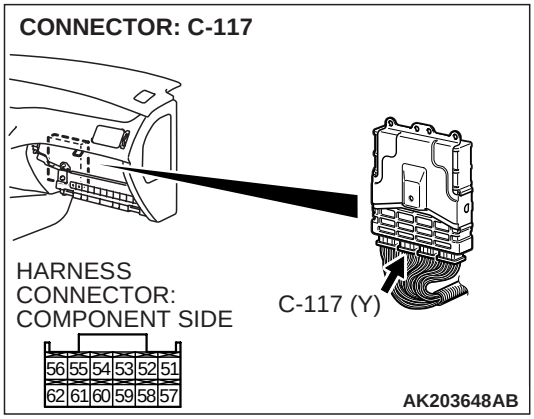


STEP 5. Check harness connector B-12X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check connectors C-21, C-105, C-123 and C-127 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 B-12X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

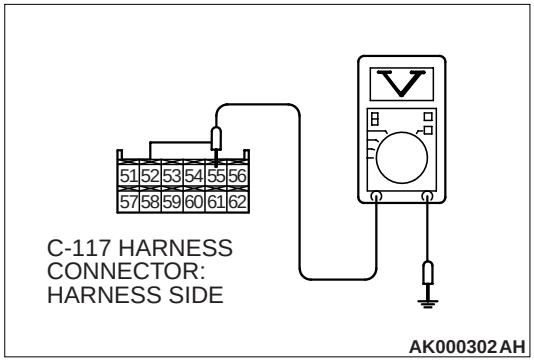
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 6. Measure the power supply voltage at ECM connector C-117 by backprobing.

(1) Do not disconnect connector C-117.

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



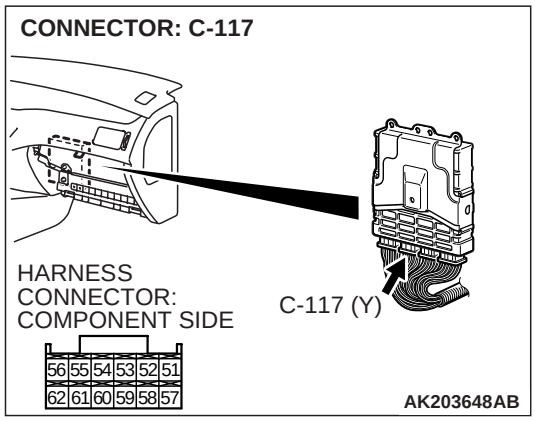
(3) Measure the voltage between terminal No. 55 and ground by backprobing.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

NO : Go to Step 7.

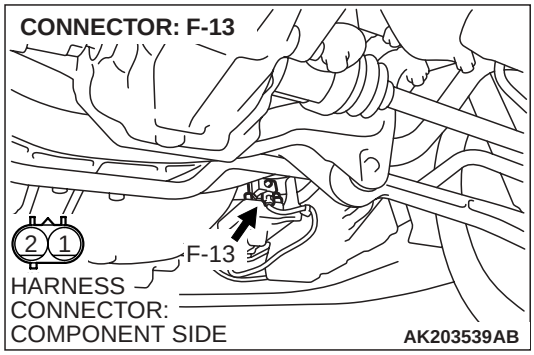


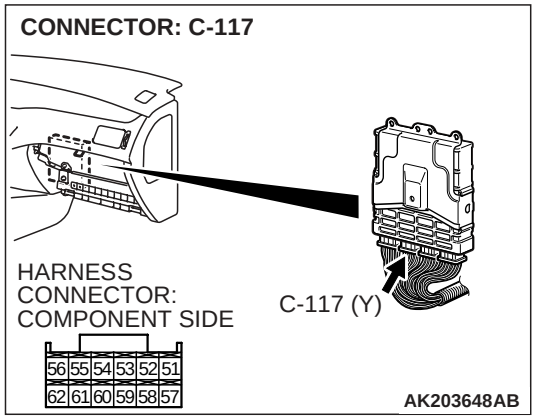
STEP 7. Check harness connector C-117 at ECM for damage.

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 12.





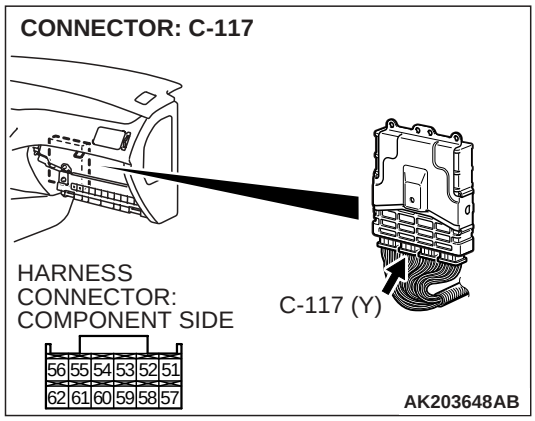
STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector F-13 (terminal No. 1) and ECM connector C-117 (terminal No. 55).

NOTE: Check harness after checking intermediate connectors C-122 and C-127. 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 ECM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

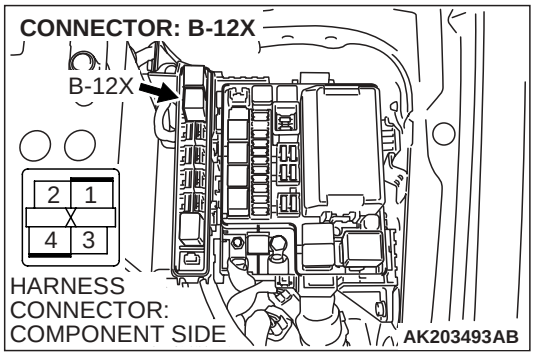


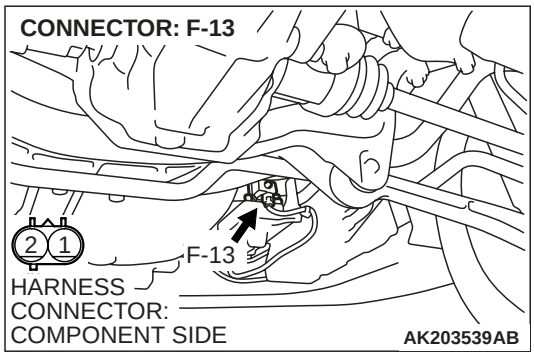
STEP 9. Check harness connector C-117 at ECM for damage.

Q: Is the harness 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.





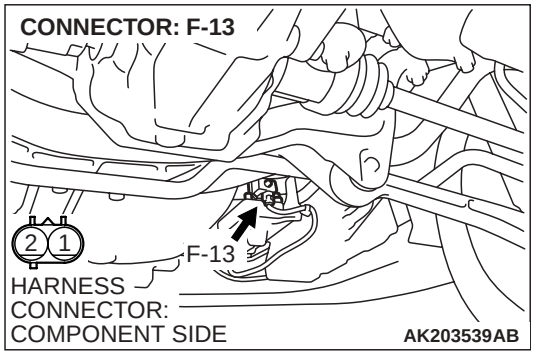
STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2).

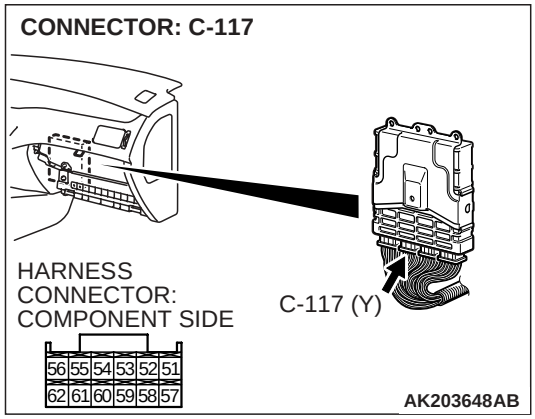
NOTE: Check harness after checking intermediate connectors C-21, C-105, C-123 and C-127. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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 F-13 (terminal No. 1) and ECM connector C-117 (terminal No. 55).

NOTE: Check harness after checking intermediate connectors C-122 and C-127. 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 ECM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Perform the OBD-II drive cycle.

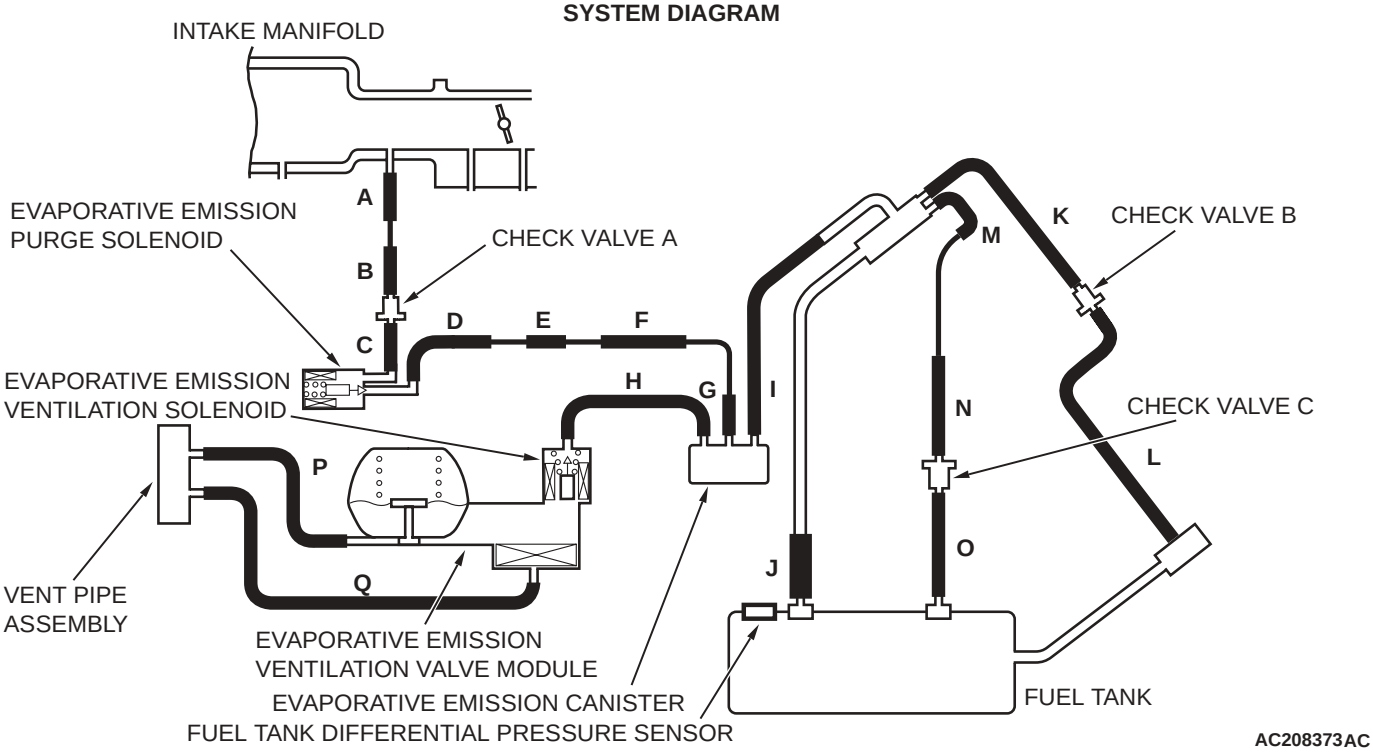
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Diagnostic Function – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0446 set?

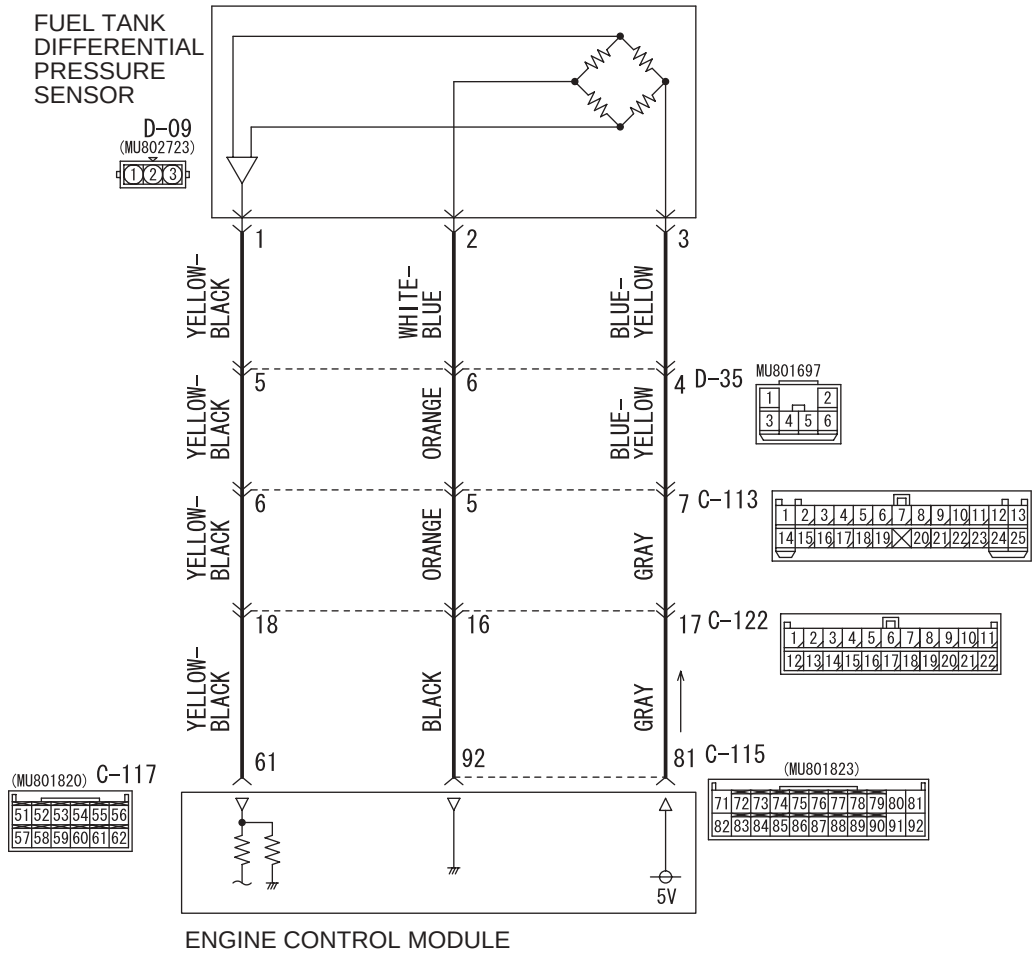
YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0451: Evaporative Emission System Pressure Sensor Range/Performance

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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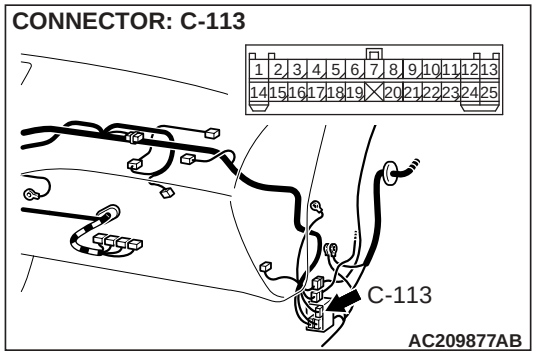
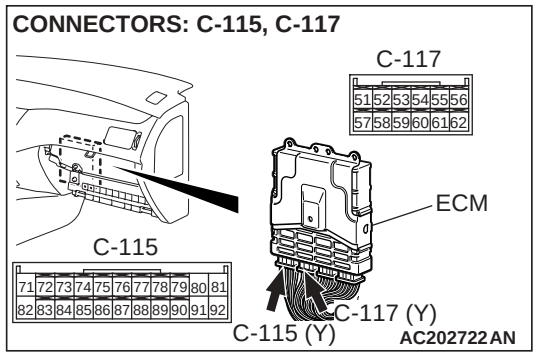
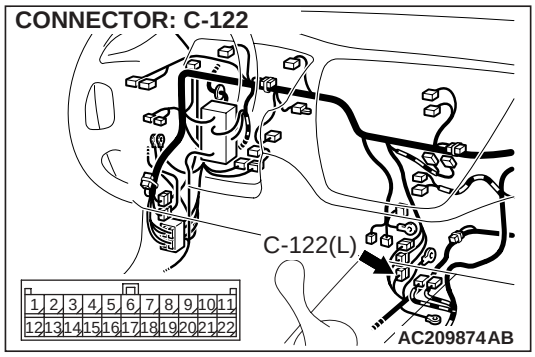
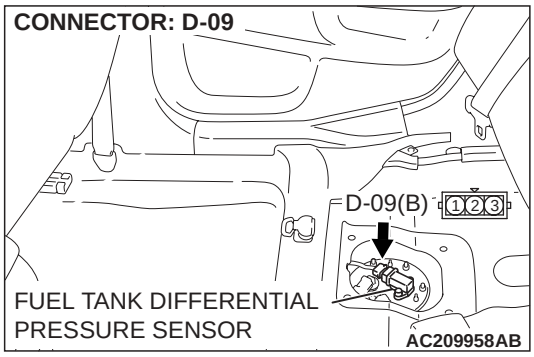
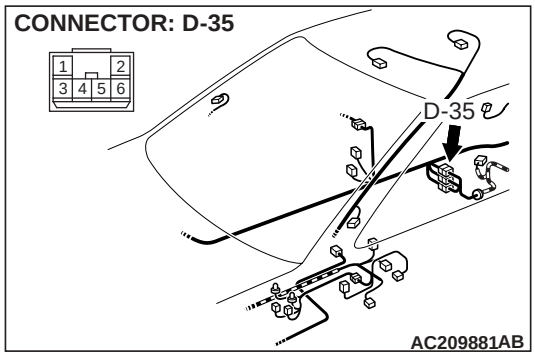




TSB Revision







CIRCUIT OPERATION

- The ECM (terminal 81) supplies a 5-volts reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM (terminal 92).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM (terminal 61) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor signal voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DTC SET CONDITIONS

Check Conditions:

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgment Criteria

- If the voltage signal from the fuel tank differential pressure sensor changes by 0.2 volt or more, DTC P0451 will set. The code may also set if a sudden pressure fluctuation occurs twenty times while the engine is idling, and then eight consecutive times during normal driving.

NOTE: If the number of sudden pressure fluctuations does not reach twenty during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to zero.

NOTE: The conditions for deviating from idling operation are as follows:

- *Engine speed is greater than 2,500 r/min.*
- *Vehicle speed is 15 km/h (9.3 mph) or greater.*
- *Volumetric efficiency is 55 percent or greater.*

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

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set by a faulty fuel differential pressure sensor or related circuit, or ECM failure.

TSB Revision

- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 or MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 or MB991958 reading. A comparison of the mechanical gauge to scan tool MB991502 or MB991958 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

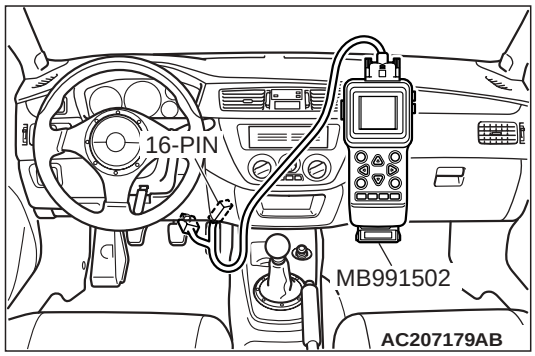
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991658: Test Harness Set

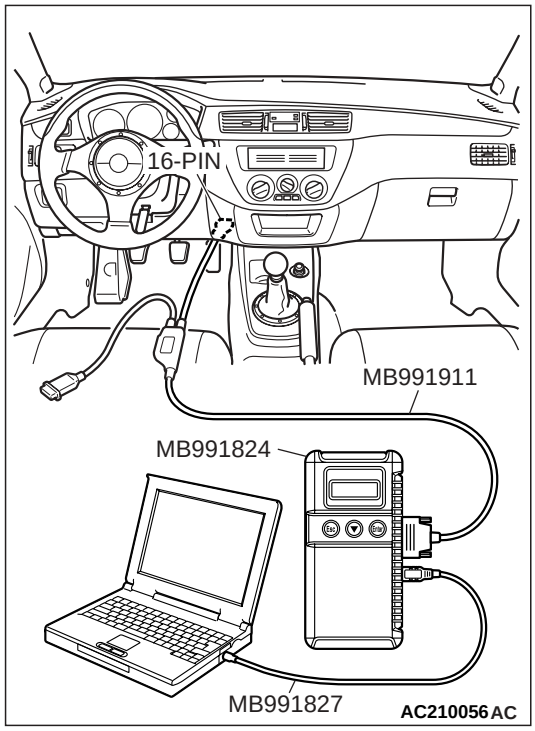
STEP 1. Using scan tool MB991502 or MB991958, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

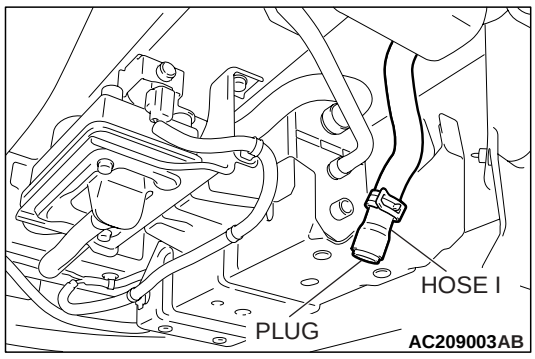
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

(1) Connect scan tool MB991502 or MB991958 to the data link connector.



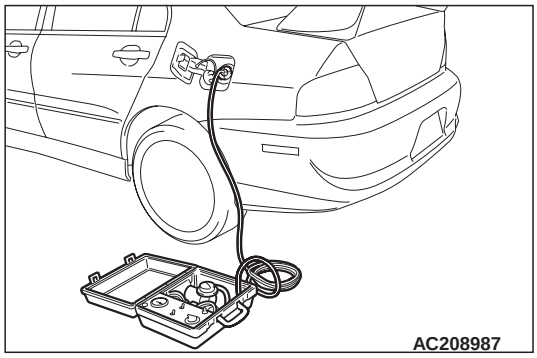


(2) Disconnect hose I from the evaporative emission canister, and plug the hose.



(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressure reading on the scan tool should be –1.5 to 1.5 kPa (–0.443 to 0.443 inHg).

TSB Revision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(4) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(5) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502 or MB991958.
(6) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(7) Connect hose I to the canister.

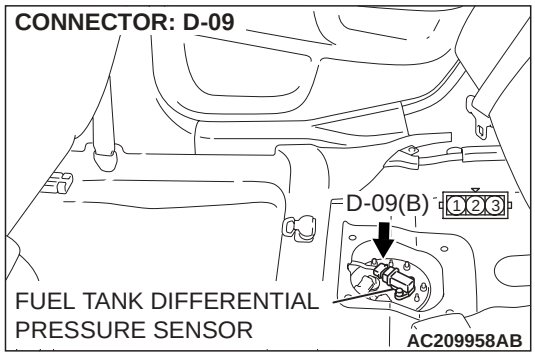
Q: Is the fuel tank pressure between −1.5 and 1.5 kPa (−0.443 and 0.443 inHg)?

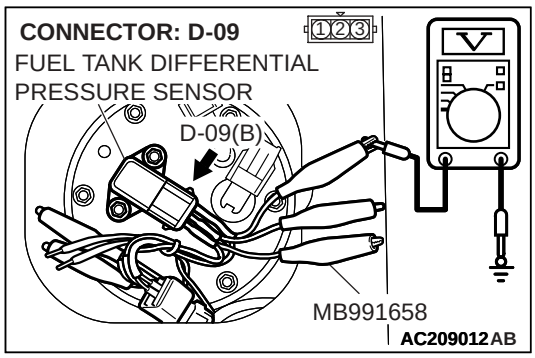
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction P.00-6. Go to Step 15.

NO : Go to Step 2.

STEP 2. Measure the signal voltage at fuel tank differential pressure sensor connector D-09.

(1) Remove the rear seat assembly (Refer to GROUP 52A, Rear Seat P.52A-22).
(2) Remove the floor pan access panel.





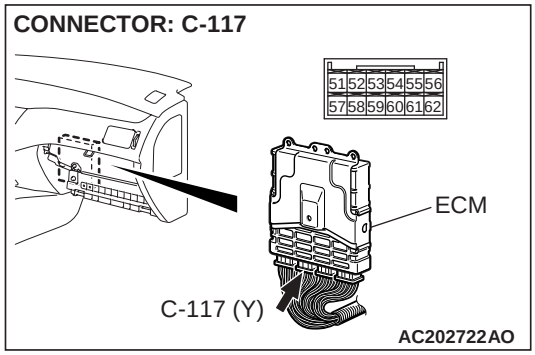
(3) Use special tool Test Harness Set (MB991658) to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-09.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Measure the voltage between connector D-09 terminal 1 and ground.
- The measured voltage should measure between 2.0 to 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

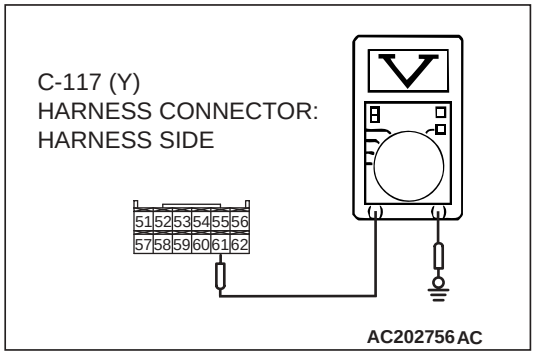
YES : Go to Step 3.

NO : Go to Step 7.



STEP 3. Measure the signal voltage at ECM connector C-117 by backprobing.

(1) Do not disconnect ECM connector C-117.



(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between connector C-117 terminal 61 and ground by backprobing.
- The measured voltage should measure between 2.0 and 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

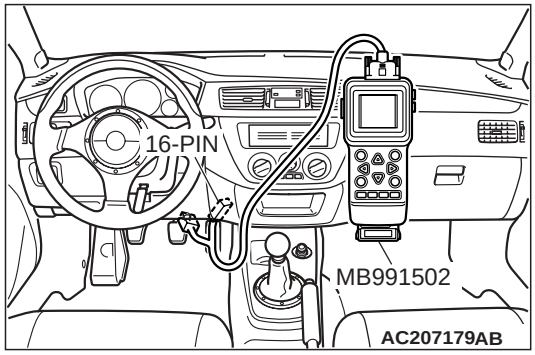
YES : Go to Step 4.
NO : Go to Step 5.

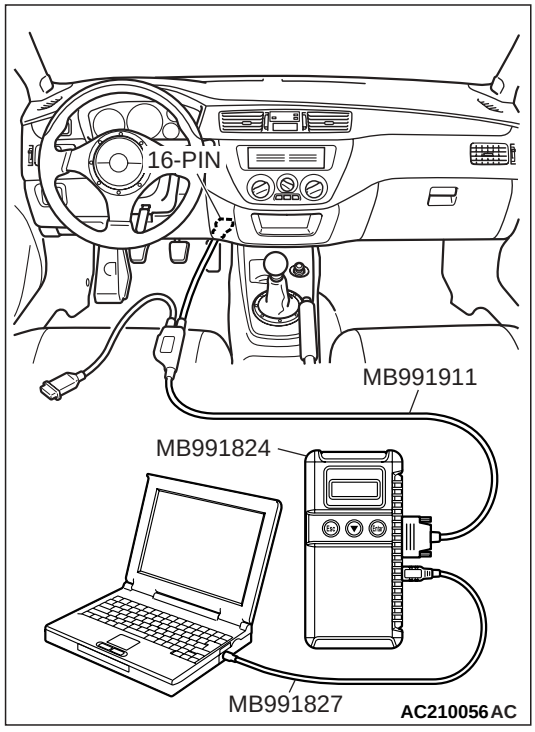
STEP 4. Using scan tool MB991502 or MB991958, check data list item 73: Fuel Tank Differential Pressure Sensor.

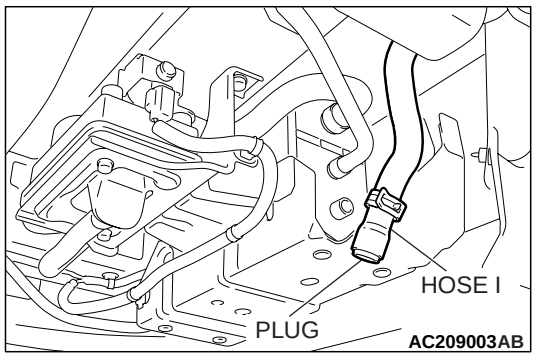
⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

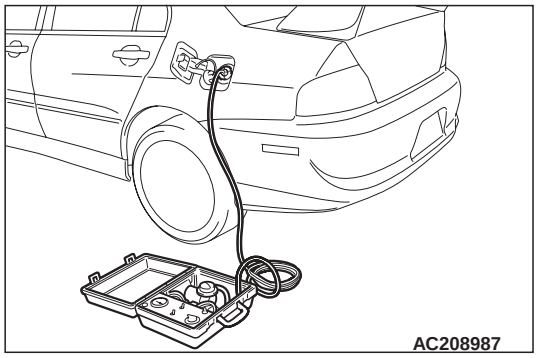
(1) Connect scan tool MB991502 or MB991958 to the data link connector.







(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 or MB991958 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressure reading on the scan tool should be –1.5 to 1.5 kPa (–.443 to.443 inHg).



(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

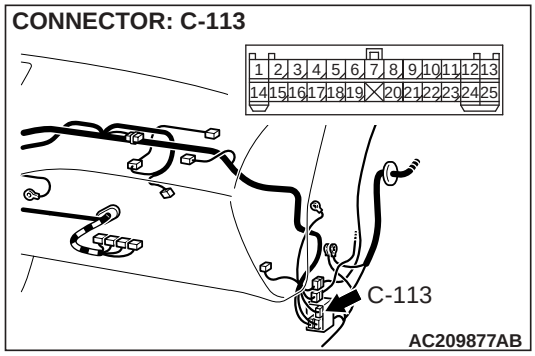
(7) Turn the ignition switch to the "LOCK" (OFF) position.
(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(9) Connect hose I to the canister.

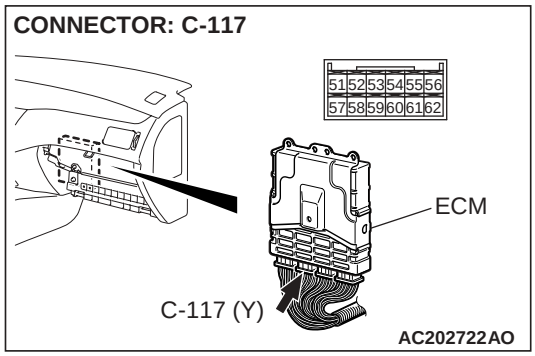
Q: Is the fuel tank pressure between −1.5 and 1.5 kPa (−0.443 and 0.443 inHg)?

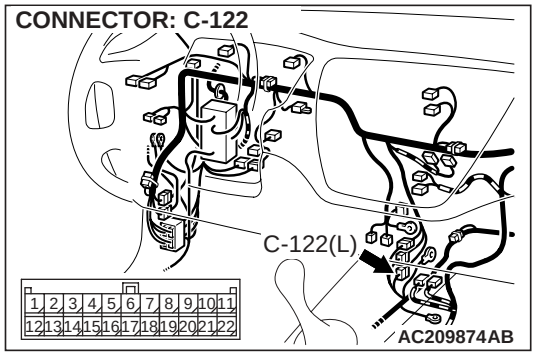
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction P.00-6. Go to Step 15.

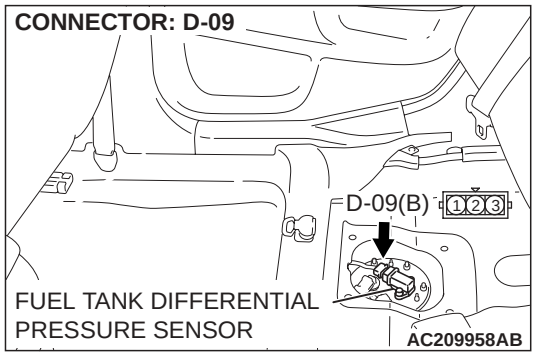
NO : Replace the ECM. Go to Step 15.

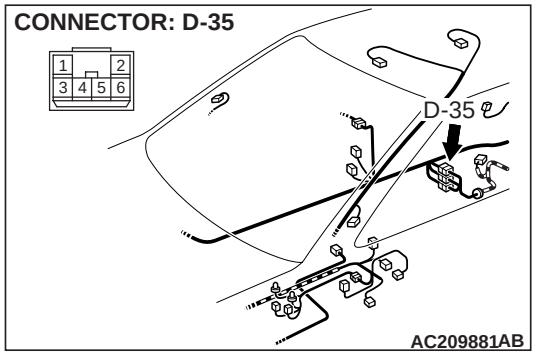
STEP 5. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-117, and fuel tank differential pressure sensor connector D-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.











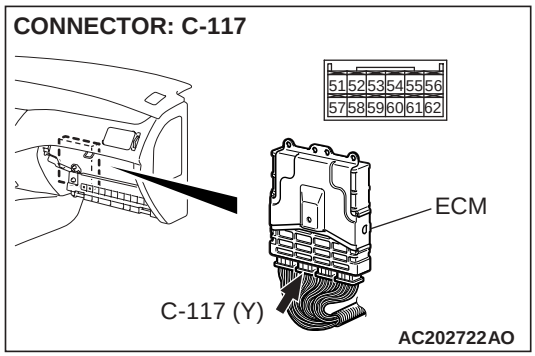
Q: Are the connectors in good condition?

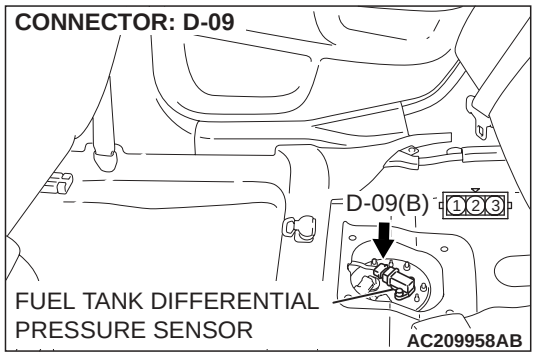
YES : Go to Step 6.

NO : Repair or replace the faulty components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.

STEP 6. Check the harness wire between ECM connector C-117 terminal 61 and intermediate connector D-09 terminal 1 for damage.

Q: Is the harness wire in good condition?

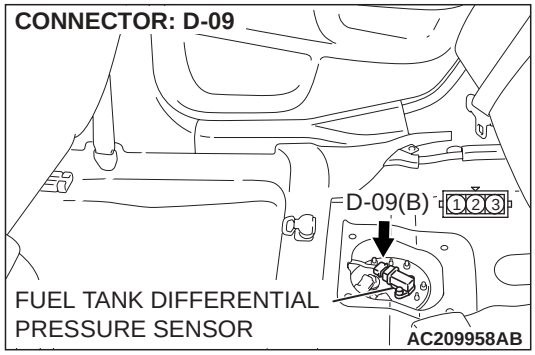




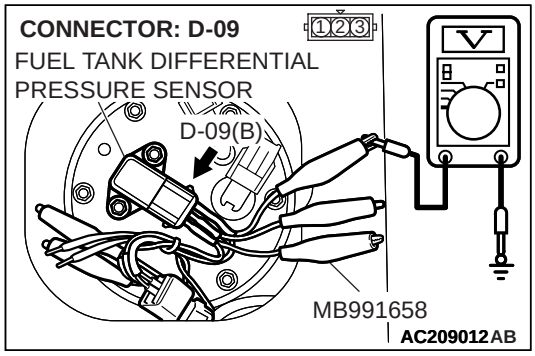
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction P.00-6. Go to Step 15.

NO : Repair the damaged harness wire. Go to Step 15.

STEP 7. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-09.



(1) Disconnect fuel tank differential pressure sensor connector D-09.



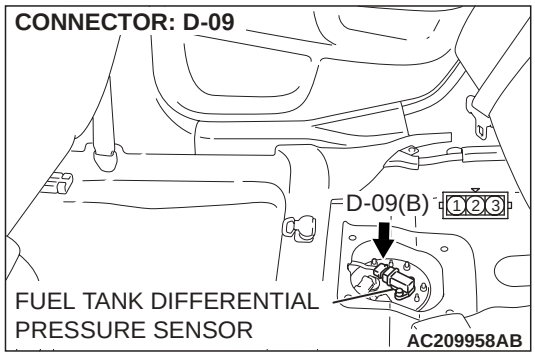
(2) Use special tool MB991658 to connect terminals 1, 2 and 3 of connector D-09.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

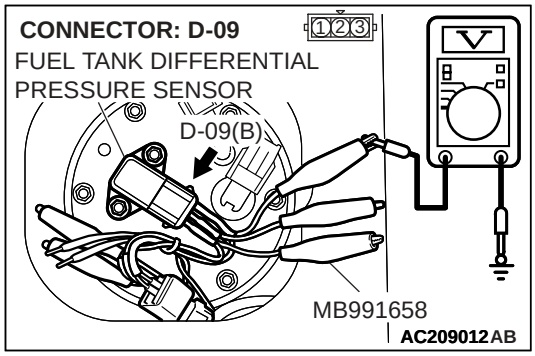
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 8.
NO : Go to Step 11.

STEP 8. Measure the return circuit voltage at fuel tank differential pressure sensor connector D-09.



(1) Disconnect fuel tank differential pressure sensor connector D-09.



(2) Use special tool MB991658 to connect terminal 3 of connector D-09.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

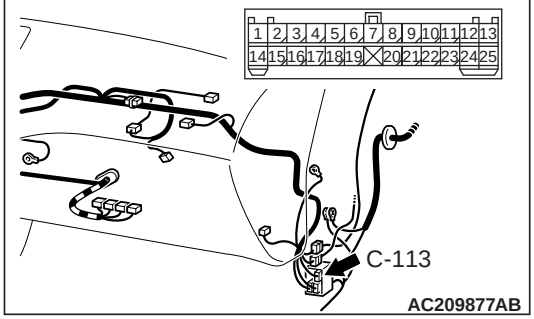
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measure voltage 0.5 volt or less?

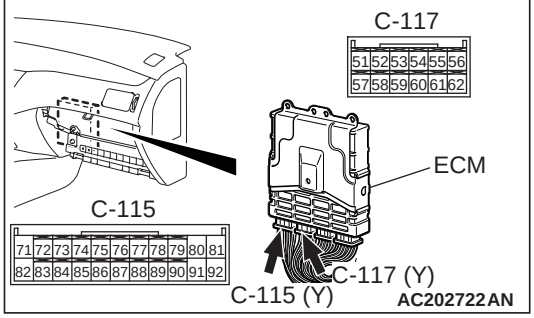
YES : Go to Step 9.
NO : Replace the fuel tank differential pressure sensor. Go to Step 15.

STEP 9. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-115,C-117 and fuel tank differential pressure sensor connector for D-09 loose, corroded or damaged terminals, or terminals pushed back in the connector.

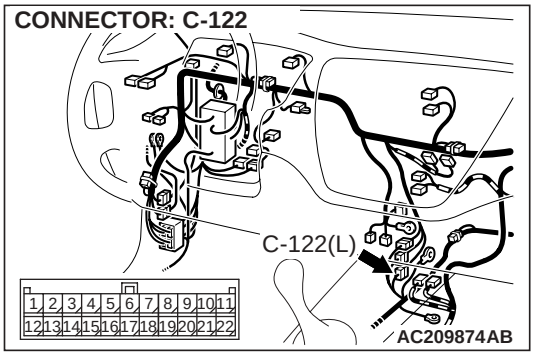
CONNECTOR: C-113

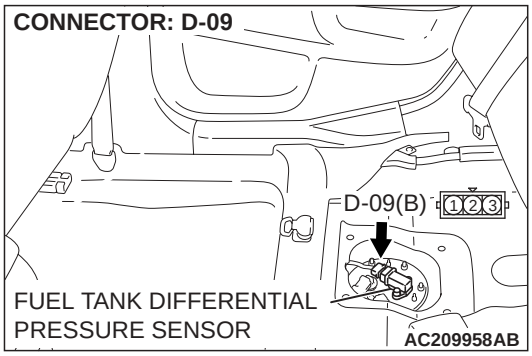


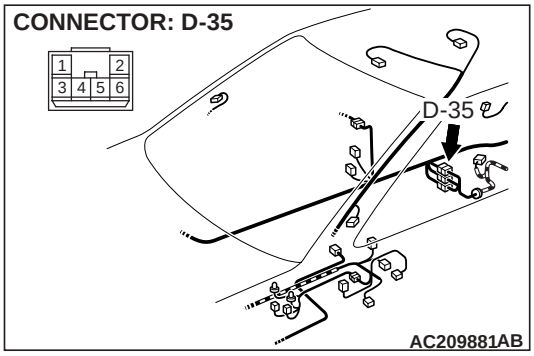
CONNECTORS: C-115, C-117



CONNECTOR: C-122







Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

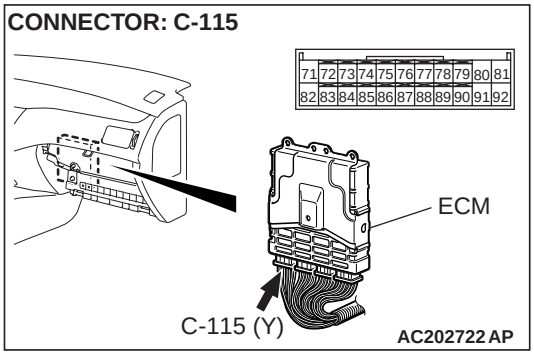
NO : Repair or replace the damage components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.

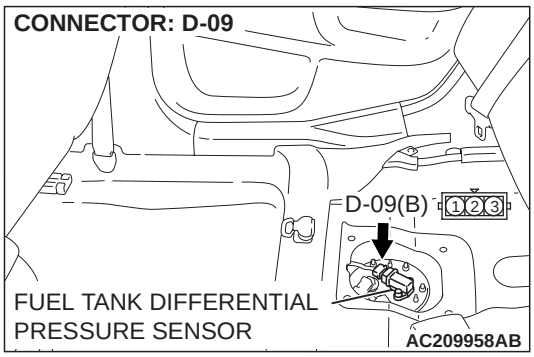
STEP 10. Check the harness wire between ECM connector C-115 terminal 92 and fuel tank differential pressure sensor connector D-09 terminal 2 for damage.

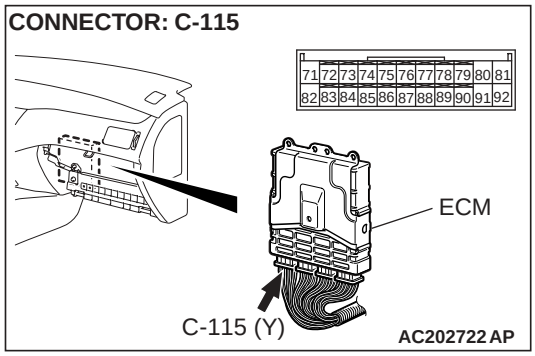
Q: Is the harness wire in good condition?

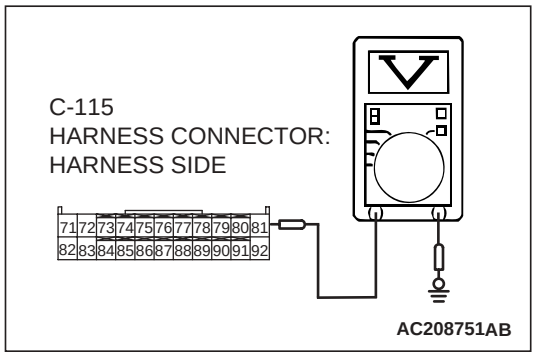
YES : Replace the fuel tank differential pressure sensor. Go to Step 15.

NO : Repair or replace the harness wire. Go to Step 15.









STEP 11. Measure the 5-volts reference signal at ECM connector C-115 by backprobing.

(1) Turn the ignition switch to the "ON" position.
(2) Measure the voltage between connector C-115 terminal 81 and ground by backprobing.
- The measured voltage should measure between 4.9 and 5.1 volts.

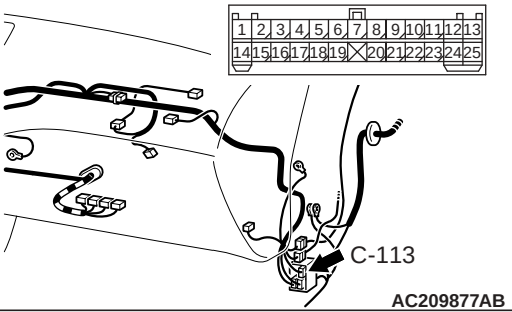
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

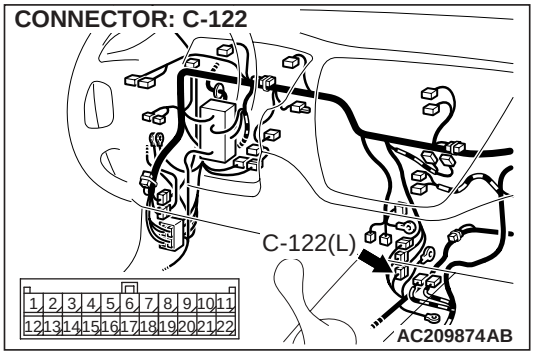
YES : Go to Step 12.
NO : Go to Step 14.

STEP 12. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-115 and fuel tank differential pressure sensor connector for D-09 loose, corroded or damaged terminals, or terminals pushed back in the connector.

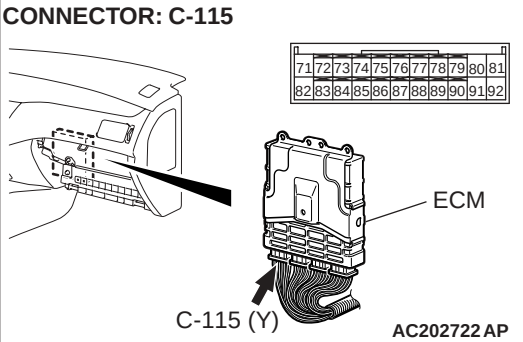
CONNECTOR: C-113



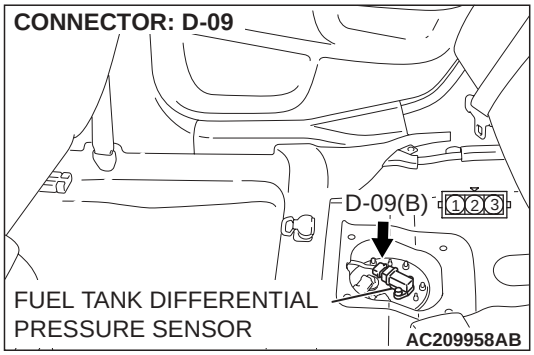
CONNECTOR: C-122

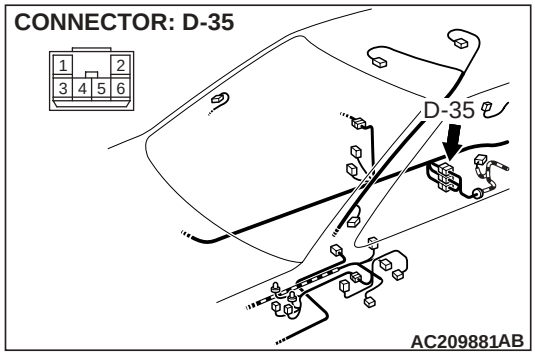


CONNECTOR: C-115



CONNECTOR: D-09





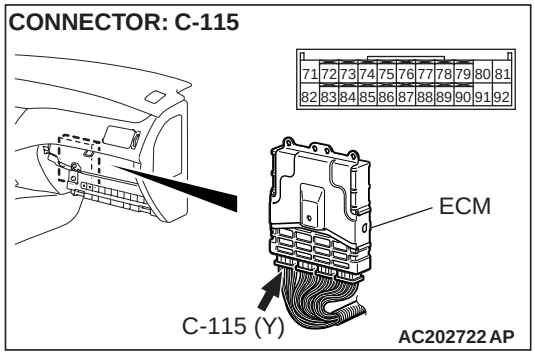
Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

NO : Repair or replace the faulty component. Go to Step 15.

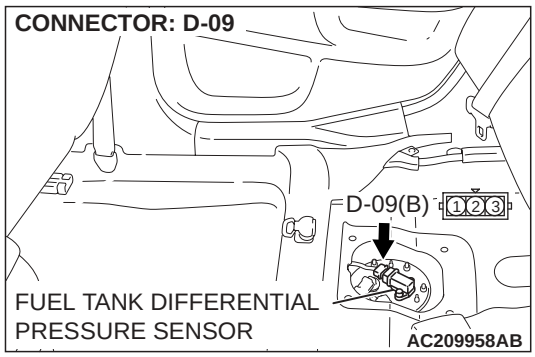
STEP 13. Check the harness wire between ECM connector C-115 terminal 81 and fuel tank differential pressure sensor connector D-09 terminal 3 for damage.

Q: Is the harness wire in good condition?



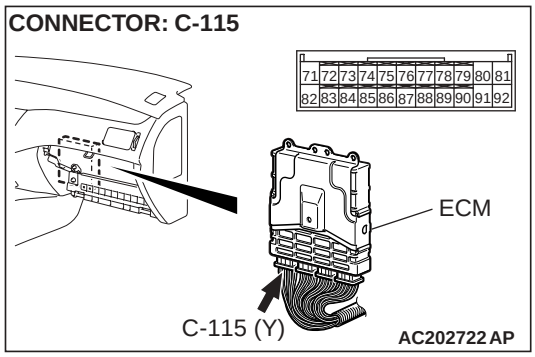
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with intermittent Malfunction P.00-6. Go to Step 15.

NO : Repair or replace the harness wire. Go to Step 15.



STEP 14. Check ECM connector C-115 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?



YES : Replace the ECM. Go to Step 15.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.

STEP 15. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission System Leak Monitor P.13A-6.

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

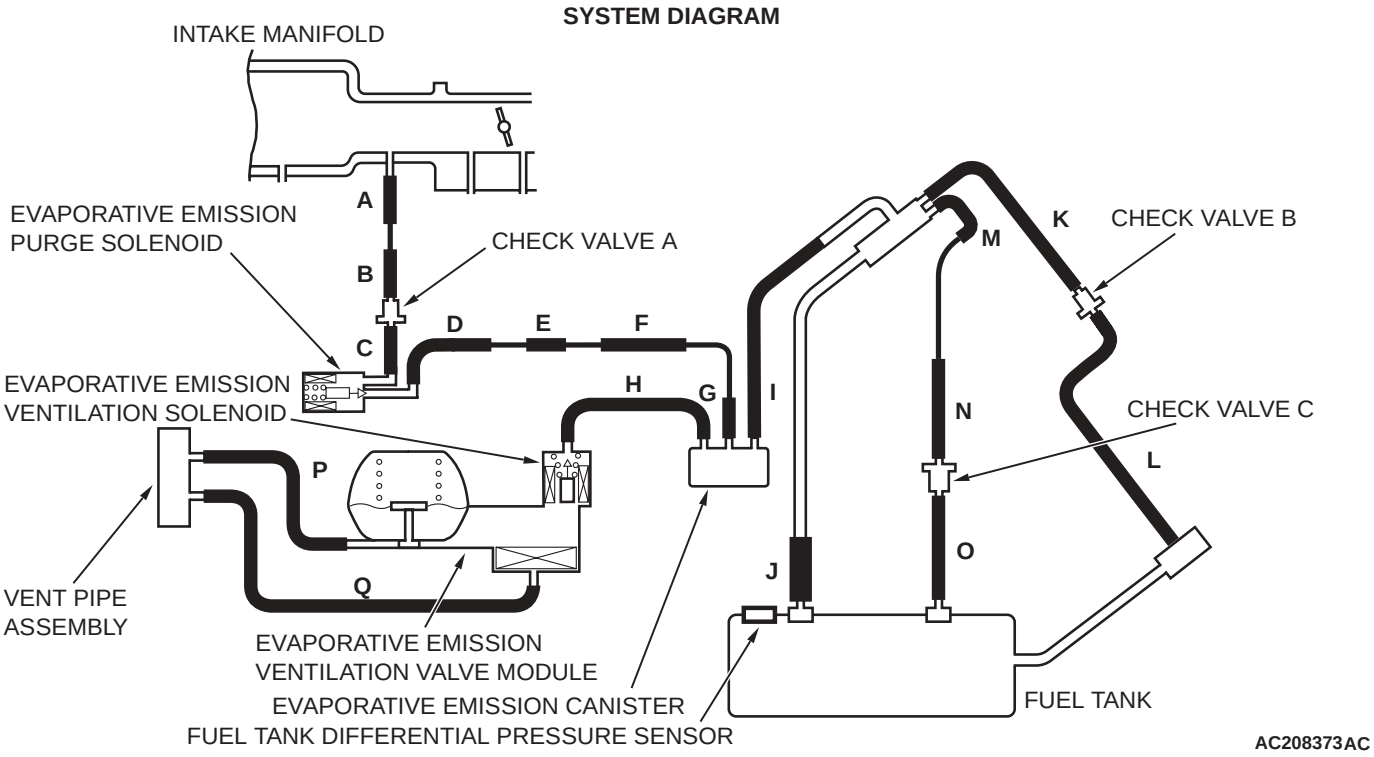
Q: Is DTC P0451 set?

YES : Go to Step 2.

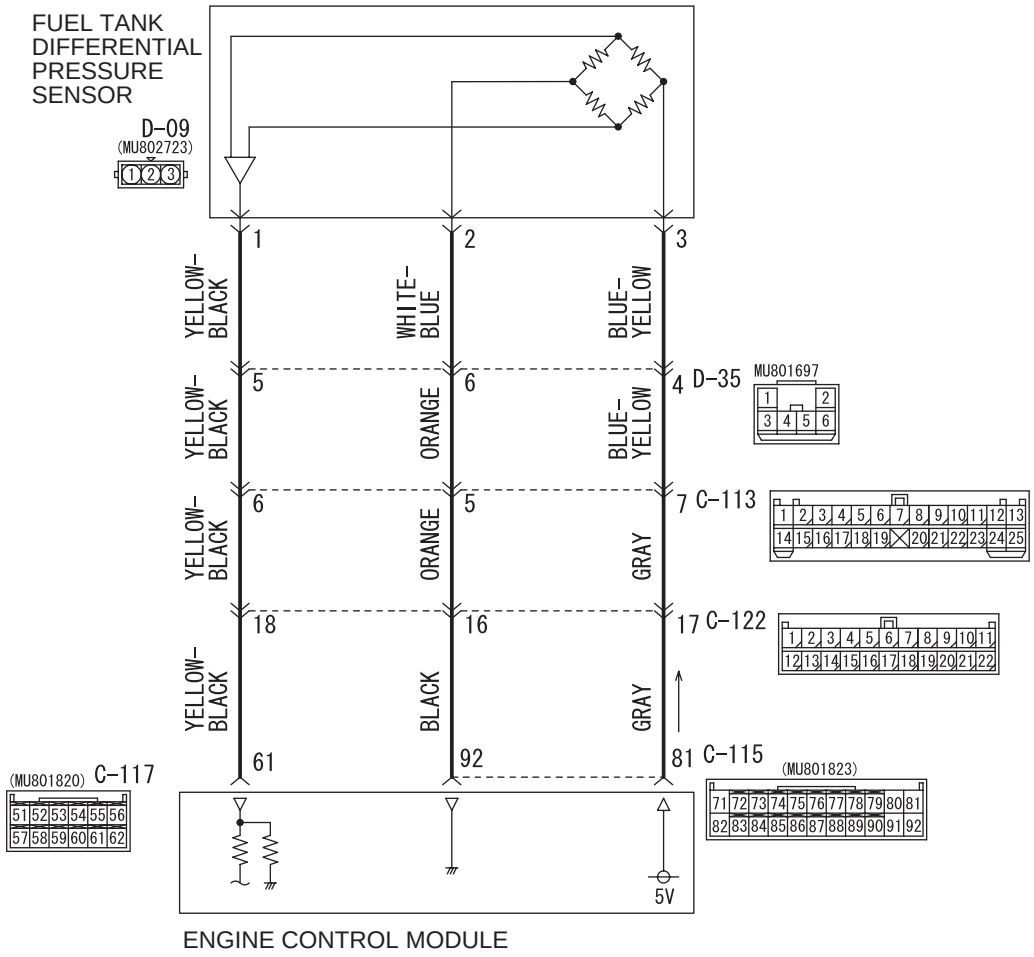
NO : The procedure is complete.

DTC P0452: Evaporative Emission System Pressure Sensor Low Input

SYSTEM DIAGRAM

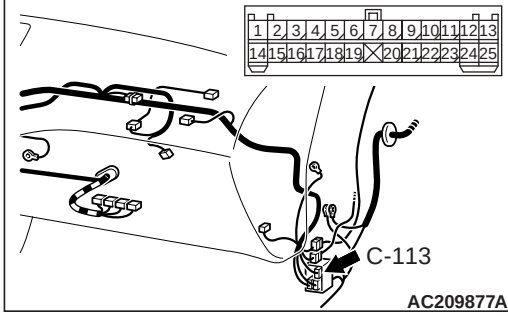


Fuel Tank Differential Pressure Sensor Circuit



AC208776
W3J12M00AA

CONNECTOR: C-113



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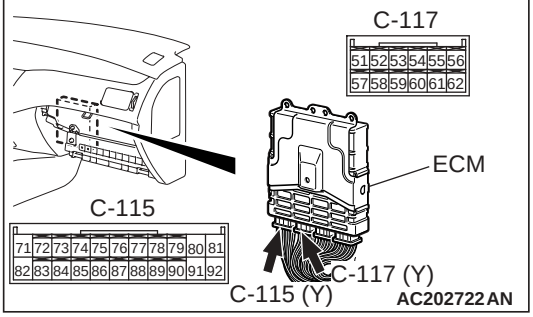
CONNECTORS: C-115, C-117



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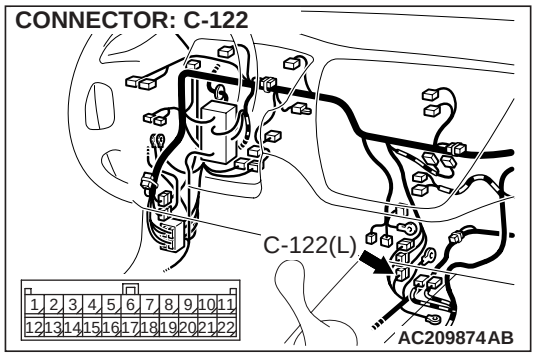
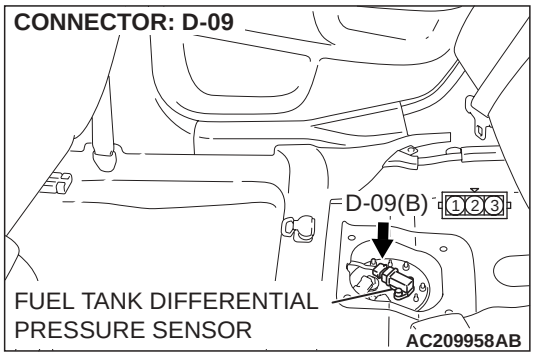
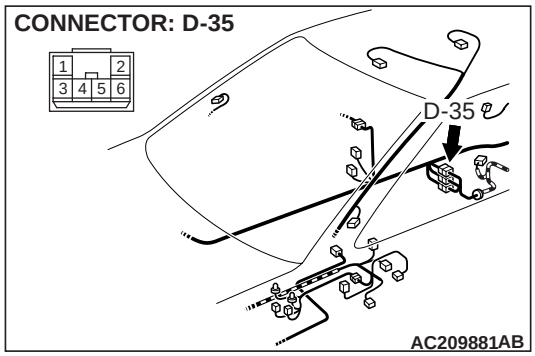
TSB Revision







CIRCUIT OPERATION

- The ECM (terminal 81) supplies a 5-volts reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM (terminal 92).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM (terminal 61) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DTC SET CONDITIONS

Check Conditions:

- Intake air temperature is greater than 5°C (41°F).
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 70 percent.

Judgment Criteria

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains at 1.0 volt or less for ten seconds.

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

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0452 can be set by a faulty fuel differential pressure sensor or related circuit, or ECM failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 or MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 or MB991958 reading. A comparison of the mechanical gauge to scan tool MB991502 or MB991958 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

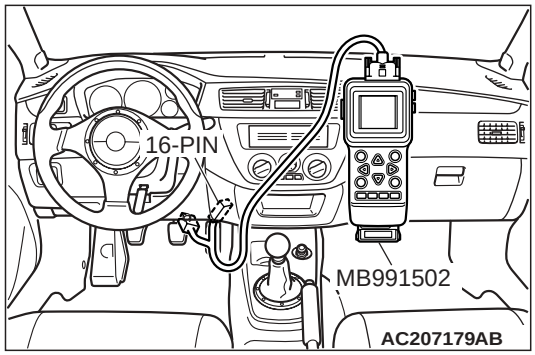
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991658: Test Harness Set

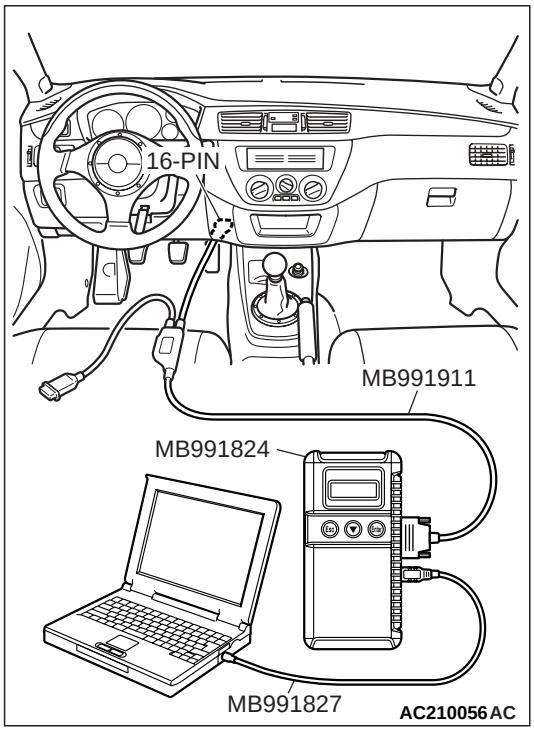
STEP 1. Using scan tool MB991502 or MB991958, check data list item 73: Fuel Tank Differential Pressure Sensor.

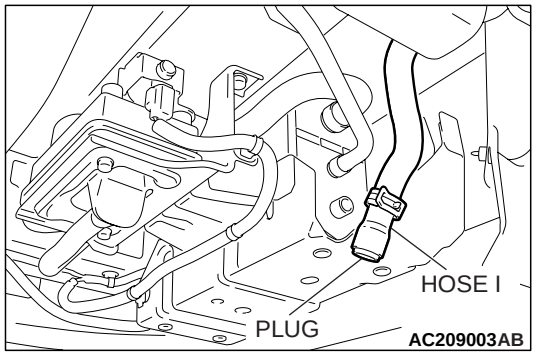
⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

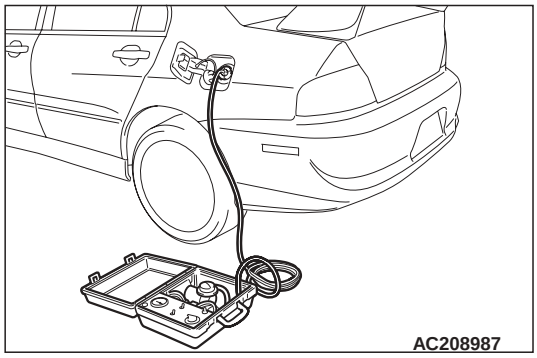
(1) Connect scan tool MB991502 or MB991958 to the data link connector.







(2) Disconnect hose I from the evaporative emission canister, and plug the hose.



(3) Set scan tool MB991502 or MB991958 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressure reading on the scan tool should be –1.5 to 1.5 kPa (–0.443 to 0.443 inHg).

(4) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(5) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502 or MB991958.
(6) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(7) Connect hose I to the canister.

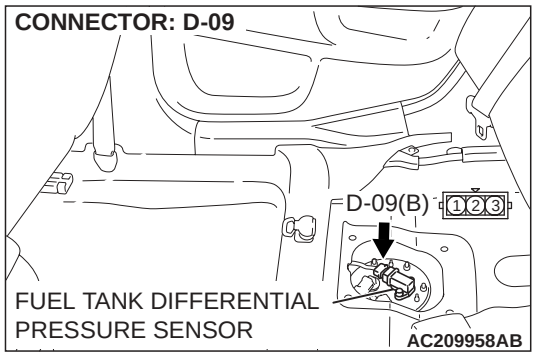
Q: Is the fuel tank pressure between –1.5 and 1.5 kPa (–0.443 and 0.443 inHg)?

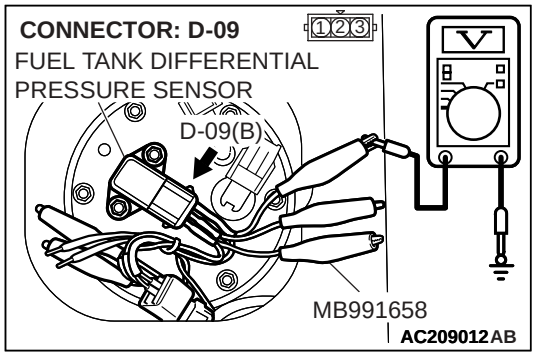
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction P.00-6. Go to Step 15.

NO : Go to Step 2.

STEP 2. Measure the signal voltage at fuel tank differential pressure sensor connector D-09.

(1) Remove the rear seat assembly (Refer to GROUP 52A, Rear Seat P.52A-22).
(2) Remove the floor pan access panel.



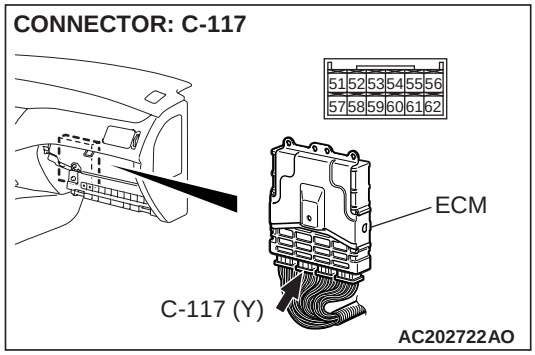


(3) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-09.
(4) Turn the ignition switch to the "ON" position.
(5) Remove the fuel cap.
(6) Measure the voltage between connector D-09 terminal 1 and ground.
- The measured voltage should measure between 2.0 and 3.0 volts.

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

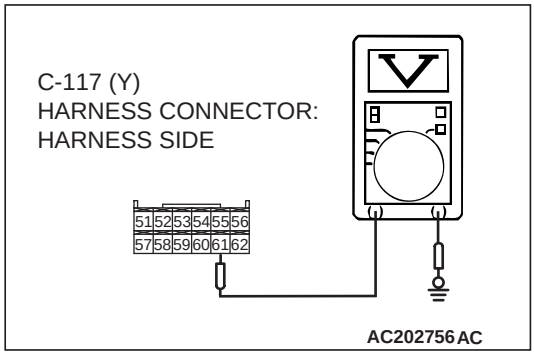
Q: Is the measured voltage between 2.0 and 3.0 volts?

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



STEP 3. Measure the signal voltage at ECM connector C-117 by backprobing.

(1) Do not disconnect ECM connector C-117.



(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between connector C-117 terminal 61 and ground by backprobing.
- The measured voltage should measure between 2.0 to 3.0 volts.

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

Q: Is the measured voltage between 2.0 and 3.0 volts?

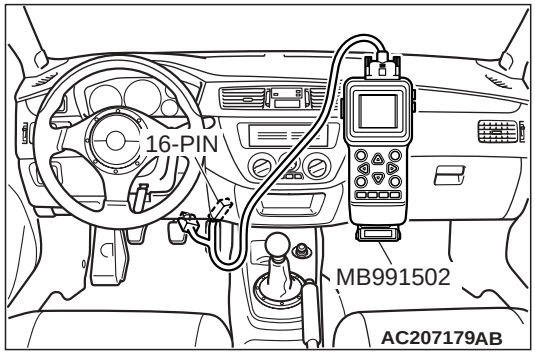
YES : Go to Step 4.
NO : Go to Step 5.

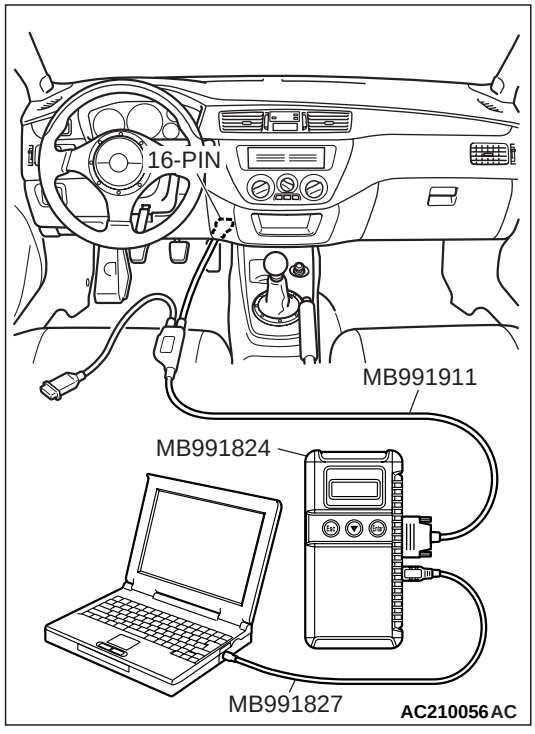
STEP 4. Using scan tool MB991502 or MB991958, check data list item 73: Fuel Tank Differential Pressure Sensor.

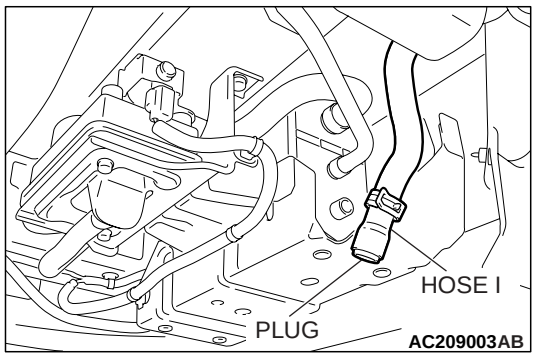
⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

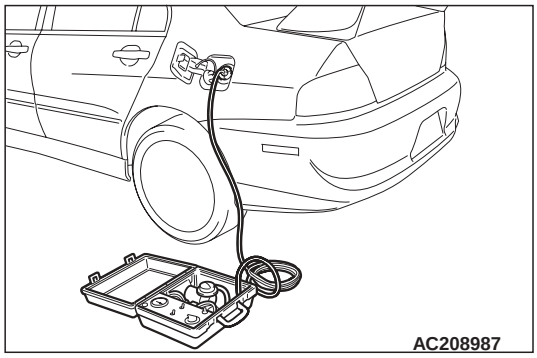
(1) Connect scan tool MB991502 or MB991958 to the data link connector.







(2) Disconnect hose I from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 or MB991958 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressure reading on the scan tool should be –1.5 to 1.5 kPa (–0.443 to 0.443 inHg).



(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

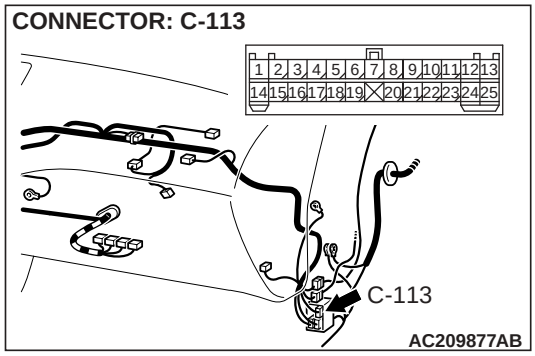
(7) Turn the ignition switch to the "LOCK" (OFF) position.
(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(9) Connect hose I to the canister.

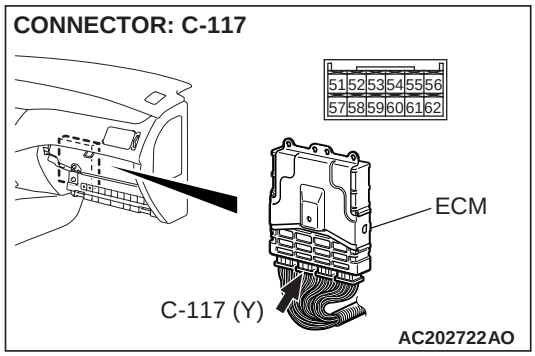
Q: Is the fuel tank pressure between −1.5 and 1.5 kPa (−0.443 and 0.443 inHg)?

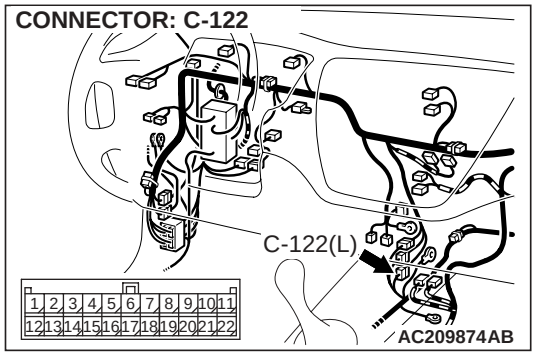
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points − Intermittent Malfunction P.00-6. Go to Step 15.

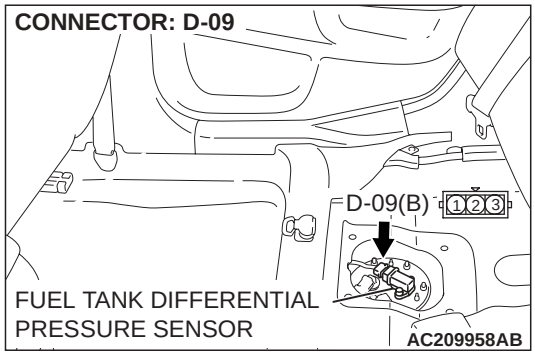
NO : Replace the ECM. Go to Step 15.

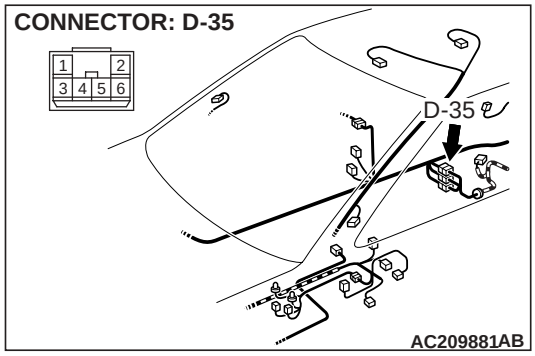
STEP 5. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-117, and fuel tank differential pressure sensor connector D-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.











Q: Are the connectors in good condition?

YES : Go to Step 6.

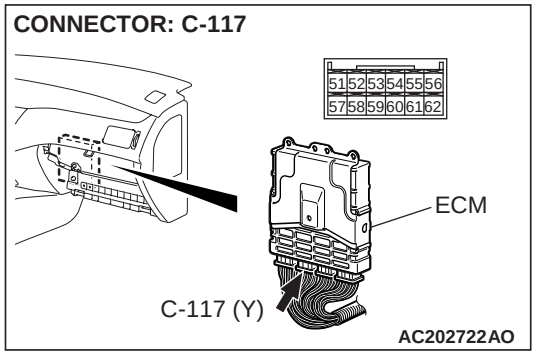
NO : Repair or replace the faulty components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.

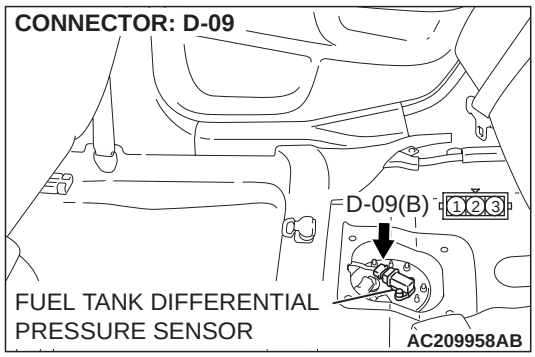
STEP 6. Check the harness wire between ECM connector C-117 terminal 61 and intermediate connector D-09 terminal 1 for damage.

Q: Is the harness wire in good condition?

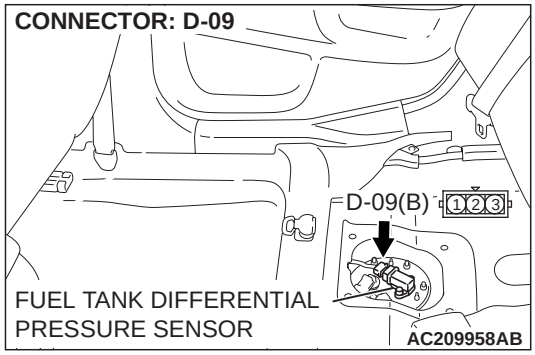
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction P.00-6. Go to Step 15.

NO : Repair the damaged harness wire. Go to Step 15.

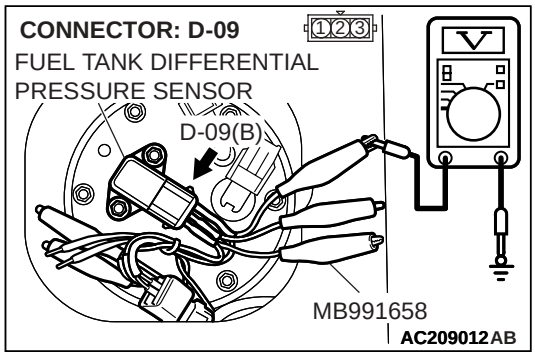




STEP 7. Measure the 5-volts reference signal at fuel tank differential pressure sensor connector D-09.



(1) Disconnect fuel tank differential pressure sensor connector D-09.



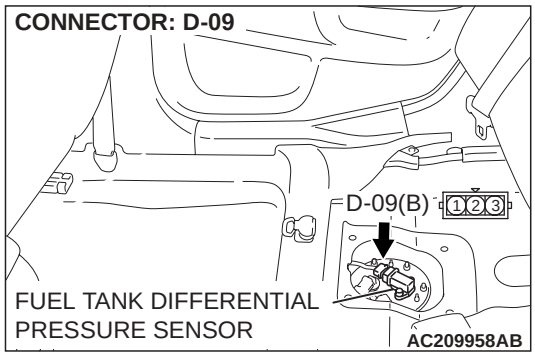
(2) Use special tool MB991658 to connect terminals 1, 2 and 3 of connector D-09.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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

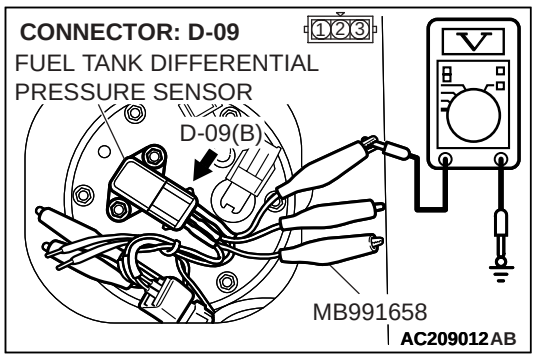
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 8.
NO : Go to Step 11.

STEP 8. Measure the return circuit voltage at fuel tank differential pressure sensor connector D-09.



(1) Disconnect fuel tank differential pressure sensor connector D-09.



(2) Use special tool MB991658 to connect terminal 3 of connector D-09.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

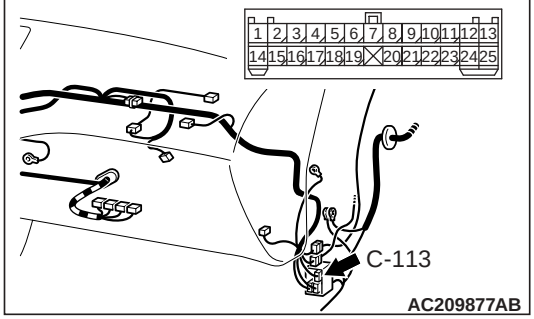
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measure voltage 0.5 volt or less?

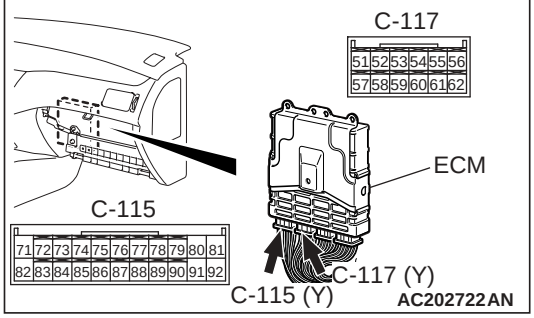
YES : Go to Step 9.
NO : Replace the fuel tank differential pressure sensor. Go to Step 15.

STEP 9. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-115,C-117 and fuel tank differential pressure sensor connector for D-09 loose, corroded or damaged terminals, or terminals pushed back in the connector.

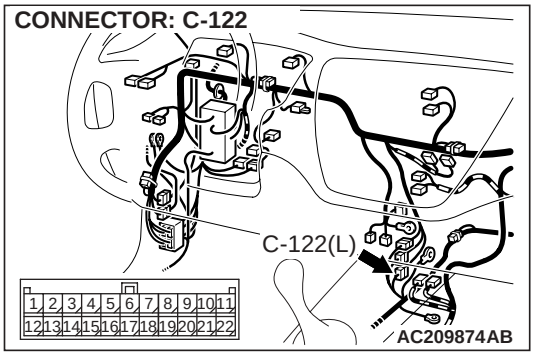
CONNECTOR: C-113



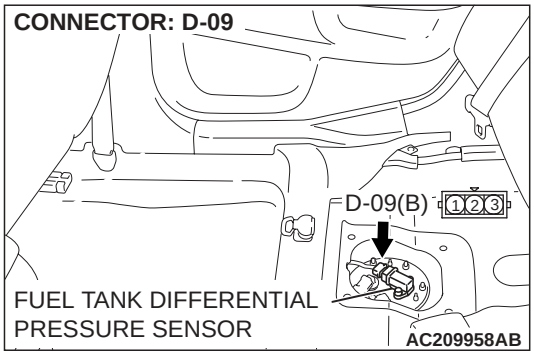
CONNECTORS: C-115, C-117

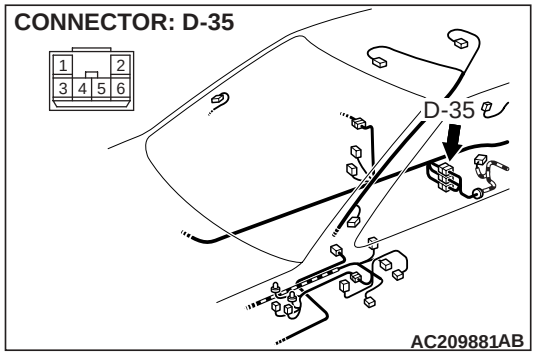


CONNECTOR: C-122



CONNECTOR: D-09





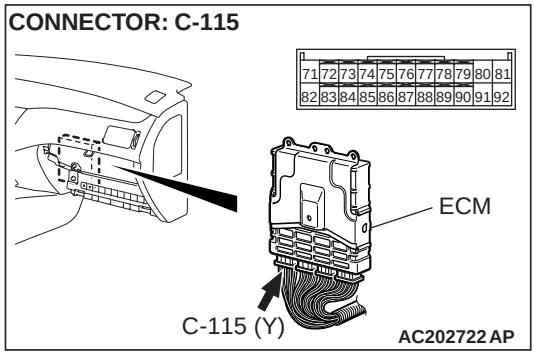
Q: Are the connectors and terminals in good condition?

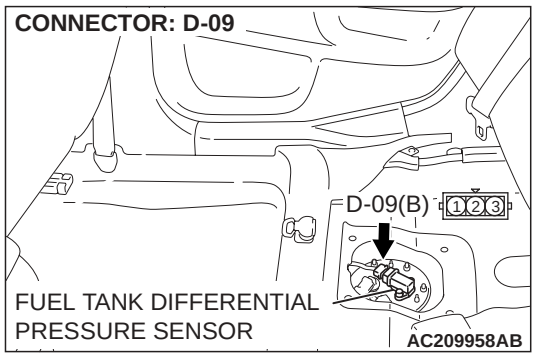
YES : Go to Step 10.

NO : Repair or replace the damage components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.

STEP 10. Check the harness wire between ECM connector C-115 terminal 92 and fuel tank differential pressure sensor connector D-09 terminal 2 for damage.

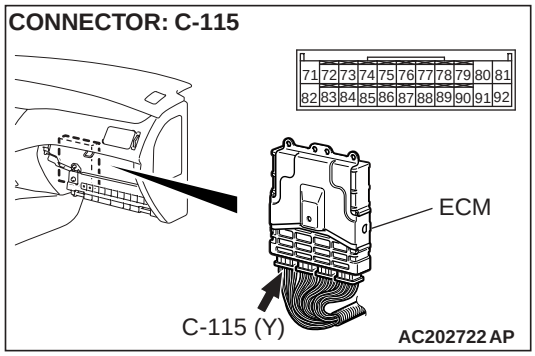
Q: Is the harness wire in good condition?

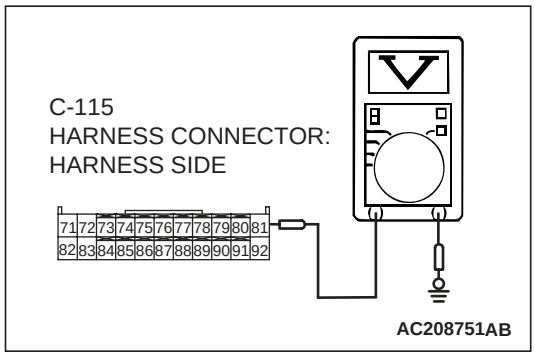




YES : Replace the fuel tank differential pressure sensor. Go to Step 15.

NO : Repair or replace the harness wire. Go to Step 15.





STEP 11. Measure the 5-volts reference signal at ECM connector C-115 by backprobing.

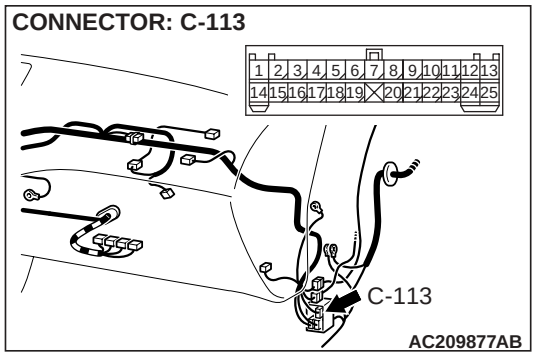
(1) Turn the ignition switch to the "ON" position.
(2) Measure the voltage between connector C-115 terminal 81 and ground by backprobing.
- The measured voltage should measure between 4.9 and 5.1 volts.

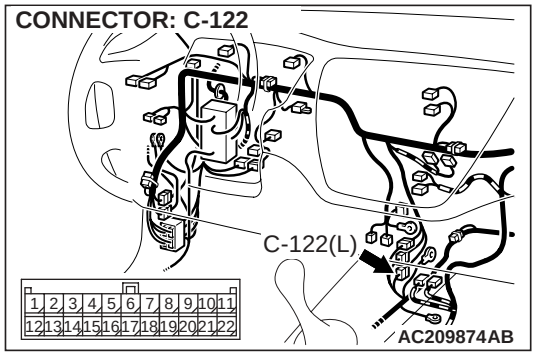
(3) Turn the ignition switch to the "LOCK" (OFF) position.

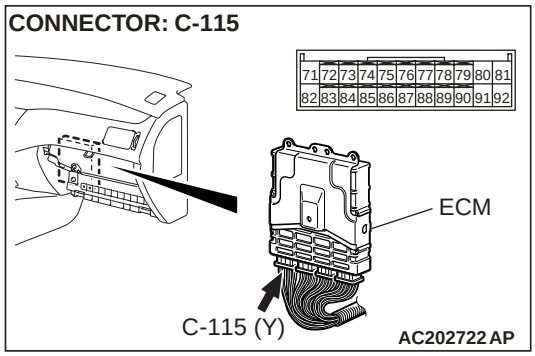
Q: Is the measured voltage between 4.9 and 5.1 volts?

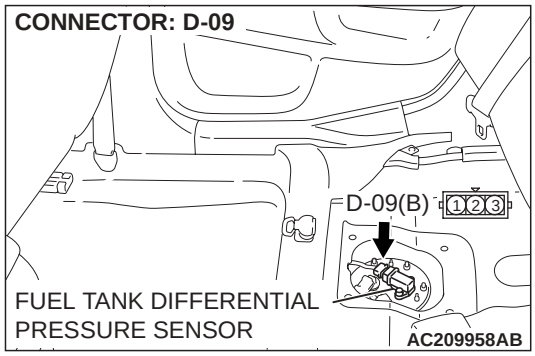
YES : Go to Step 12.
NO : Go to Step 14.

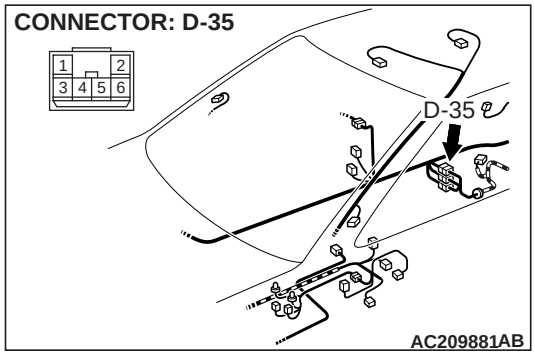
STEP 12. Check intermediate connectors C-113, C-122 and D-35, and ECM connector C-115 and fuel tank differential pressure sensor connector for D-09 loose, corroded or damaged terminals, or terminals pushed back in the connector.











Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

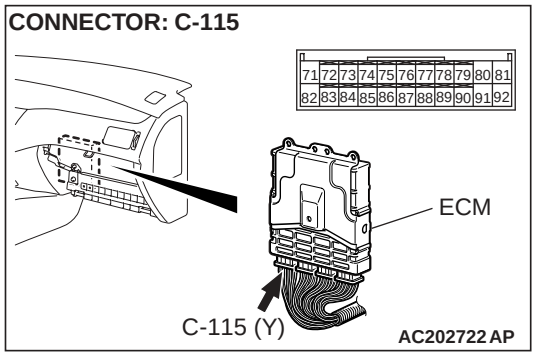
NO : Repair or replace the faulty component. Go to Step 15.

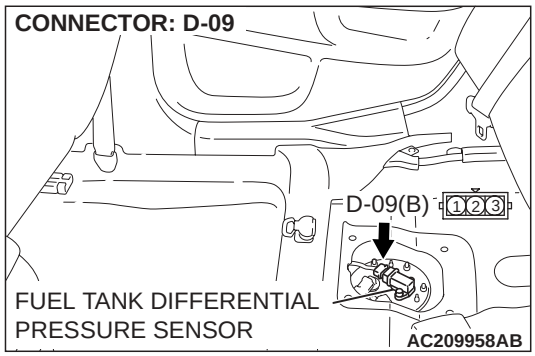
STEP 13. Check the harness wire between ECM connector C-115 terminal 81 and fuel tank differential pressure sensor connector D-09 terminal 3 for damage.

Q: Is the harness wire in good condition?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with intermittent Malfunction P.00-6. Go to Step 15.

NO : Repair or replace the harness wire. Go to Step 15.



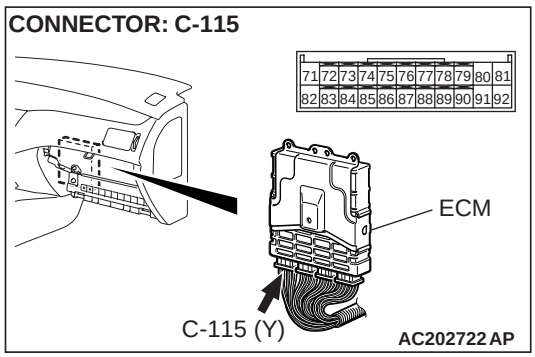


STEP 14. Check ECM connector C-115 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Replace the ECM. Go to Step 15.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Go to Step 15.



STEP 15. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission System Leak Monitor P.13A-6.

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

Q: Is DTC P0452 set?

YES : Go to Step 2.

NO : The procedure is complete.