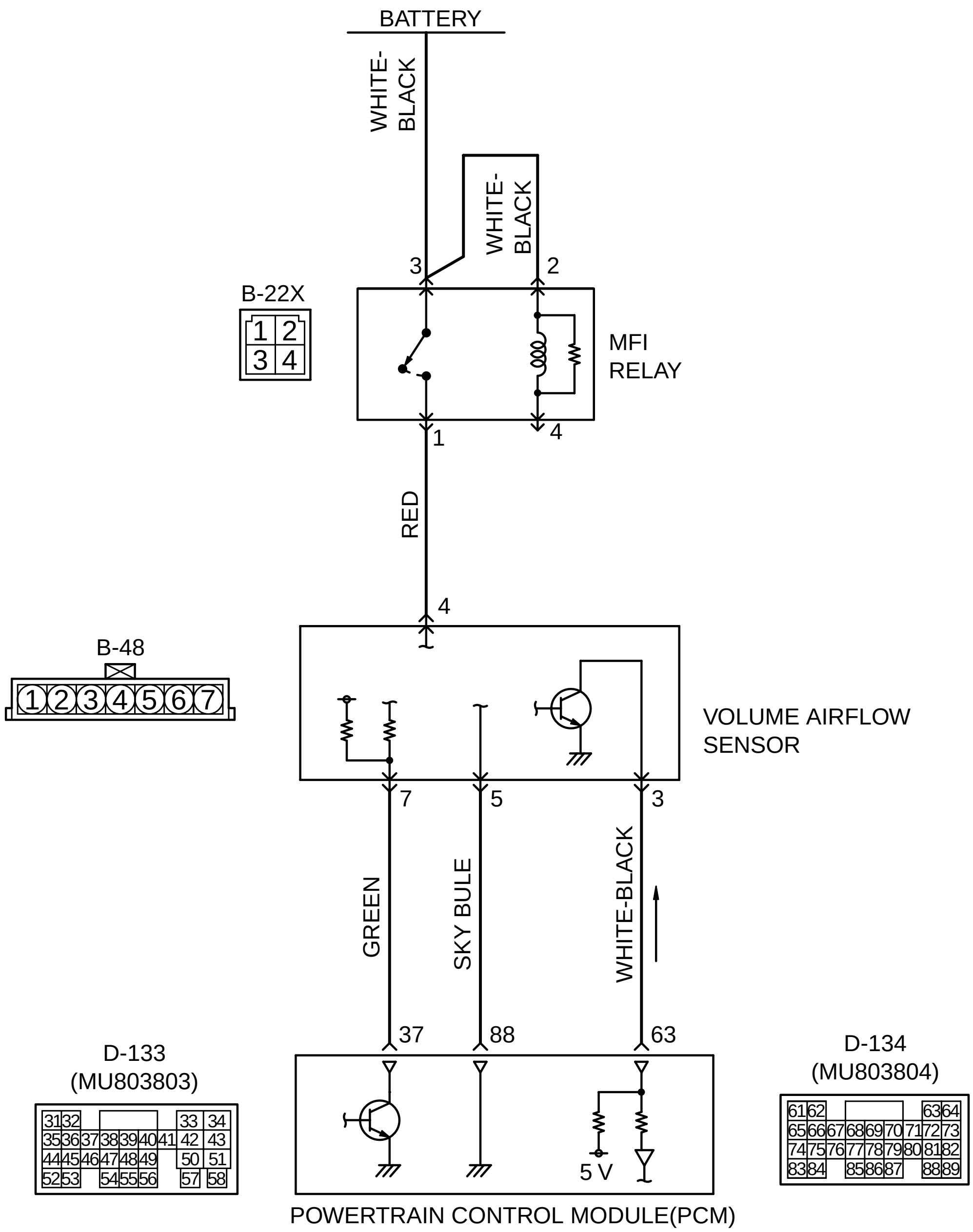
GROUP 13Ac

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P0101: Volume Airflow Circuit Range/Performance Ploblem

Volume Airflow Sensor Circuit



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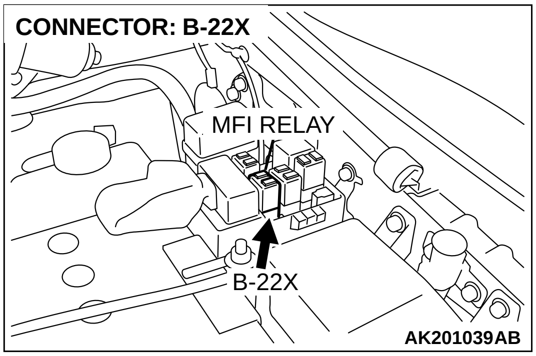
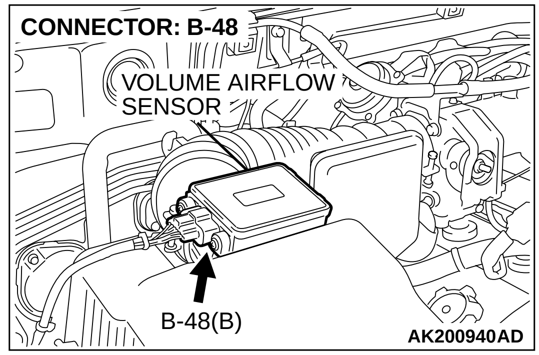
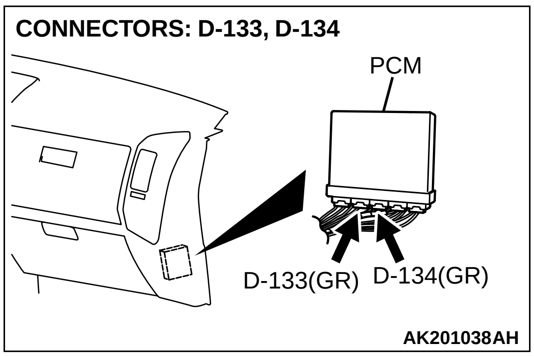






CIRCUIT OPERATION

- The volume airflow sensor power is supplied from the MFI relay (terminal No. 1), and the ground is provided on the PCM (terminal No. 88).
- 5-volt power is applied to the volume airflow sensor output terminal (terminal No. 3) from the PCM (terminal No. 63). The volume airflow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

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

Check Conditions

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

Judgement Criteria

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

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

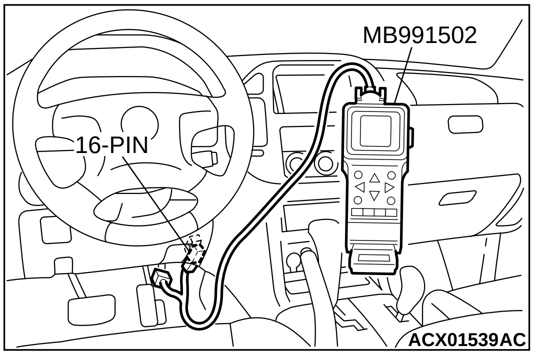
- Volume airflow sensor failed.
- Open or shorted volume airflow sensor circuit, or loose connector.
- PCM failed.
- Air leak between volume airflow sensor and throttle body.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

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



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - The standard value during idling should be 10 Hz or more.
  - When the engine is revved, the frequency should increase according to the increase in engine speed.

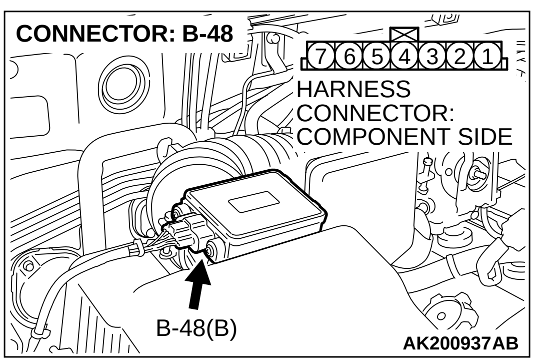
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

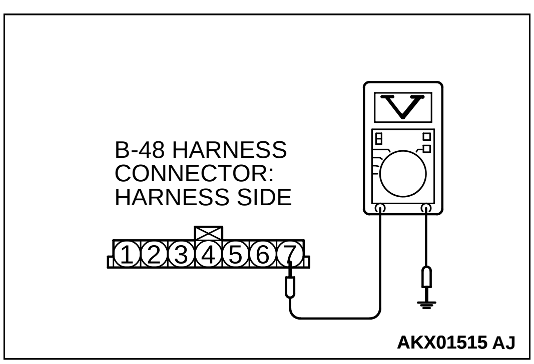
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the reset signal voltage at volume airflow sensor connector B-48 by backprobing.



(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.



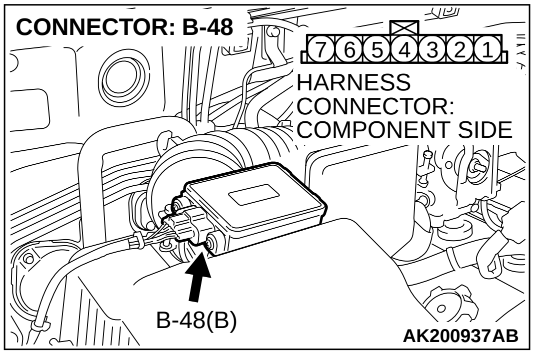
(3) Measure the voltage between terminal No. 7 and ground by backprobing.
  - Voltage should be between 6.0 and 9.0 volts.

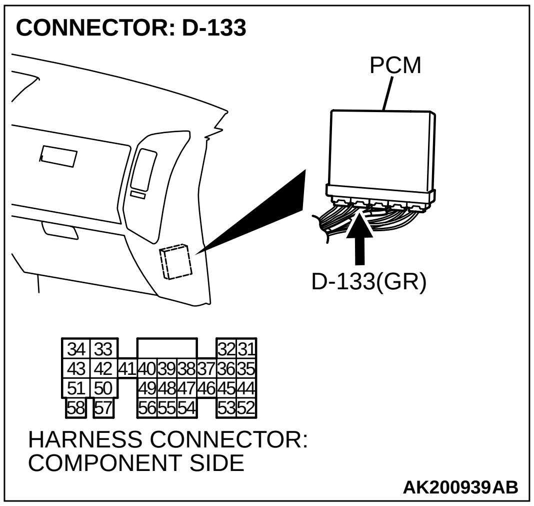
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 6.0 and 9.0 volts?

YES : Go to Step 5.

NO : Go to Step 3.



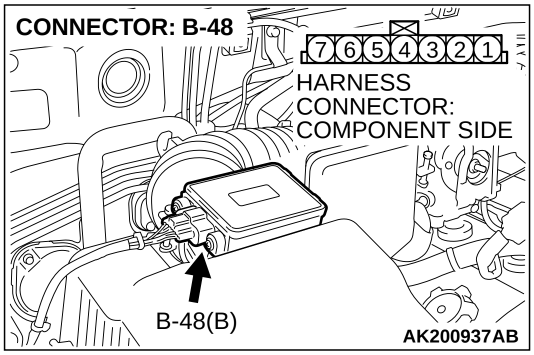


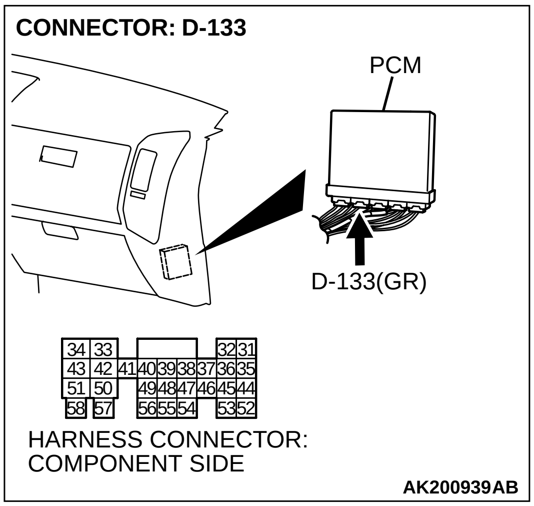
STEP 3. Check connector B-48 at volume airflow sensor and connector D-133 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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



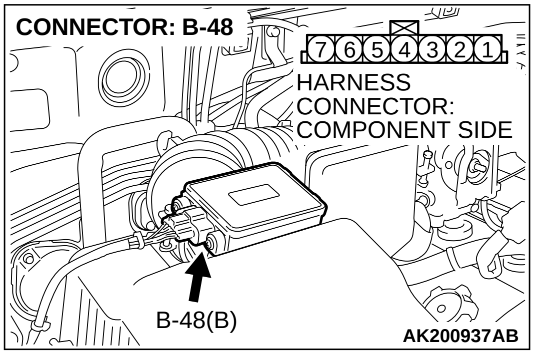


STEP 4. Check for short circuit to ground between volume airflow sensor connector B-48 (terminal No. 7) and PCM connector D-133 (terminal No. 37).

Q: Is the harness wire in good condition?

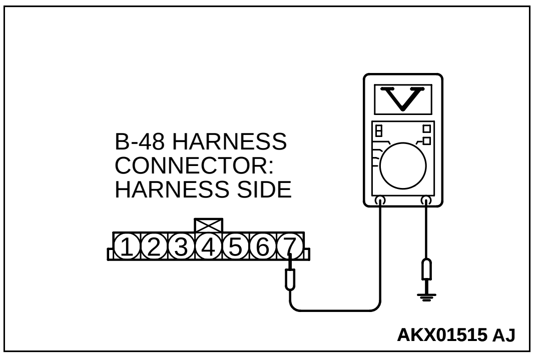
YES : Replace the volume airflow sensor. Then go to Step 9.

NO : Repair it. Then go to Step 9.



STEP 5. Measure the reset signal voltage at volume airflow sensor connector B-48 by backprobing.

(1) Do not disconnect the connector B-48.
(2) Start the engine and run at idle.

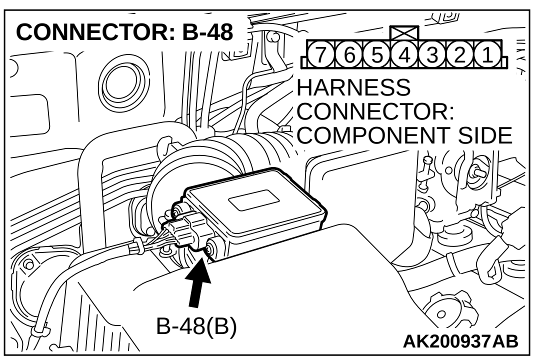


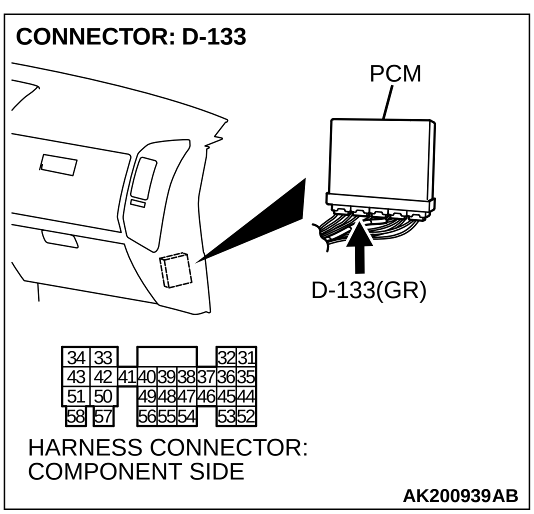
(3) Measure the voltage between terminal No. 7 and ground by backprobing.
- When the engine idling, voltage should be 1.0 volt or less.
- When the engine speed is 3,000 r/min, voltage should be between 6.0 and 9.0 volts.

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

Q: Is the voltage normal?

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

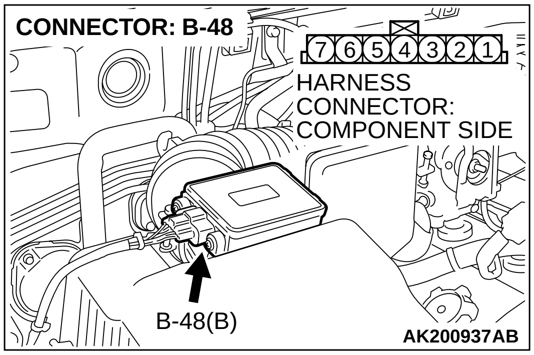


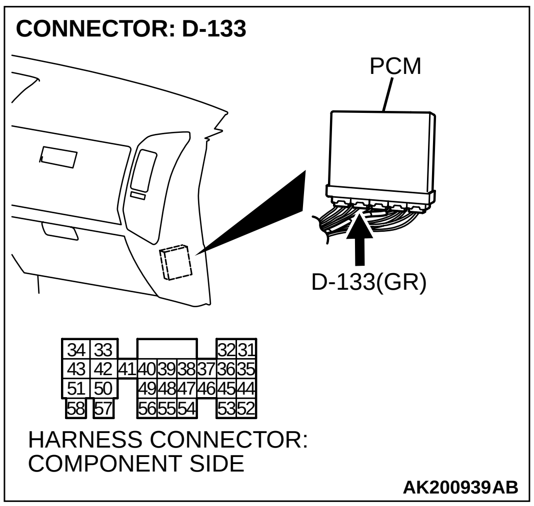


STEP 6. Check connector B-48 at volume airflow sensor and connector D-133 at PCM for damage.

Q: Is the connector in good condition?

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

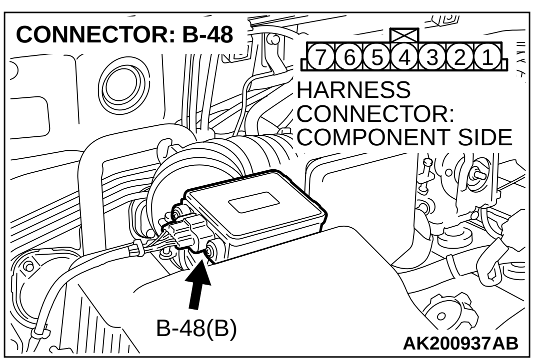




STEP 7. Check for open circuit and harness damage between volume airflow sensor connector B-48 (terminal No. 7) and PCM connector D-133 (terminal No. 37).

Q: Is the harness wire in good condition?

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



STEP 8. Replace the volume airflow sensor.

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

Q: Is DTC P0101 set?

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

STEP 9. Test the OBD-II drive cycle.

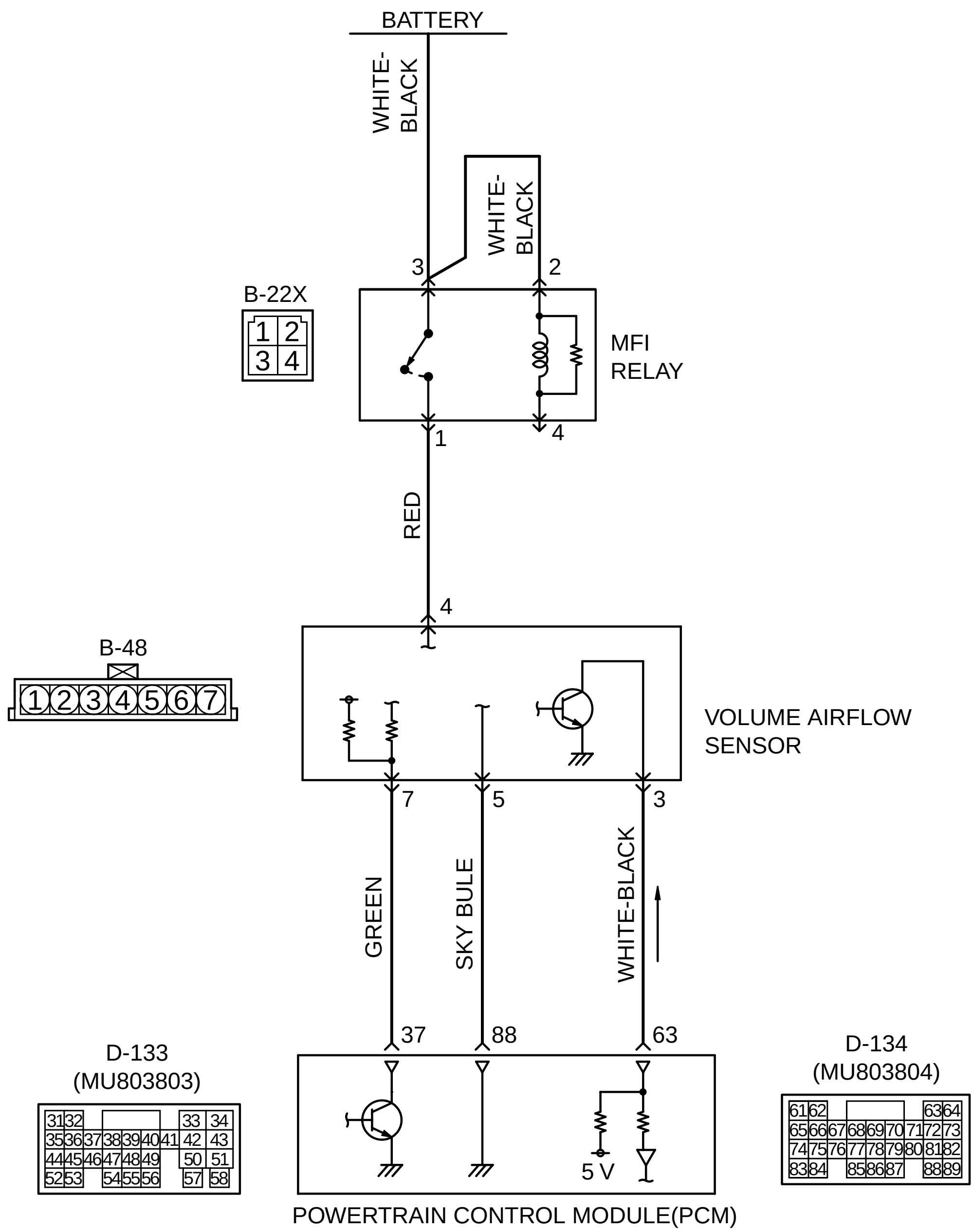
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0101 set?

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

DTC P0102: Volume Airflow Circuit Low Input

Volume Airflow Sensor Circuit



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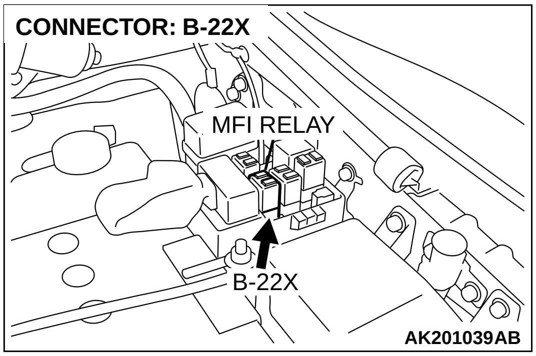
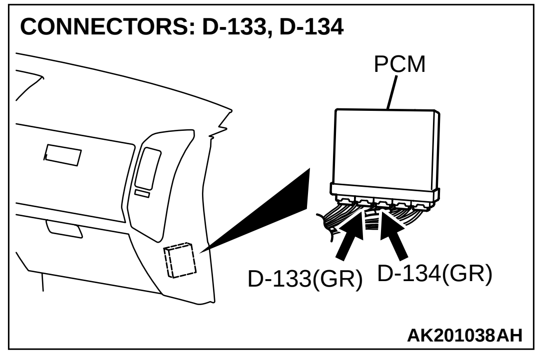
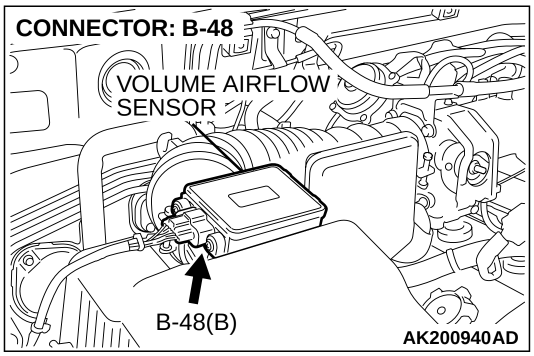






CIRCUIT OPERATION

- The volume airflow sensor power is supplied from the MFI relay (terminal No. 1), and the ground is provided on the PCM (terminal No. 88).
- 5-volt power is applied to the volume airflow sensor output terminal (terminal No. 3) from the PCM (terminal No. 63). The volume airflow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 500 r/min.

Judgement Criteria

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

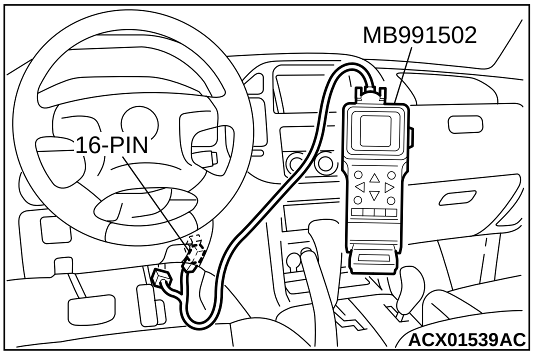
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

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

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



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

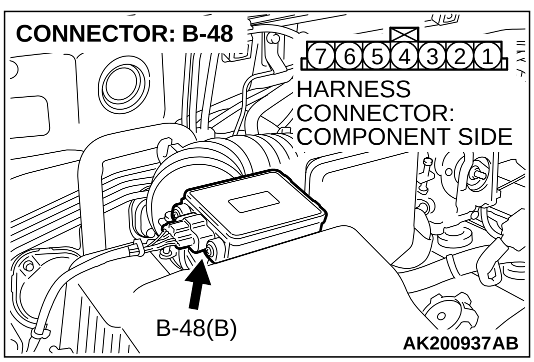
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- The standard value during idling should be 10 Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

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

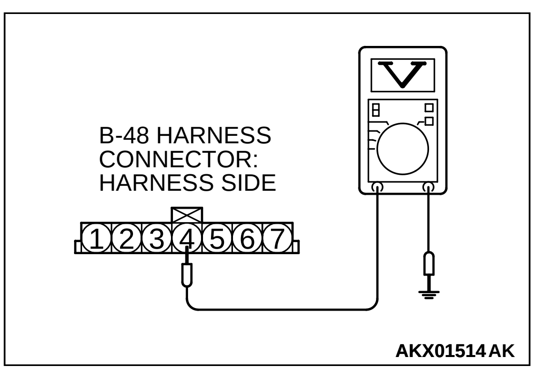
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Measure the power supply voltage at volume airflow sensor connector B-48 by backprobing.



(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.

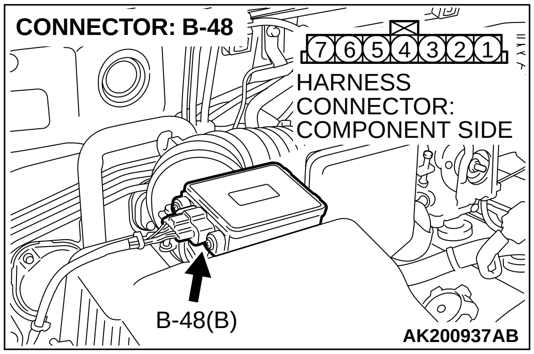


(3) Measure the voltage between terminal No.4 and ground by backprobing.
- Voltage should be battery positive voltage.

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

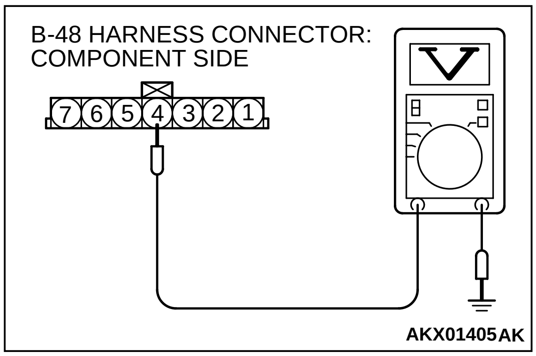
Q: Is battery positive voltage (approximately 12 volts) present?

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



STEP 3. Measure the power supply voltage at volume airflow sensor harness side connector B-48.

(1) Disconnect the connector B-48 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

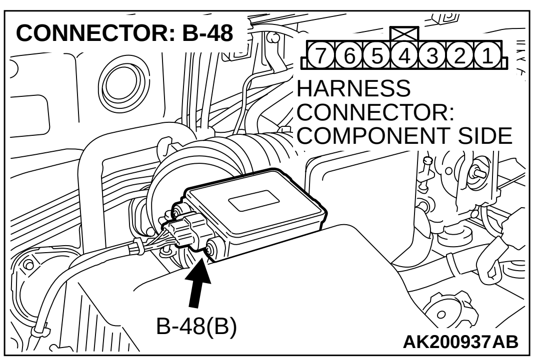


(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

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

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

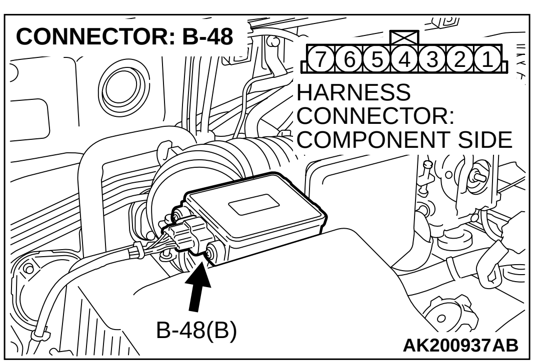
YES : Go to Step 4.
NO : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and volume airflow sensor connector B-48 (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 13.



STEP 4. Check connector B-48 at the volume airflow sensor for damage.

Q: Is the connector in good condition?

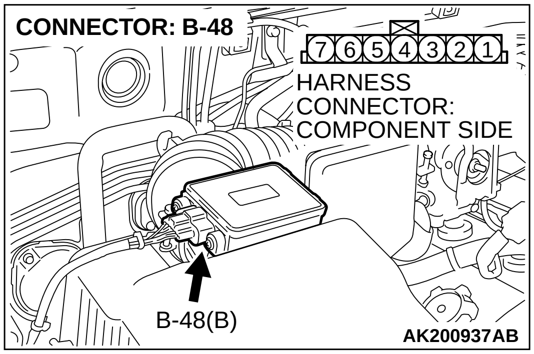
YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and volume airflow sensor connector B-48 (terminal No. 4) because of harness damage. Then go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 5. Check connector B-48 at volume airflow sensor for damage.

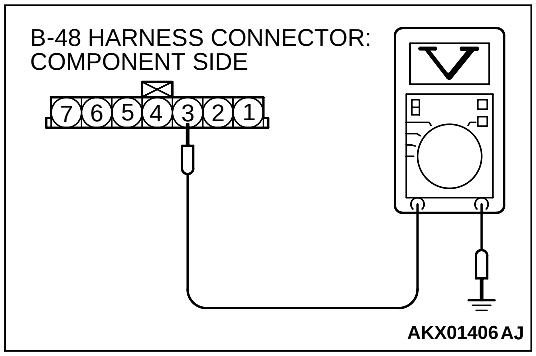
Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 6. Measure the sensor supply voltage at volume airflow sensor harness side connector B-48.

(1) Disconnect the connector B-48 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 be between 4.8 and 5.2 volts.

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

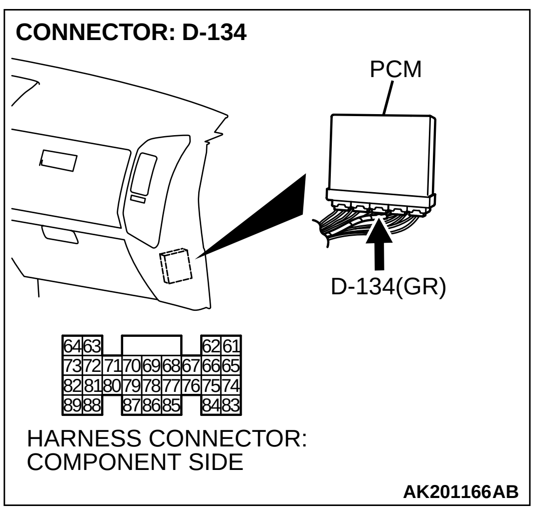
Q: Is the measured voltage between 4.8 and 5.2 volts?

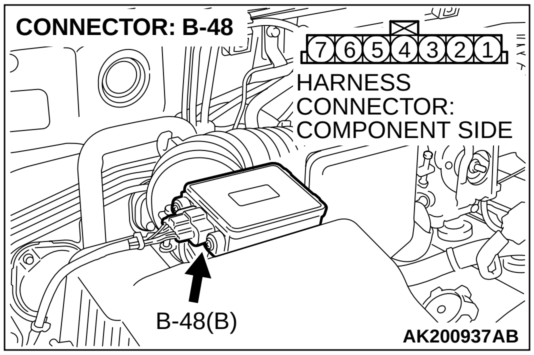
YES : Go to Step 9.
NO : Go to Step 7.

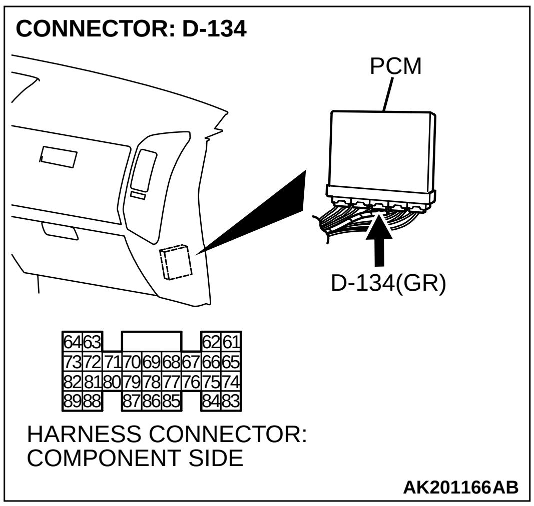
STEP 7. Check connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.







STEP 8. Check for short circuit to ground between volume airflow sensor connector B-48 (terminal No. 3) and PCM connector D-134 (terminal No. 63).

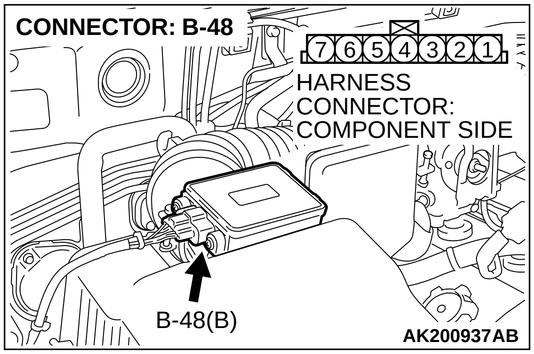
Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 13.

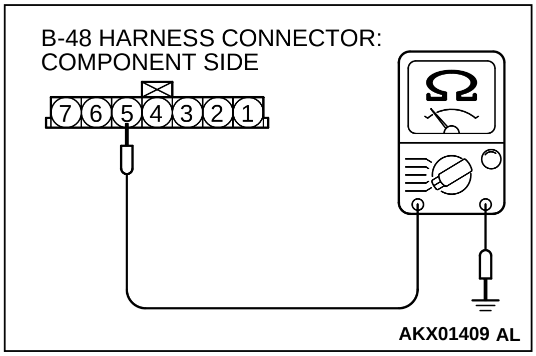
STEP 9. Check the continuity at volume airflow sensor harness side connector B-48.

(1) Disconnect the connector B-48 and measure at the harness side.



(2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.



Q: Is the continuity normal?

YES : Go to Step 12.

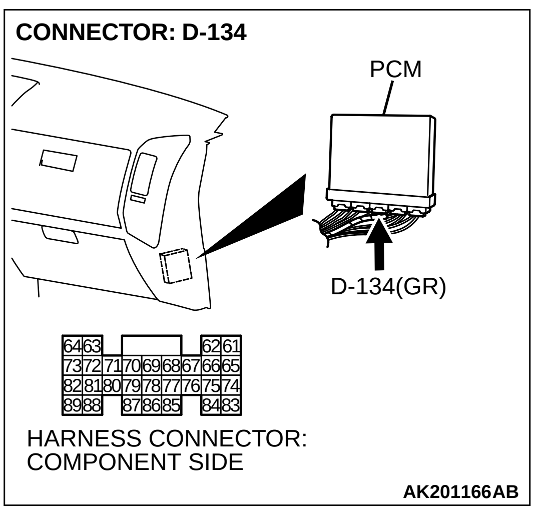
NO : Go to Step 10.

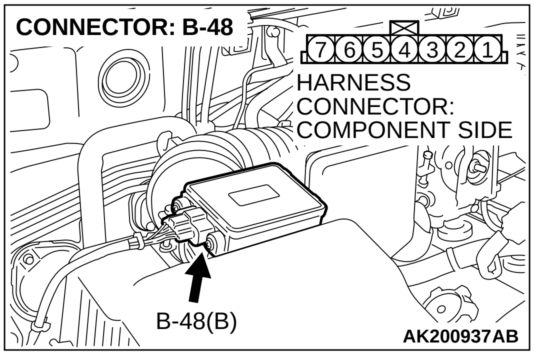
STEP 10. Check connector D-134 at PCM for damage.

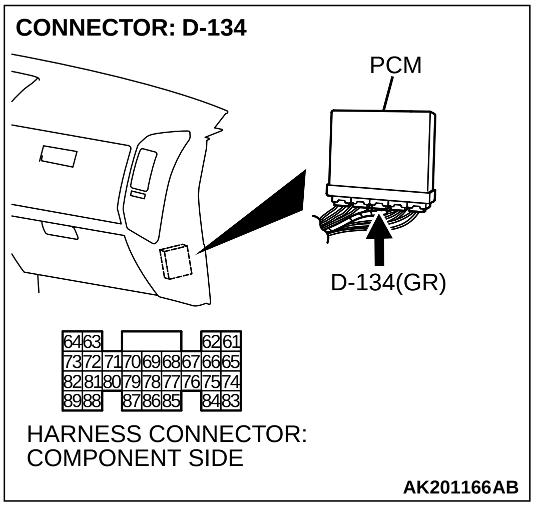
Q: Is the connector in good condition?

YES : Go to Step 11.

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





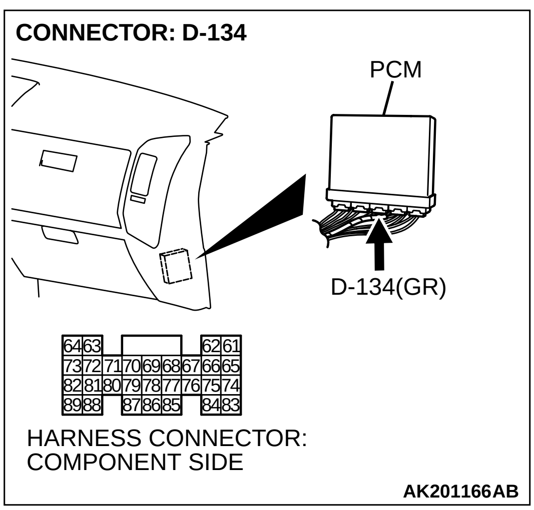


STEP 11. Check for open circuit and harness damage between volume airflow sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 13.



STEP 12. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

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

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

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

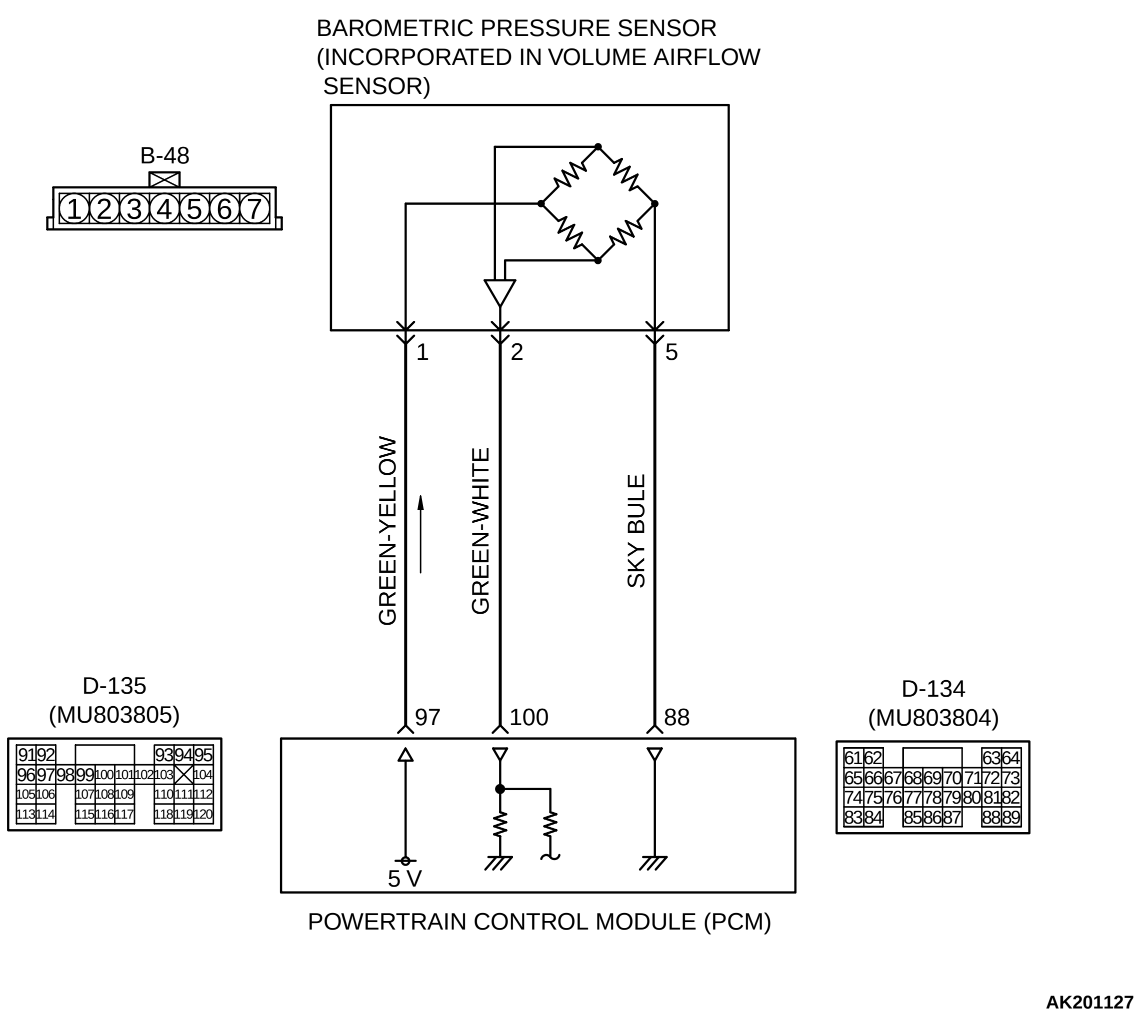
Q: Is DTC P0102 set?

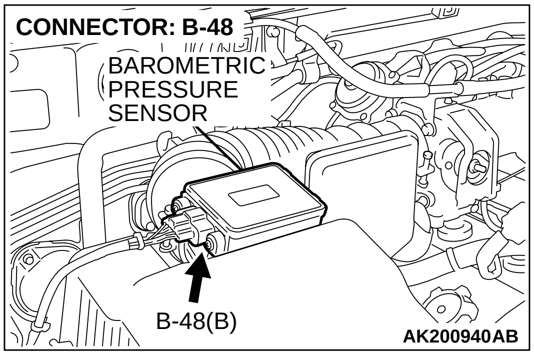
YES : Retry the troubleshooting.

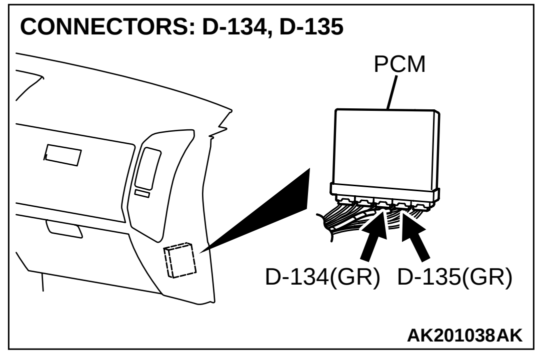
NO : The inspection is complete.

DTC P0106: Barometric Pressure Circuit Range/Performance Problem

Barometric Pressure Sensor Circuit







CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the PCM (terminal No. 97). The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- A voltage that is proportional to the atmospheric pressure is sent to the PCM (terminal No. 100) from the barometric pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Barometric pressure is lower than 76 kPa (11 psi).

Judgement Criteria

- During 15 times of driving, the changes in the sensor output voltage should be 0.015 volt [equivalent to 0.4 kPa (0.06 psi)] or less.
- Make sure that the engine coolant temperature is 72°C (160°F) or higher during each of the 15 times of driving. Also, during each of the 15 times of driving, make sure that after the engine has been started, the engine coolant temperature has increased for 23°C (40°F) or higher.

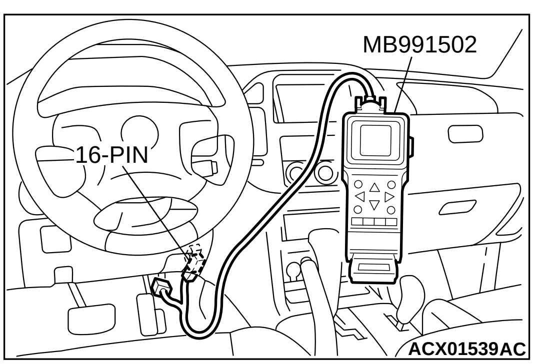
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

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

Q: Is DTC P0107 set?

YES : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input P.13Ac-22.

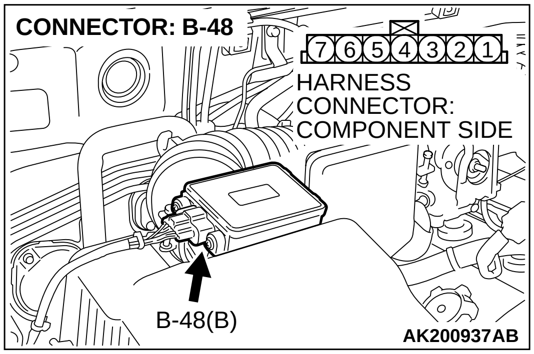
NO : Go to Step 2.

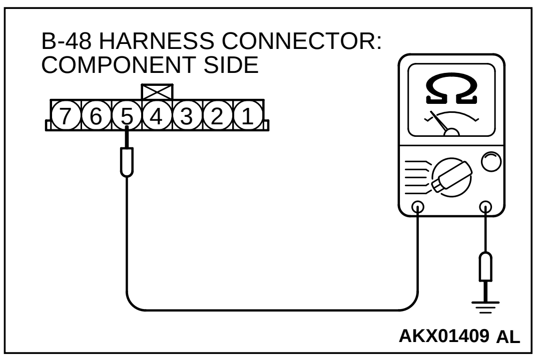
STEP 2. Check connector B-48 at the barometric pressure sensor for damage.

Q: Is the connector in good condition?

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

STEP 3. Check the continuity at barometric pressure sensor harness side connector B-48.





(1) Disconnect the connector B-48 and measure at the harness side.
(2) Check for the continuity between terminal No. 5 and ground.
- Should be less than 2 ohms.

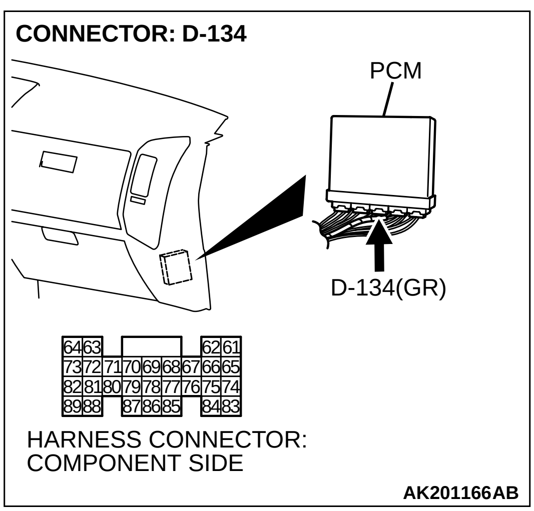
Q: Is the continuity normal?

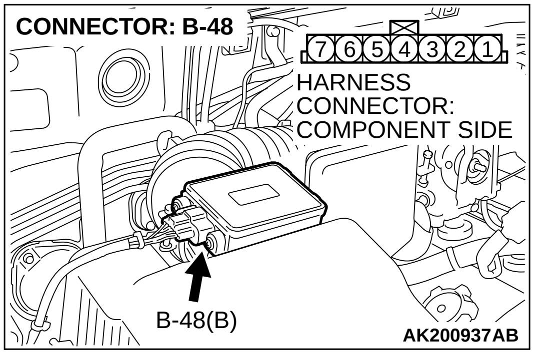
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



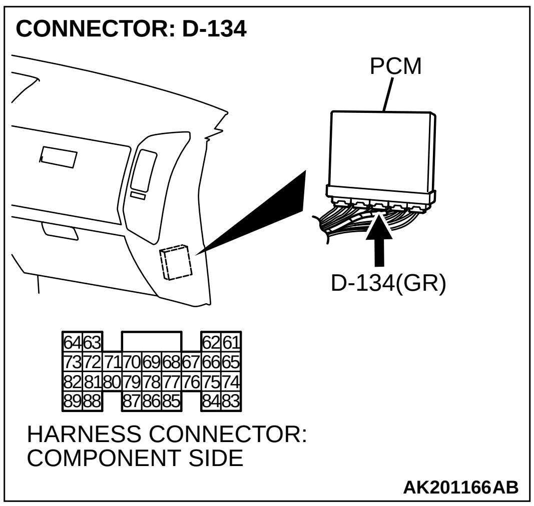


STEP 5. Check for open circuit and harness damage between barometric pressure sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 9

NO : Repair it. Then go to Step 9.

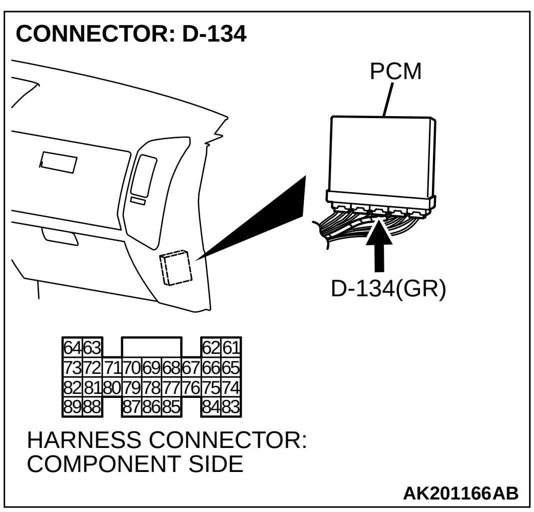


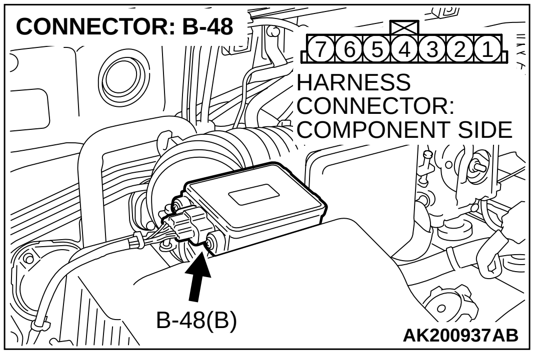
STEP 6. Check connector D-134 at PCM for damage.

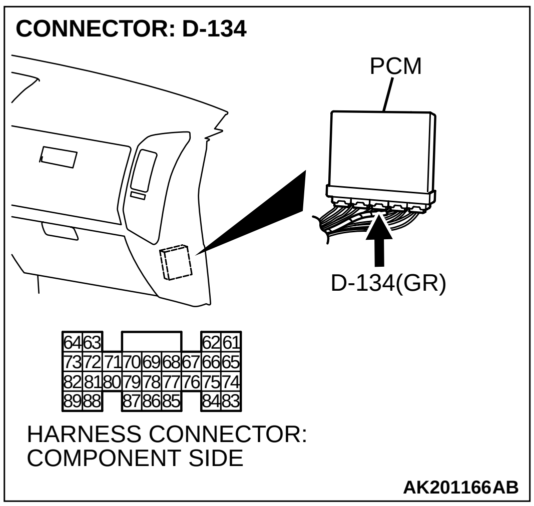
Q: Is the connector in good condition?

YES : Go to Step 7.

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



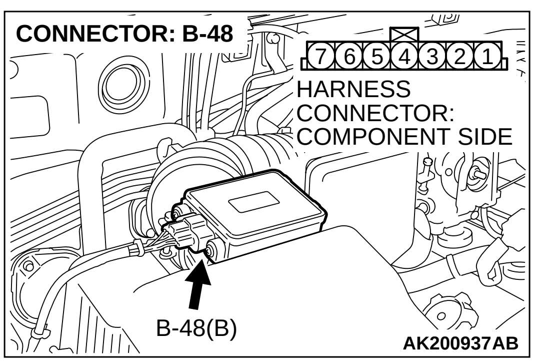




STEP 7. Check for open circuit and harness damage between barometric pressure sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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



STEP 8. Replace the barometric pressure sensor.

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

Q: Is DTC P0106 set?

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

STEP 9. Test the OBD-II drive cycle.

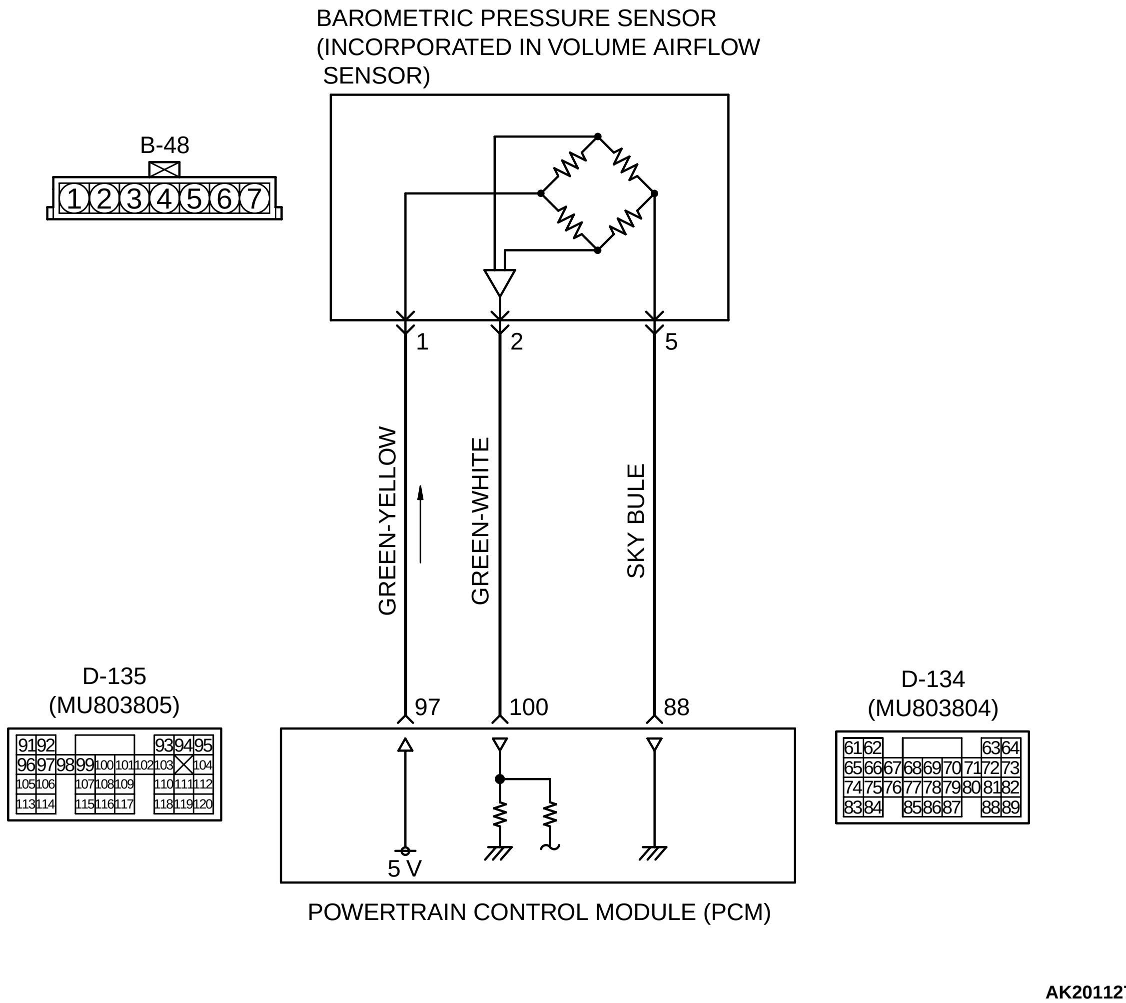
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

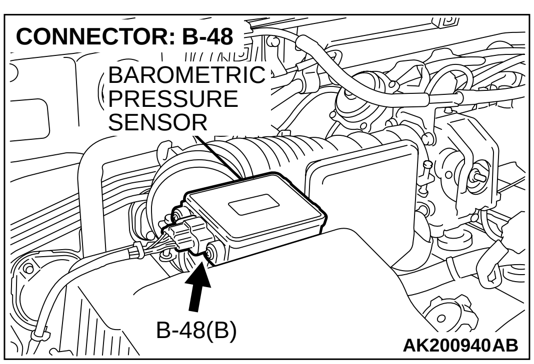
Q: Is DTC P0106 set?

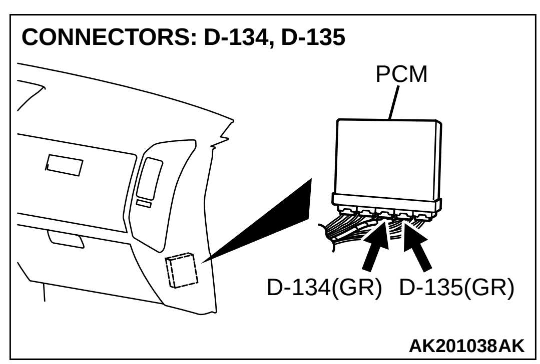
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0107: Barometric Pressure Circuit Low Input

Barometric Pressure Sensor Circuit







CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the PCM (terminal No. 97). The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- A voltage that is proportional to the atmospheric pressure is sent to the PCM (terminal No. 100) from the barometric pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- Barometric pressure sensor output signal has continued to be approximately 50 kPa (7.2 psi) or lower (approximately 15,000 ft above sea level) for 10 seconds.

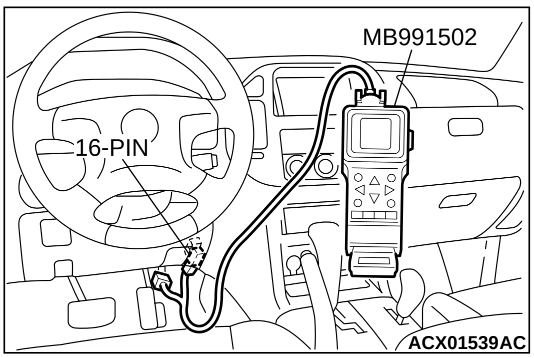
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

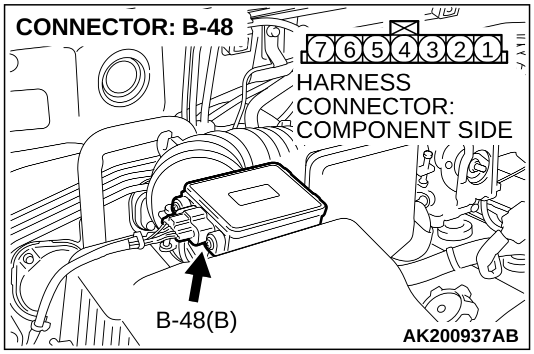
Q: Is the sensor operating properly?

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.

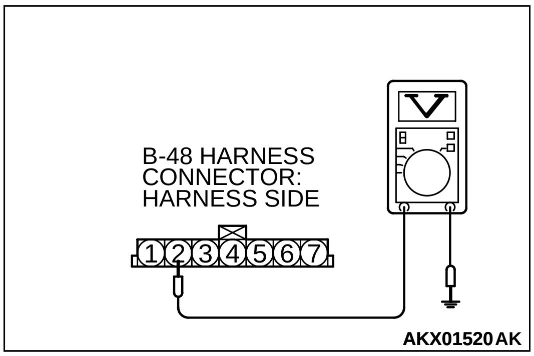
STEP 2. Measure the sensor output voltage at barometric pressure sensor connector B-48 by backprobing.

(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.



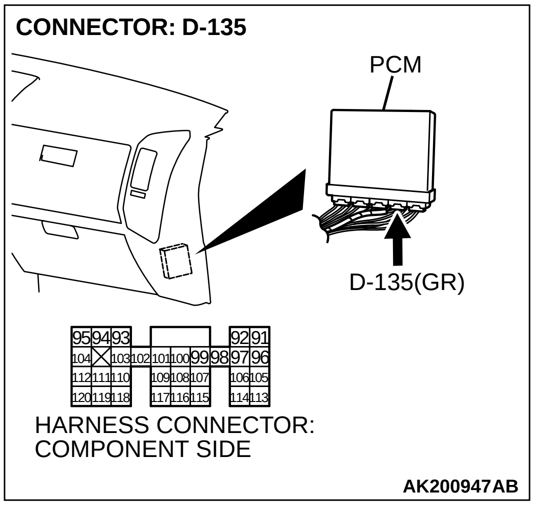
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

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



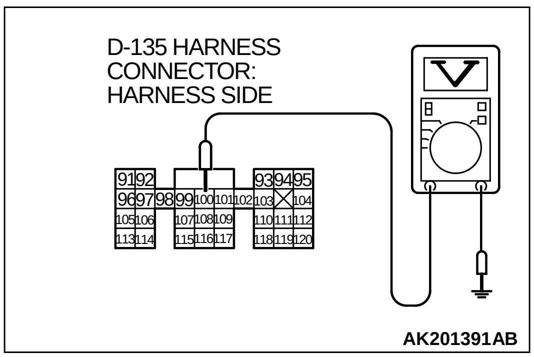
Q: Is the voltage normal?

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



STEP 3. Measure the sensor output voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect the connector D-135.
(2) Turn the ignition switch to the "ON" position.

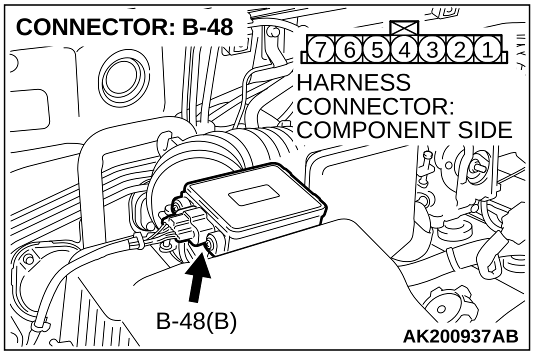


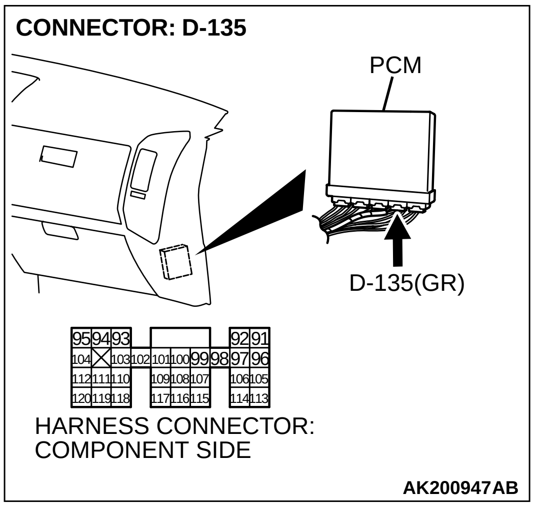
(3) Measure the voltage between terminal No. 100 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

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

Q: Is the voltage normal?

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



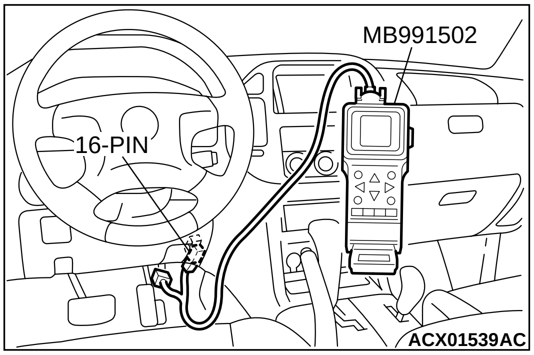


STEP 4. Check connector B-48 (terminal No. 2) at the barometric pressure sensor and connector D-135 (terminal No. 100) at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

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



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

⚠ CAUTION

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

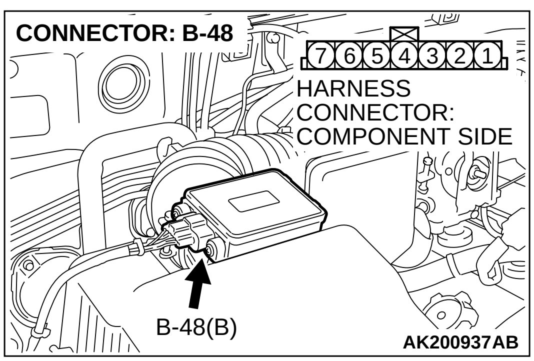
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa(23.9 in.Hg.).

(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 PCM. Then go to Step 18.

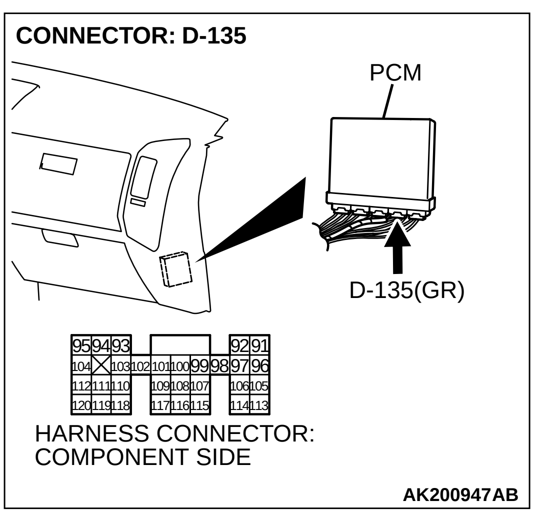


STEP 6. Check connector B-48 at the barometric pressure sensor and connector D-135 at PCM for damage.

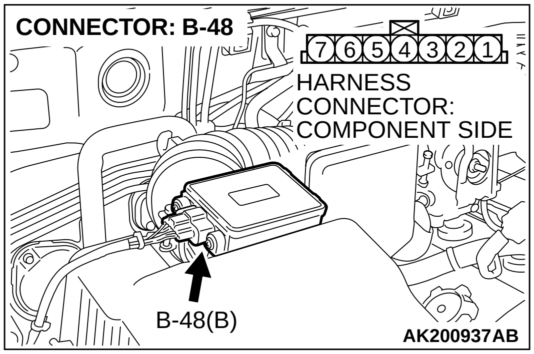
Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-48 (terminal No. 2) and PCM connector D-135 (terminal No. 100) because of open circuit or harness damage. Then go to Step 18.

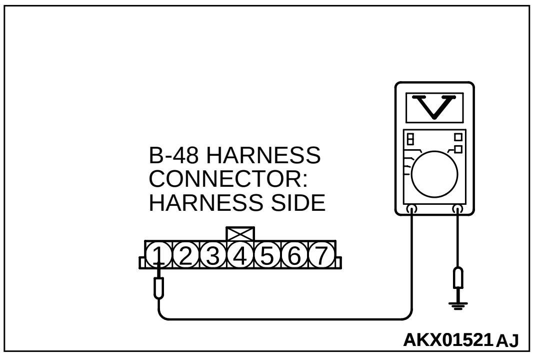
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



STEP 7. Measure the sensor supply voltage at barometric pressure sensor connector B-48 by backprobing.



(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.



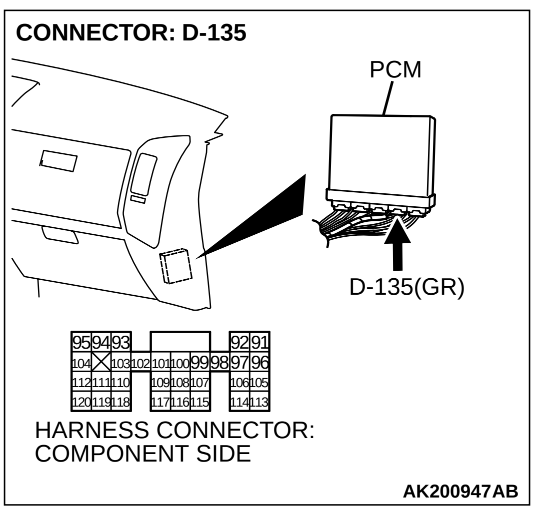
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

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

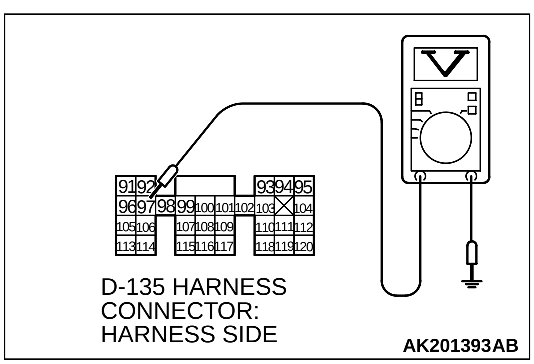
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 12.
NO : Go to Step 8.

STEP 8. Measure the sensor supply voltage at PCM connector D-135 by backprobing.



(1) Do not disconnect the connector D-135.
(2) Turn the ignition switch to the "ON" position.

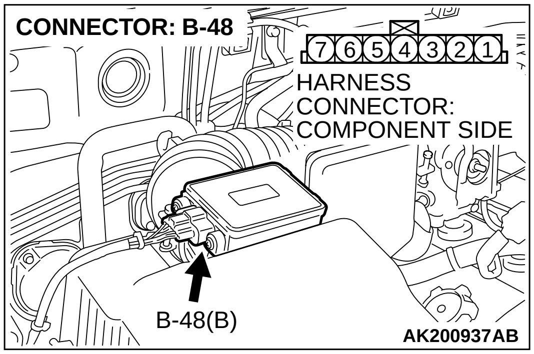


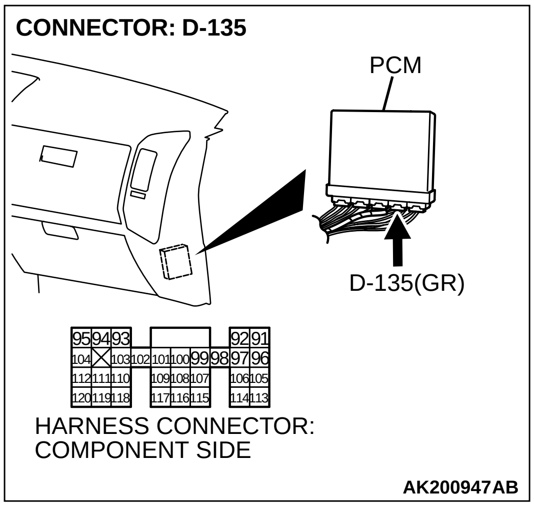
(3) Measure the voltage between terminal No. 97 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

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

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

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



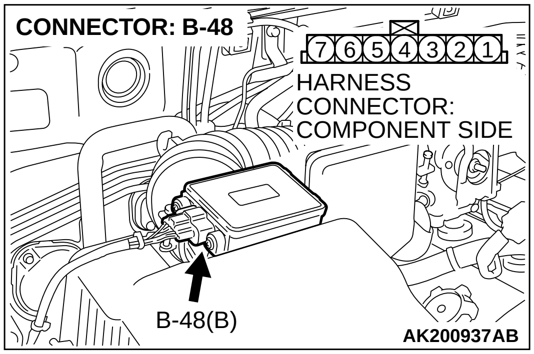


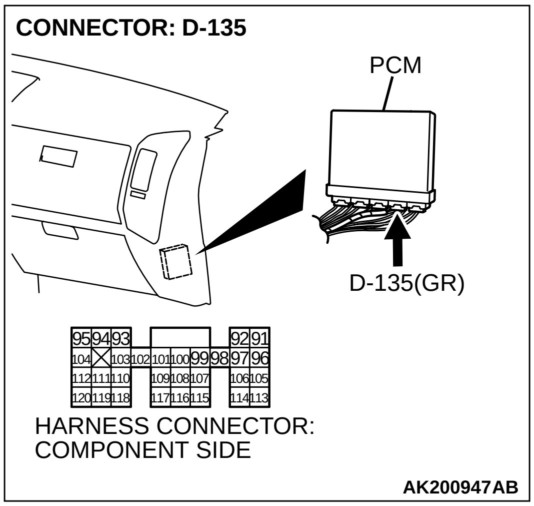
STEP 9. Check connector B-48 at the barometric pressure sensor and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-48 (terminal No. 1) and PCM connector D-135 (terminal No. 97) because of open circuit or harness damage. Then go to Step 18.

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



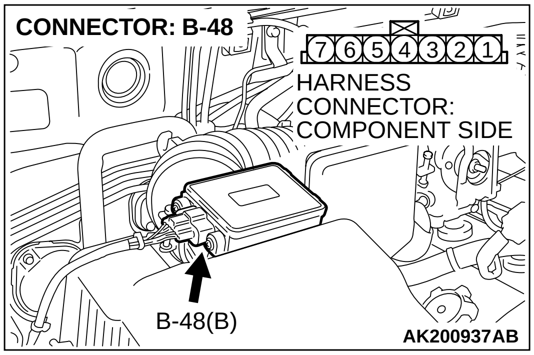


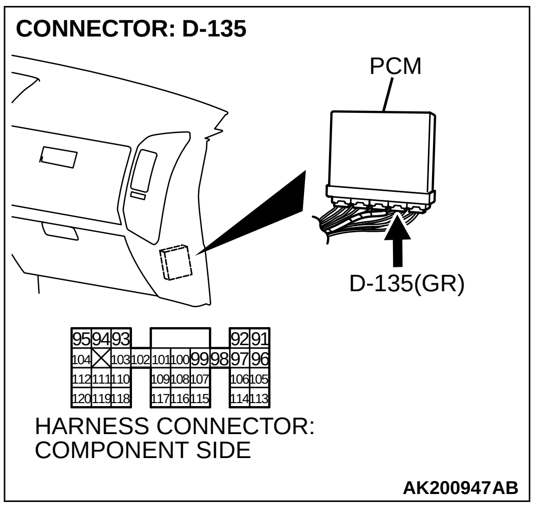
STEP 10. Check connector B-48 at the barometric pressure sensor and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

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



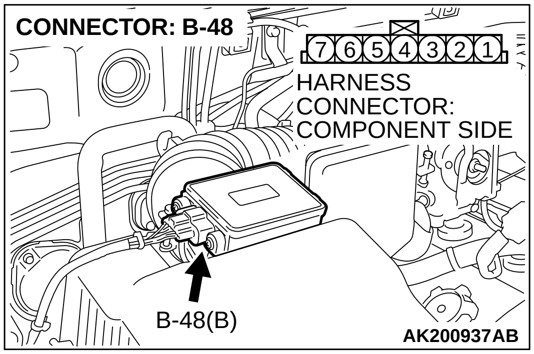


STEP 11. Check for short circuit to ground between barometric pressure sensor connector B-48 (terminal No. 1) and PCM connector D-135 (terminal No. 97).

Q: Is the harness wire in good condition?

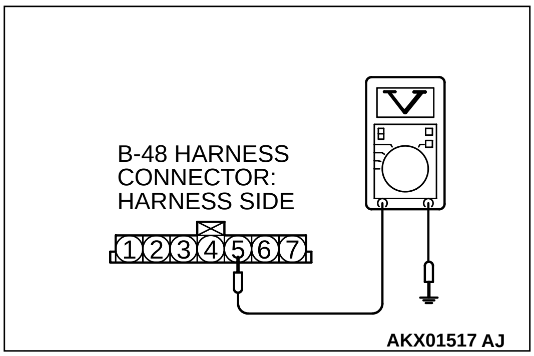
YES : Replace the PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.



STEP 12. Measure the ground voltage at barometric pressure sensor connector B-48 by backprobing.

(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.

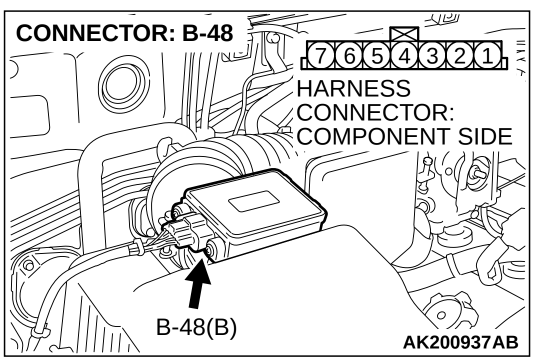


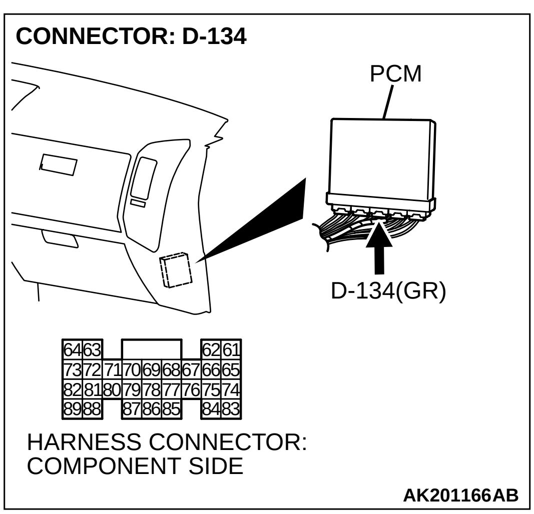
(3) Measure the voltage between terminal No. 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the voltage normal?

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

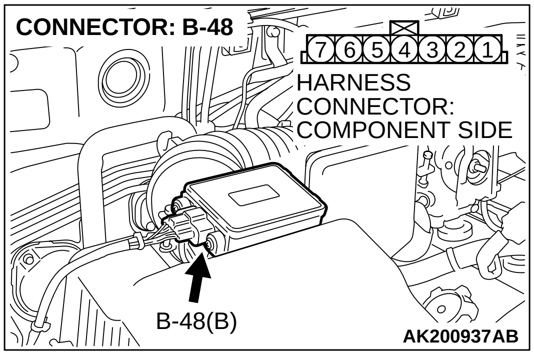




STEP 13. Check connector B-48 at the barometric pressure sensor and connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.

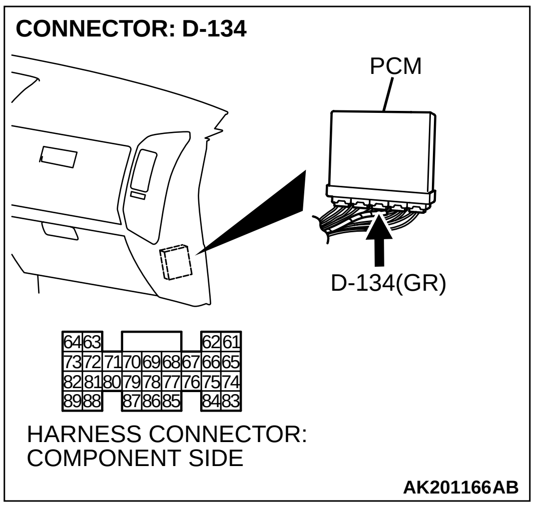


STEP 14. Check for harness damage between barometric pressure sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 18.

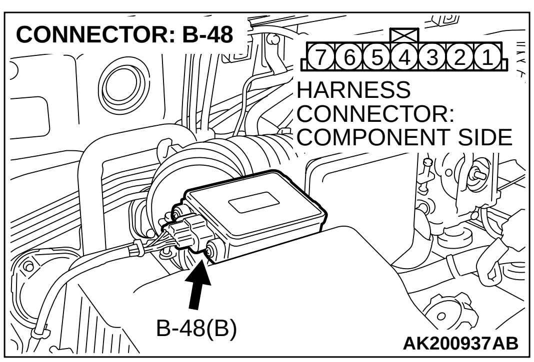


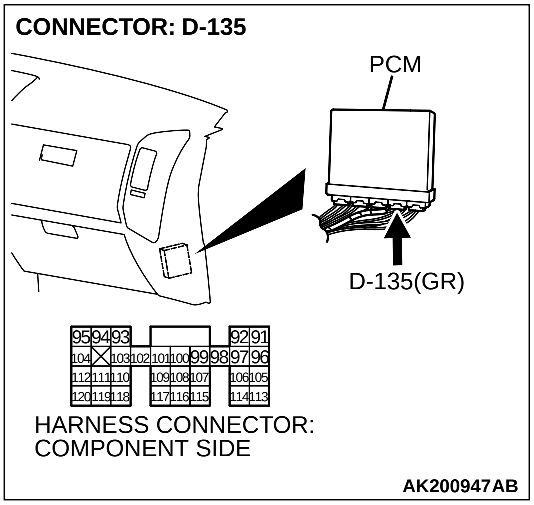
STEP 15. Check connector B-48 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

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



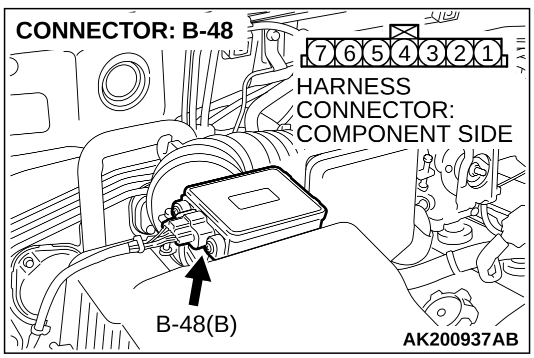


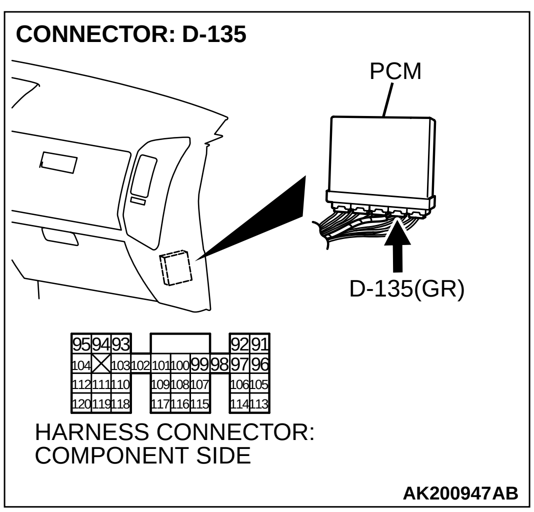
STEP 16. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

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





STEP 17. Check for short circuit to ground and harness damage between barometric pressure sensor connector B-48 (terminal No. 2) and PCM connector D-135 (terminal No. 100).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 18.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

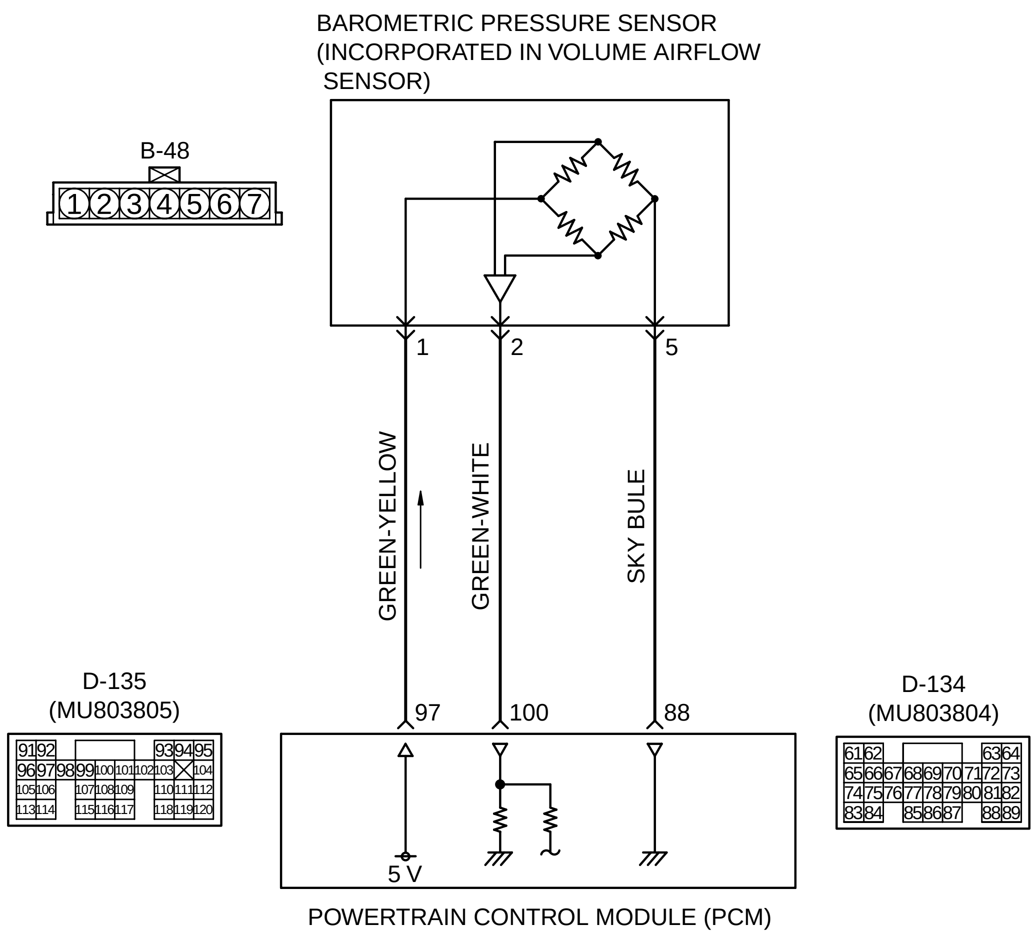
Q: Is DTC P0107 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0108: Barometric Pressure Circuit High Input

Barometric Pressure Sensor Circuit



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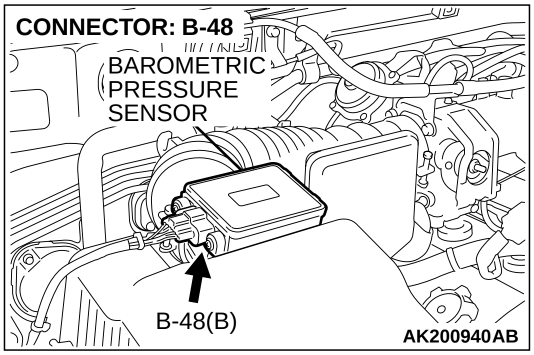
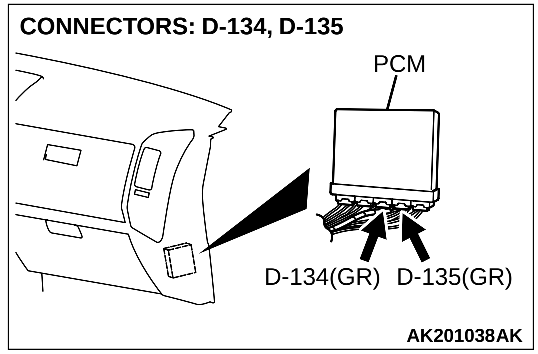




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the PCM (terminal No. 97). The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- A voltage that is proportional to the atmospheric pressure is sent to the PCM (terminal No. 100) from the barometric pressure sensor output terminal (terminal No. 2).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

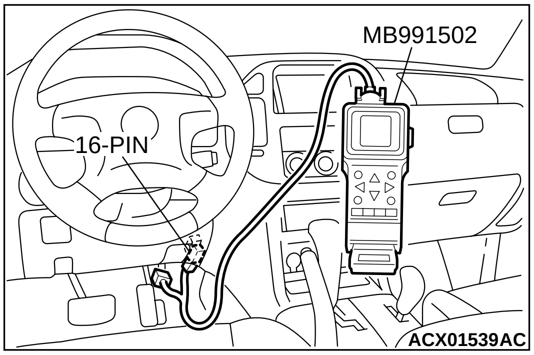
- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output signal has continued to be approximately 113 kPa (16 psi) or higher (approximately 4,000 ft below sea level) for 10 seconds.

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

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



DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

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

⚠ CAUTION

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

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

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

(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.

- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

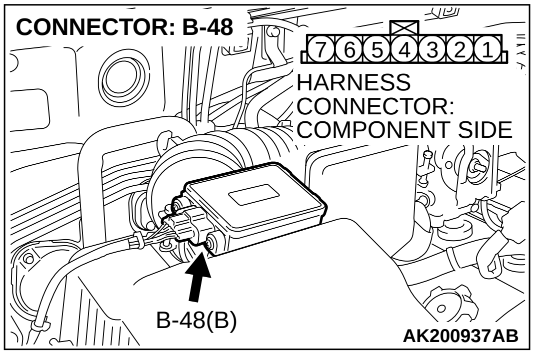
Q: Is the sensor operating properly?

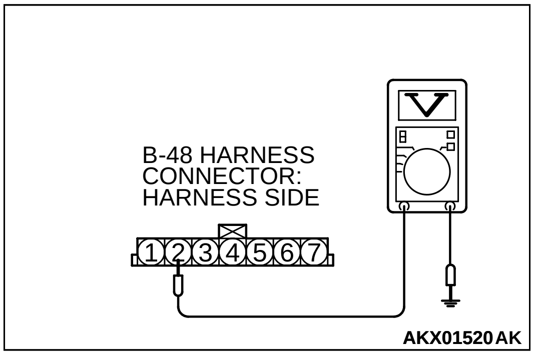
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at barometric pressure sensor connector B-48 by backprobing.

(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.



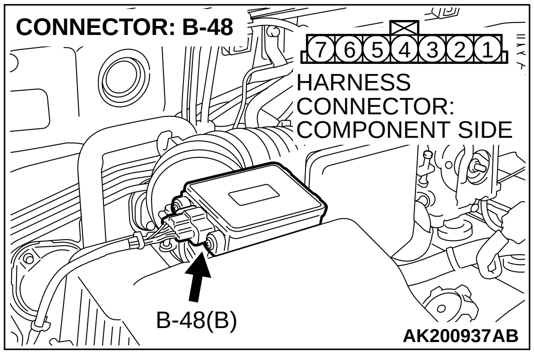


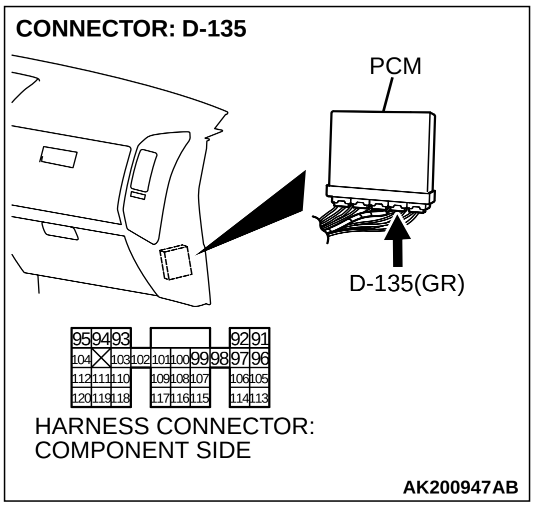
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

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

Q: Is the voltage normal?

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



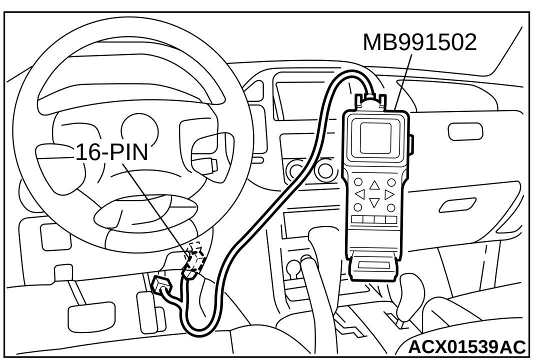


STEP 3. Check connector B-48 at the barometric pressure sensor and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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



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

⚠ CAUTION

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

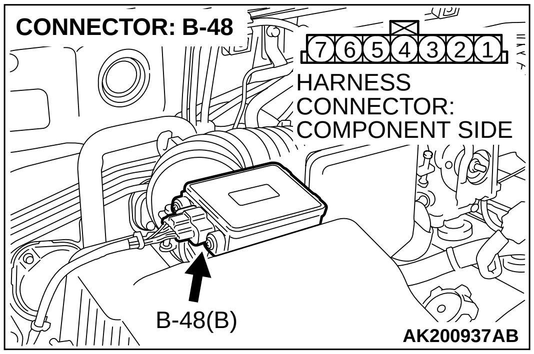
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

Q: Is the sensor operating properly?

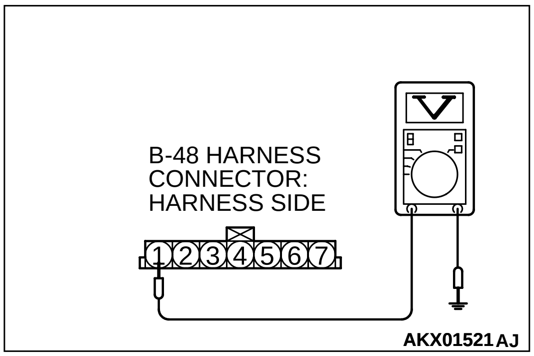
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

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



STEP 5. Measure the sensor supply voltage at barometric pressure sensor connector B-48 by backprobing.

(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.

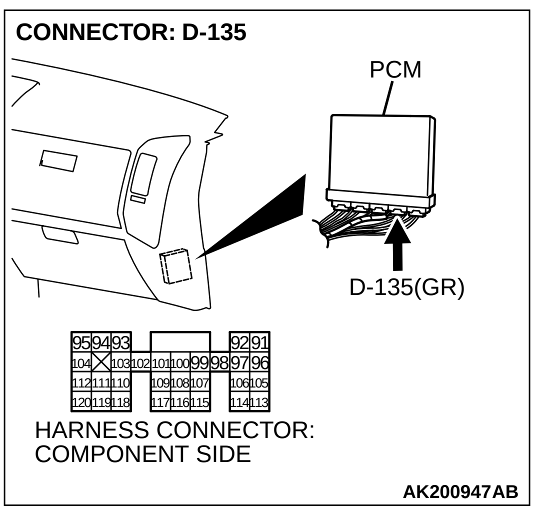


(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

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

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

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

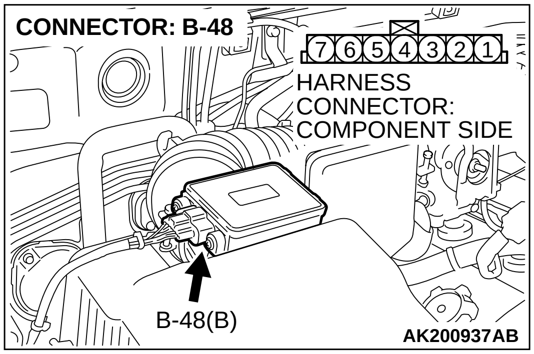


STEP 6. Check connector D-135 at PCM for damage.

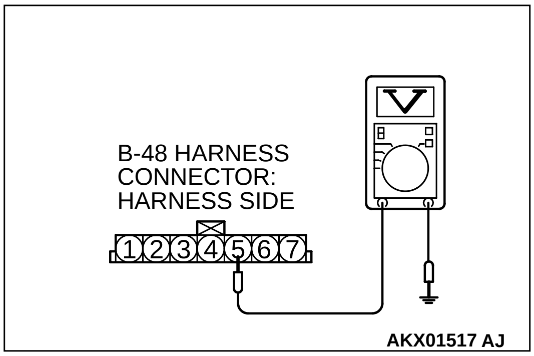
Q: Is the connector in good condition?

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

STEP 7. Measure the ground voltage at barometric pressure sensor connector B-48 by backprobing.



(1) Do not disconnect the connector B-48.
(2) Turn the ignition switch to the "ON" position.



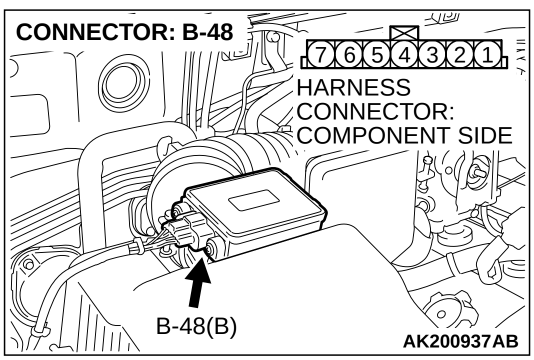
(3) Measure the voltage between terminal No. 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

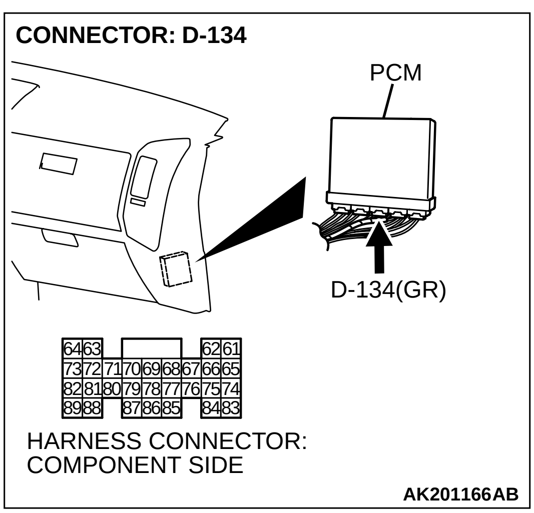
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

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

STEP 8. Check connector B-48 at the barometric pressure sensor and connector D-134 at PCM for damage.





Q: Is the connector in good condition?

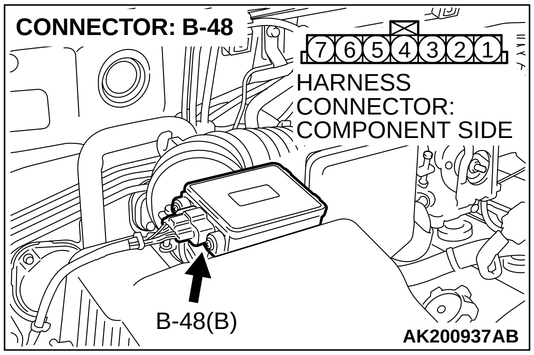
YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

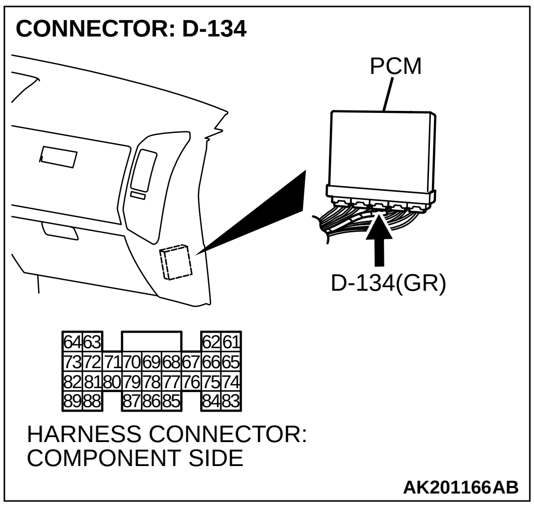
STEP 9. Check for open circuit between barometric pressure sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.



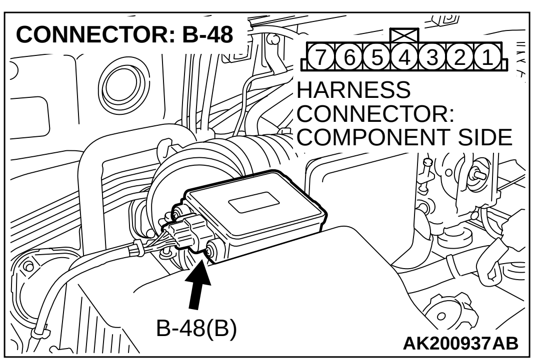


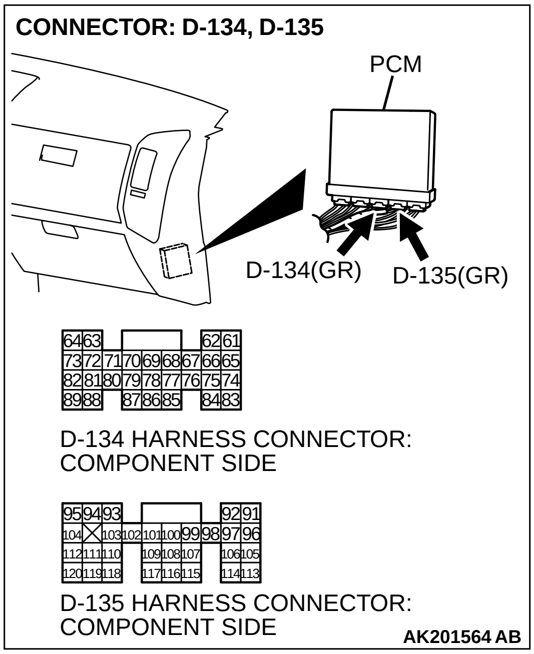
STEP 10. Check connector B-48 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

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





STEP 11. Check connector D-134 and D-135 at PCM for damage.

Q: Is the connector in good condition?

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

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

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

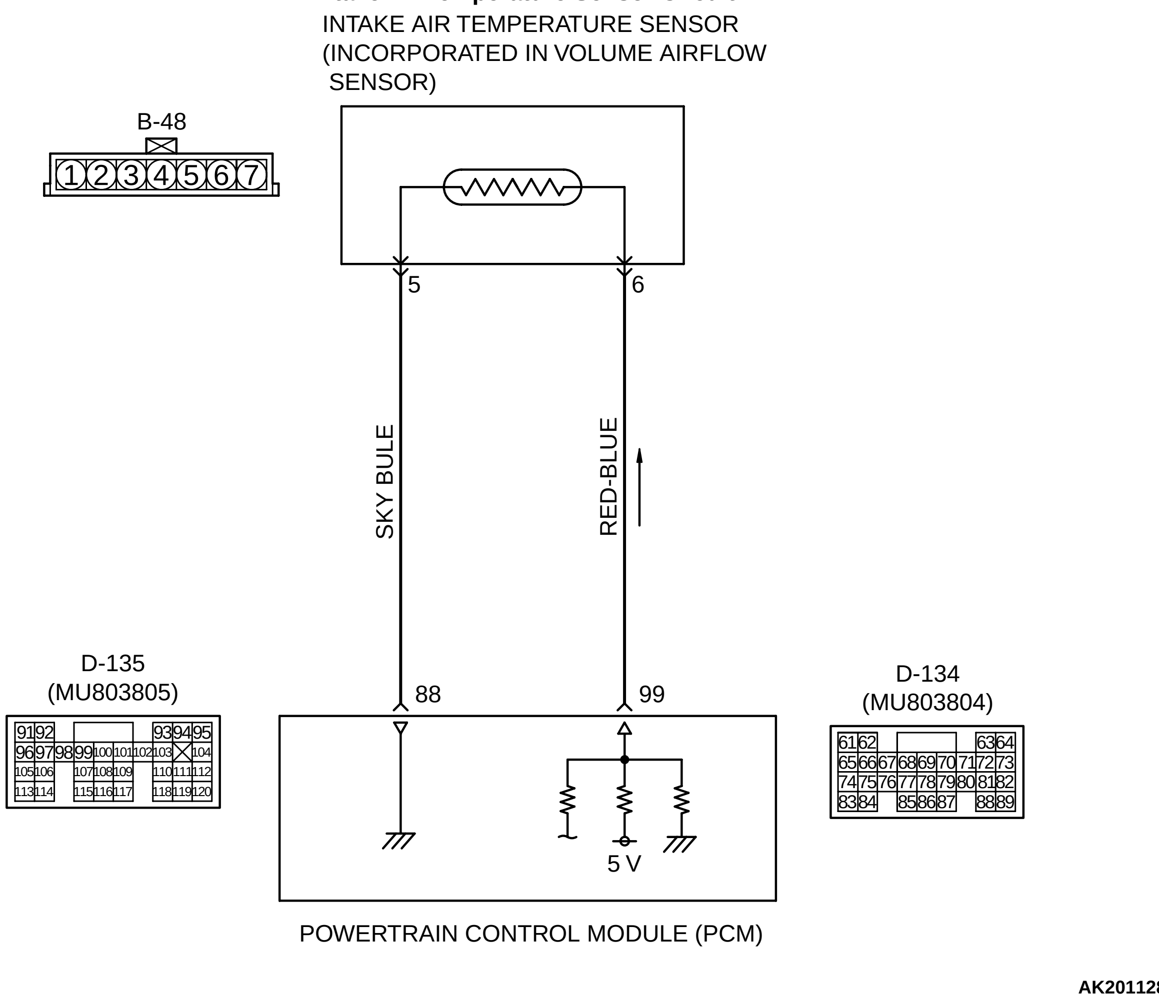
Q: Is DTC P0108 set?

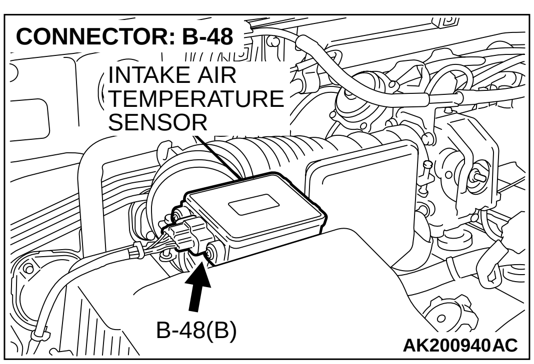
YES : Retry the troubleshooting.

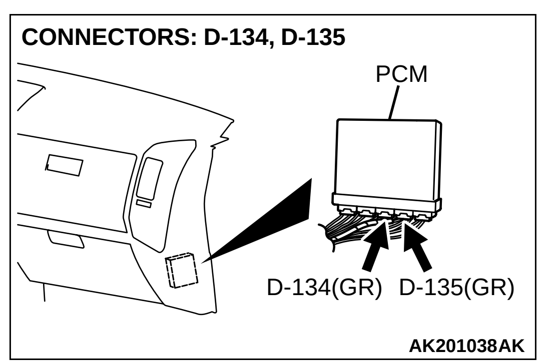
NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

Intake Air Temperature Sensor Circuit







CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the PCM (terminal No. 99) via the resistor in the PCM. The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Repeat 5 or more times: drive*1, stop*2.

  Drive*1: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.

  Stop*2: vehicle speed lower than 1.5 km/h (0.9 mph) lasting more than 30 seconds.

Judgement Criteria

- Changes in the intake air temperature is lower than 1°C (1.8°F).

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

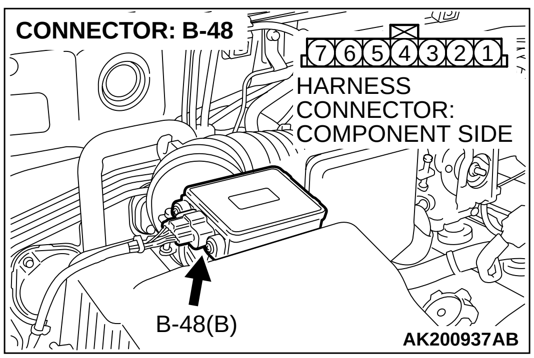
- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

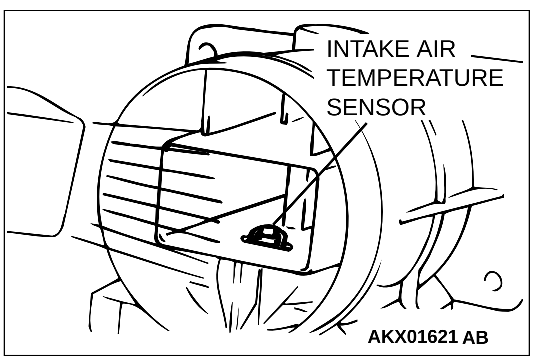
STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Remove the air intake hose from the volume airflow sensor.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.



(5) Heating the sensor using a hair drier.
- The indicated temperature increases.

  NOTE: Do not allow it to increase over 80°C (176°F).

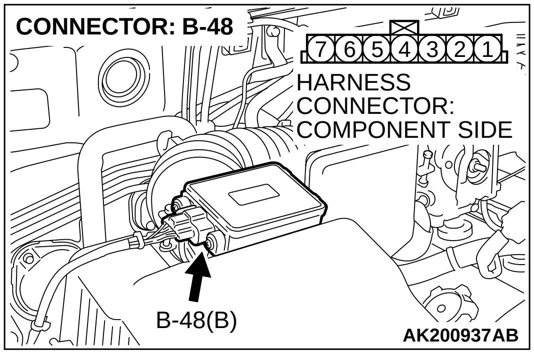
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Attach the air intake hose.

Q: Is the sensor operating properly?

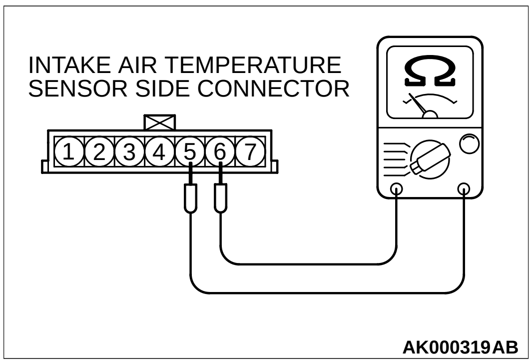
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

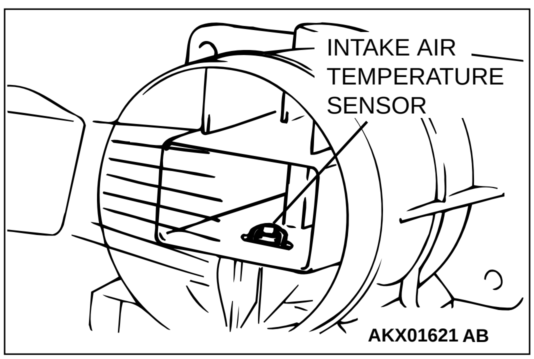
STEP 2. Check the intake air temperature sensor.



(1) Disconnect the intake air temperature sensor connector B-48



(2) Measure the resistance between intake air temperature sensor side connector terminal No. 5 and No. 6.



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

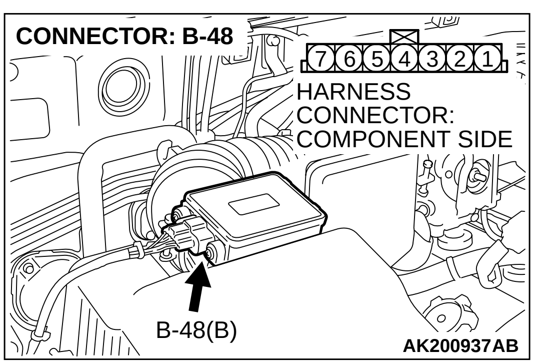
Standard value:

13 – 17 kiloohms [at –20°C (–4°F)]
5.3 – 6.7 kiloohms [at 0°C (32°F)]
2.3 – 3.0 kiloohms [at 20°C (68°F)]
1.0 – 1.5 kiloohms [at 40°C (104°F)]
0.56 – 0.76 kiloohm [at 60°C (140°F)]
0.30 – 0.42 kiloohm [at 80°C (176°F)]

Q: Is the resistance at the standard value?

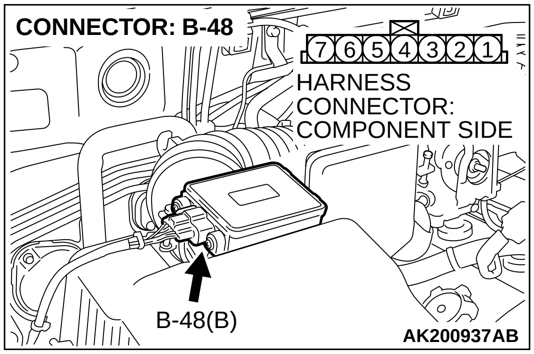
YES : Go to Step 3.
NO : Replace the volume airflow sensor. Then go to Step 9.

STEP 3. Check connector B-48 at the intake air temperature sensor for damage.



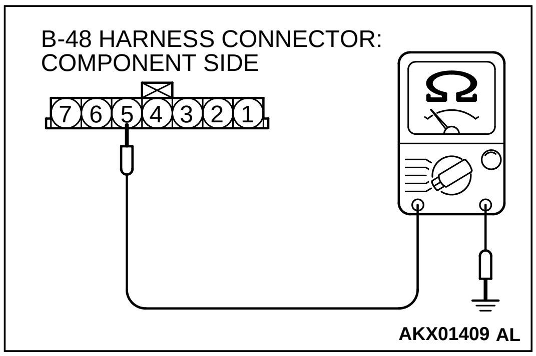
Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



STEP 4. Check the continuity at intake air temperature sensor harness side connector B-48.

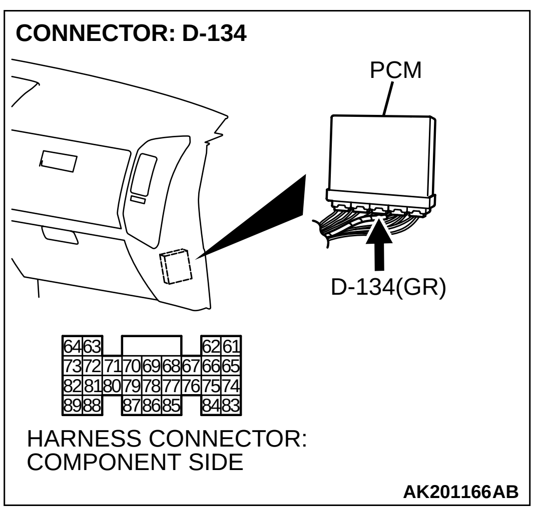
(1) Disconnect the connector B-48 and measure at the harness side.



(2) Check for the continuity between terminal No. 5 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

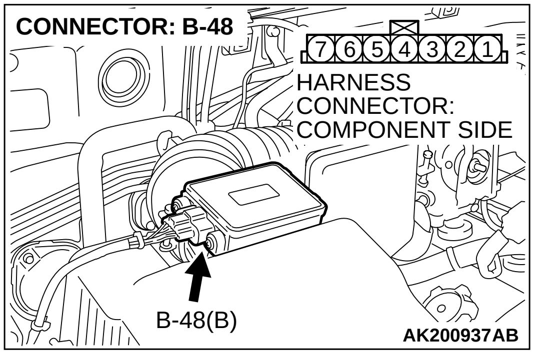
YES : Go to Step 7.
NO : Go to Step 5.

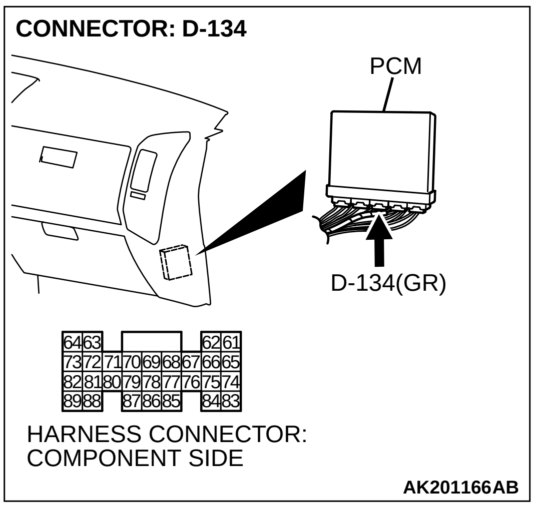


STEP 5. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

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



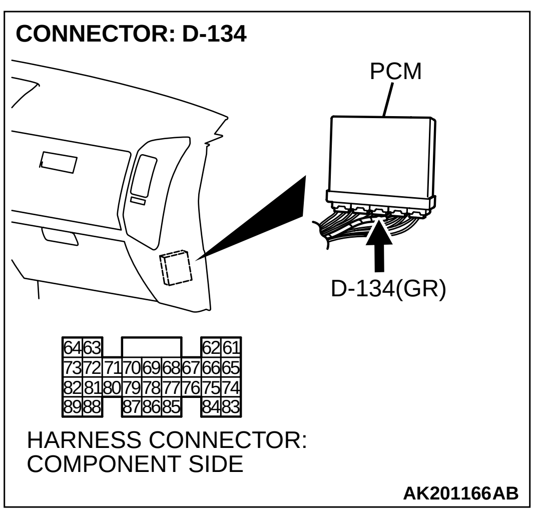


STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.

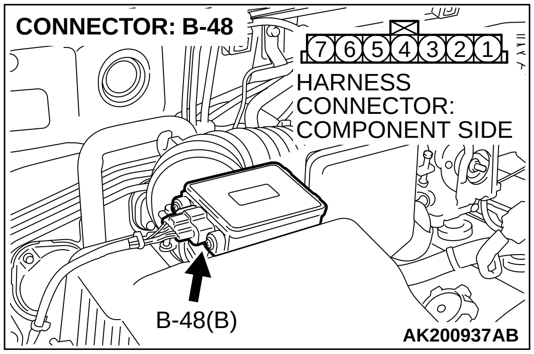


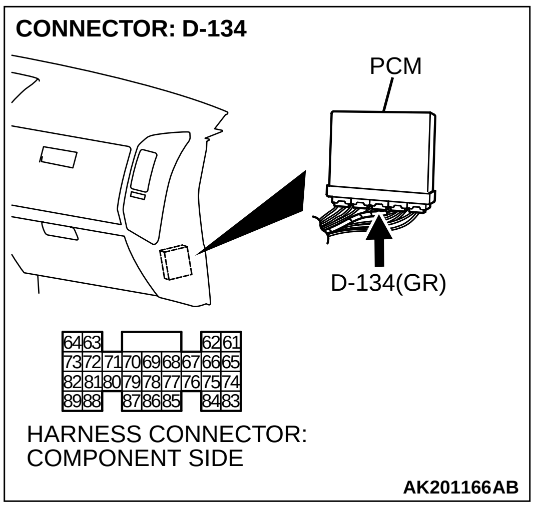
STEP 7. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

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





STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

STEP 9. Test the OBD-II drive cycle.

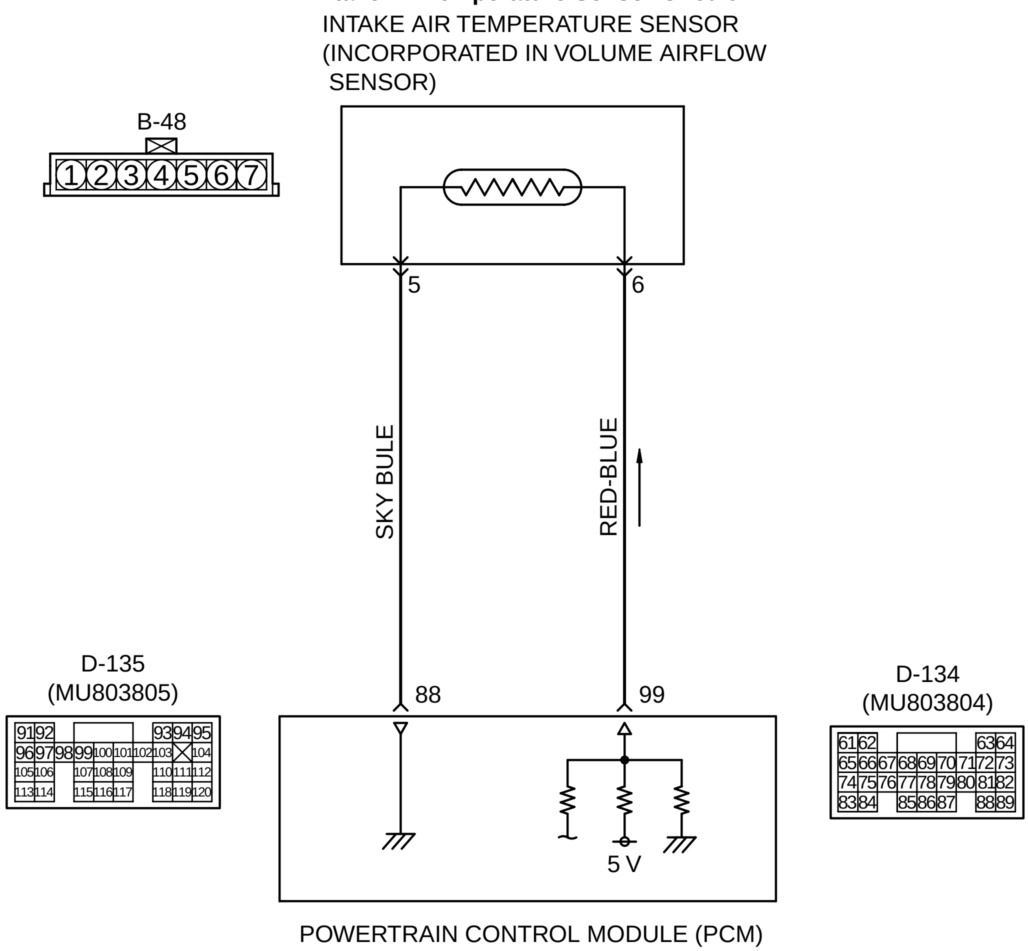
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0111 set?

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

DTC P0112: Intake air temperature Circuit Low Input

Intake Air Temperature Sensor Circuit



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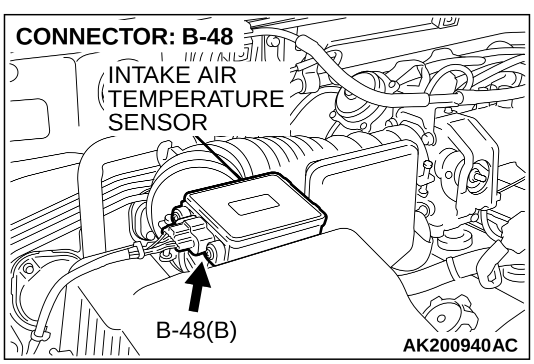

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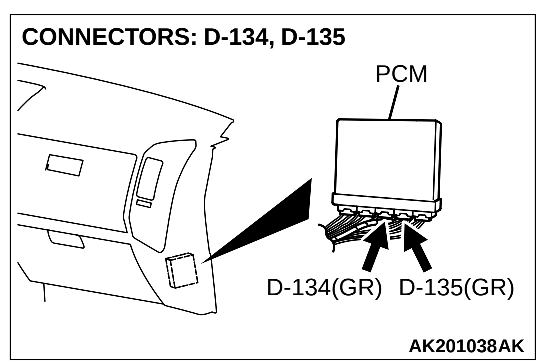

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CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the PCM (terminal No. 99) via the resistor in the PCM. The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 115°C (239°F) or higher] for 2 seconds.

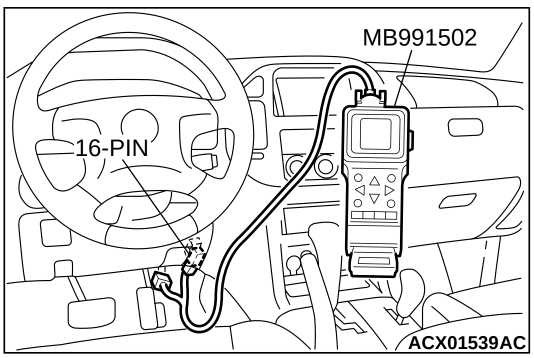
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

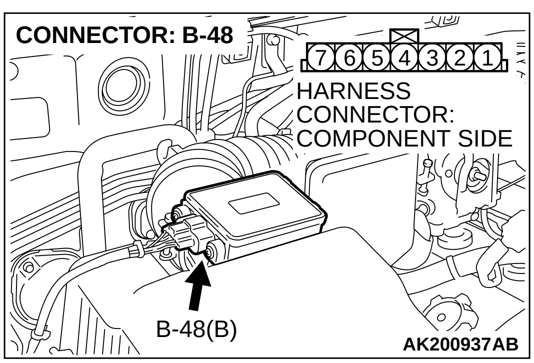
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



STEP 2. Check connector B-48 at the intake air temperature sensor for damage.

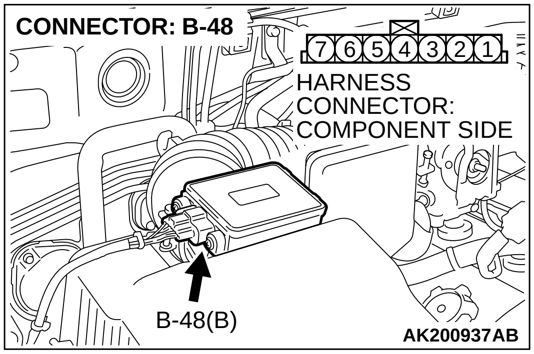
Q: Is the connector in good condition?

YES : Go to Step 3.

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

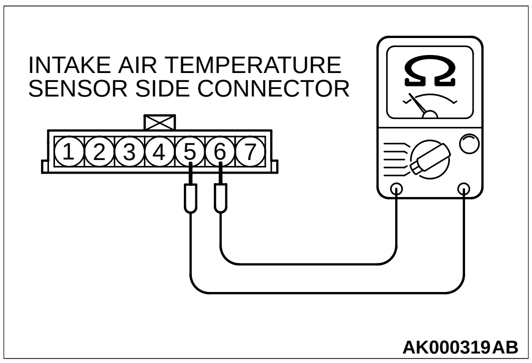
STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-48.



(2) Measure the resistance between intake air temperature sensor side connector terminal No. 5 and No. 6.

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



Q: Is the measured resistance between 0.30 and 1.0 ohms?

YES : Go to Step 4.

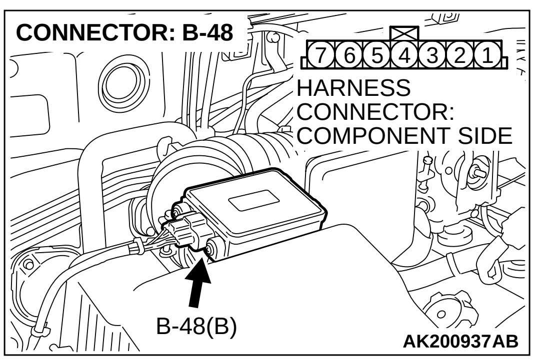
NO : Replace the volume airflow sensor. Then go to Step 6.

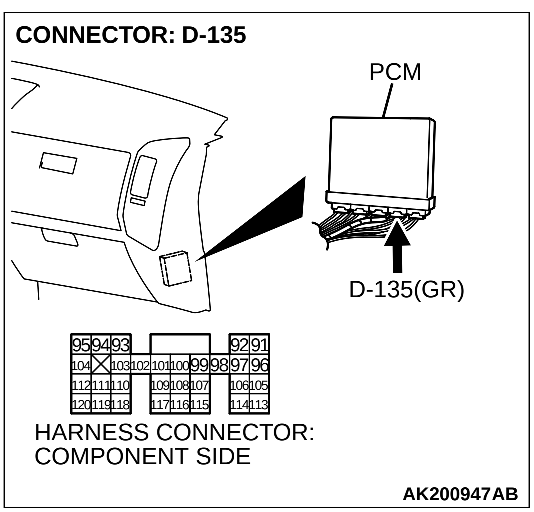
STEP 4. Check for short circuit to ground between intake air temperature sensor connector B-48 (terminal No.6) and PCM connector D-135 (terminal No. 99).

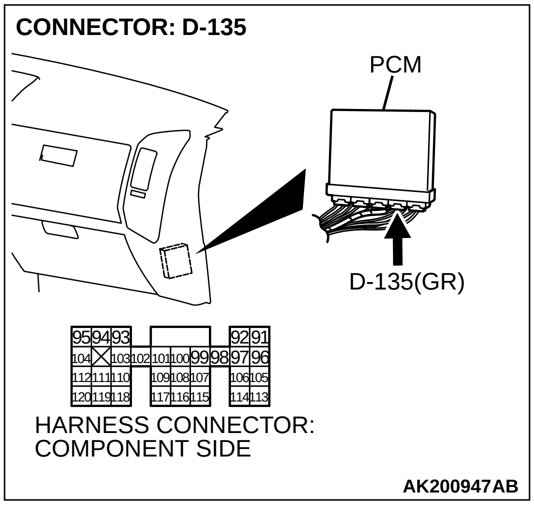
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.







STEP 5. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Replace the PCM. Then go to Step 6.

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

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

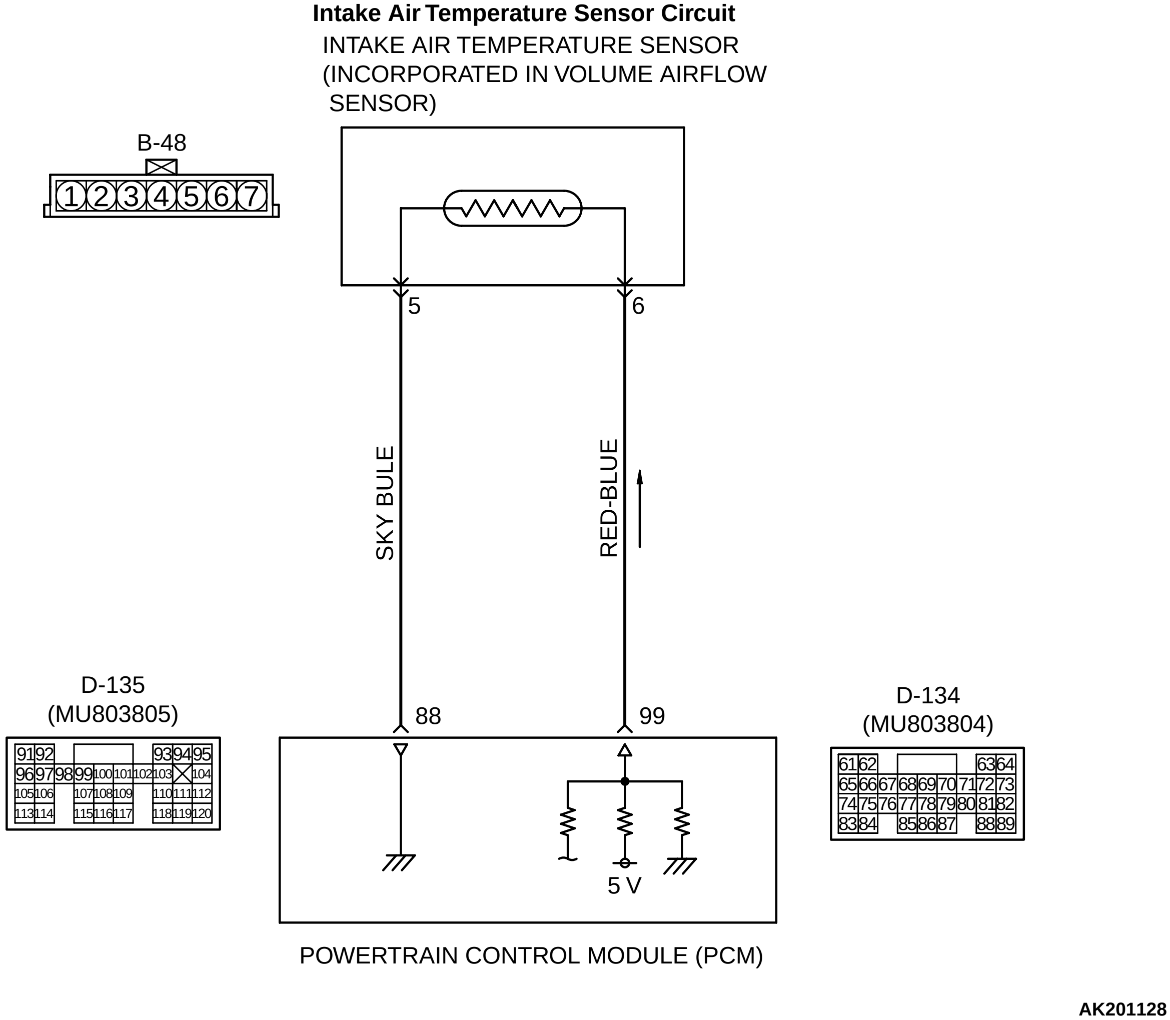
(2) Check the diagnostic trouble code (DTC).

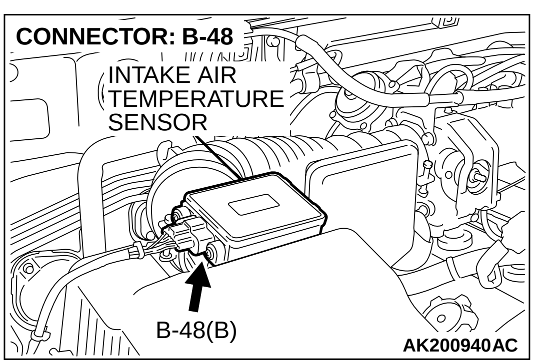
Q: Is DTC P0112 set?

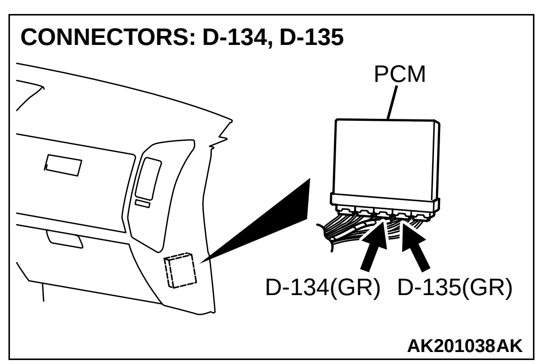
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0113: Intake air temperature Circuit High Input







CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the PCM (terminal No. 99) via the resistor in the PCM. The ground terminal (terminal No. 5) is grounded with PCM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an air intake temperature of –40°C (–40°F) or lower] for 2 seconds.

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

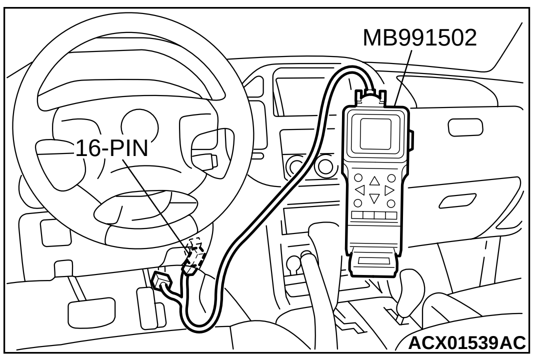
- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

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



⚠ CAUTION

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

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

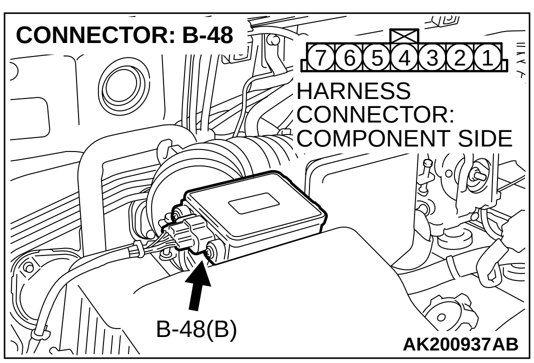
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

STEP 2. Check connector B-48 at the intake air temperature sensor for damage.

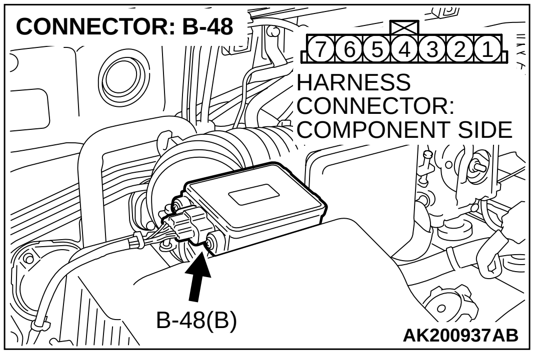


Q: Is the connector in good condition?

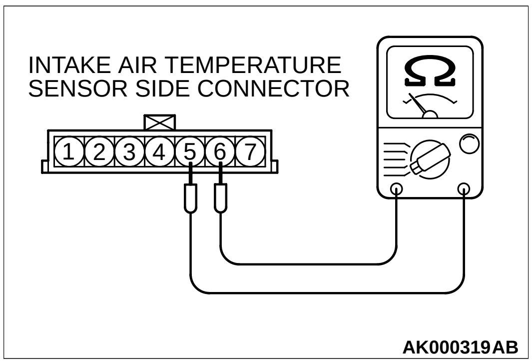
YES : Go to Step 3.

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

STEP 3. Check the intake air temperature sensor.



(1) Disconnect the intake air temperature sensor connector B-48.

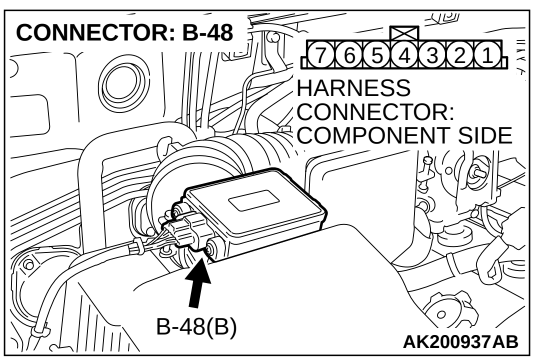


(2) Measure the resistance between intake air temperature sensor side connector terminal No. 5 and No. 6.
- There should be continuity. (0.30 – 1.0 kiloohm)

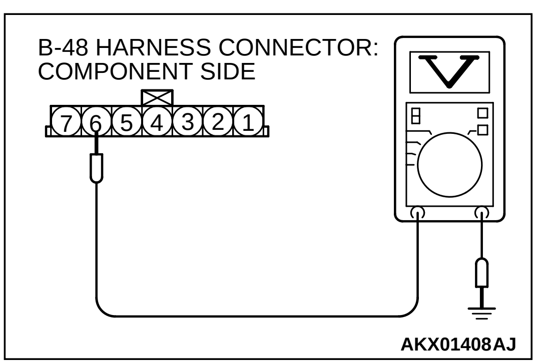
Q: Is the measured resistance between 0.30 and 1.0 ohms?

YES : Go to Step 4.
NO : Replace the volume airflow sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at intake air temperature sensor harness side connector B-48.



(1) Disconnect the connector B-48 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



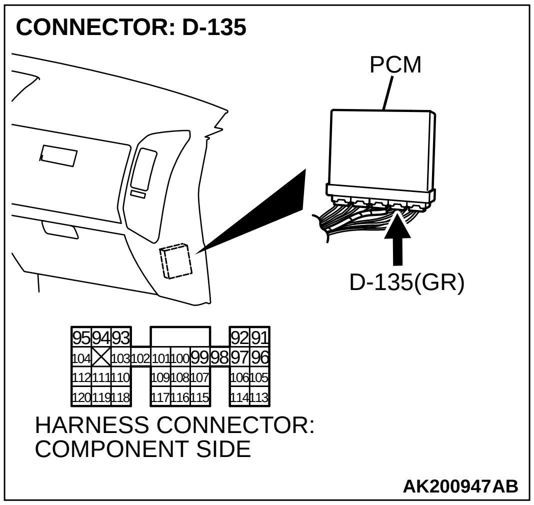
(3) Measure the voltage between terminal No. 6 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

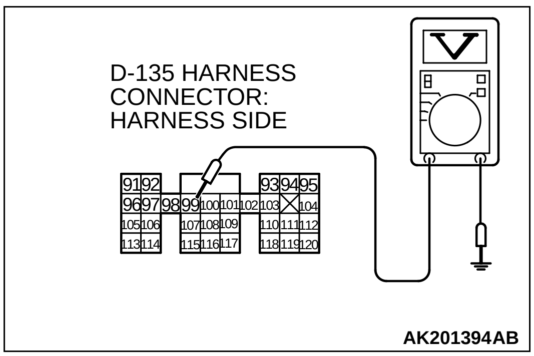
Q: Is the measured voltage between 4.5 and 4.9 volts?

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

STEP 5. Check the sensor supply voltage at PCM connector D-135 by backprobing.



(1) Do not disconnect the PCM connector D-135.
(2) Disconnect the intake air temperature sensor connector B-48.
(3) Turn the ignition switch to the "ON" position.



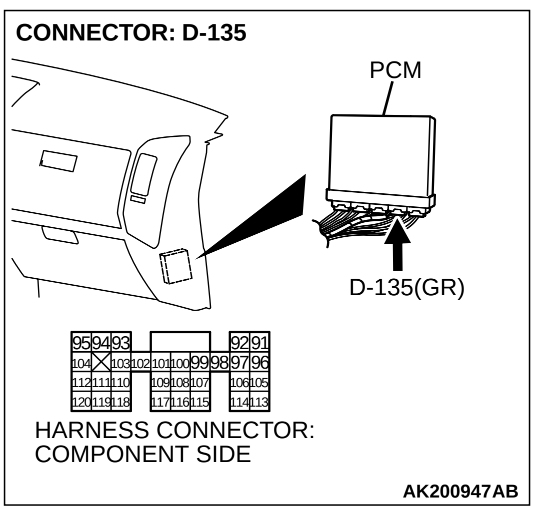
(4) Measure the voltage between terminal No. 99 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

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

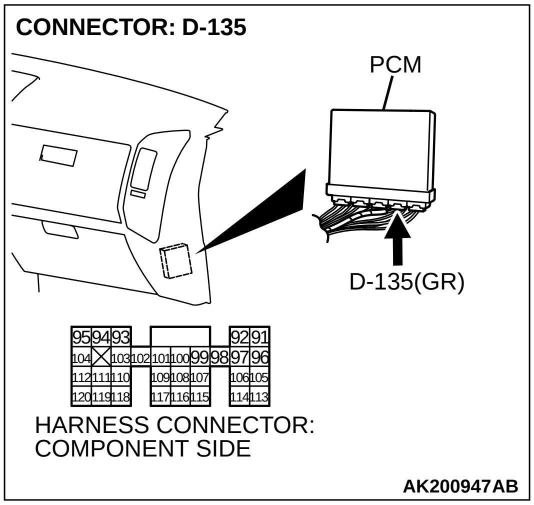
YES : Go to Step 6.
NO : Go to Step 7.

STEP 6. Check connector D-135 at PCM for damage.



Q: Is the connector in good condition?

YES : Repair harness wire between intake air temperature sensor connector B-48 (terminal No. 6) and PCM connector D-135 (terminal No. 99) 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.

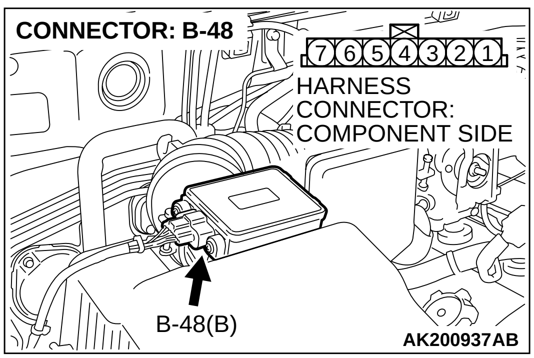


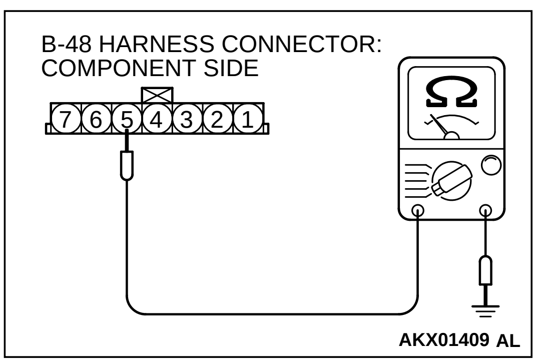
STEP 7. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

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

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





STEP 8. Check the continuity at intake air temperature sensor harness side connector B-48.

(1) Disconnect the connector B-48 and measure at the harness side.

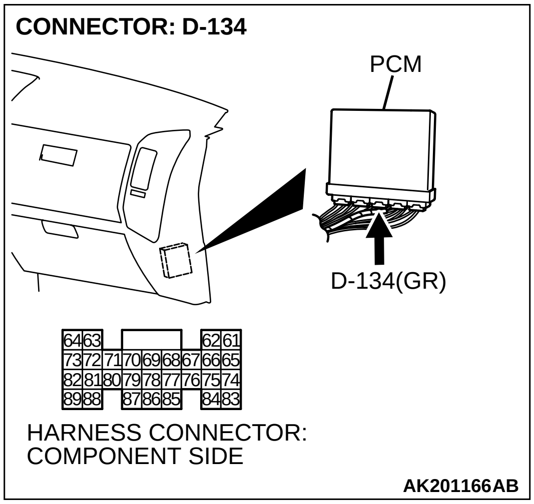
(2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

Q: Is the continuity normal?

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

NO : Go to Step 9.

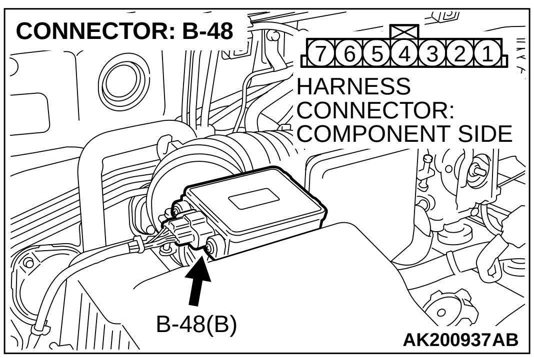


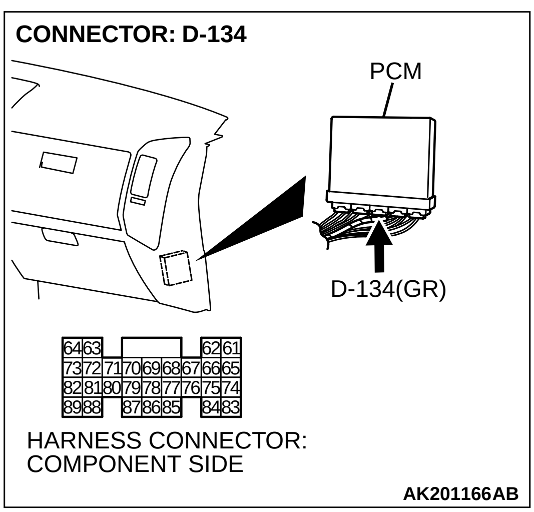
STEP 9. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check for open circuit between intake air temperature sensor connector B-48 (terminal No. 5) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

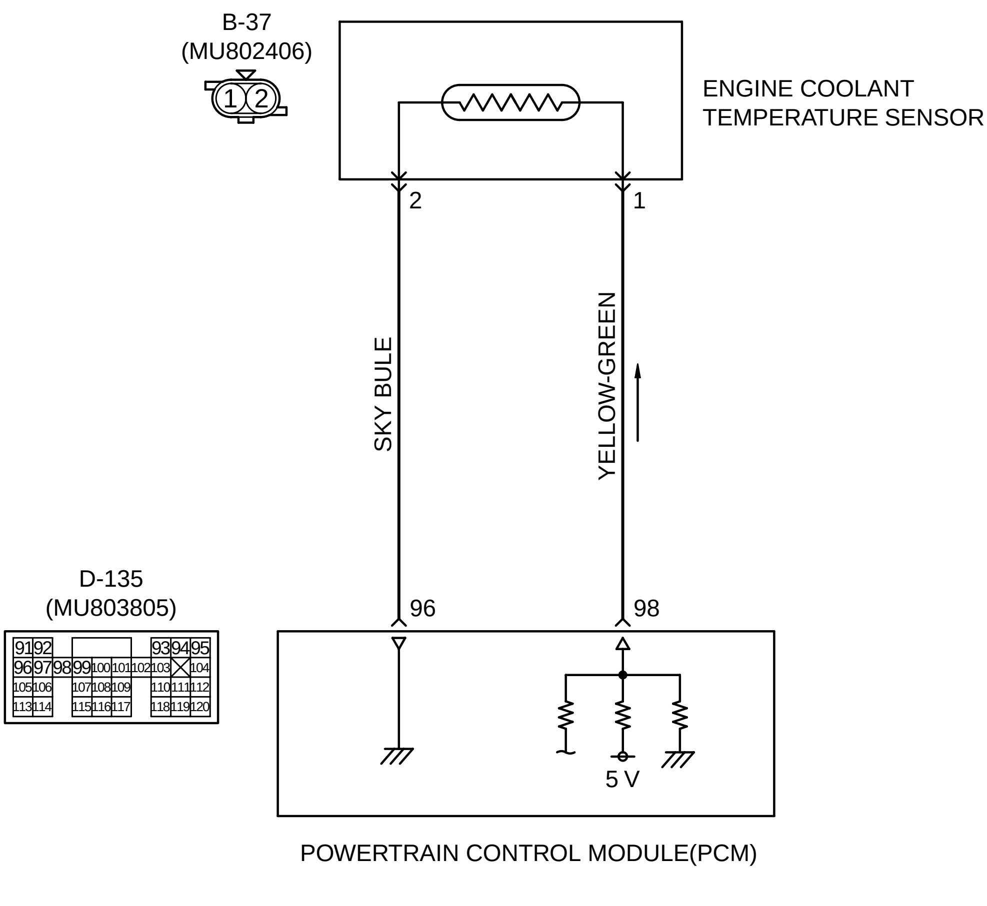
Q: Is DTC P0113 set?

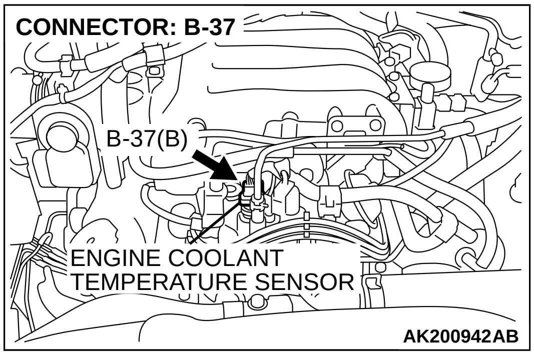
YES : Retry the troubleshooting.

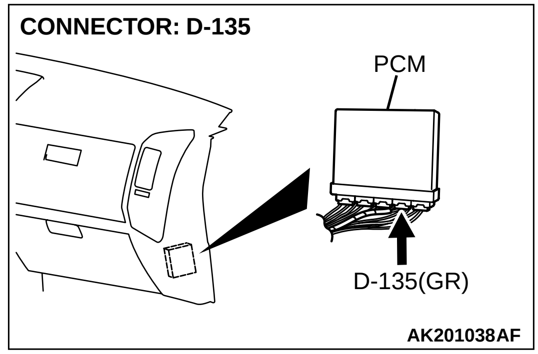
NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

Engine Coolant Temperature Sensor Circuit







CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 98) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with (terminal No. 96).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

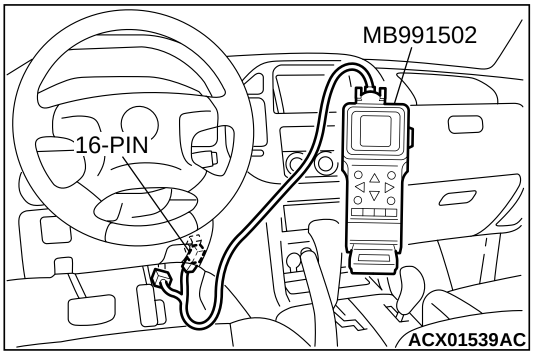
- Engine coolant temperature was 7°C (45°F) or more immediately before the engine was stopped at the last drive.
- Engine coolant temperature was 7°C (45°F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1°C (1.8°F) after 5 minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60°C (140°F) or more.
  2. Volume airflow sensor output frequency is 70 Hz or less.
  3. During fuel shut-off operation.
- The PCM monitors for this condition once during the drive cycle.

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

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



DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

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

⚠ CAUTION

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

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

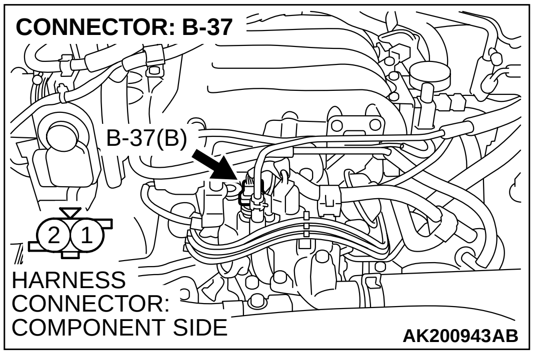
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

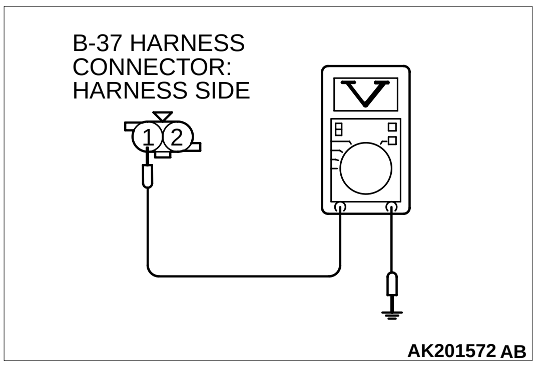
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-37 by backprobing.



(1) Do not disconnect the connector B-37.
(2) Turn the ignition switch to the "ON" position.



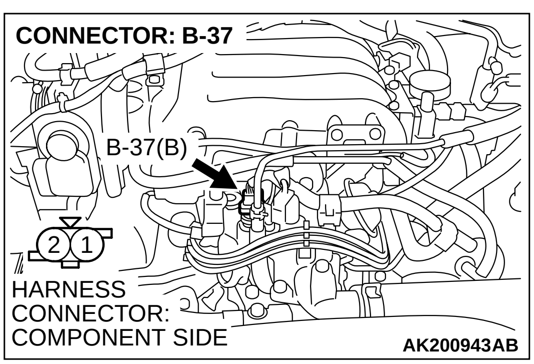
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

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

Q: Is the voltage normal?

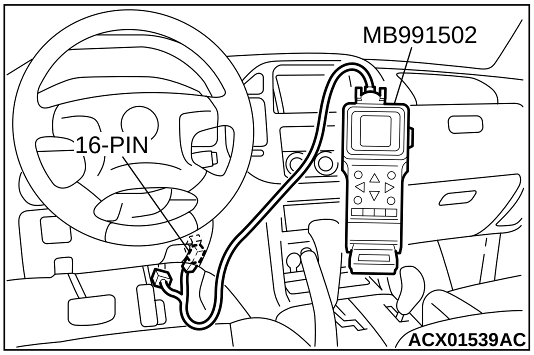
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check connector B-37 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

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



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

⚠ CAUTION

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

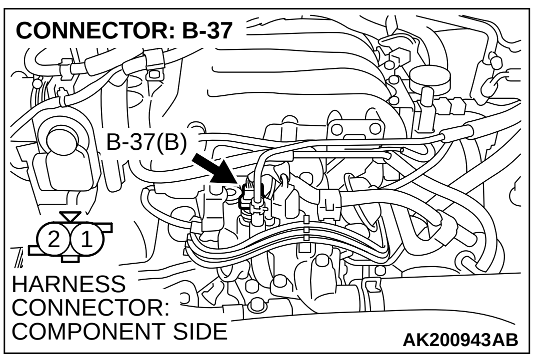
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately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

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

Q: Is the sensor operating properly?

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

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

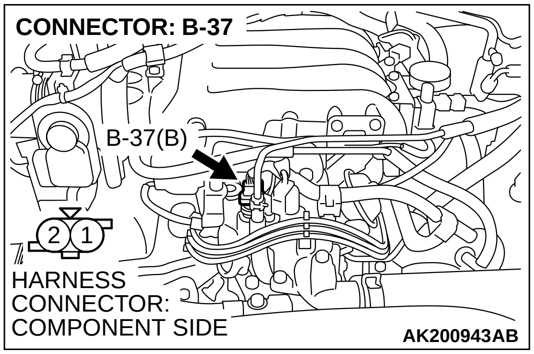


STEP 5. Check connector B-37 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

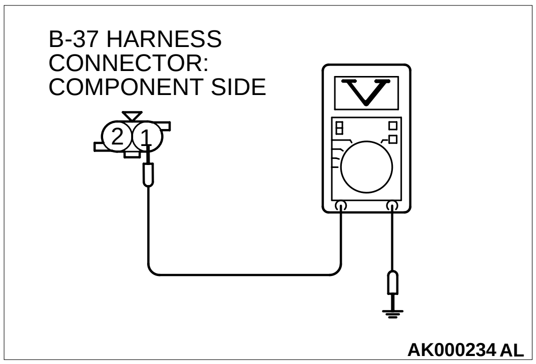
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-37.

(1) Disconnect the connector B-37 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.

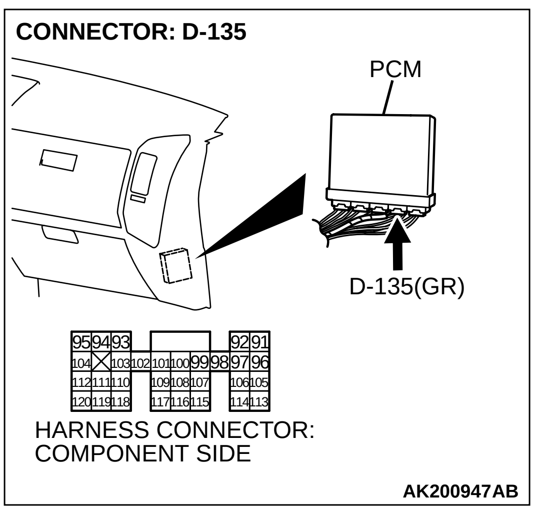
- Voltage should be between 4.5 and 4.9 volts.

(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 7.

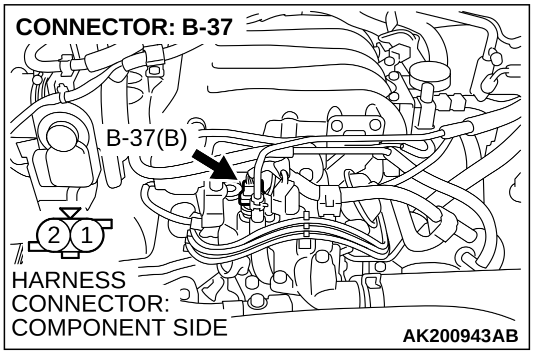


STEP 7. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

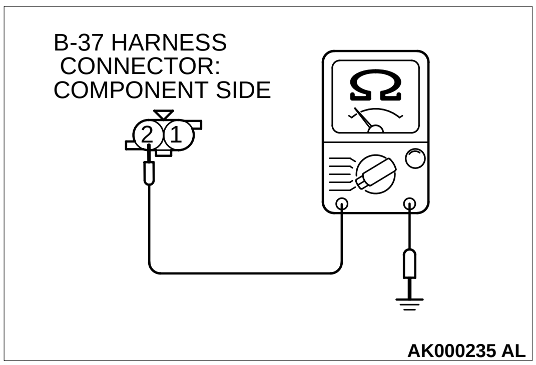
YES : Replace the PCM. Then go to Step 14.

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



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-37.

(1) Disconnect the connector B-37 and measure at the harness side.



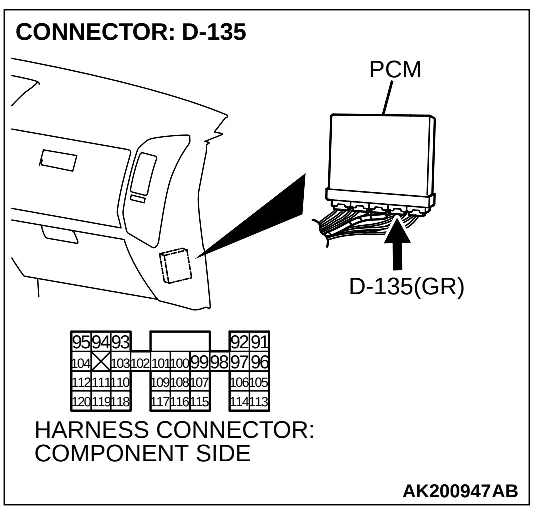
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

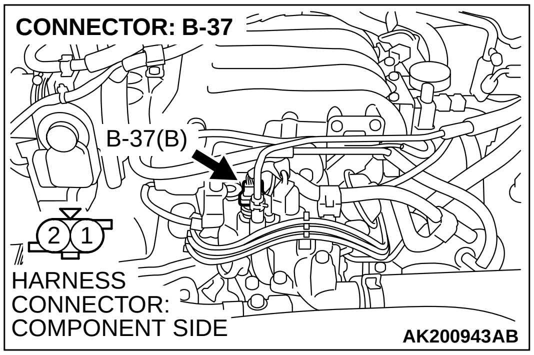


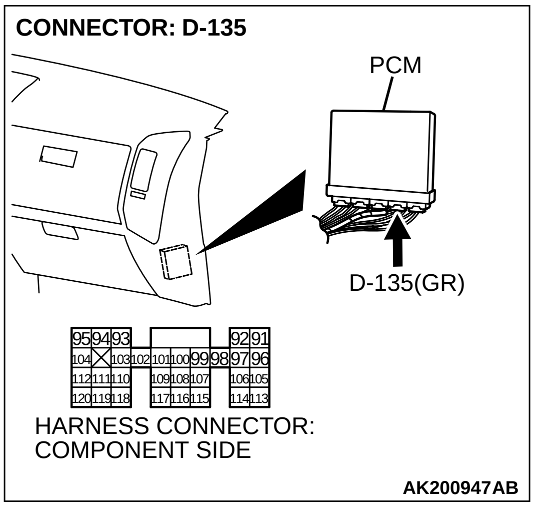
STEP 9. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

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



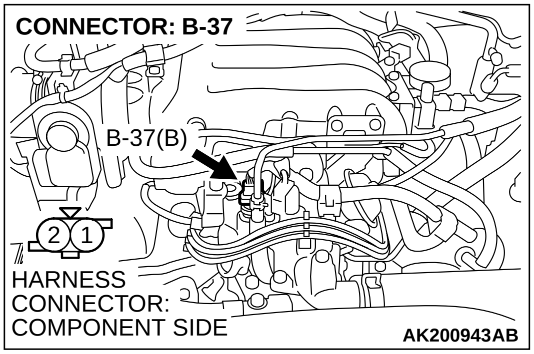


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-37 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

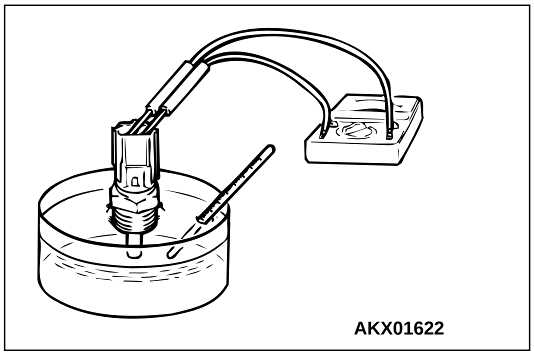
YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



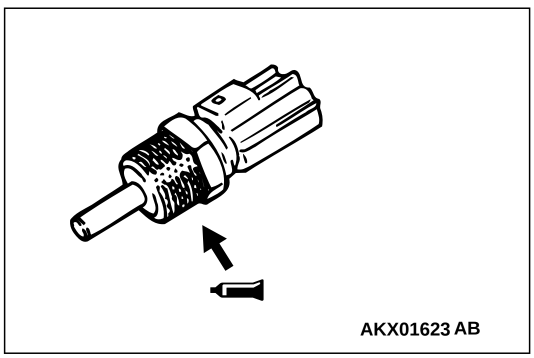
STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-37.
(2) Remove the engine coolant temperature sensor.



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

Standard value:
14 – 17 kiloohms [at –20°C (–4°F)]
5.1 – 6.5 kiloohms [at 0°C (32°F)]
2.1 – 2.7 kiloohms [at 20°C (68°F)]
0.9 – 1.3 kiloohms [at 40°C (104°F)]
0.48 – 0.68 kiloohm [at 60°C (140°F)]
0.26 – 0.36 kiloohm [at 80°C (176°F)]

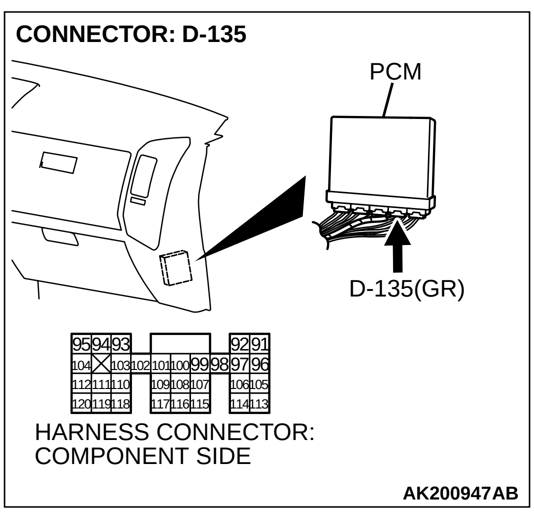


(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

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

Q: Is the resistance at the standard value?

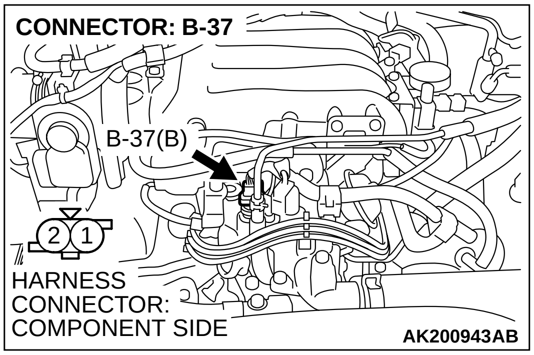
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

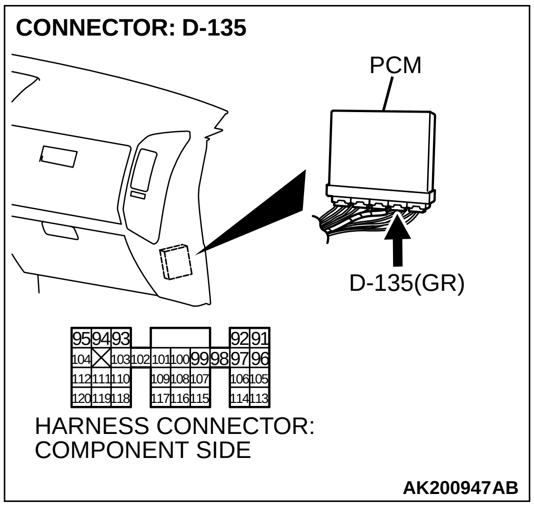


STEP 12. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

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





STEP 13. Check for harness damage between engine coolant temperature sensor connector B-37 (terminal No. 1) and PCM connector D-135 (terminal No. 98).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

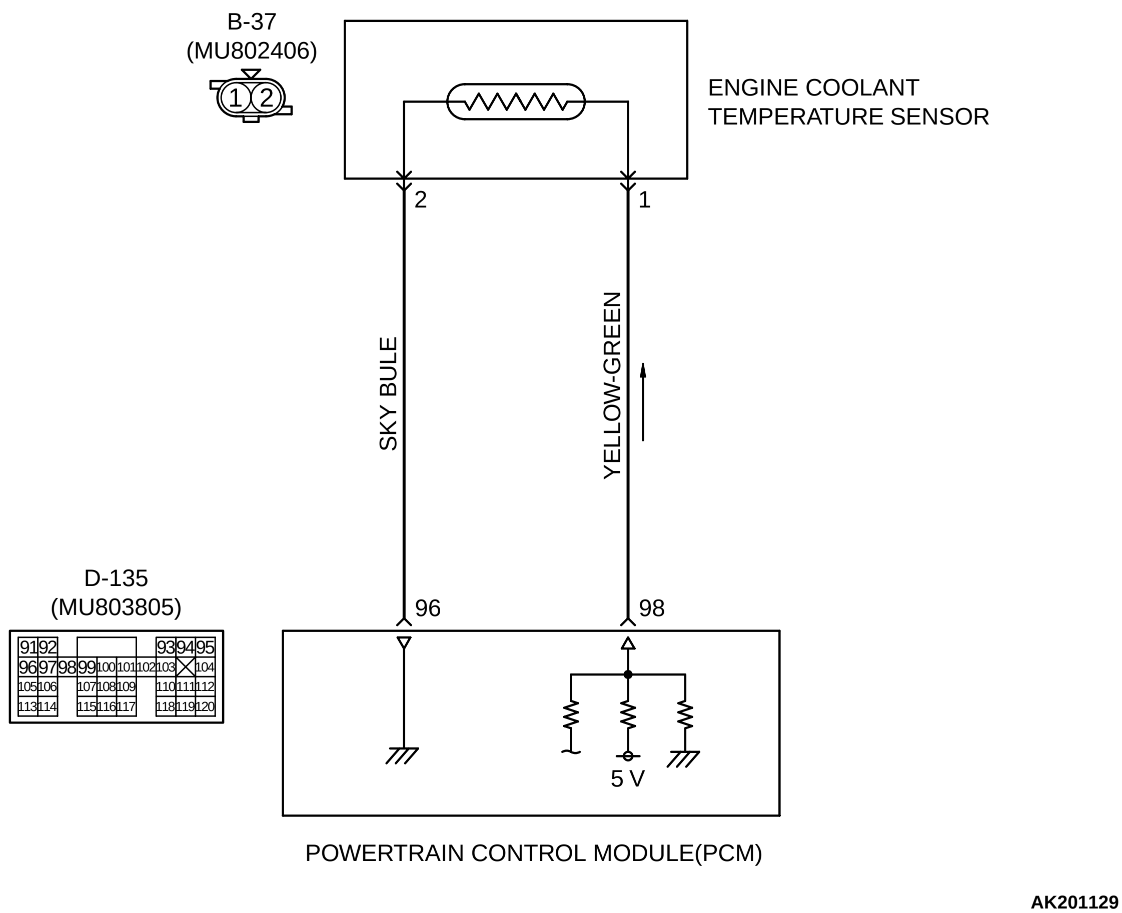
Q: Is DTC P116 set?

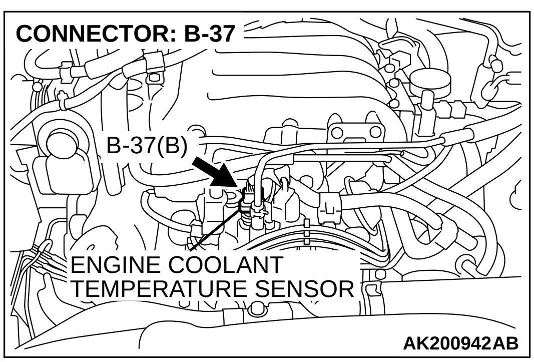
YES : Retry the troubleshooting.

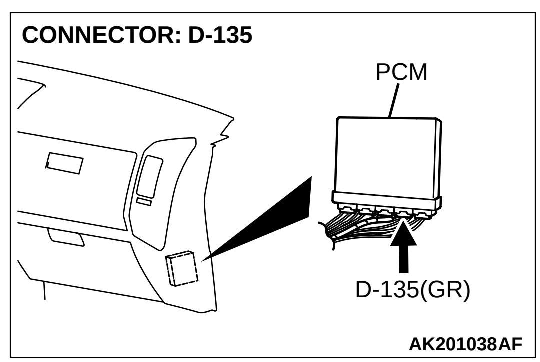
NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

Engine Coolant Temperature Sensor Circuit







CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 98) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with (terminal No. 96).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

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

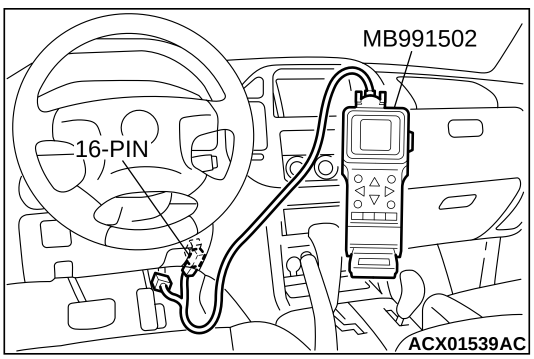
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

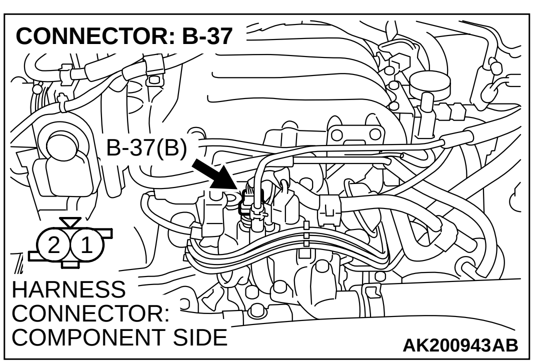
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately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

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

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



STEP 2. Check connector B-37 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

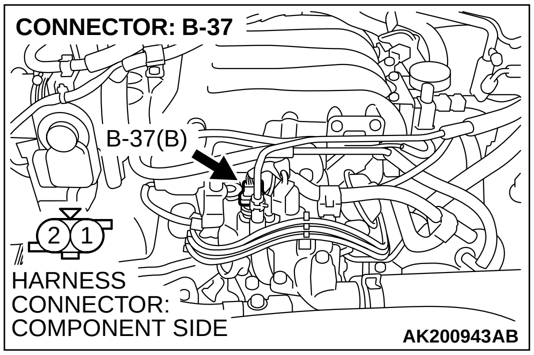
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

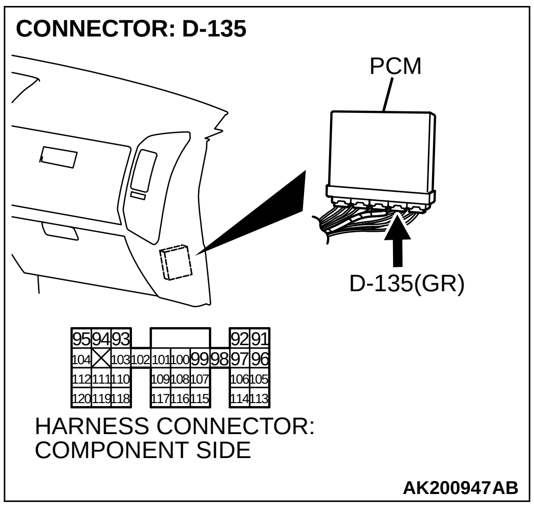
STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-37 (terminal No. 1) and PCM connector D-135 (terminal No. 98).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 6.



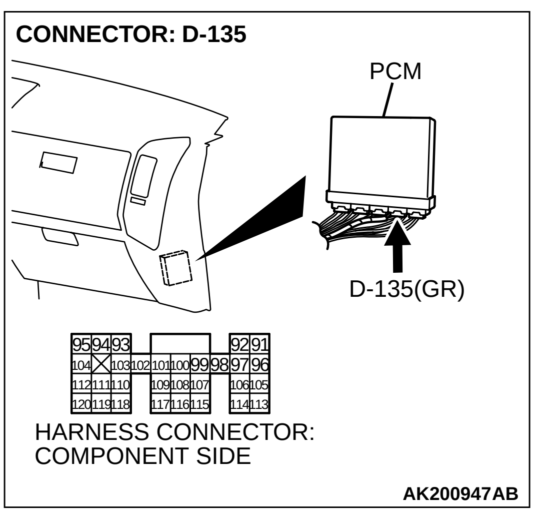


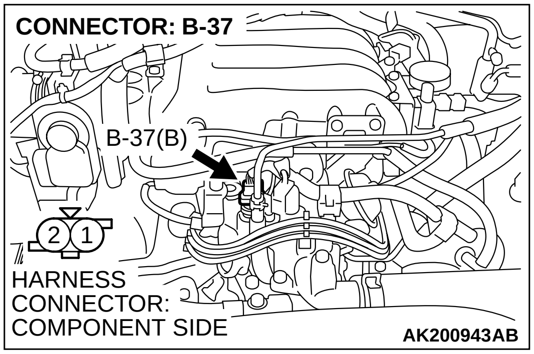
STEP 4. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

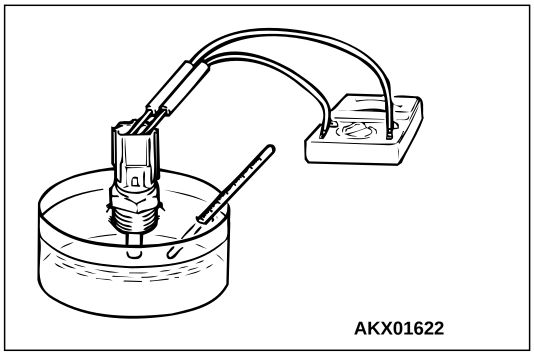
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.





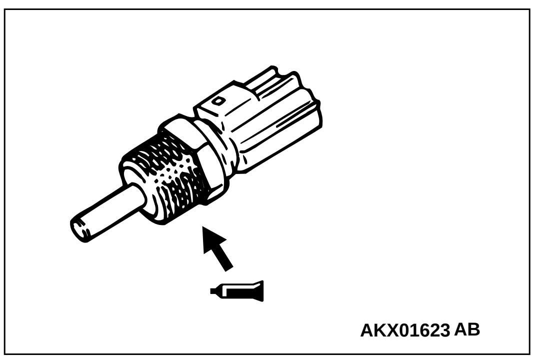
STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-37.
(2) Remove the engine coolant temperature sensor.



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

Standard value:
14 – 17 kiloohms [at –20°C (–4°F)]
5.1 – 6.5 kiloohms [at 0°C (32°F)]
2.1 – 2.7 kiloohms [at 20°C (68°F)]
0.9 – 1.3 kiloohms [at 40°C (104°F)]
0.48 – 0.68 kiloohm [at 60°C (140°F)]
0.26 – 0.36 kiloohm [at 80°C (176°F)]



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

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

Q: Is the resistance at the standard value?

YES : Replace the PCM. Then go to Step 6.
NO : Replace the engine coolant temperature sensor. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

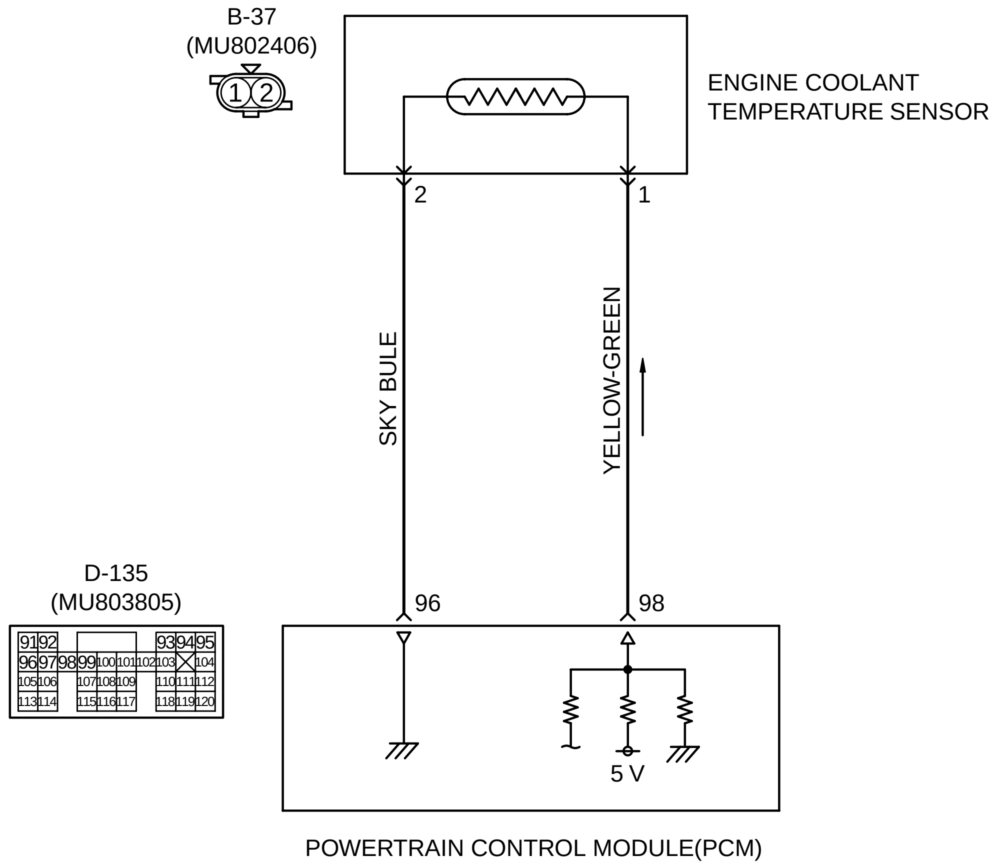
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0117 set?

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

DTC P0118: Engine Coolant Temperature Circuit High Input

Engine Coolant Temperature Sensor Circuit



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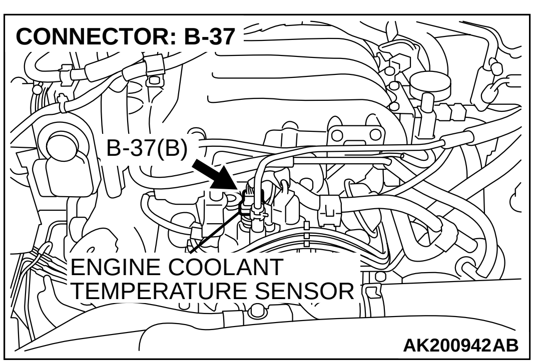
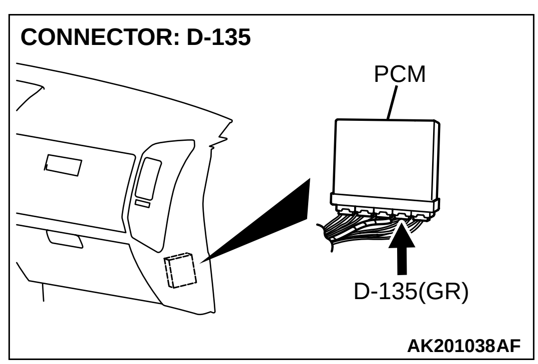




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 98) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with (terminal No. 96).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

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

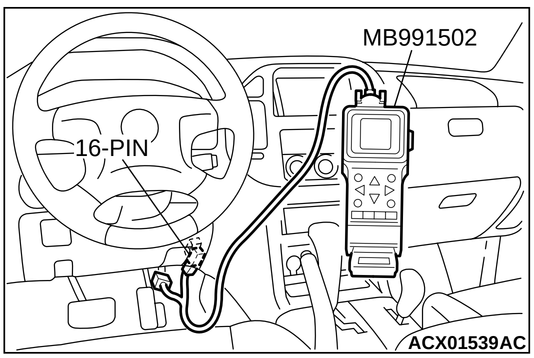
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

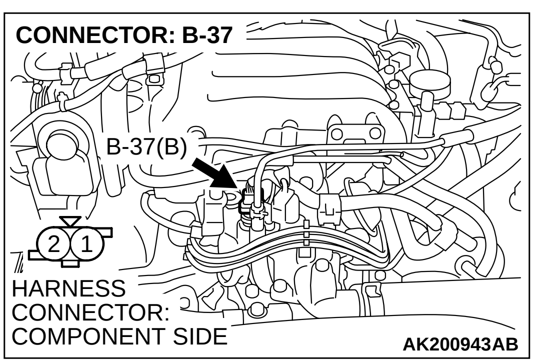
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately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

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

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



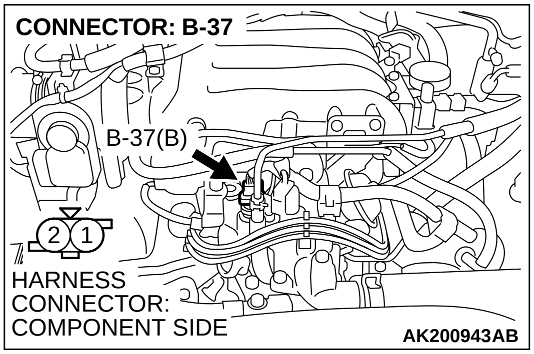
STEP 2. Check connector B-37 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

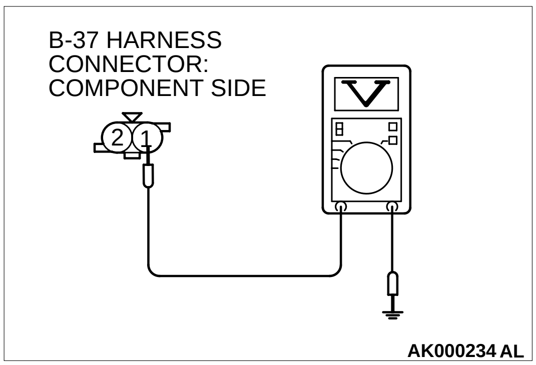
YES : Go to Step 3.

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

STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-37.



(1) Disconnect the connector B-37 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



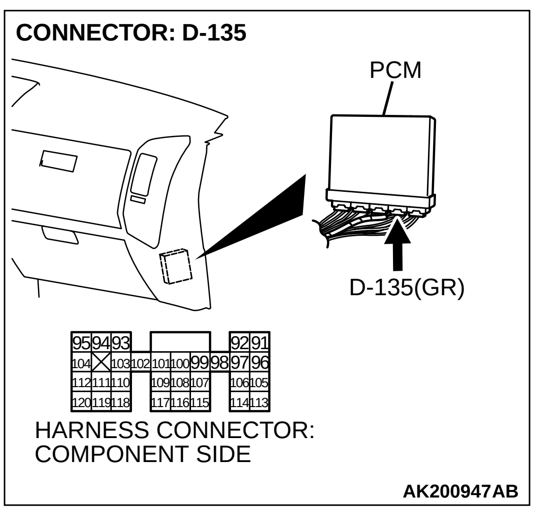
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

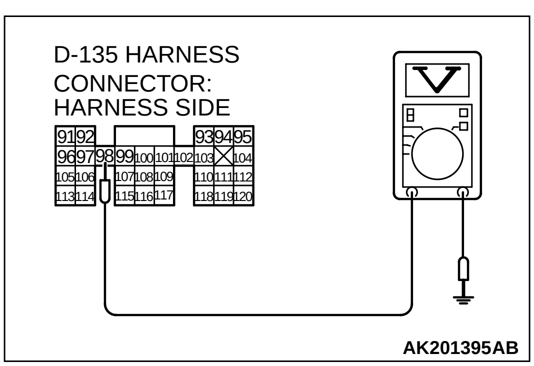
Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Measure the sensor supply voltage at PCM connector D-135 by backprobing.



(1) Do not disconnect the PCM connector D-135.
(2) Disconnect the engine coolant temperature sensor connector B-37.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 98 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

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

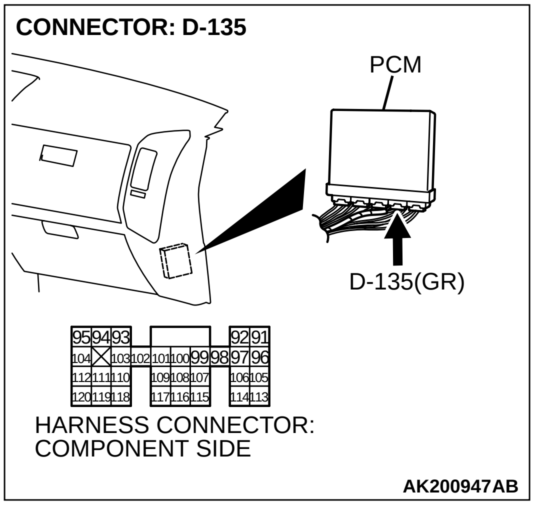
YES : Go to Step 5.
NO : Go to Step 6.

STEP 5. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between engine coolant temperature sensor connector B-37 (termial No. 1) and PCM connector D-135 (termial No. 98) 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.

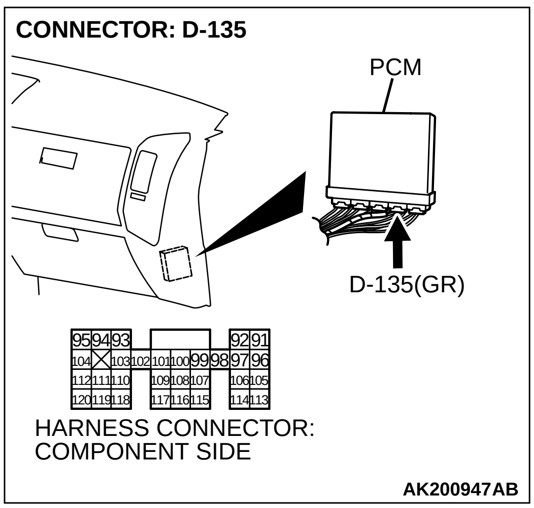


STEP 6. Check connector D-135 at PCM for damage.

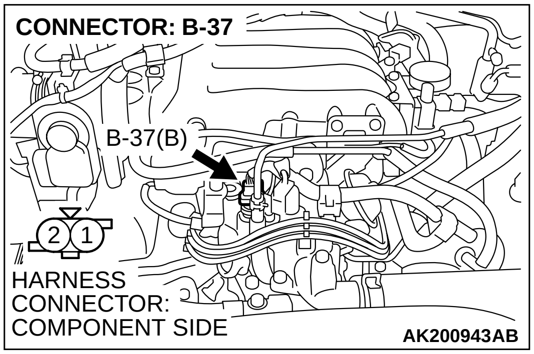
Q: Is the connector in good condition?

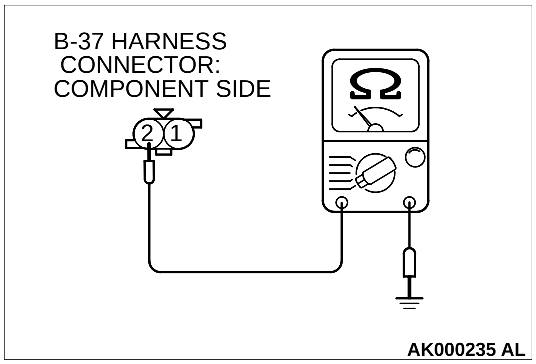
YES : Replace the PCM. Then go to Step 11.

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



STEP 7. Check the continuity at engine coolant temperature sensor harness side connector B-37.



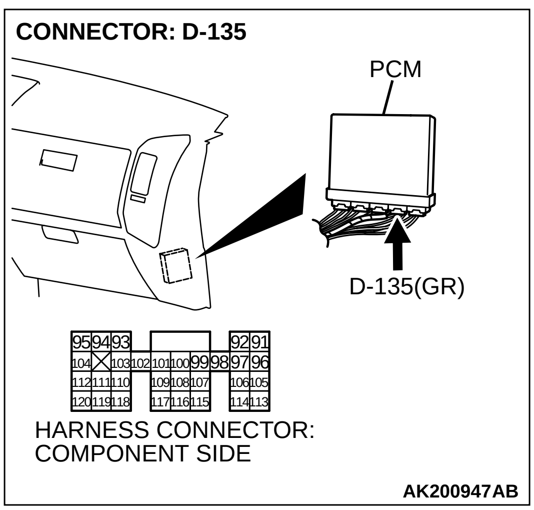


(1) Disconnect the connector B-37 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

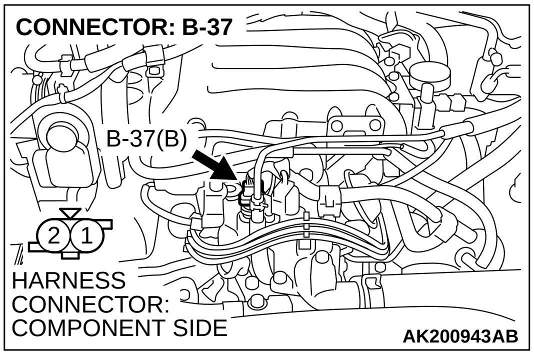
YES : Go to Step 10.
NO : Go to Step 8.

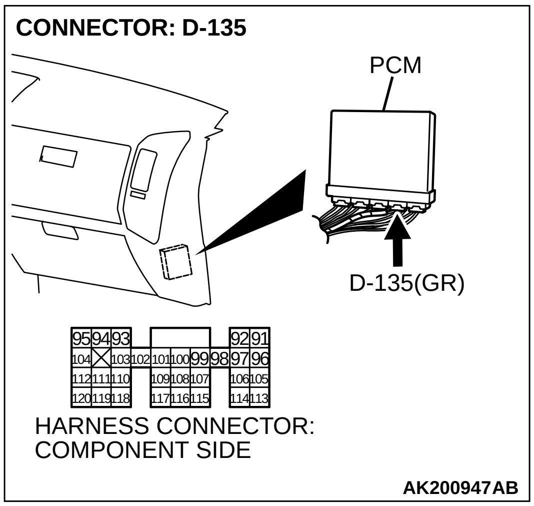
STEP 8. Check connector D-135 at PCM for damage.



Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





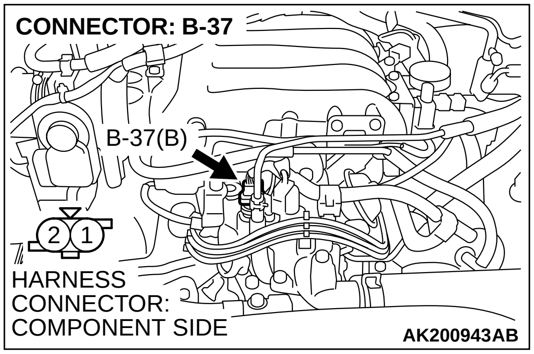
STEP 9. Check for open circuit between engine coolant sensor connector B-37 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

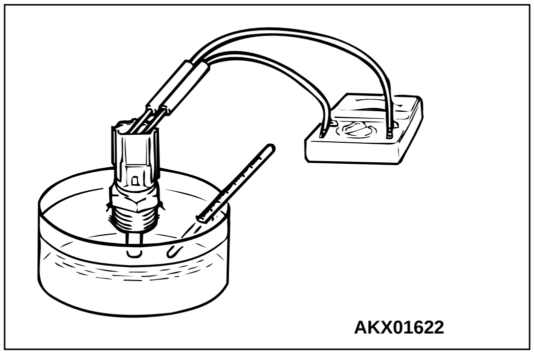
YES : Replace the PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 10. Check the engine coolant temperature sensor.

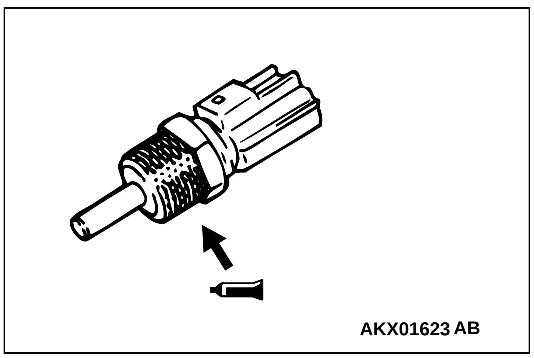


(1) Disconnect the engine coolant temperature sensor connector B-37.
(2) Remove the engine coolant temperature sensor.



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

Standard value:
14 – 17 kiloohms [at –20°C (–4°F)]
5.1 – 6.5 kiloohms [at 0°C (32°F)]
2.1 – 2.7 kiloohms [at 20°C (68°F)]
0.9 – 1.3 kiloohms [at 40°C (104°F)]
0.48 – 0.68 kiloohm [at 60°C (140°F)]
0.26 – 0.36 kiloohm [at 80°C (176°F)]



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

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

Q: Is the resistance at the standard value?

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

STEP 11. Test the OBD-II drive cycle.

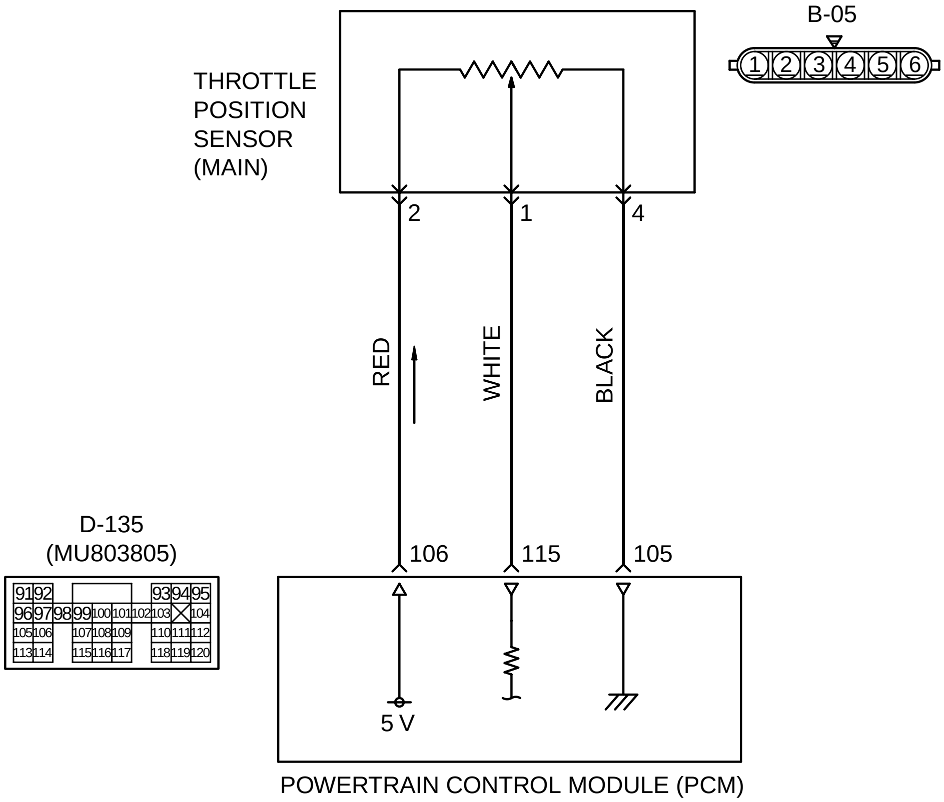
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0118 set?

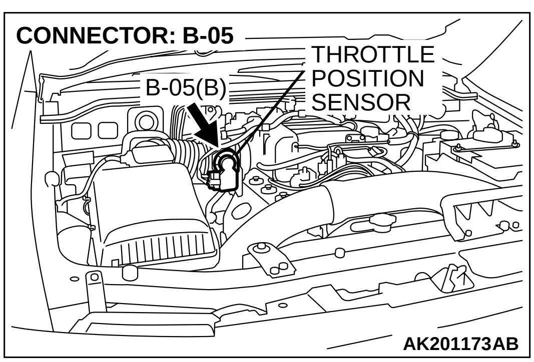
YES : Retry the troubleshooting.
NO : The inspection is complete.

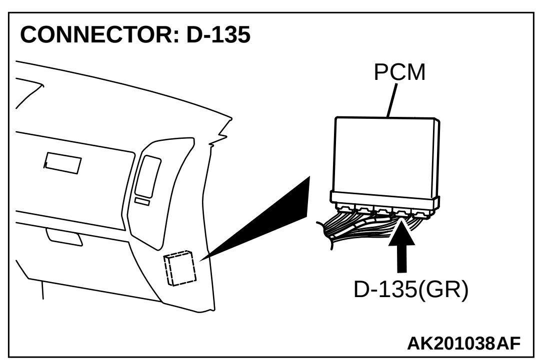
P0122 Throttle Position Sensor (Main) Circuit Low Input

Throttle Position Sensor (Main) Circuit



AK201130





CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS (main) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resister between the TPS (main) output terminal (terminal No. 1) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS (main) outputs voltage which corresponds to the throttle valve opening angle.

- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Condition
- Ignition switch "ON" position.

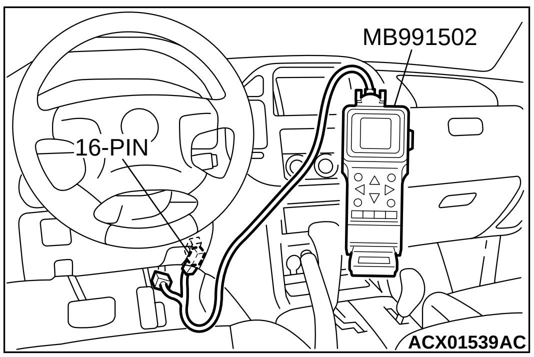
Judgement Criteria
- TPS (main) output voltage should be 0.35 volts or less for 0.5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- TPS failed or maladjusted.
- Open or shorted TPS (main) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

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

STEP 1. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).



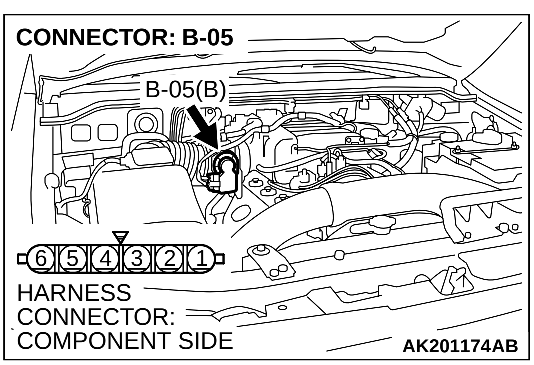
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
   - Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
   - Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.
(7) 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.

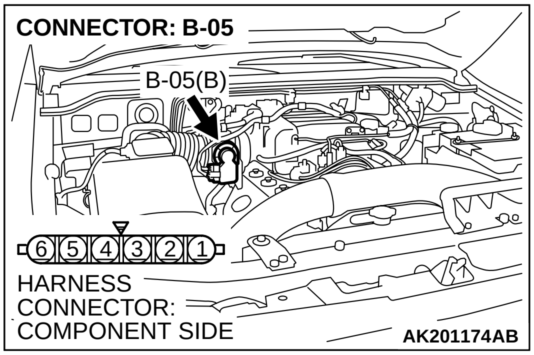
STEP 2. Check connector B-05 at throttle position sensor for damage.



Q: Is the connector in good condition?

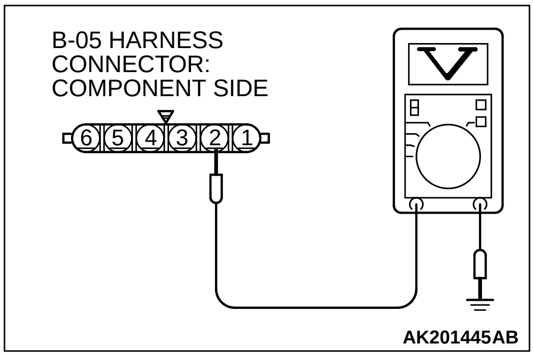
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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



(1) Disconnect the connector B-05 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 2 and ground.

- Voltage should be between 4.8 and 5.2 volts.

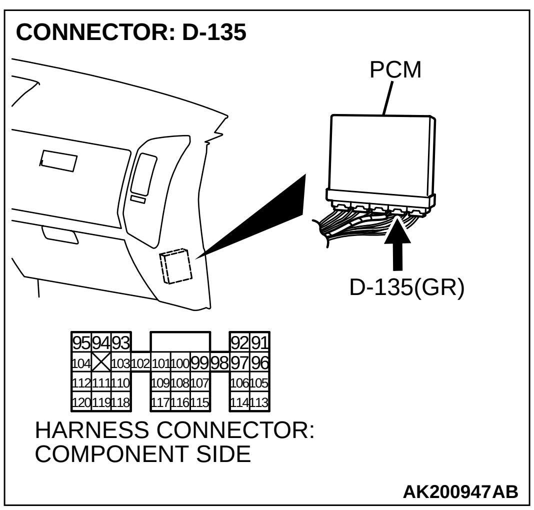
(4) Turn the ignition switch to the "LOCK"(OFF) position.

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

YES : Go to Step 7.

NO : Go to Step 4.

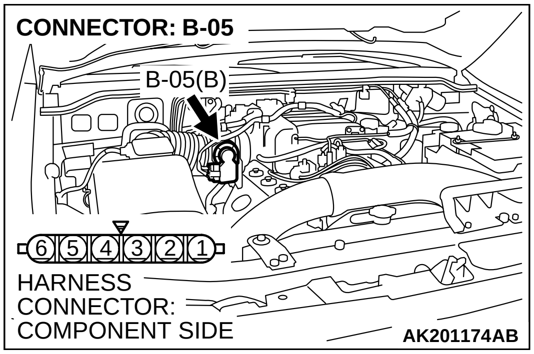
STEP 4. Check connector D-135 at PCM for damage.

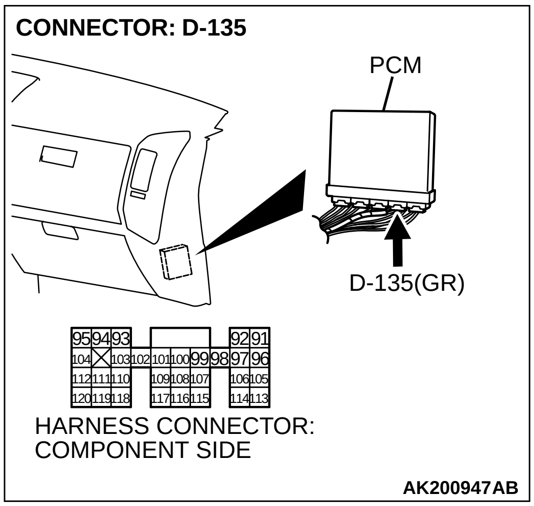


Q: Is the connector in good condition?

YES : Go to Step 5.

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





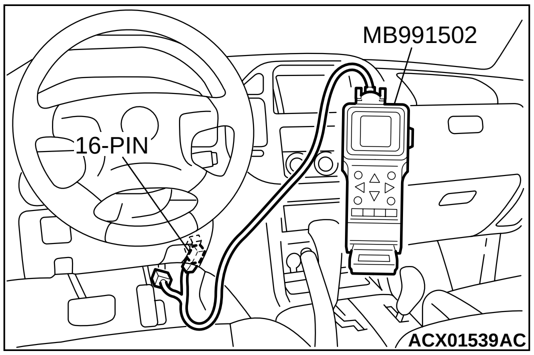
STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 12.

STEP 6. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
- Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

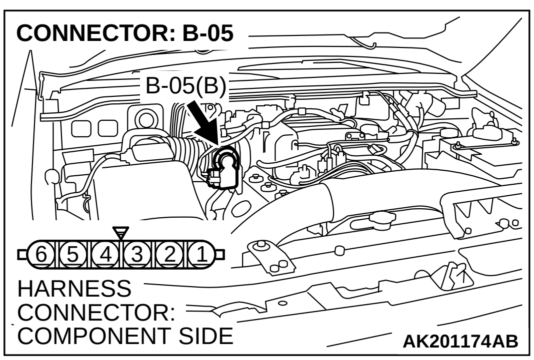
(7) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

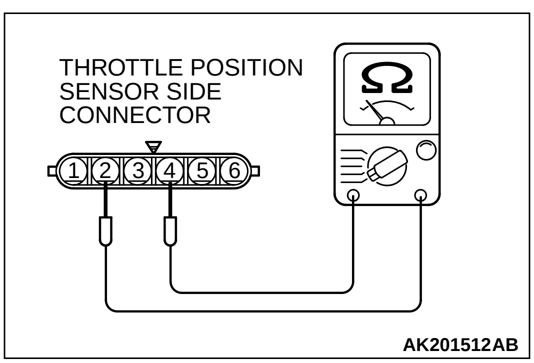
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

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

STEP 7. Check the throttle position sensor.



(1) Disconnect the connector B-05.



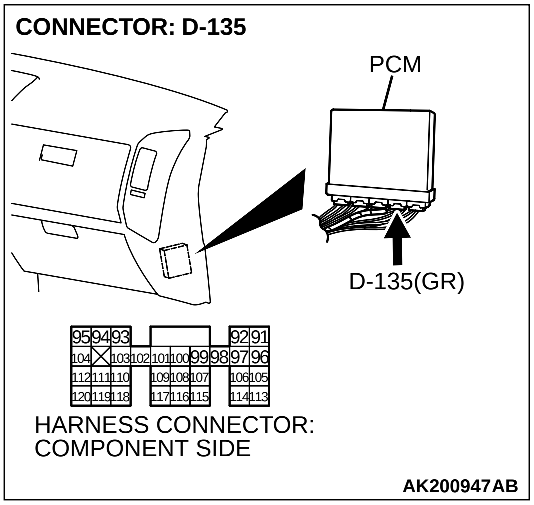
(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 4.

Standard value: 2 – 4 kiloohms

Q: Is the measured resistance between 2 and 4 kiloohms?

YES : Go to Step 8.

NO : Replace the throttle body ASSY. Then go to Step 12.

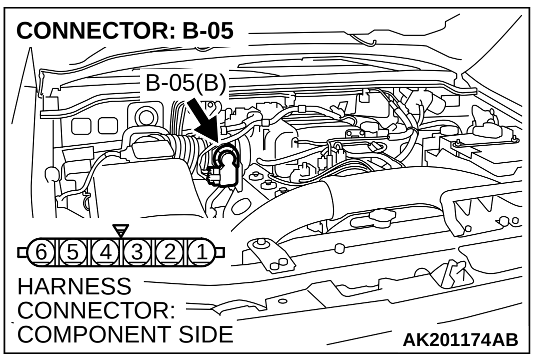


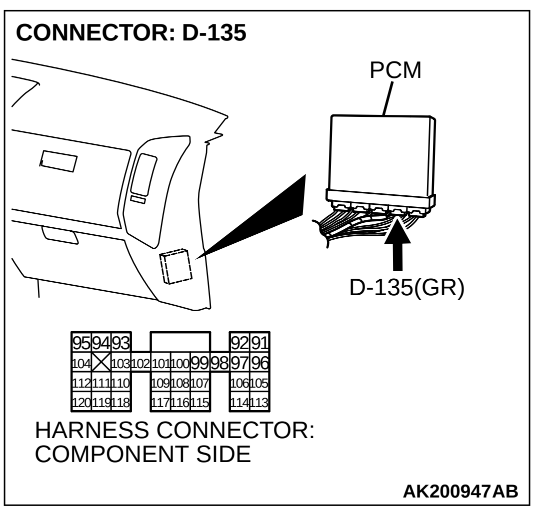
STEP 8. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

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



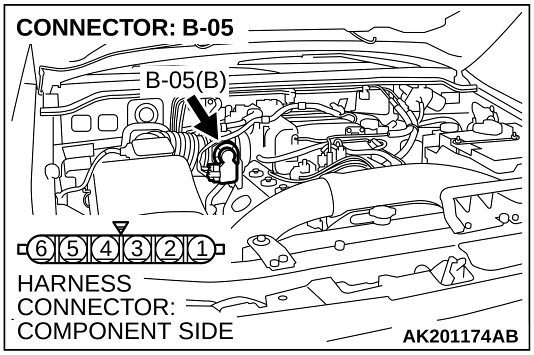


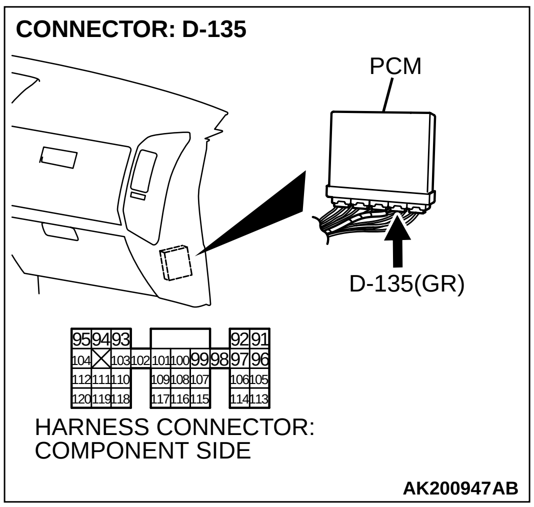
STEP 9. Check for harness damage between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



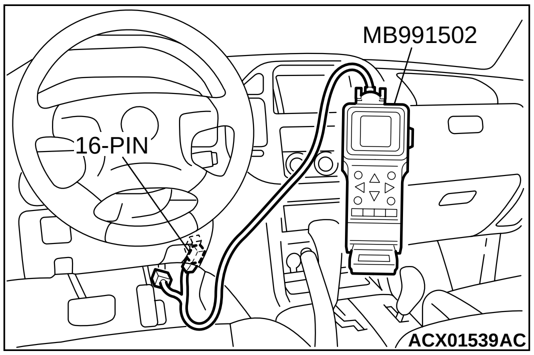


STEP 10. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-05 (terminal No. 1) and PCM connector D-135 (terminal No. 115).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



STEP 11. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).

⚠ CAUTION

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

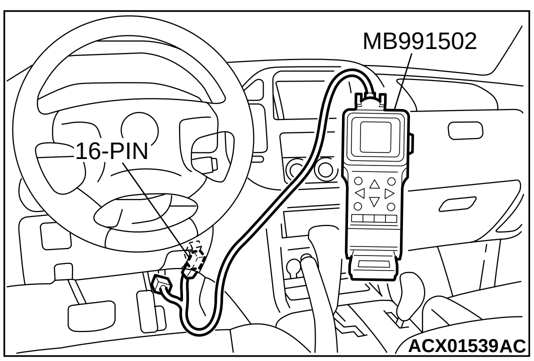
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
- Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

(7) 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 PCM. Then go to Step 12.



STEP 12. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

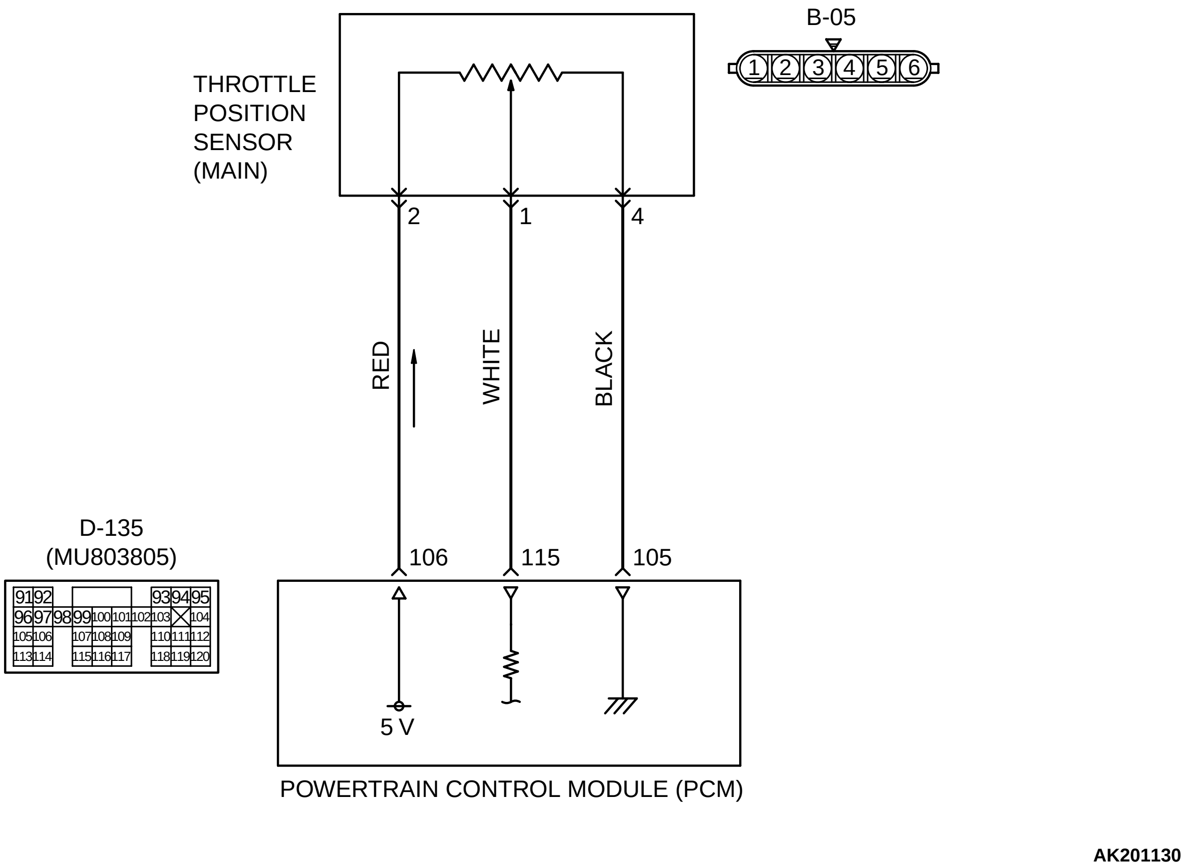
Q: Is DTC P0122 set?

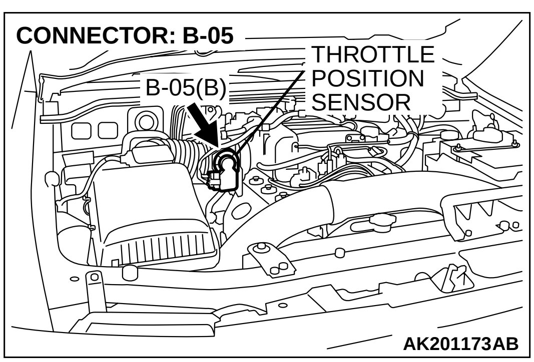
YES : Retry the troubleshooting.

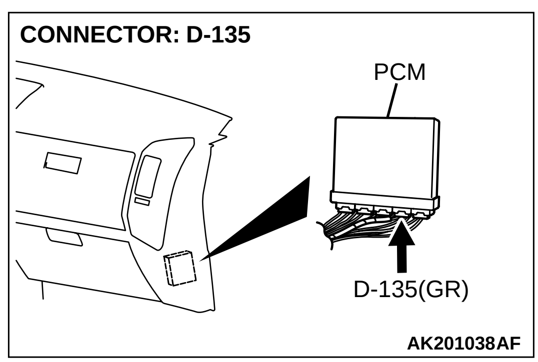
NO : The inspection is complete.

P0123 Throttle Position Sensor (Main) Circuit high Input

Throttle Position Sensor (Main) Circuit







CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS (main) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resister between the TPS (main) output terminal (terminal No. 1) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS (main) outputs voltage which corresponds to the throttle valve opening angle.

- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

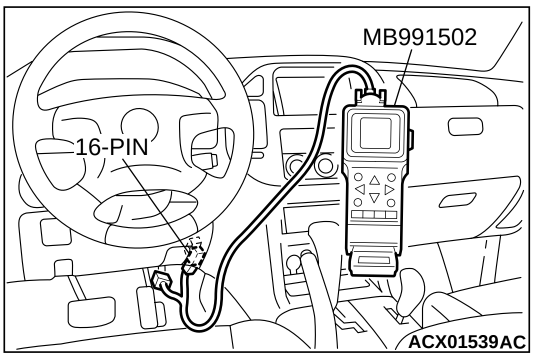
Check Conditions
- Ignition switch "ON" position.

Judgement Criteria
- TPS (main) output voltage should be 4.8 volts or more for 0.5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- TPS failed or maladjusted.
- Open or shorted TPS (main) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

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



STEP 1. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).

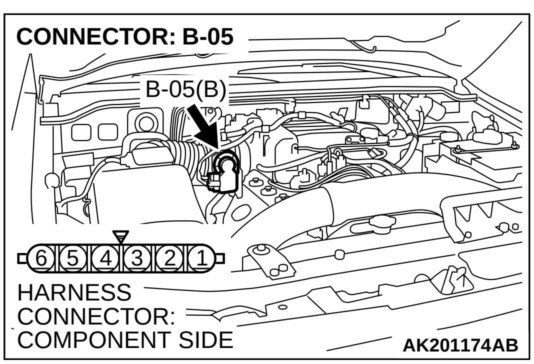
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
- Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

(7) 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.

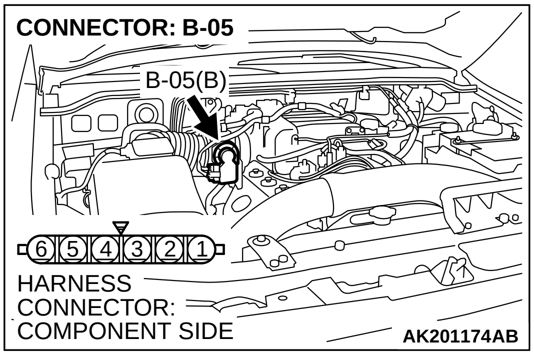


STEP 2. Check connector B-05 at throttle position sensor for damage.

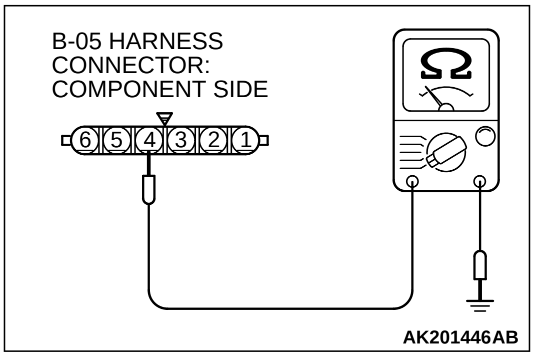
Q: Is the connector in good condition?

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

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



(1) Disconnect the connector B-05 and measure at the harness side.

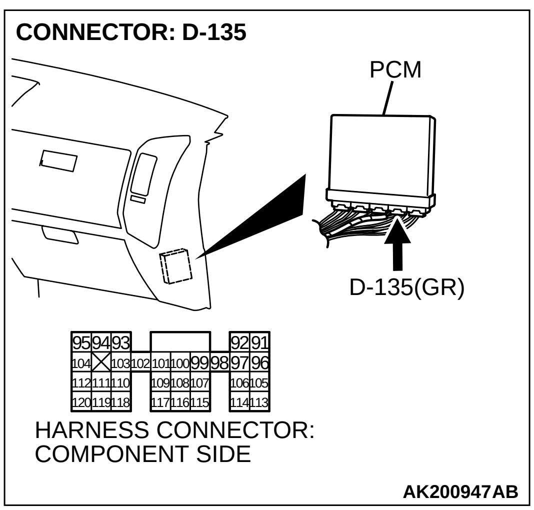


(2) Measure the continuity between terminal No. 4 and ground
- Should be less than 2 ohms.

Q: Is the continuity normal?

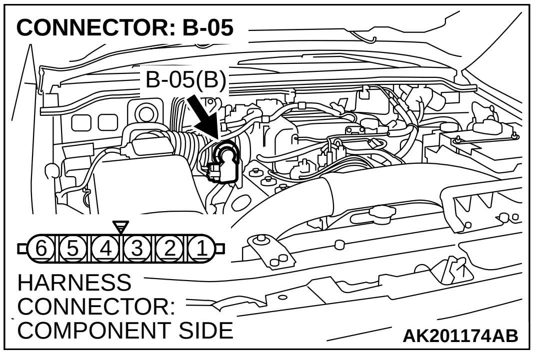
YES : Go to Step 7.
NO : Go to Step 4.

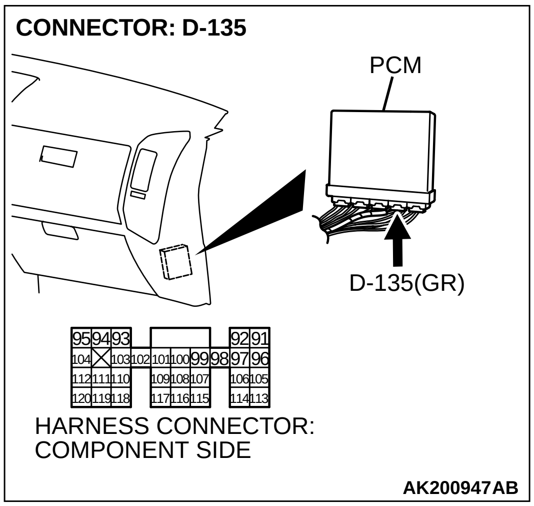
STEP 4. Check connector D-135 at PCM for damage.



Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





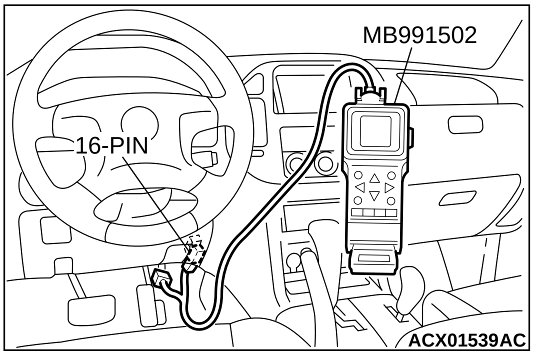
STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-05 (terminal No. 4) and PCM connector D-135 (terminal No. 105).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 9.

STEP 6. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
- Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

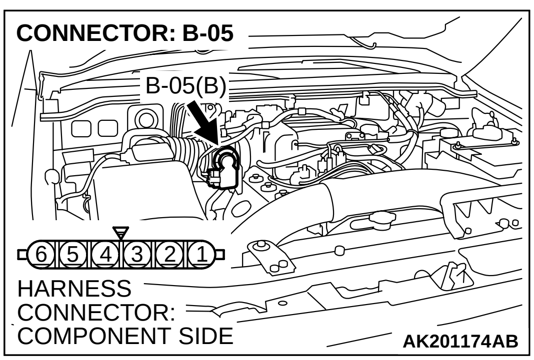
(7) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

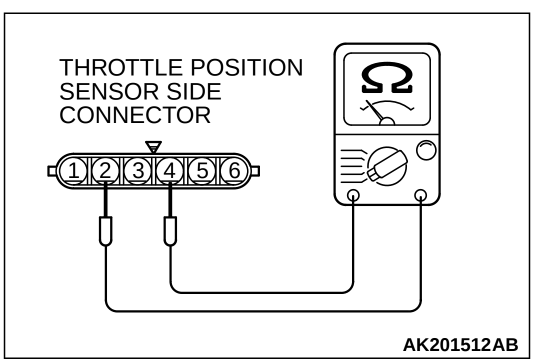
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

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

STEP 7. Check the throttle position sensor.



(1) Disconnect the connector B-05.



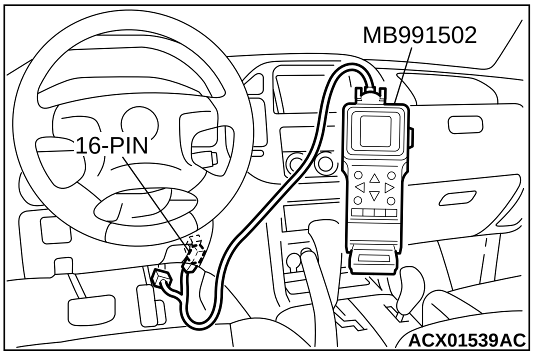
(2) Measure the resistance between throttle position sensor side connector terminals No. 2 and No. 4.

Standard value: 2 – 4 kiloohms

Q: Is the measured resistance between 2 snd 4 kiloohms?

YES : Go to Step 8.

NO : Replace the throttle body ASSY. Then go to Step 9.



STEP 8. Using scan tool MB991502, check data list item 79: Throttle Position Sensor (main).

⚠ CAUTION

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

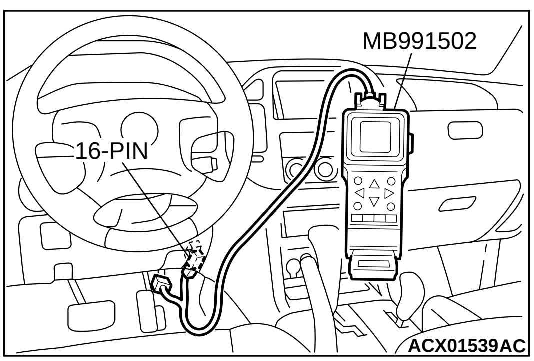
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 79, Throttle Position Sensor (main).
- Output voltage should be between 0.2 and 0.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

(7) 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 PCM. Then go to Step 9.



STEP 9. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

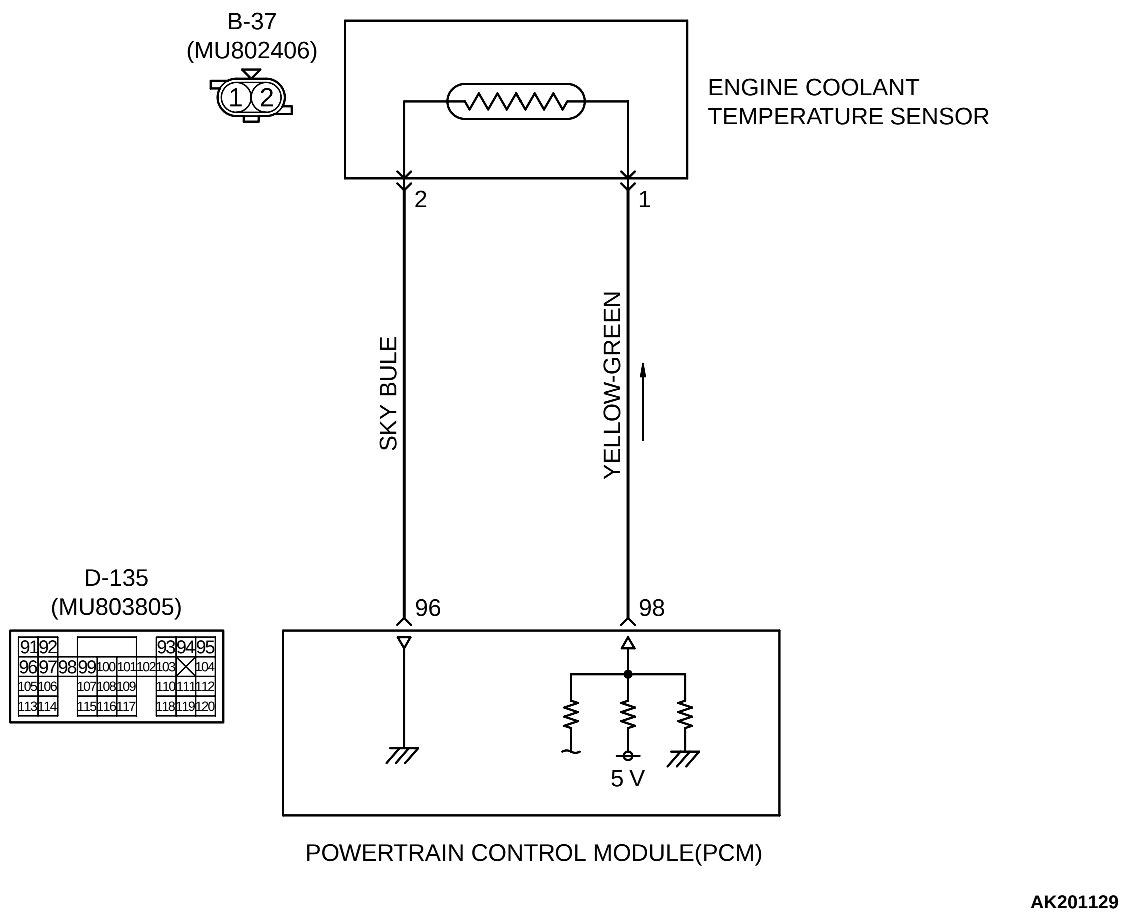
Q: Is DTC P0123 set?

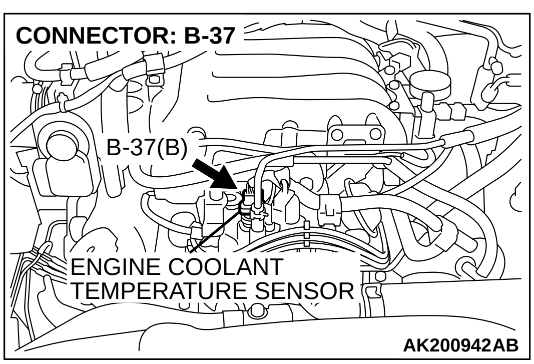
YES : Retry the troubleshooting.

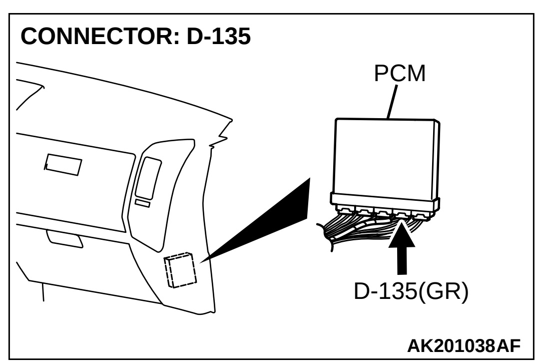
NO : The inspection is complete.

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

Engine Coolant Temperature Sensor Circuit







CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the PCM (terminal No. 98) via the resistor in the PCM. The ground terminal (terminal No. 2) is grounded with (terminal No. 96).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40°C (104°F) to lower than 40°C (104°F).
- Then the engine coolant temperature has continued to be 40°C (104°F) or lower for 5 minutes.

Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7°C (44.6°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

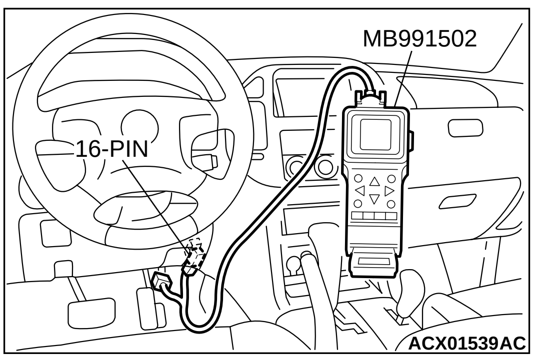
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

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

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

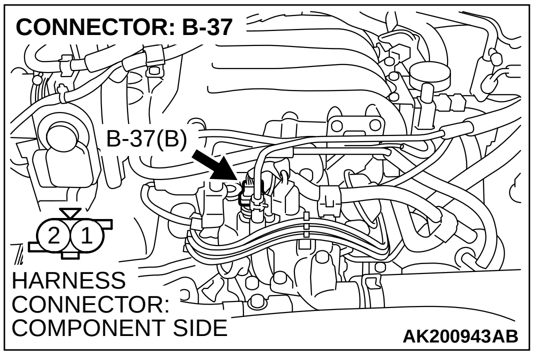
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

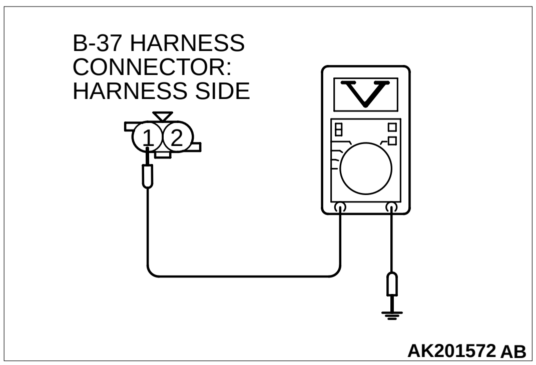
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-37 by backprobing.



(1) Do not disconnect the connector B-37.
(2) Turn the ignition switch to the "ON" position.



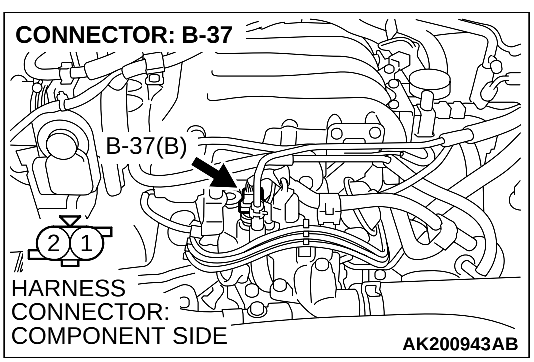
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

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

Q: Is the voltage normal?

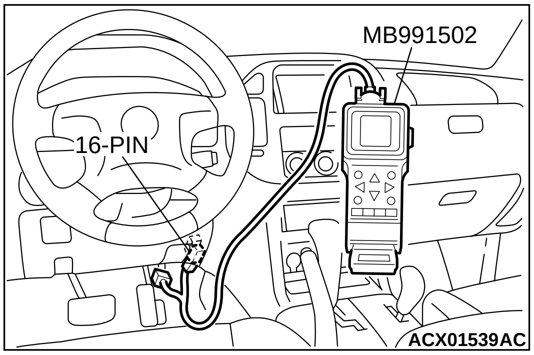
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check connector B-37 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

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



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

⚠ CAUTION

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

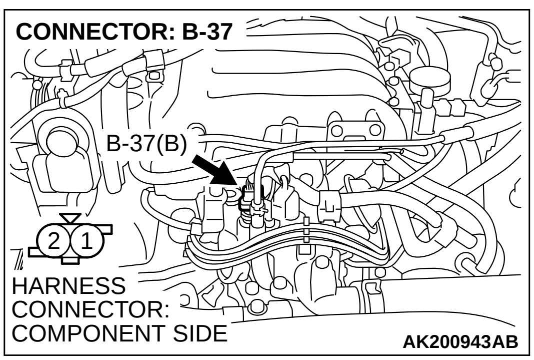
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately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

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

Q: Is the sensor operating properly?

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

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

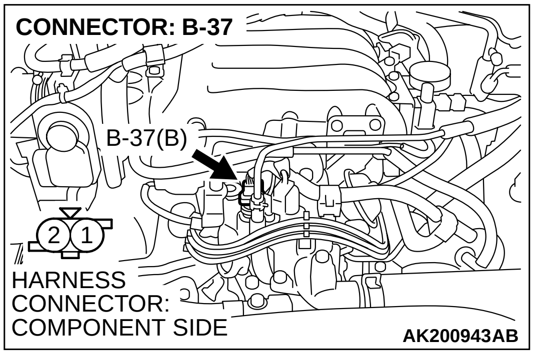


STEP 5. Check connector B-37 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

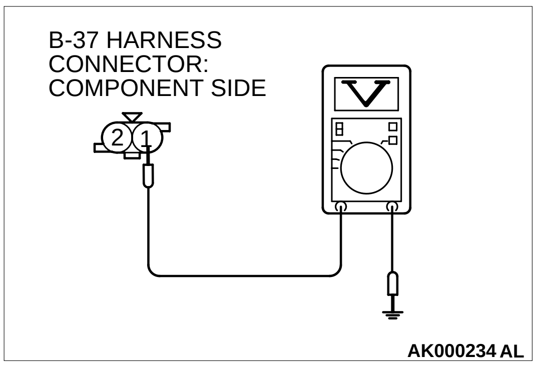
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-37.

(1) Disconnect the connector B-37 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.

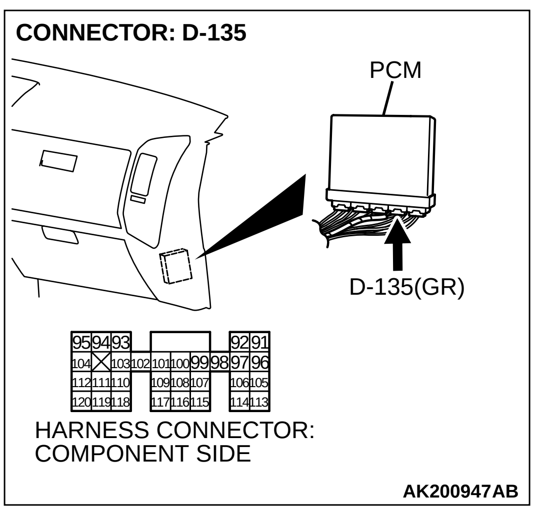
- Voltage should be between 4.5 and 4.9 volts.

(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 7.

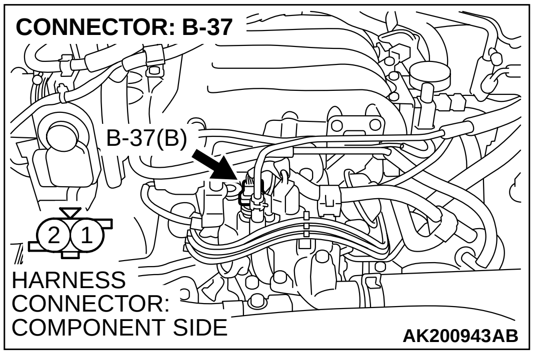


STEP 7. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

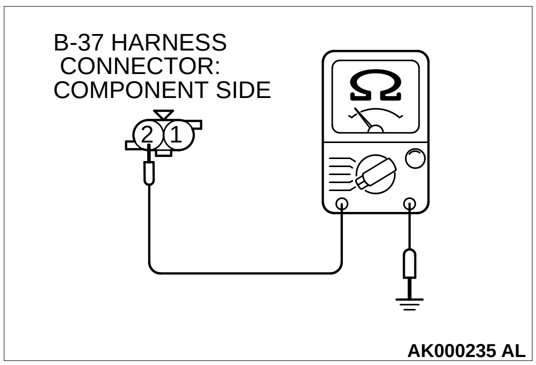
YES : Replace the PCM. Then go to Step 14.

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



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-37.

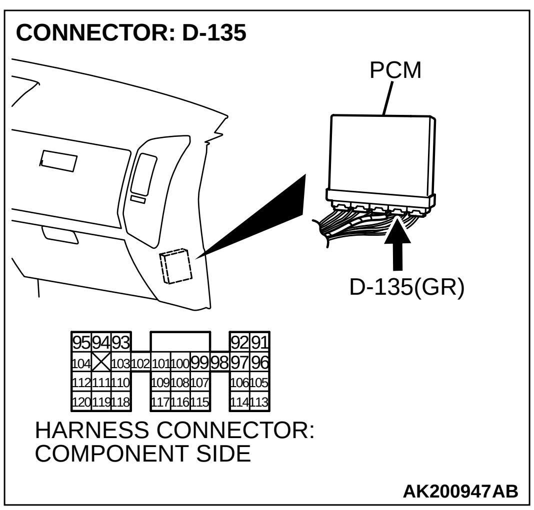
(1) Disconnect the connector B-37 and measure at the harness side.



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

Q: Is the continuity normal?

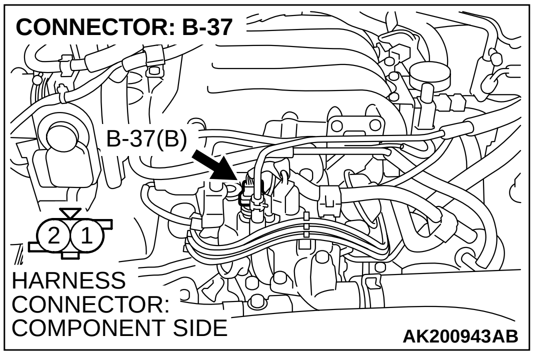
YES : Go to Step 11.
NO : Go to Step 9.

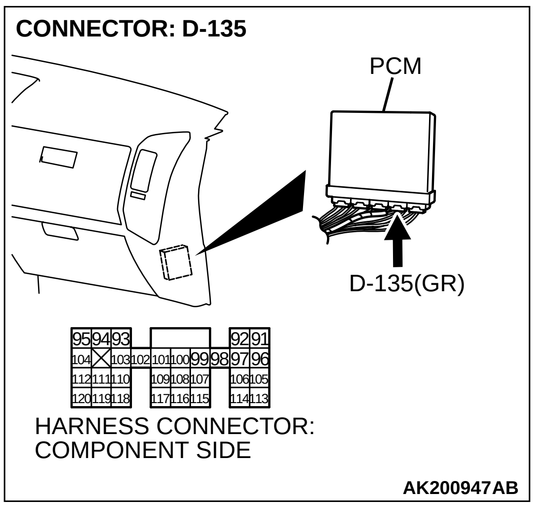


STEP 9. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



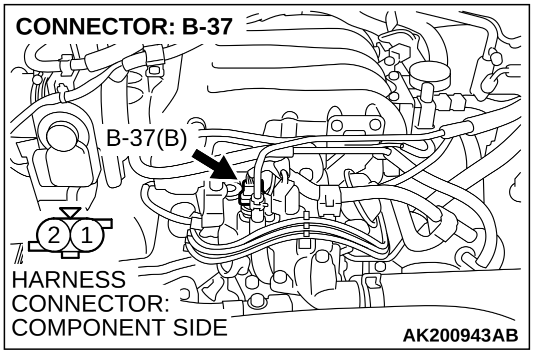


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-37 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

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

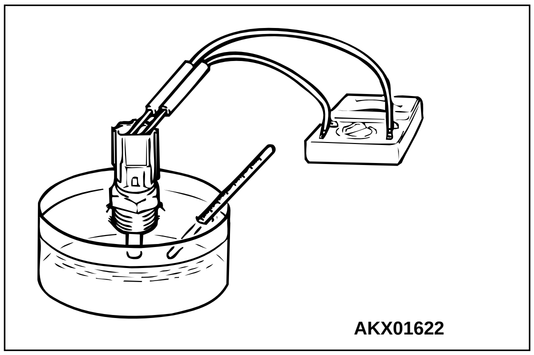
NO : Repair it. Then go to Step 14.



STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-37.

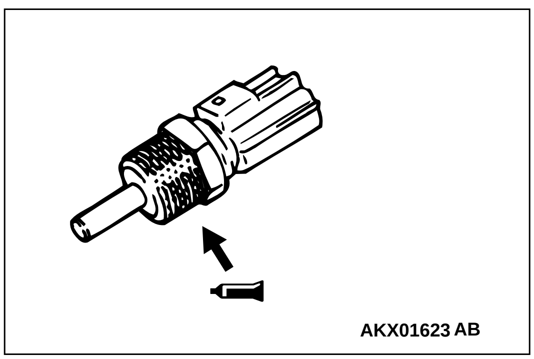
(2) Remove the engine coolant temperature sensor.



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

Standard value:

14 – 17 kiloohms [at –20°C (–4°F)]
5.1 – 6.5 kiloohms [at 0°C (32°F)]
2.1 – 2.7 kiloohms [at 20°C (68°F)]
0.9 – 1.3 kiloohms [at 40°C (104°F)]
0.48 – 0.68 kiloohm [at 60°C (140°F)]
0.26 – 0.36 kiloohm [at 80°C (176°F)]



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

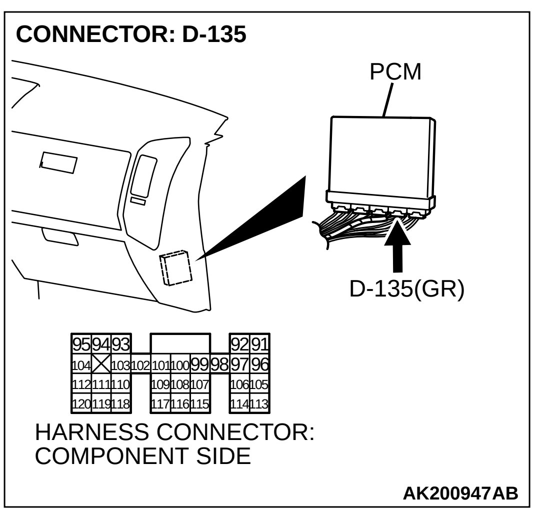
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

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

Q: Is the resistance at the standard value?

YES : Go to Step 12.

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

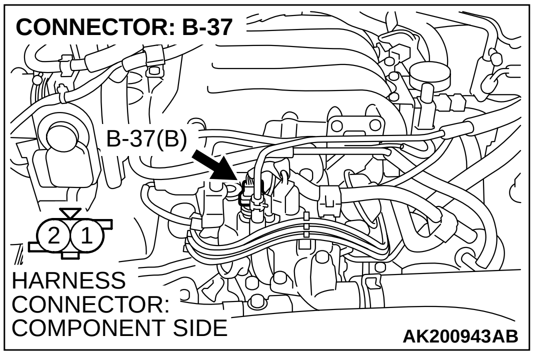


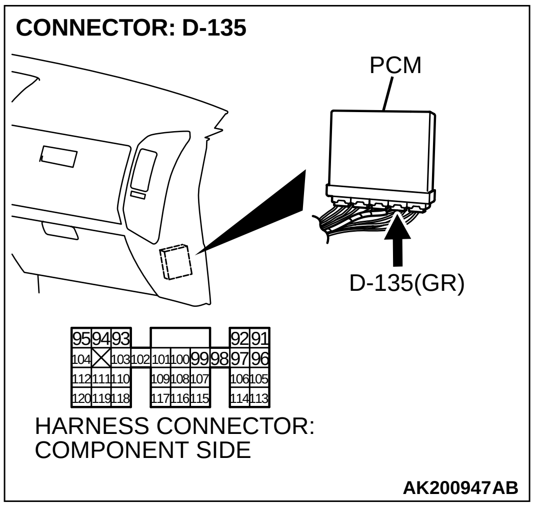
STEP 12. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

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





STEP 13. Check for harness damage between engine coolant temperature sensor connector B-37 (terminal No. 1) and PCM connector D-135 (terminal No. 98).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

Q: Is DTC P0125 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0128: Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

TECHNICAL DESCRIPTION

- The PCM checks the time for the cooling water temperature to reach the judgment temperature.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is between –10°C (14°F) and 77°C (171°F) when the engine is started.
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 5°C (9°F) or less.
- The volume airflow sensors output frequency is in the low frequency state for 300 seconds or less.

Judgment Criteria

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 13 to 20 minutes.
- The PCM monitors for this condition once during the drive cycle.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- The thermostat is faulty.
- PCM failed.

DIAGNOSIS

STEP 1. Check the cooling system.

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

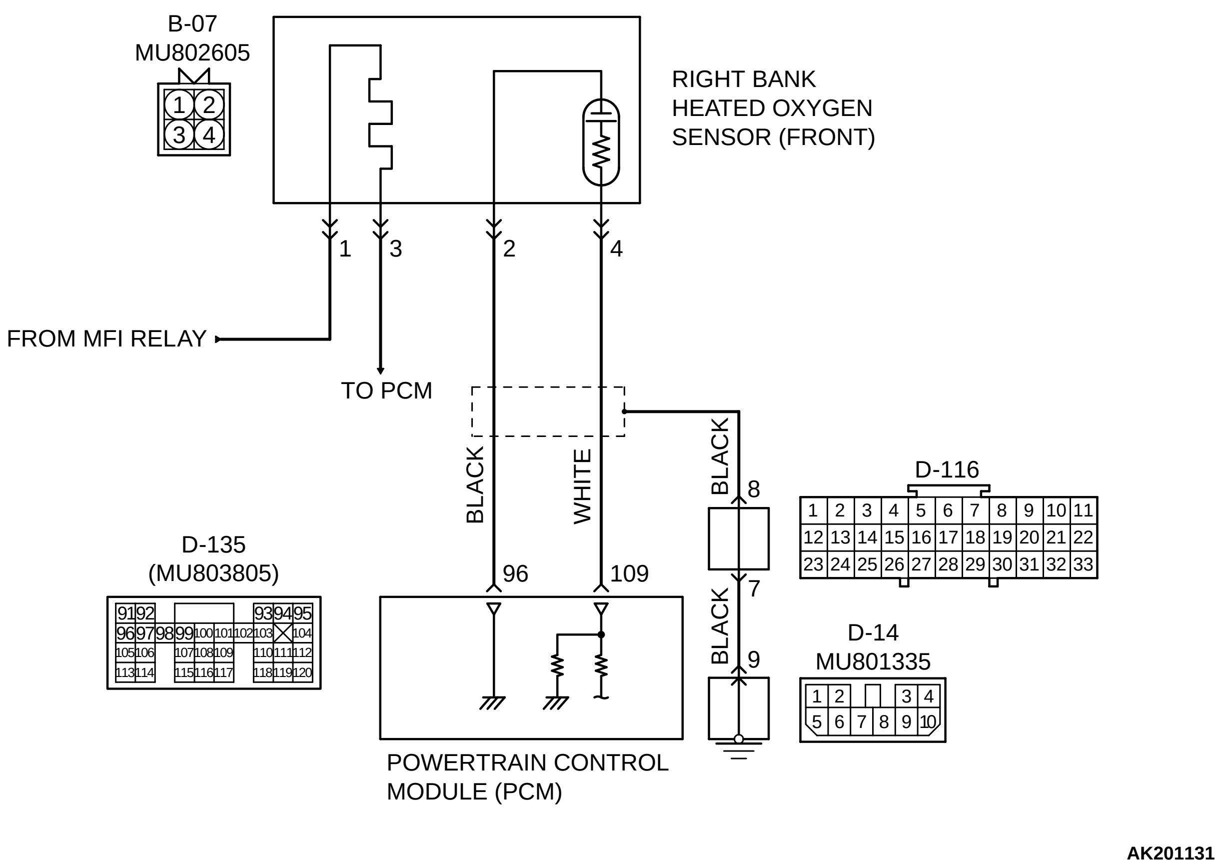
Q: Is the cooling system normal?

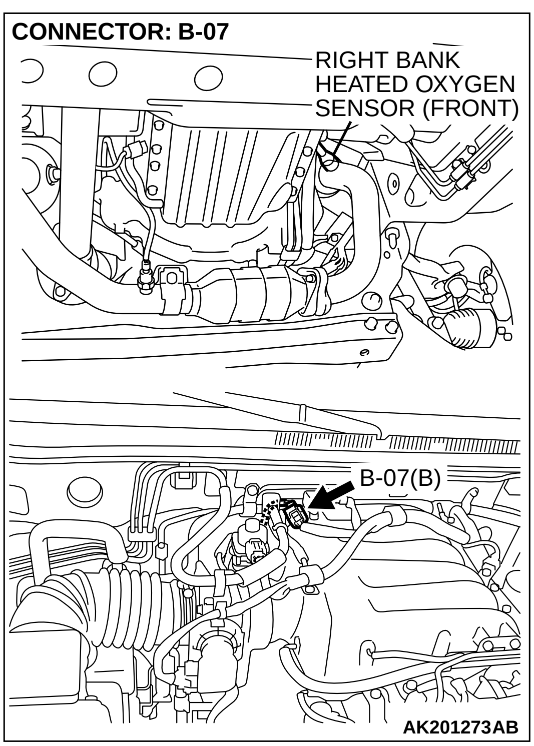
YES : Replace the PCM. Then check that the DTC P0128 does not reset.

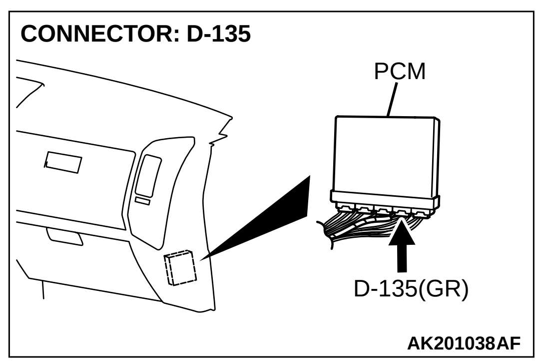
NO : Repair it. Then check that the DTC P0128 does not reset.

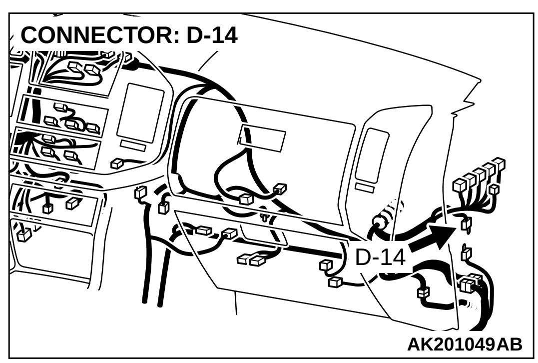
DTC P0130: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1)

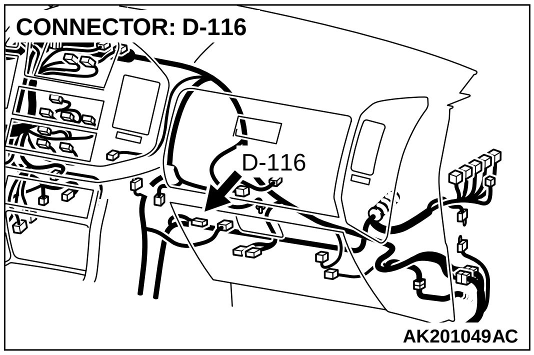
Right Bank Heated Oxygen Sensor (front) Circuit











CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 109) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the right bank heated oxygen sensor (front) output line via a resistor.
- The PCM monitors for this condition once during the drive cycle.

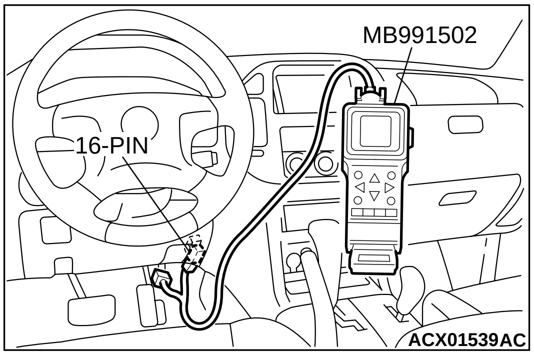
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (front) deteriorated.
- Open circuit in right bank heated oxygen sensor (front) output line.
- Open circuit in right black heated oxygen sensor (front) ground line.
- PCM failed.

DIAGNOSIS

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

STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

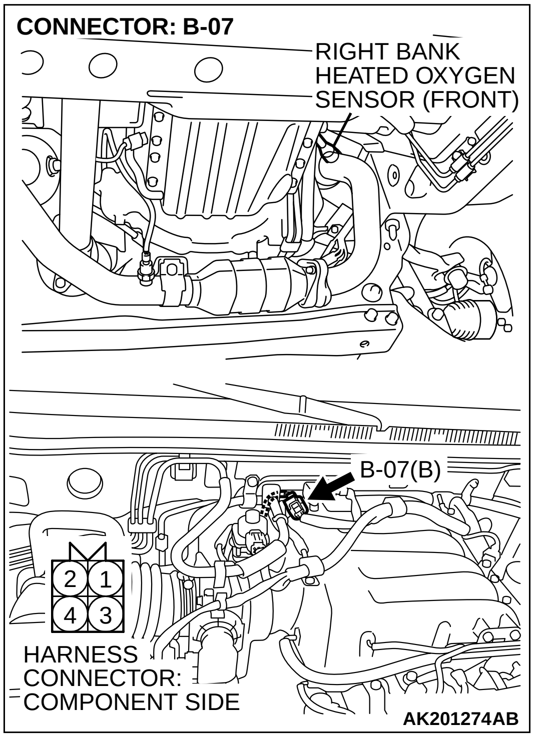
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

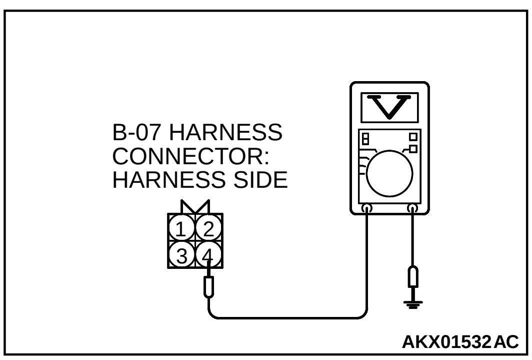
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at right bank heated oxygen sensor (front) connector B-07 by backprobing



(1) Do not disconnect the connector B-07.
(2) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

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

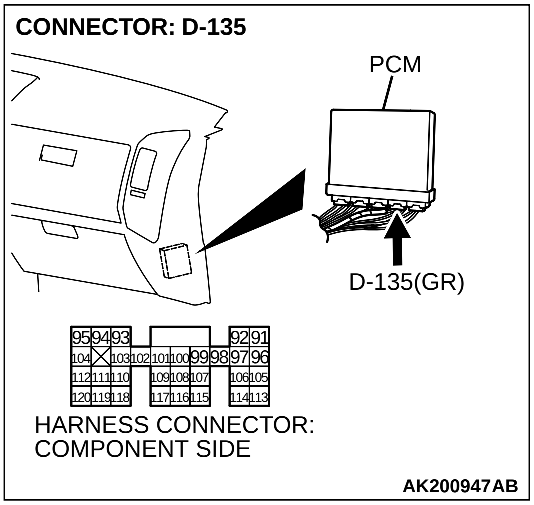
Q: Is the voltage normal?

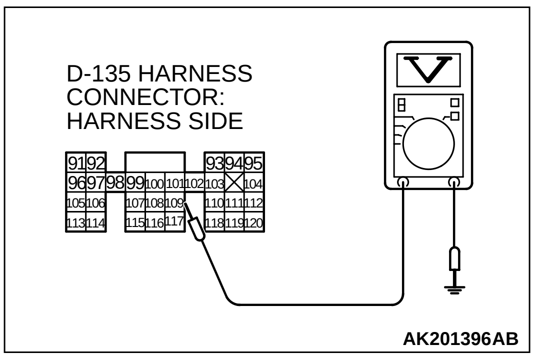
YES : Go to Step 3.
NO : Go to Step 7.

STEP 3. Measure the sensor output voltage at PCM connector D-135 by backprobing

(1) Do not disconnect the connector D-135.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 109 and ground by backprobing.

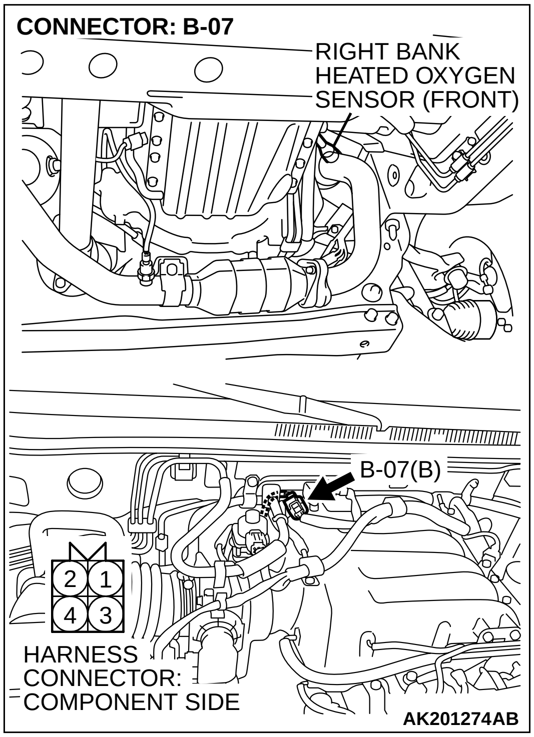
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

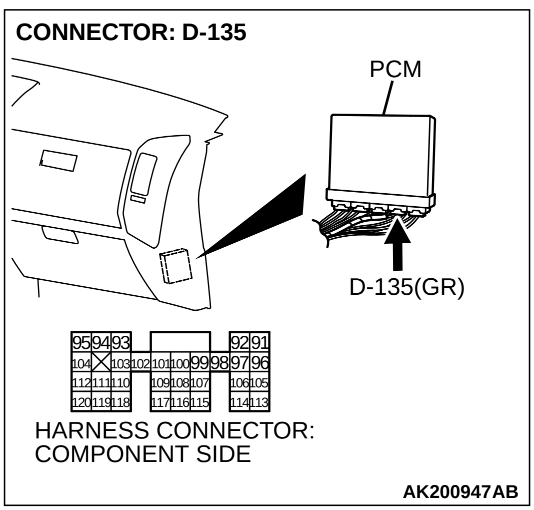
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Go to Step 6.





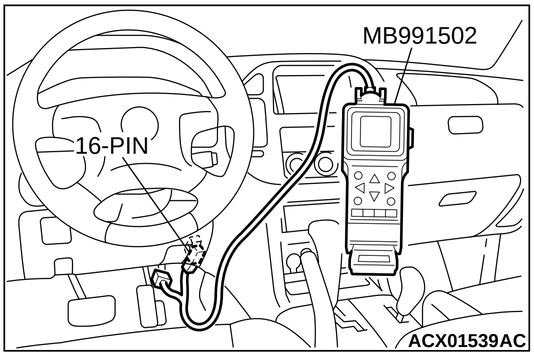
STEP 4. Check harness connector B-07 at right bank heated oxygen sensor (front) and harness connector D-135 at PCM for damage.

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 15.

STEP 5. Using scan tool MB991502, check data list item 39: Right Bank Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



⚠ CAUTION

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

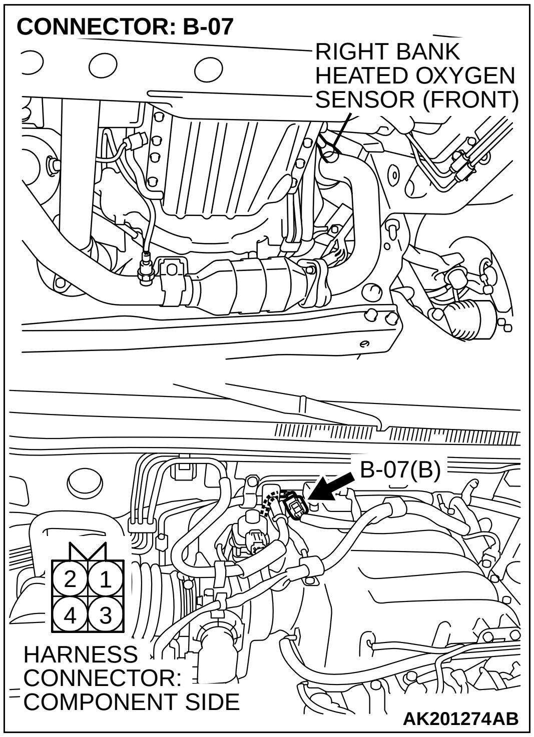
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

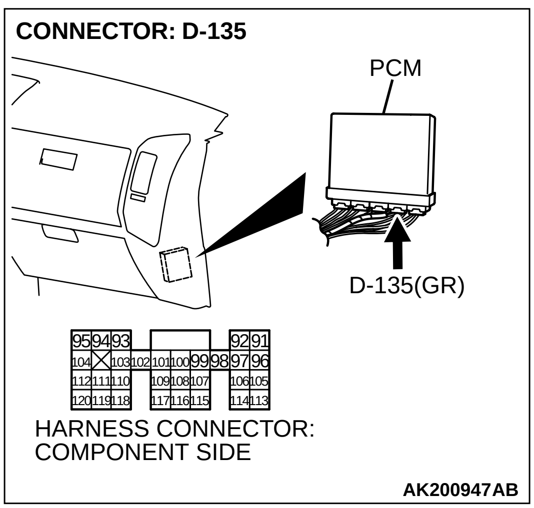
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

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



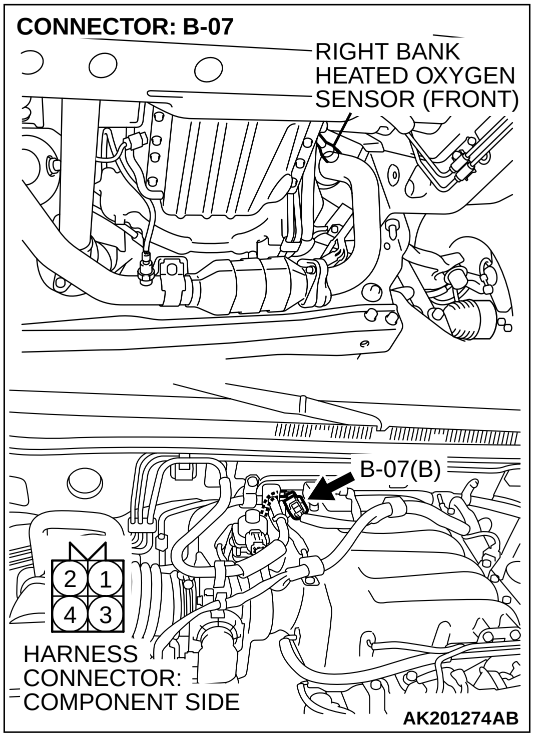


STEP 6. Check harness connector B-07 at right bank heated oxygen sensor (front) and harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-07 (terminal No. 4) and PCM connector D-135 (terminal No. 109) because of open circuit or harness damage. Then go to Step 15.

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

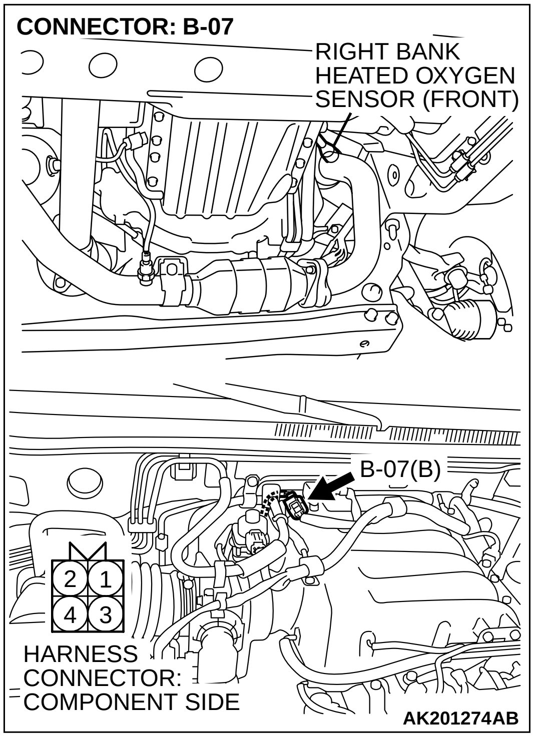


STEP 7. Check harness connector B-07 at right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

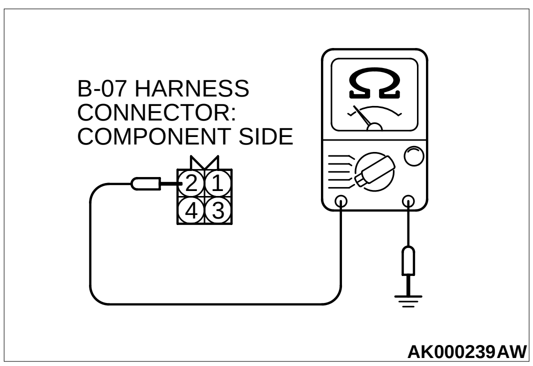
YES : Go to Step 8.

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



STEP 8. Check the continuity at right bank heated oxygen sensor (front) harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

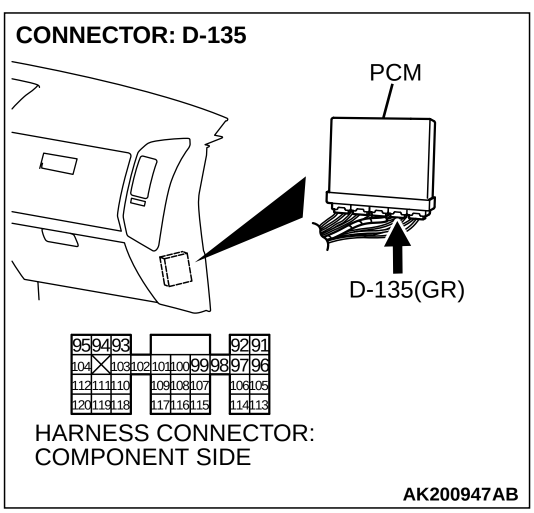


(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 11.
NO : Go to Step 9.



STEP 9. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

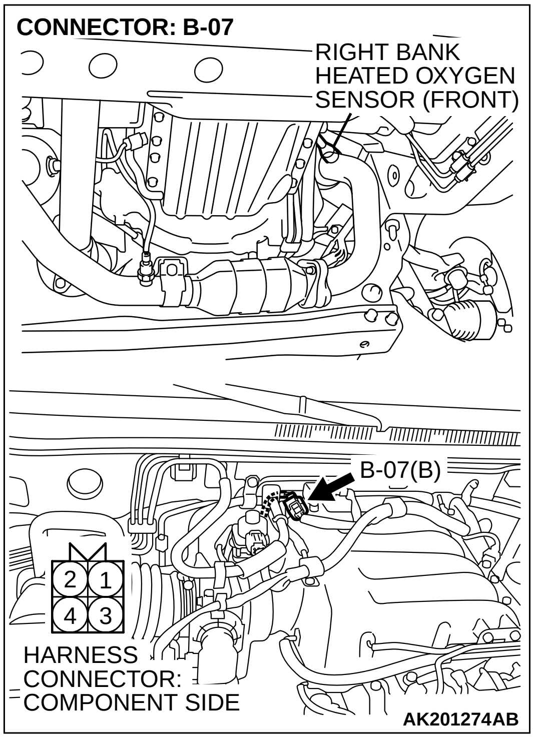
YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

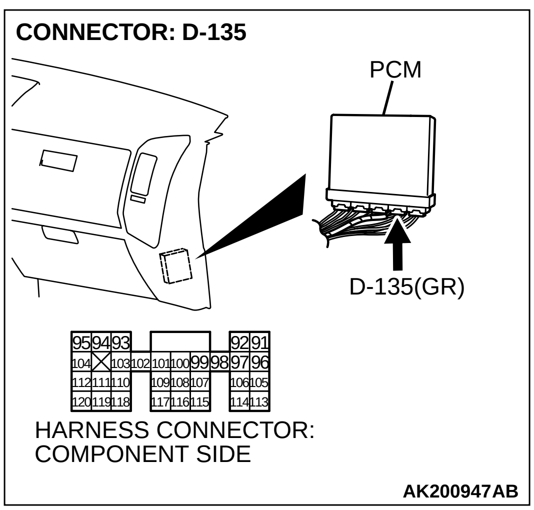
STEP 10. Check for open circuit and harness damage between right bank heated oxygen sensor (front) connector B-07 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

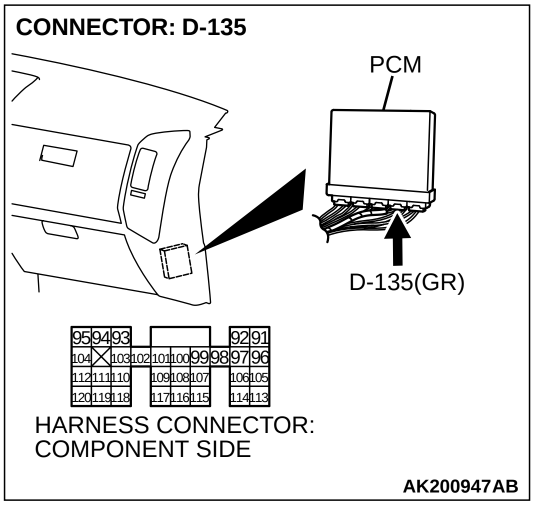
Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 15.







STEP 11. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.

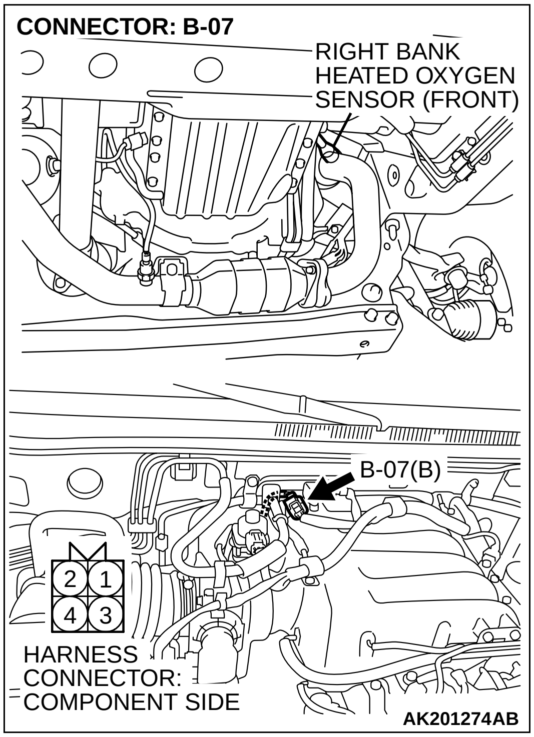
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

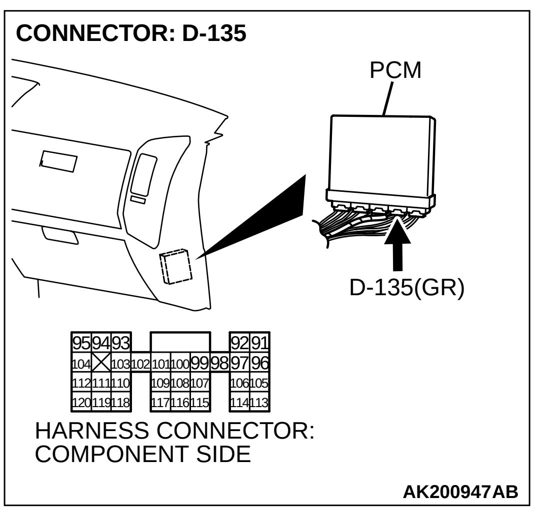
STEP 12. Check for harness damage between right bank heated oxygen sensor (front) connector B-07 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

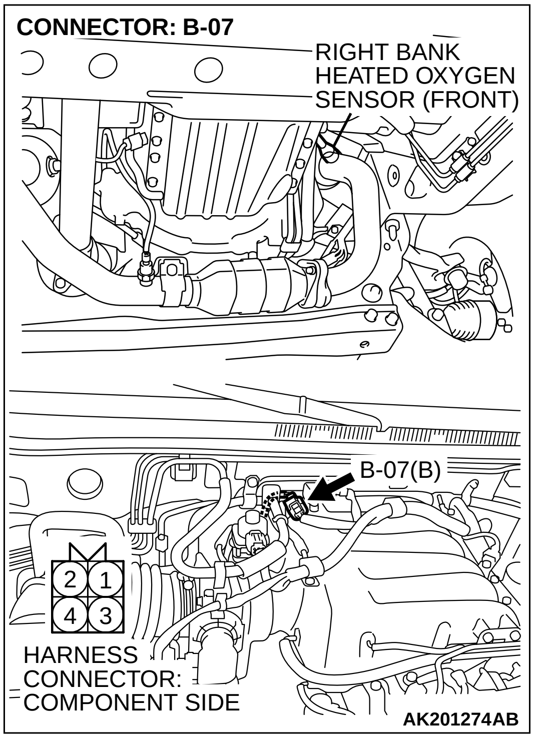
Q: Is the harness wire in good condition?

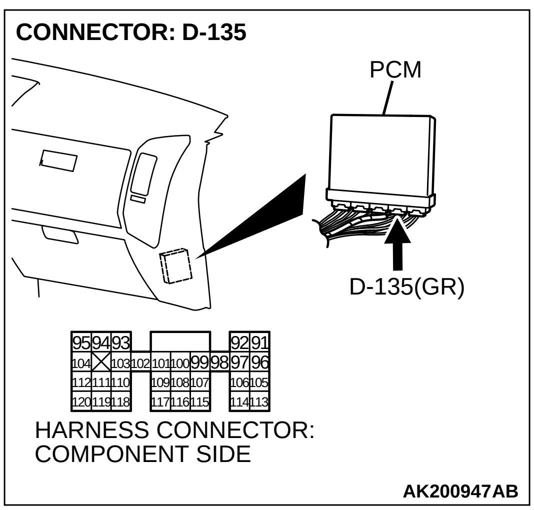
YES : Go to Step 13.

NO : Repair it. Then go to Step 15.







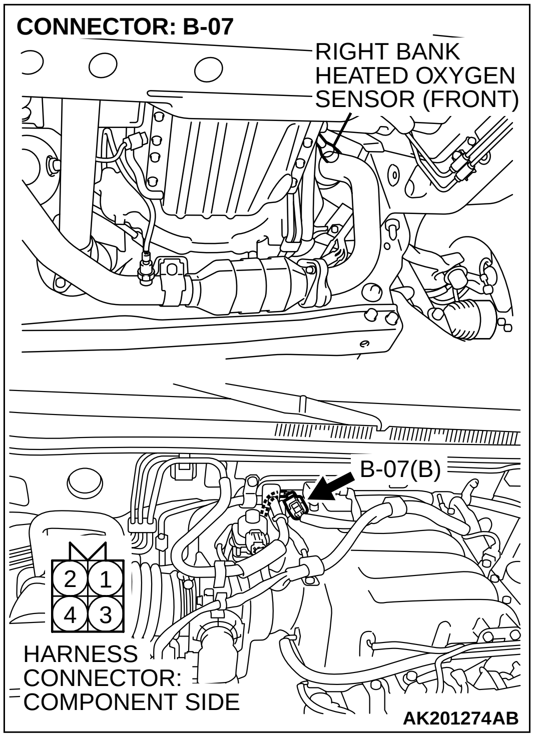


STEP 13. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (front) connector B-07 (terminal No. 4) and PCM connector D-135 (terminal No. 109).

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to Step 15.



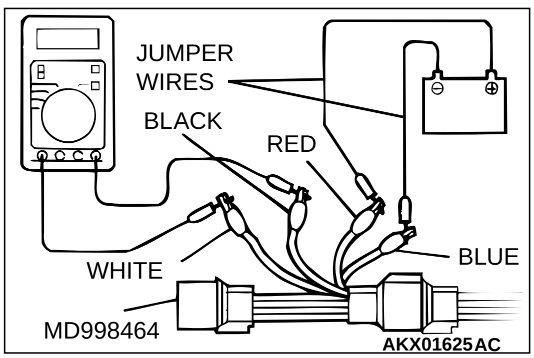
STEP 14. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-07 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

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

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

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

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

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

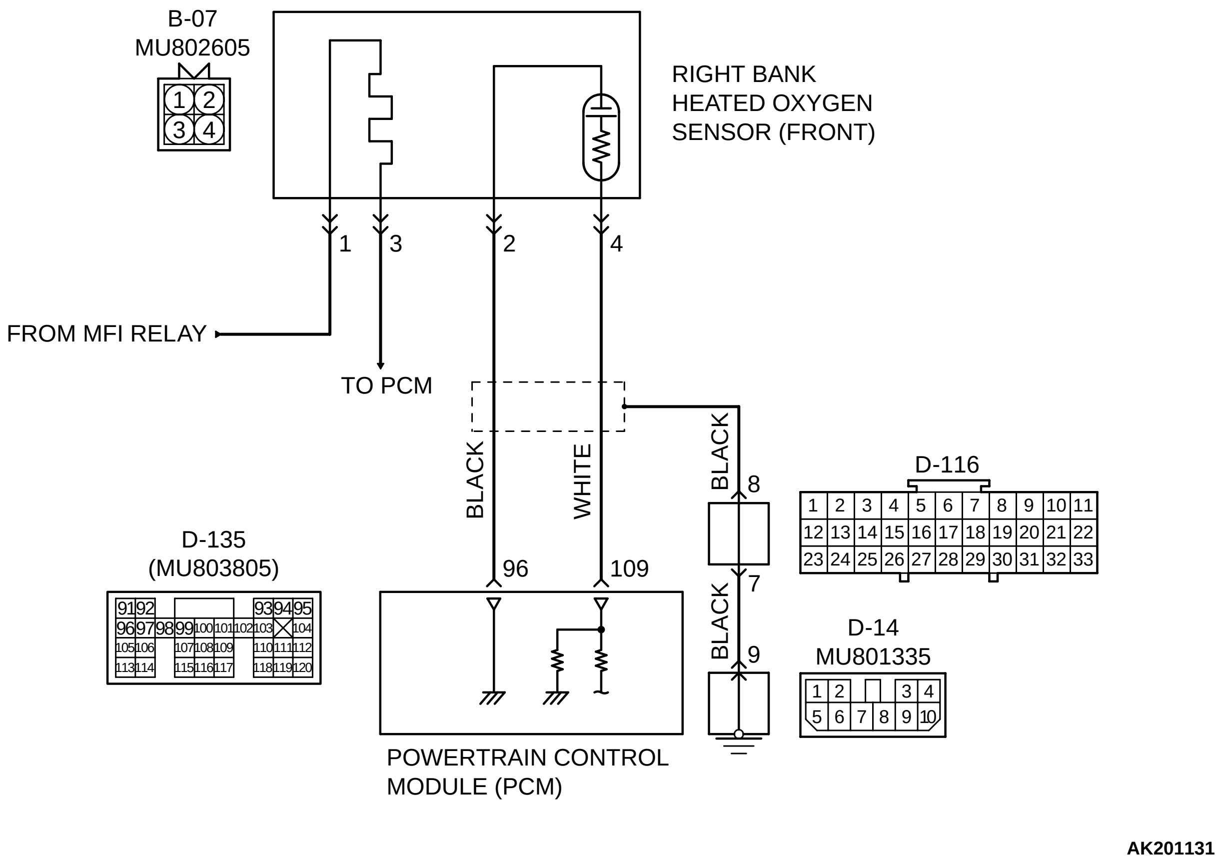
Q: Is DTC P0132 set?

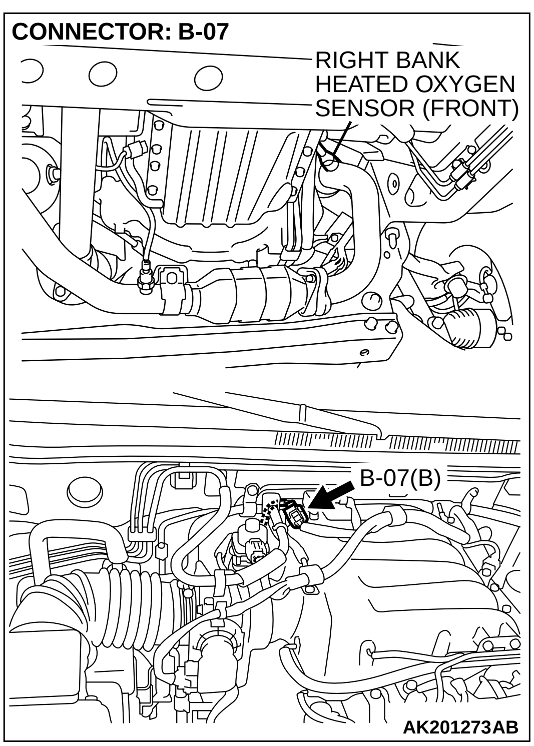
YES : Retry the troubleshooting.

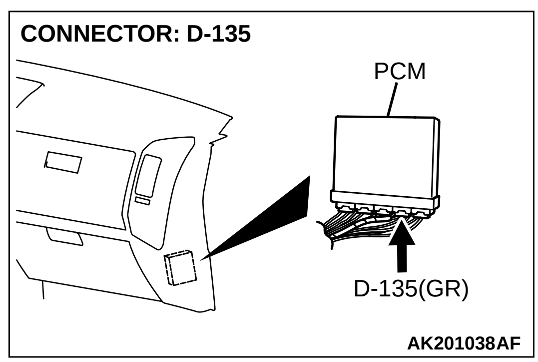
NO : The inspection is complete.

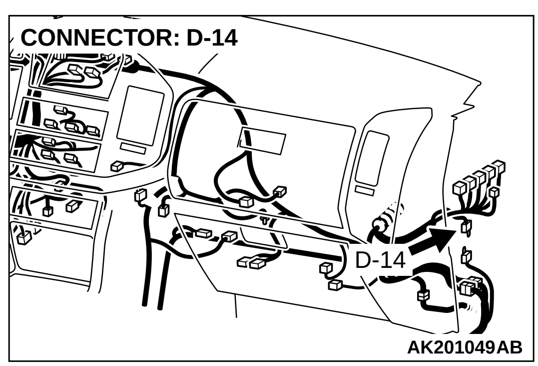
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1)

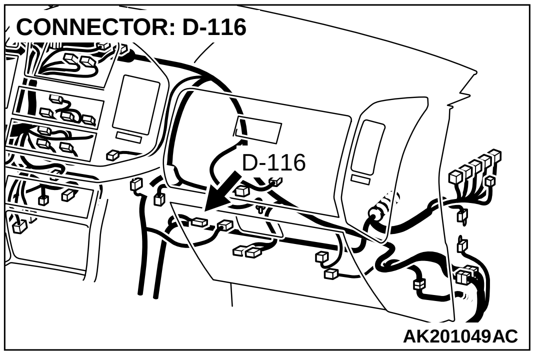
Right Bank Heated Oxygen Sensor (front) Circuit











CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 109) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume airflow sensor output frequency is 100 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned "ON" position, the changes in the output voltage of the right bank heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.2 volt.
- The PCM monitors for this condition once during the drive cycle.

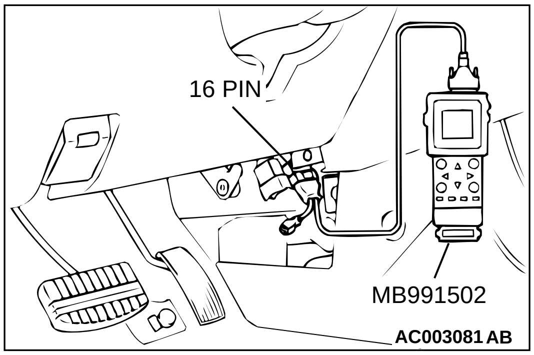
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (front) failed.
- Short circuit in right bank heated oxygen sensor (front) output line.
- PCM failed.

DIAGNOSIS

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

STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

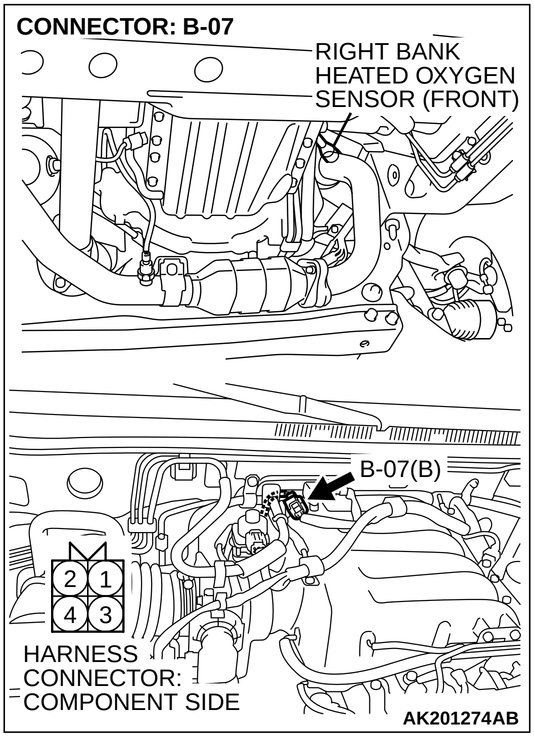
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

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

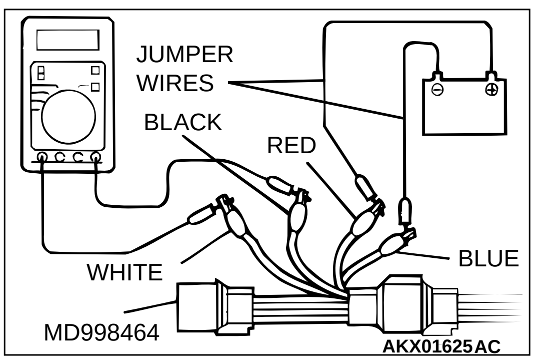


(1) Disconnect the right bank heated oxygen sensor (front) connector B-07 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

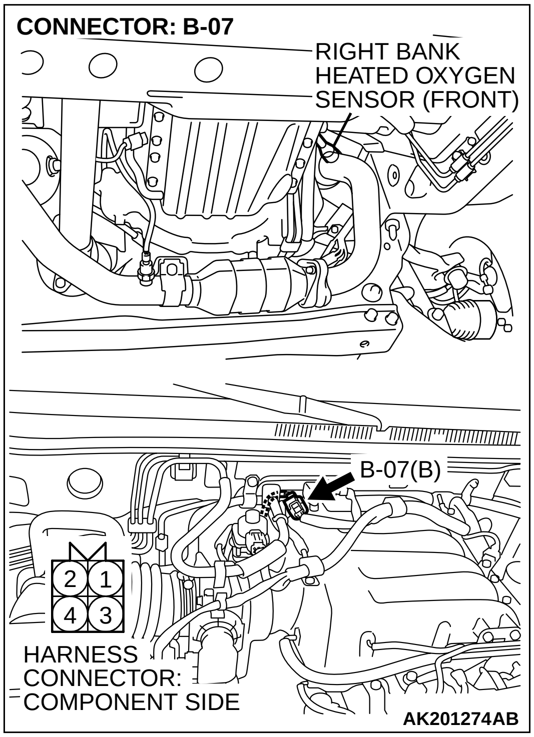
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

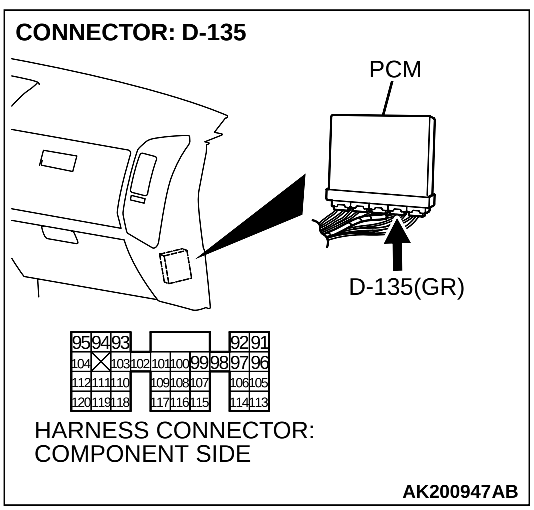
Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 3.

NO : Replace the right bank heated oxygen sensor (front). Then go to Step 5.



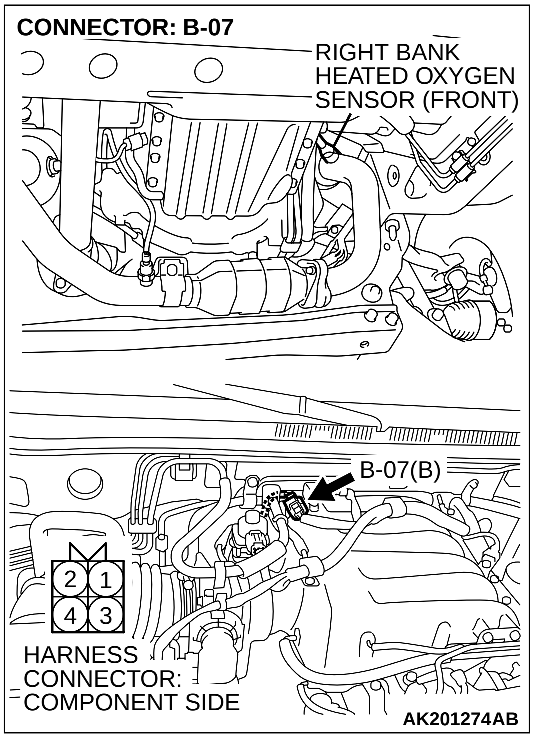


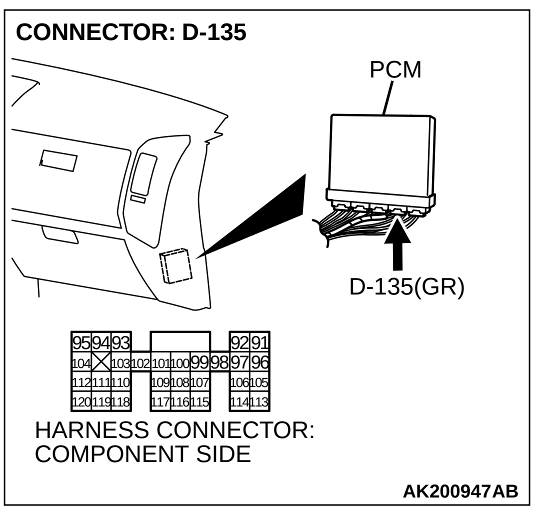
STEP 3. Check connector B-07 at right bank heated oxygen sensor (front) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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





STEP 4. Check for short circuit to ground between right bank heated oxygen sensor (front) connector B-07 (terminal No. 4) and PCM connector D-135 (terminal No. 109).

Q: Is the harness wire in good condition?

YES : Replace the PCM. 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, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.

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

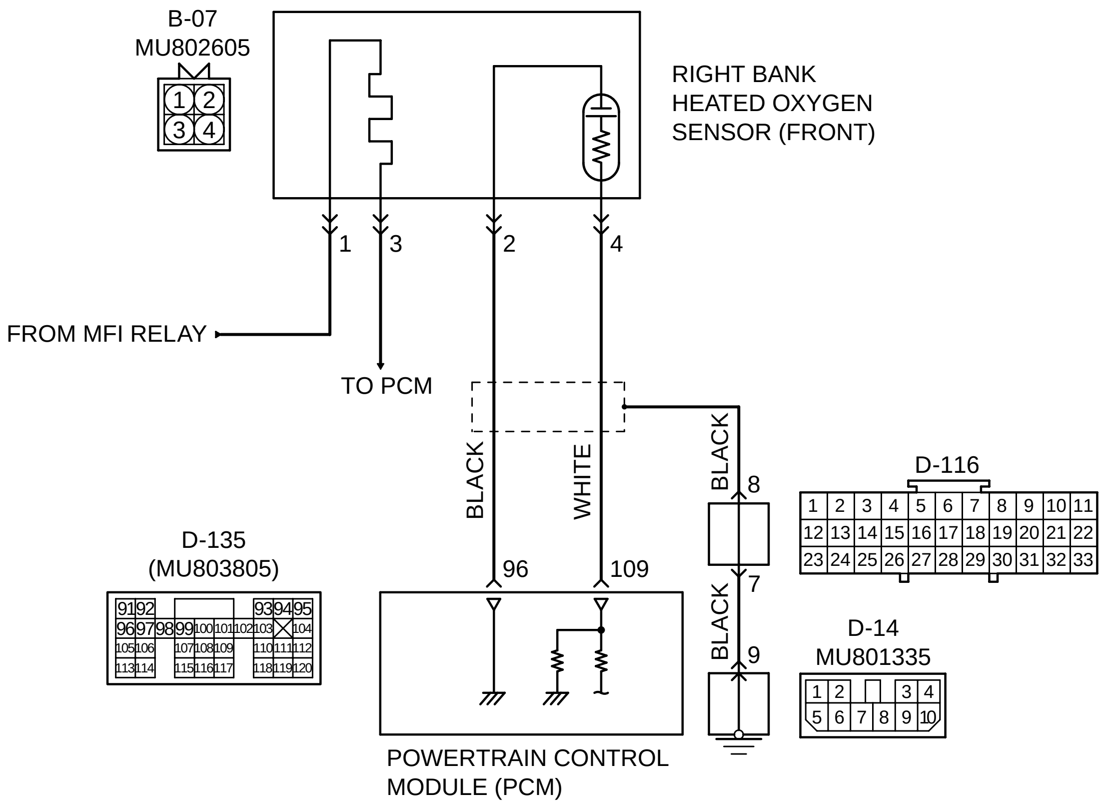
Q: Is DTC P0131 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0132: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



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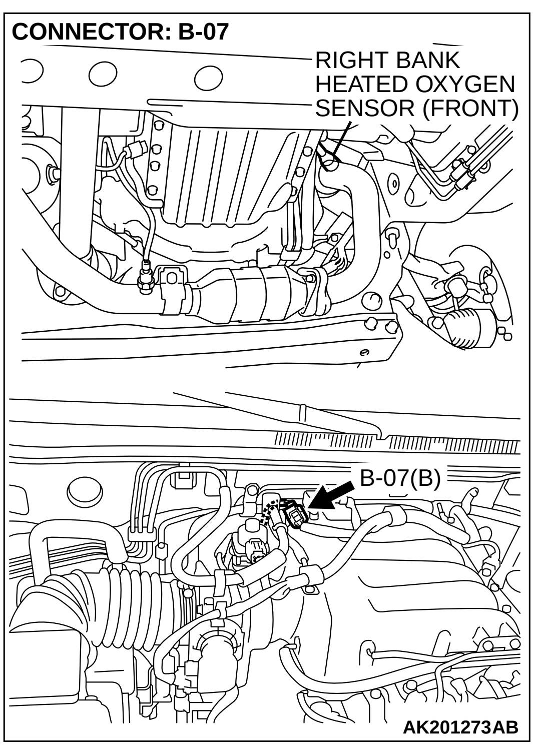
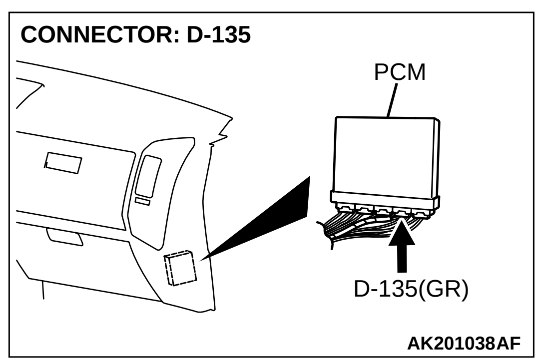
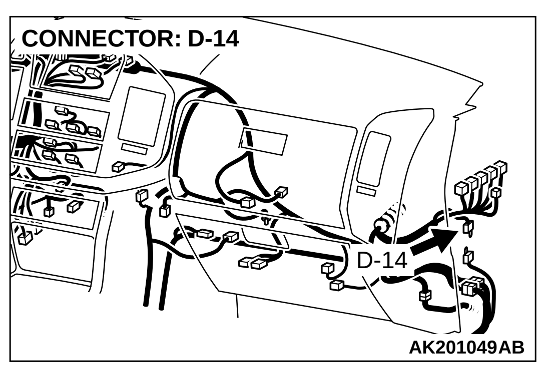
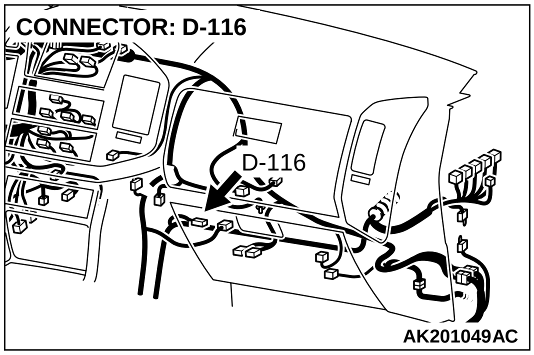








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 109) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgment Criteria

- Right bank heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Short circuit in right bank heated oxygen sensor (front) output line.
- PCM failed.

DIAGNOSIS

Required Special Tool:

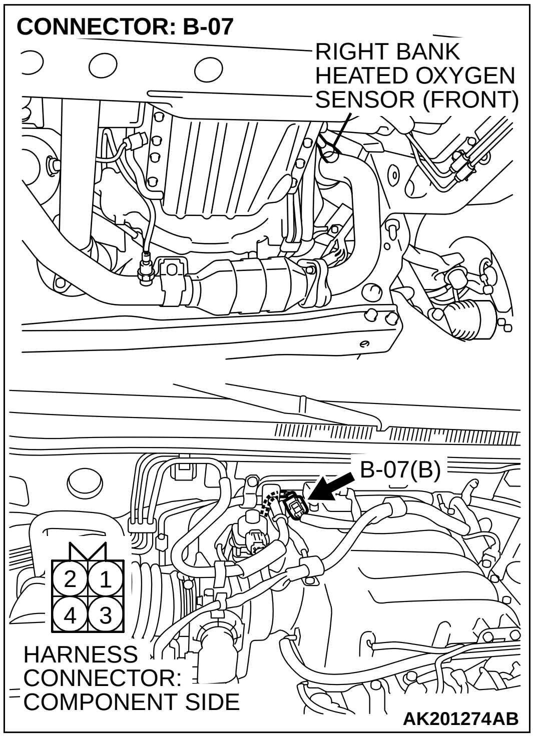
- MB991502: Scan Tool (MUT-II)

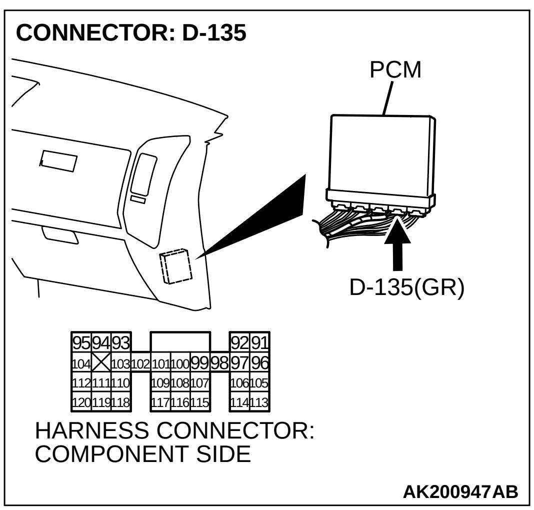
STEP 1. Check connector B-07 at right bank heated oxygen sensor (front) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

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

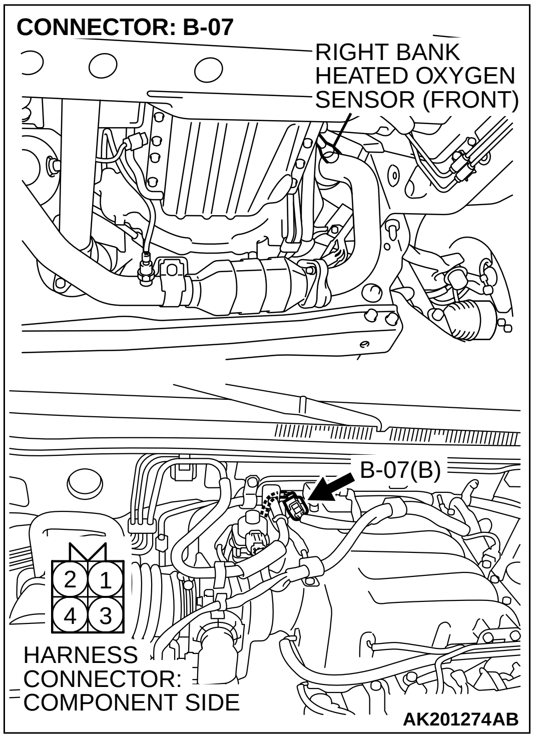


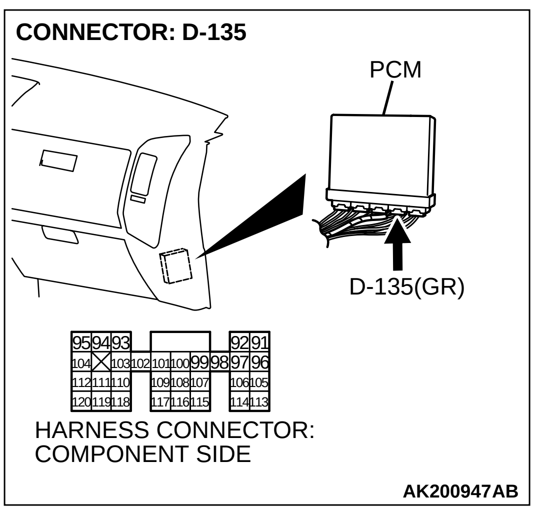


STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-07 (terminal No. 4) and PCM connector D-135 (terminal No. 109).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Perform the OBD-II drive cycle.

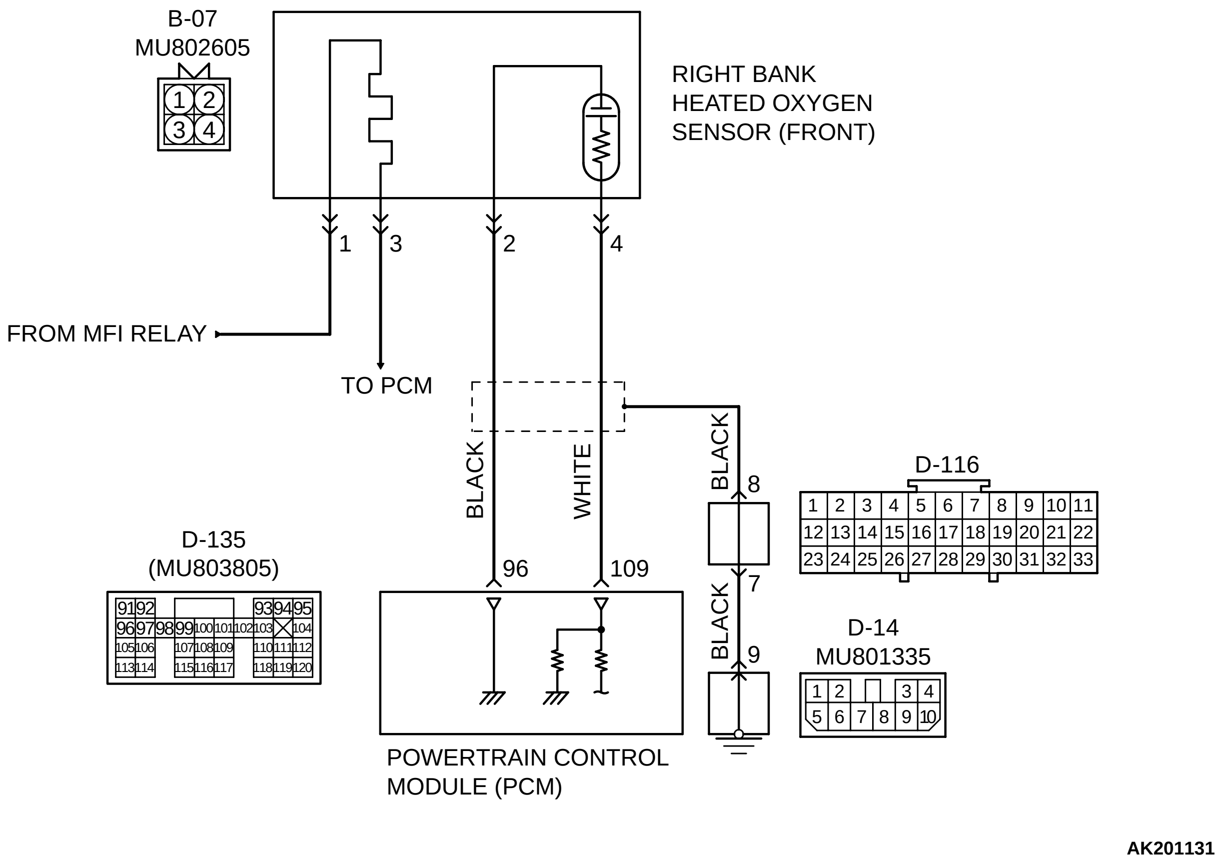
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

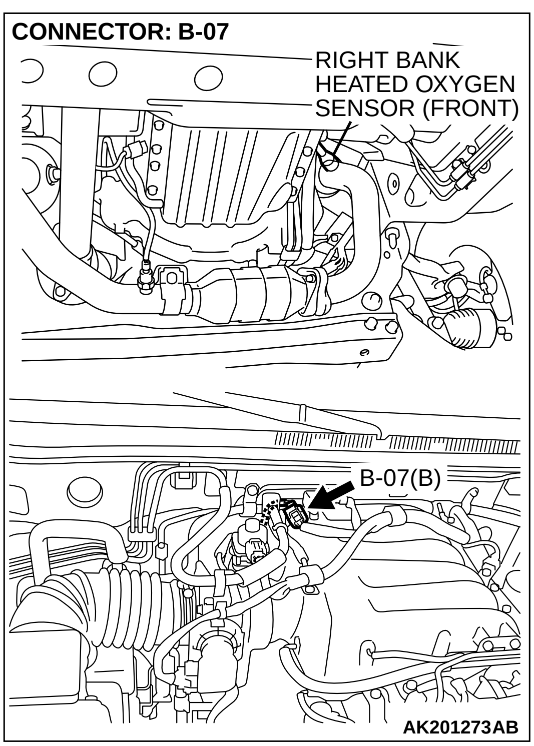
Q: Is DTC P0132 set?

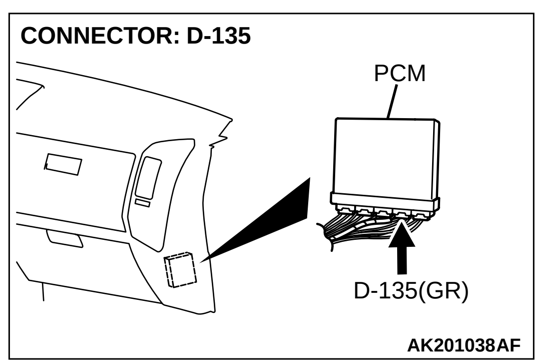
YES : Repeat the troubleshooting.
NO : The procedure is complete.

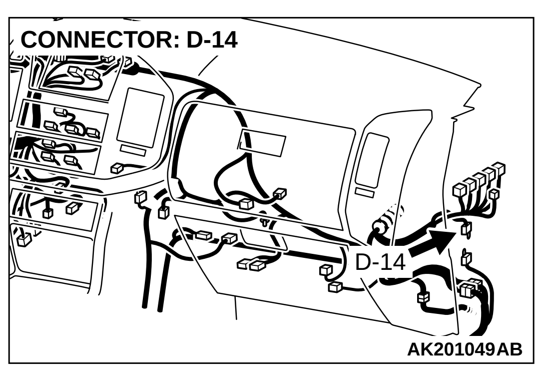
DTC P0133: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 1)

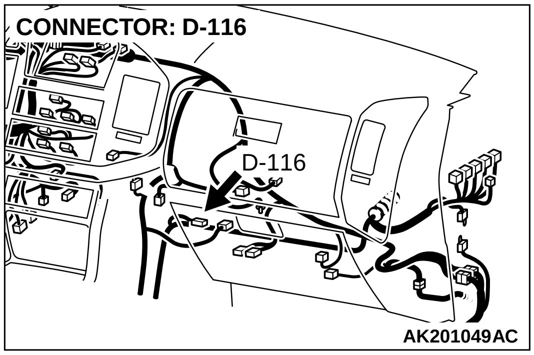
Right Bank Heated Oxygen Sensor (front) Circuit











CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 109) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is at between 1,250 and 3,000 r/min.
- Volumetric efficiency is at between 24 and 65 percent.
- Under the closed loop air/fuel control.
- The throttle valve is open.
- Short-term fuel trim is at between –30 and +25 percent.
- More than 3 seconds have elapsed after the abovementioned conditions have been met.
- The PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.

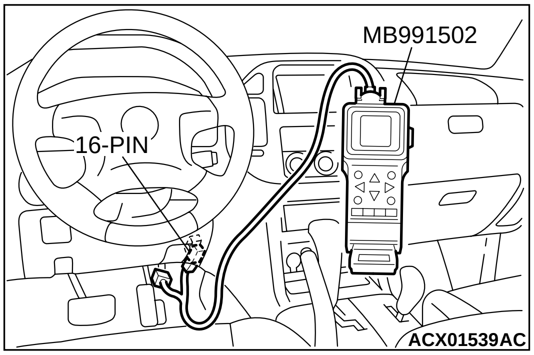
Judgment Criteria

- The right bank heated oxygen sensor (front) sends "lean" and "rich" signals alternately 11 times or less for 12 seconds.

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

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

- Right bank heated oxygen sensor (front) deteriorated.
- PCM failed.



DIAGNOSIS

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

STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
(4) Warm up the engine, 2,500 r/min.
- Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 4 – Heated Oxygen Sensor Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0133 set?

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

DTC P0134: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1)

Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1) Circuit

- Refer to, DTC P0130 – Right Bank Heated Oxygen Sensor (Front) Circuit P.13Ac-105.
- Refer to, DTC P0201, P0202, P0203, P0204, P0205, P0206 – Injector Circuit P.13Ac-318.

CIRCUIT OPERATION

- Refer to, DTC P0132-Right Bank Heated Oxygen Sensor (Front) Circuit P.13Ac-126.
- Refer to, DTC P0201, P0202, P0203, P0204, P0205, P0206-Injector Circuit P.13Ac-318.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the right bank heater oxygen sensor (front).
- If the right bank heated oxygen sensor (front) has deteriorated, corrections will be made by the right bank heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DTC SET CONDITIONS

Check Conditions

- 30 seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 80 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgment Criteria

- Right bank heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

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

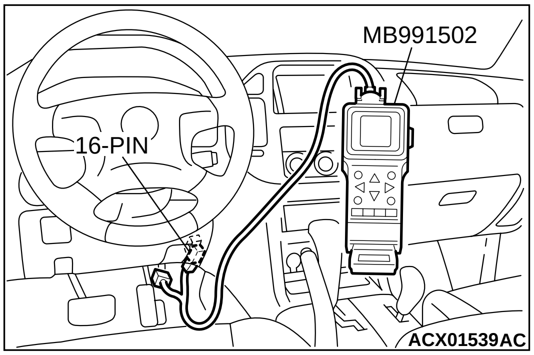
- Right bank heated oxygen sensor (front) deteriorated.
- Open circuit in right bank heated oxygen sensor (front) output line.
- Open circuit in right black heated oxygen sensor (front) ground line.
- Right bank heated oxygen sensor (rear) deteriorated.

  NOTE: When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the right bank heated oxygen sensor (rear).
  If the right bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the right bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the right bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0136 – Heated Oxygen Sensor Circuit (bank 1, sensor 2) DTC P.13Ac-151, P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13Ac-166, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13Ac-172, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13Ac-176.

STEP 2. Check the exhaust leaks.

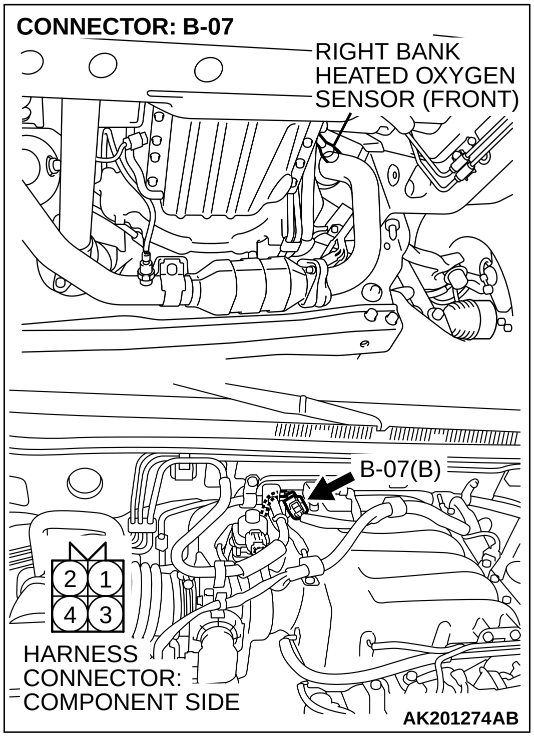
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 13.
NO : Go to Step 3.

STEP 3. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 13.
NO : Go to Step 4.

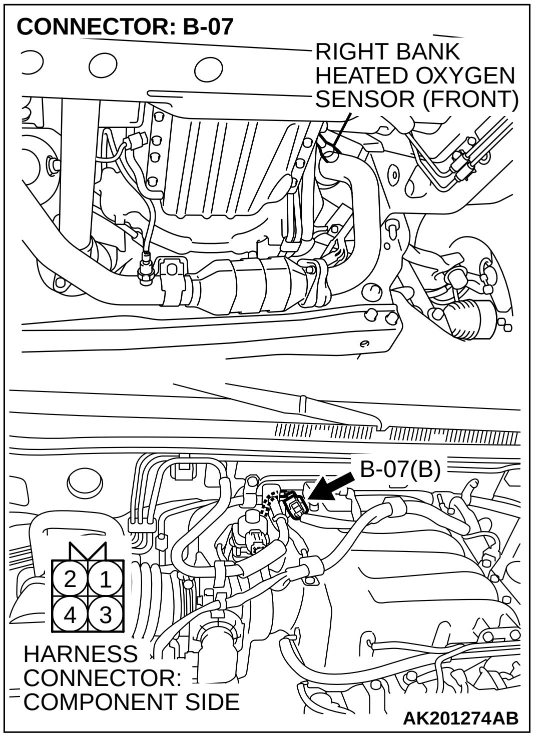


STEP 4. Check connector B-07 at the right bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

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



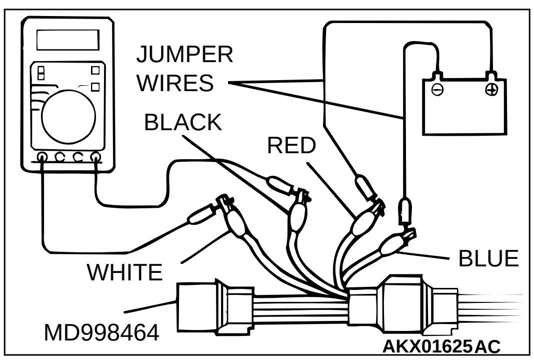
STEP 5. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-07 and connect test harness special tool, MD998464 to the connector on the right bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

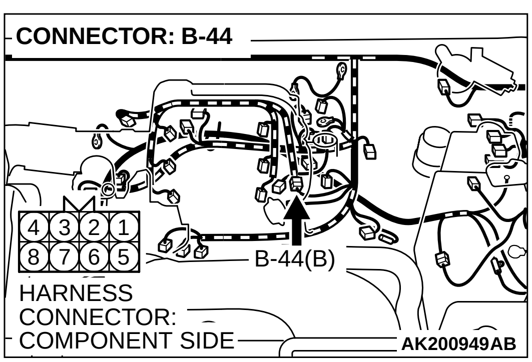
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.

NO : Replace the right bank heated oxygen sensor (front). Then go to Step 13.



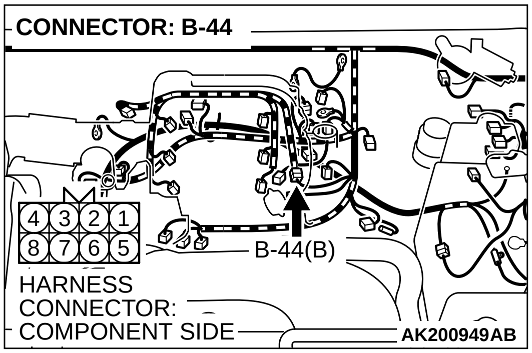
STEP 6. Check connector B-44 at injector intermediate connector for damage.

Q: Is the connector in good condition?

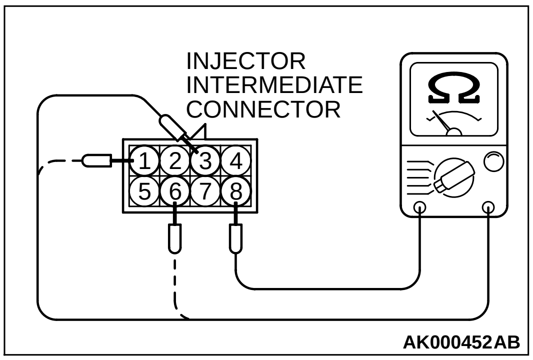
YES : Go to Step 7.

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

STEP 7. Measure the right bank injector resistance at intermediate connector B-44.



(1) Disconnect the injector intermediate connector B-44.

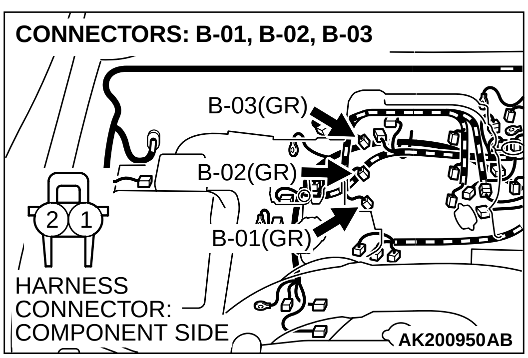


(2) Measure the resistance between each injector side connector terminal.
   a. Measure the resistance between terminal No. 3 and No. 8 when measuring No. 1 cylinder.
   b. Measure the resistance between terminal No. 1 and No. 8 when measuring No. 3 cylinder.
   c. Measure the resistance between terminal No. 6 and No. 8 when measuring No. 5 cylinder.
   - Resistance should be between 13 and 16 ohms [at 20°C (68° F)].

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

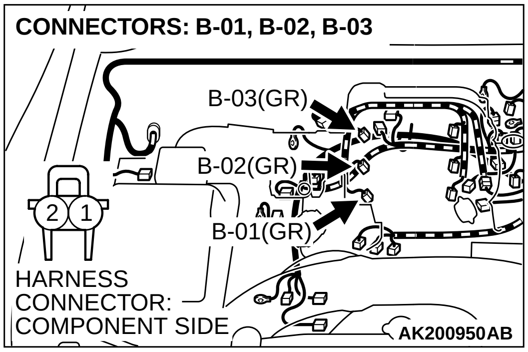
STEP 8. Check connector B-01, B-02, B-03 at right bank injector for damage.



(1) Remove the intake manifold.
(2) Check the right bank injector connector, which deviates from the standard value at Step 7.

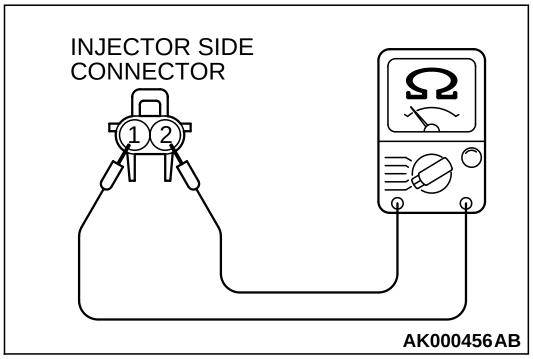
Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 9. Check the right bank injector.

(1) Check the right bank injector connector, which deviates from the standard value at Step 7.



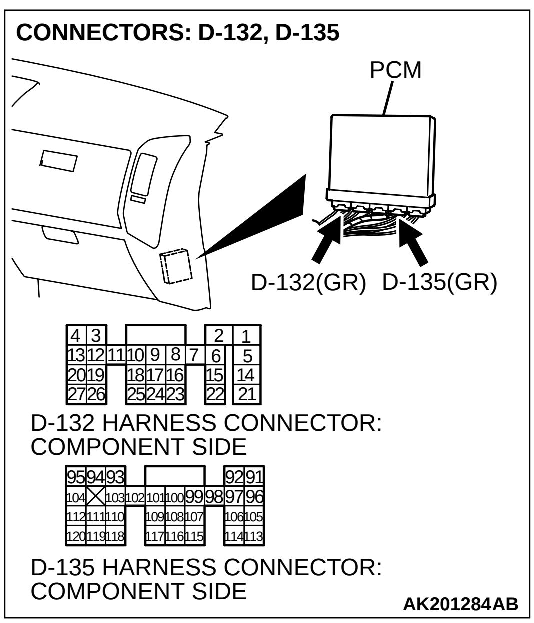
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 13.

NO : Replace the injector. Then go to Step 13.

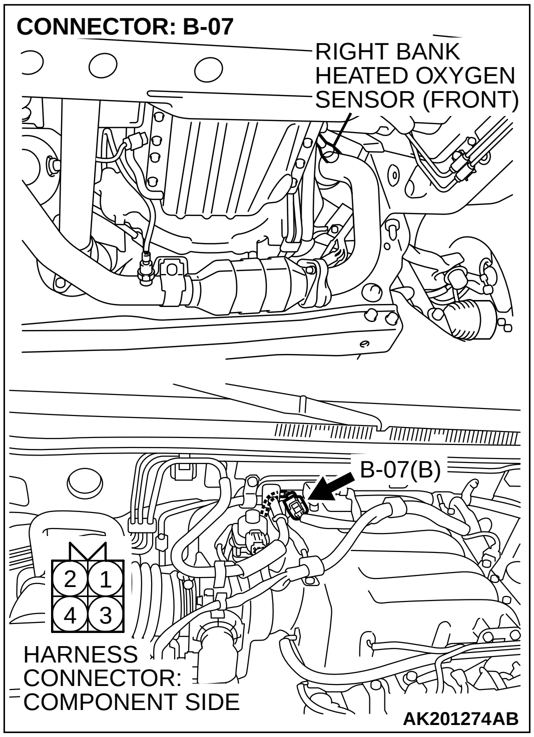


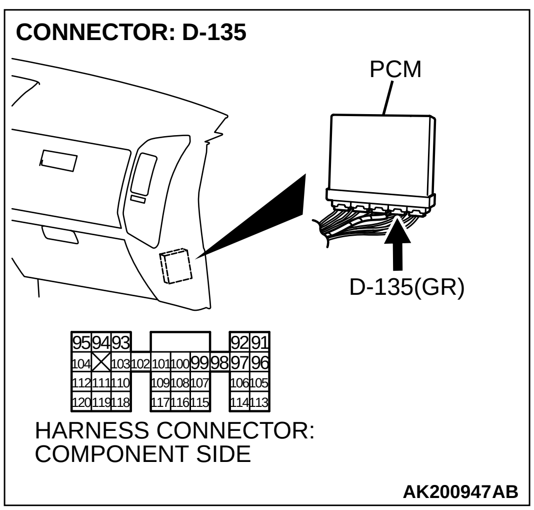
STEP 10. Check connector D-132, D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

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



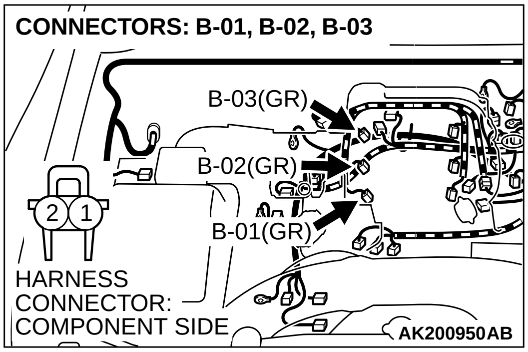


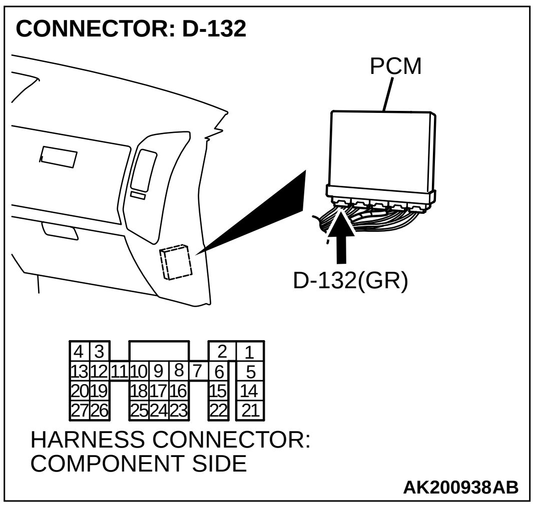
STEP 11. Check for harness damage between right bank heated oxygen sensor (front) connector B-07 (terminal No. 4) and PCM connector D-135 (terminal No. 109).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 13.





STEP 12. Check for harness damage between right bank injector connector and PCM connector.

a. Check the harness wire between right bank injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) when checking No. 1 cylinder.
b. Check the harness wire between right bank injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 14) when checking No. 3 cylinder.
c. Check the harness wire between right bank injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 2) when checking No. 5 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

Q: Is the fuel pressure normal?

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

STEP 14. Test the OBD-II drive cycle.

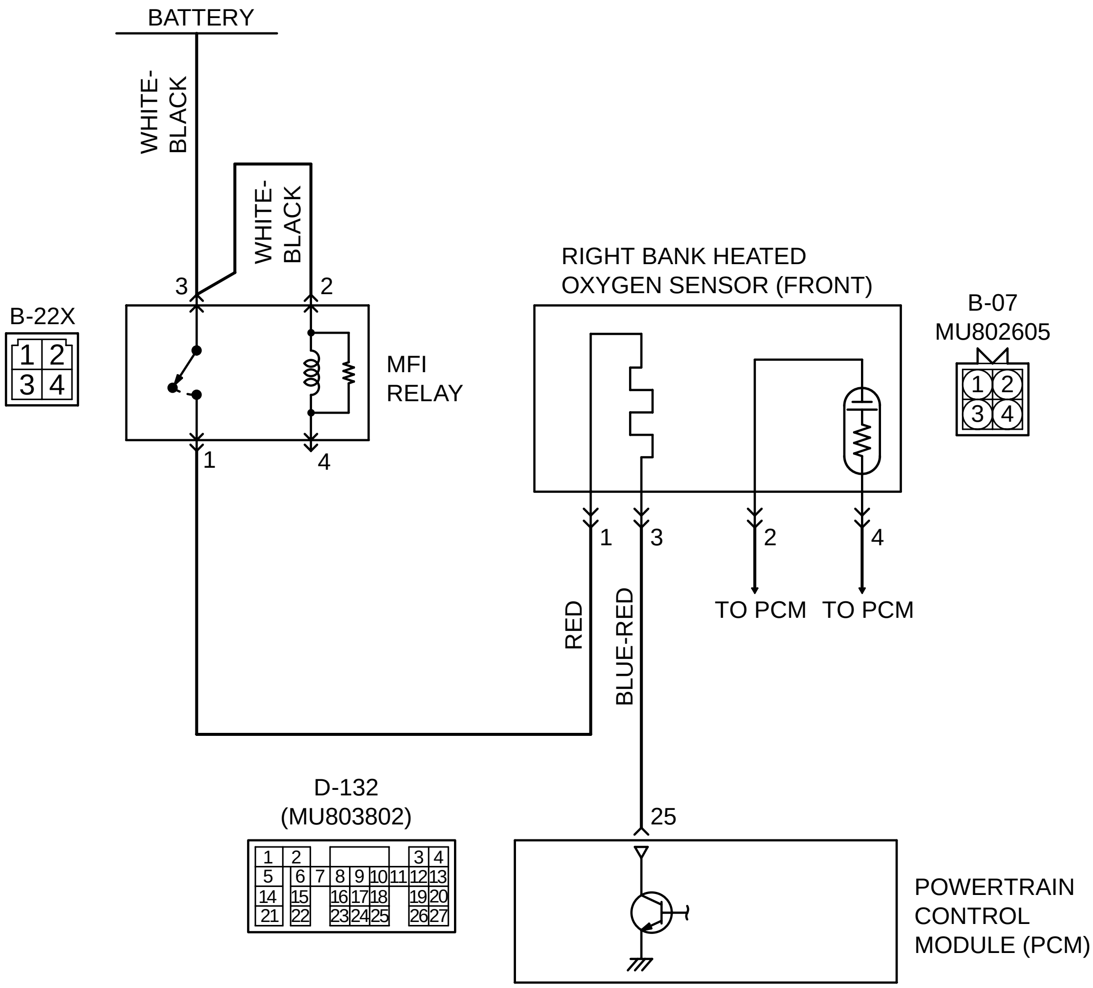
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

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

DTC P0135: Heated Oxygen Sensor Heater Circuit (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Heater Circuit



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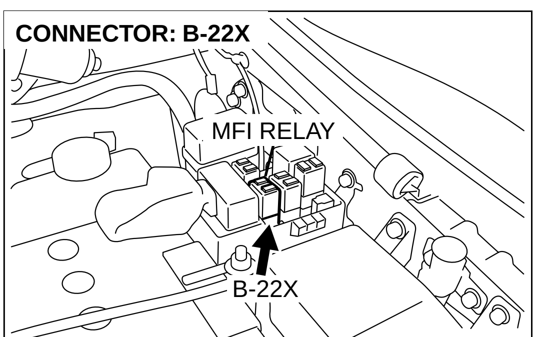

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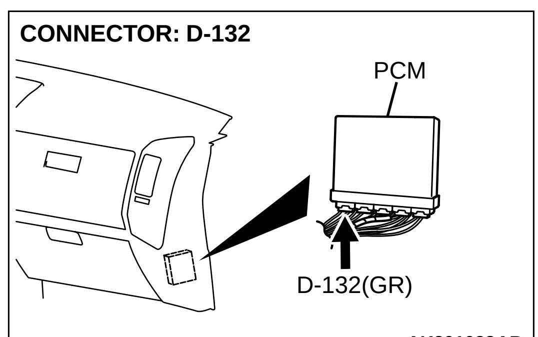

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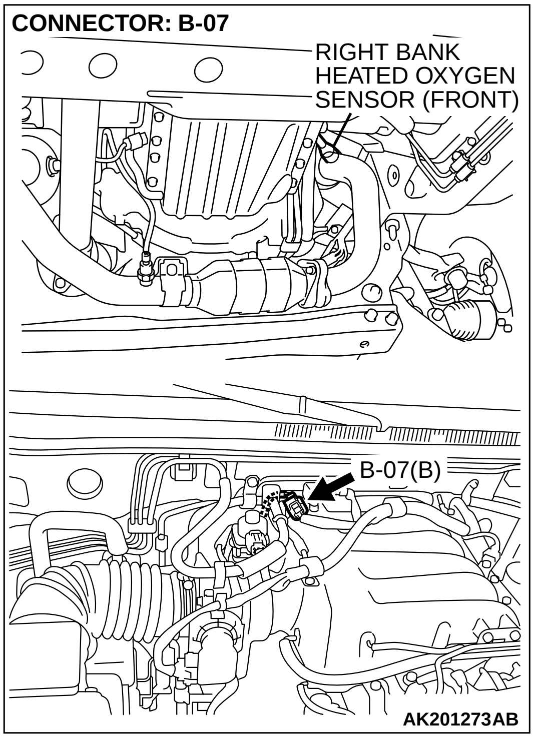


CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 1) to the right bank heated oxygen sensor (front) heater.
- The PCM (terminal No. 25)
  controls continuity to the right bank heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

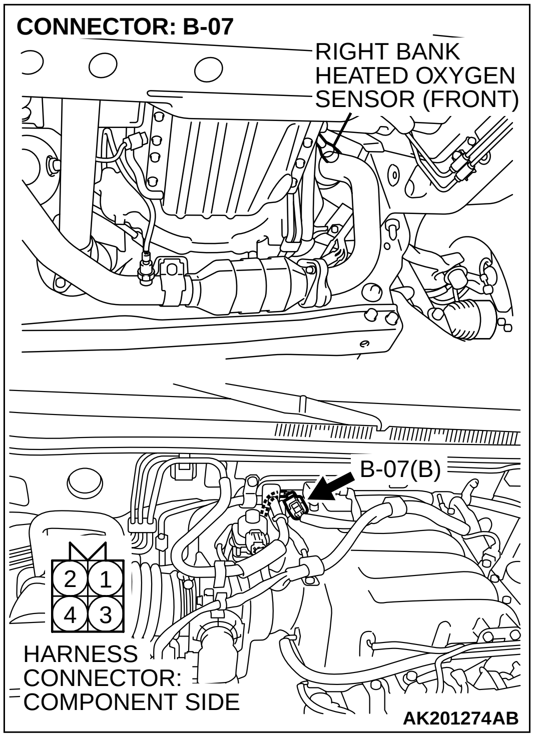
- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the right bank heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the right bank heated oxygen sensor (front) heater has continued to be lower than 0.16 ampere or higher than 7.5 ampere for 4 seconds.

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

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



DIAGNOSIS

Required Special Tool:

- MD998464: Test Harness

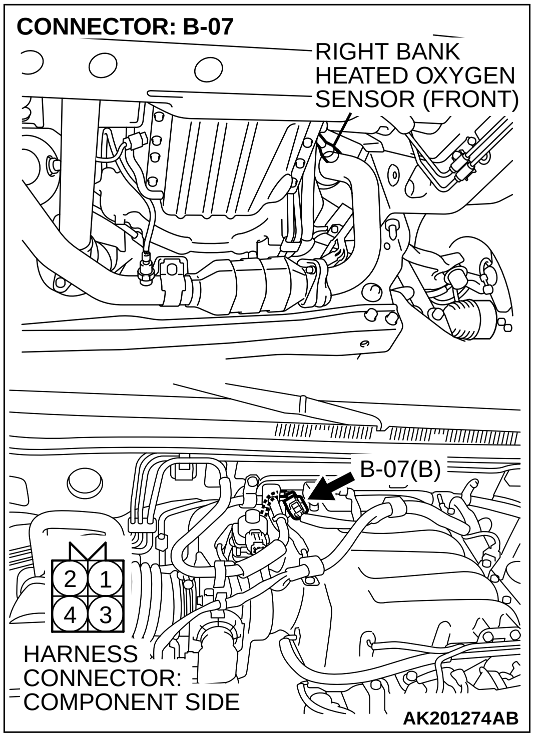
STEP 1. Check harness connector B-07 at the right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

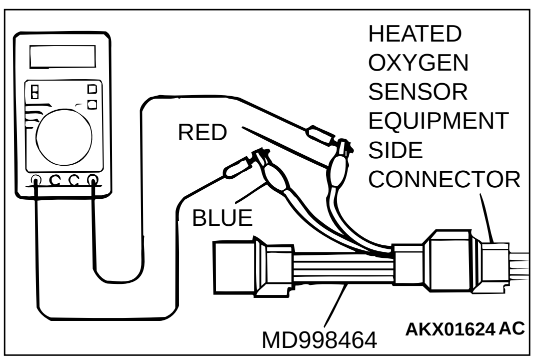
YES : Go to Step 2.

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

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



(1) Disconnect right bank heated oxygen sensor (front) connector B-07 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen (front) sensor side.



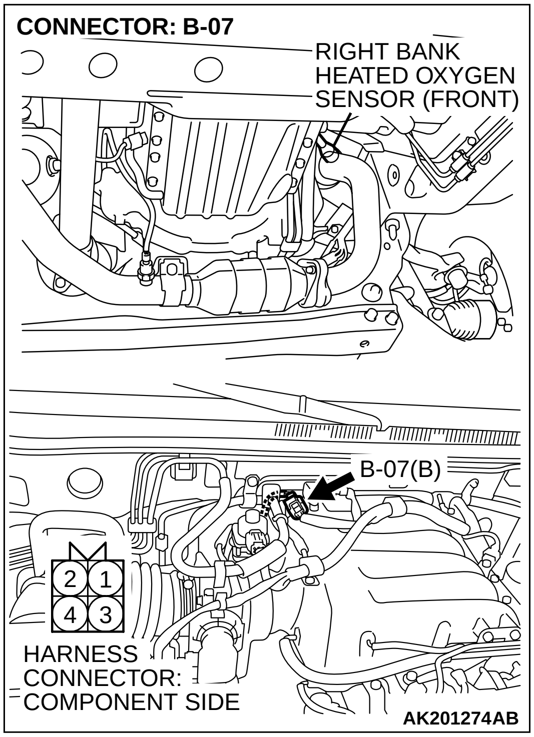
(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

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

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

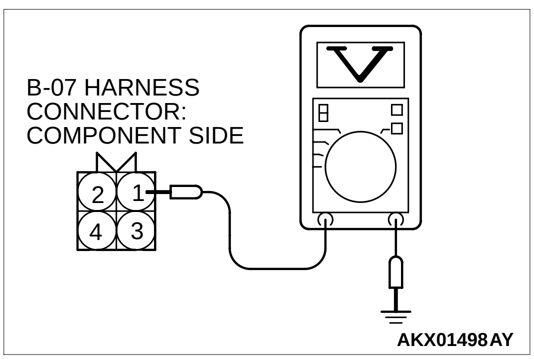
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 12.



STEP 3. Measure the power supply voltage at right bank heated oxygen sensor (front) harness side connector B-07.

(1) Disconnect the connector B-07 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.

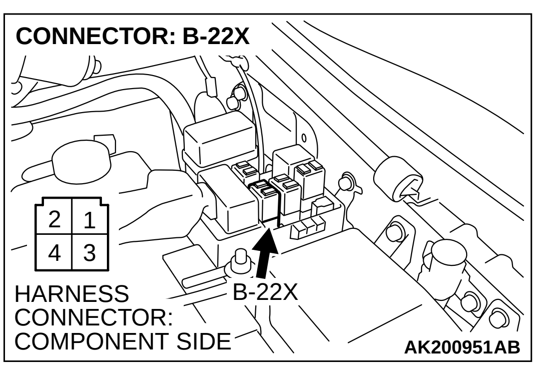
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 5.

NO : Go to Step 4.

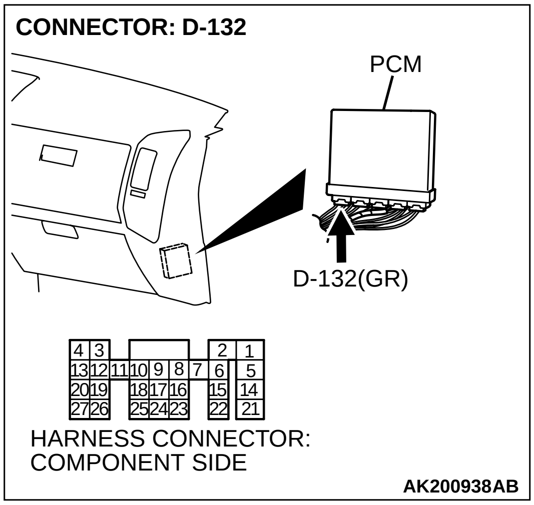


STEP 4. Check harness connector B-22X at the MFI relay for damage.

Q: Is the harness connector in good condition?

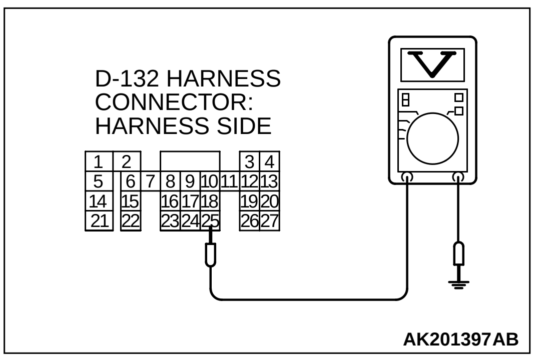
YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and right bank heated oxygen sensor (front) connector B-07 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

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



STEP 5. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Turn the ignition switch to the "ON" position.

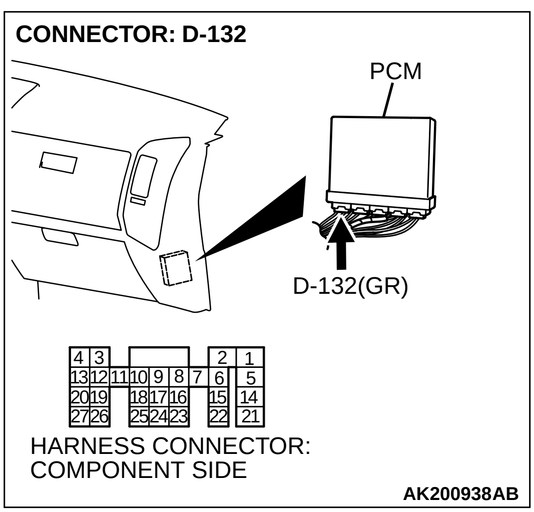


(3) Measure the voltage between terminal No. 25 and ground by backprobing.
- Voltage should be battery positive voltage.

(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 6.



STEP 6. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

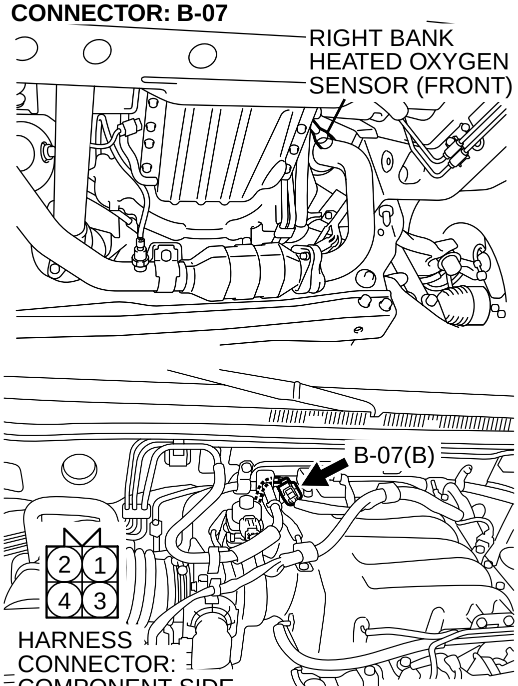
STEP 7. Check for open circuit or short circuit to ground between right bank heated oxygen sensor (front) connector B-07 (terminal No. 3) and PCM connector D-132 (terminal No. 25).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.

CONNECTOR: B-07



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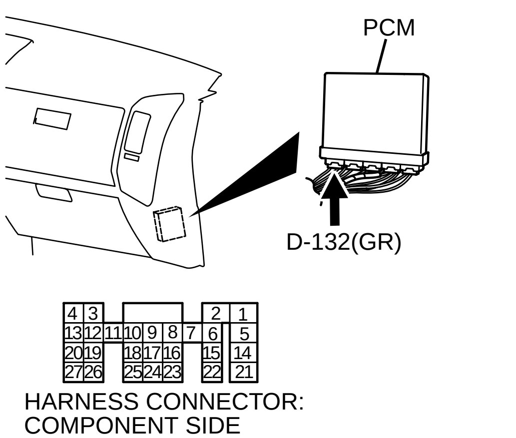
CONNECTOR: D-132



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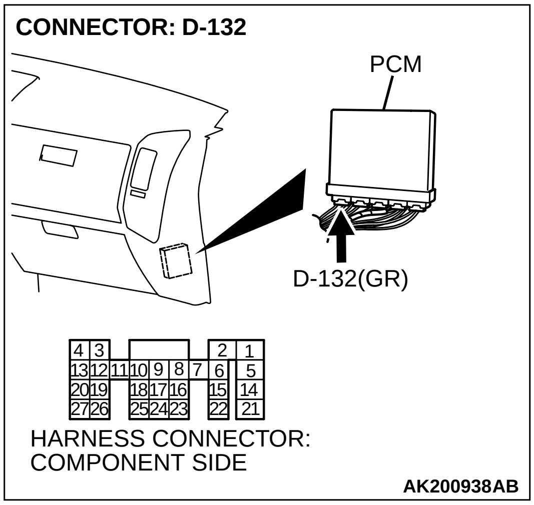
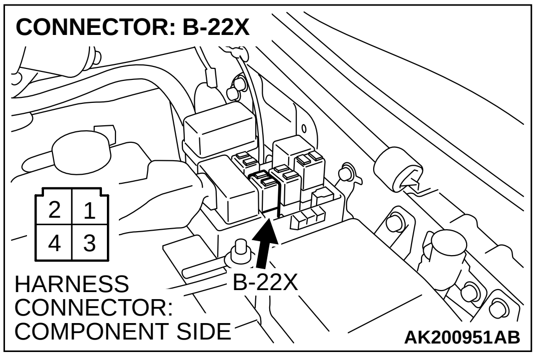


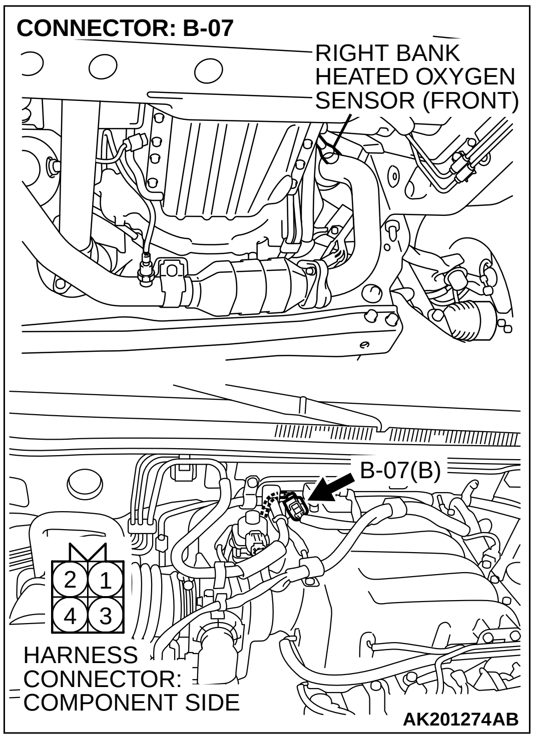
STEP 8. Check harness connector D-132 at PCM for damage.

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.



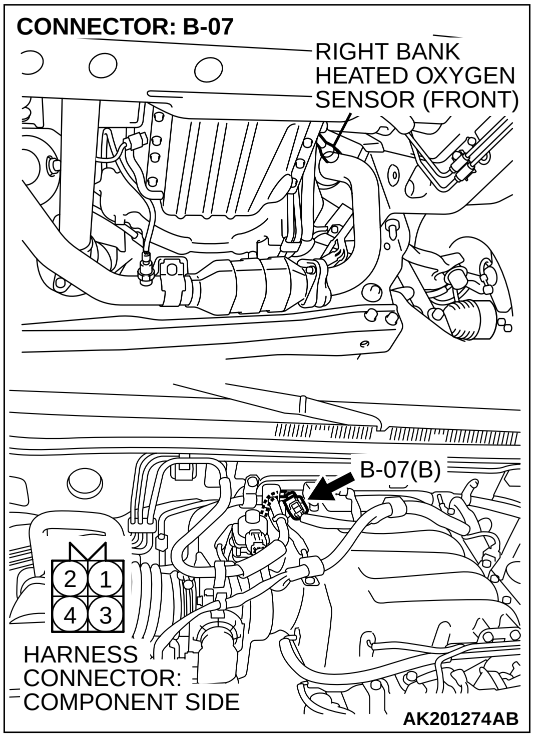


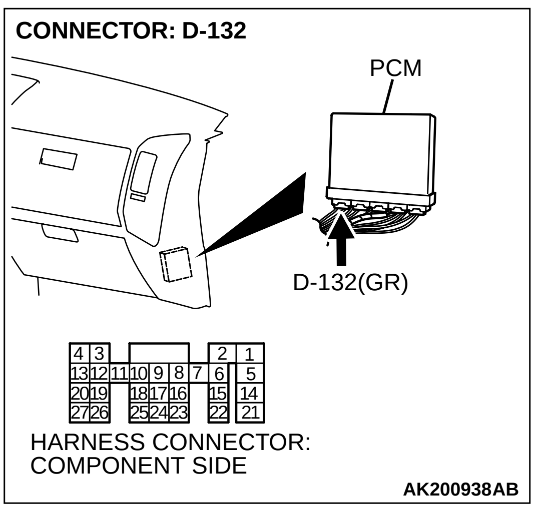
STEP 9. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and right bank heated oxygen sensor (front) connector B-07 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between right bank heated oxygen sensor (front) connector B-07 (terminal No. 3) and PCM connector D-132 (terminal No. 25).

Q: Is the harness wire in good condition?

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

STEP 11. Check the trouble symptoms.

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

Q: Is DTC P0135 set?

YES : Replace the PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

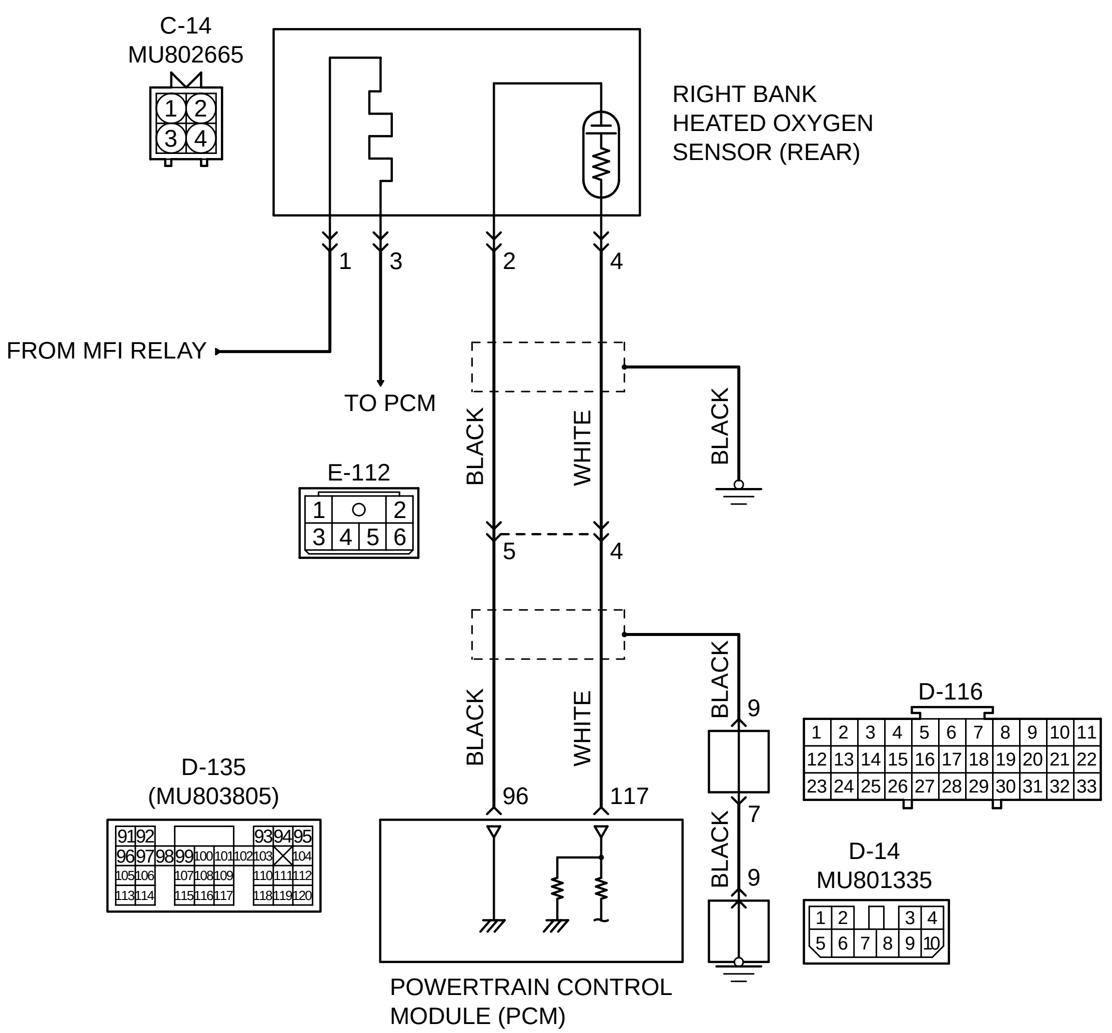
Q: Is DTC P0135 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0136: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



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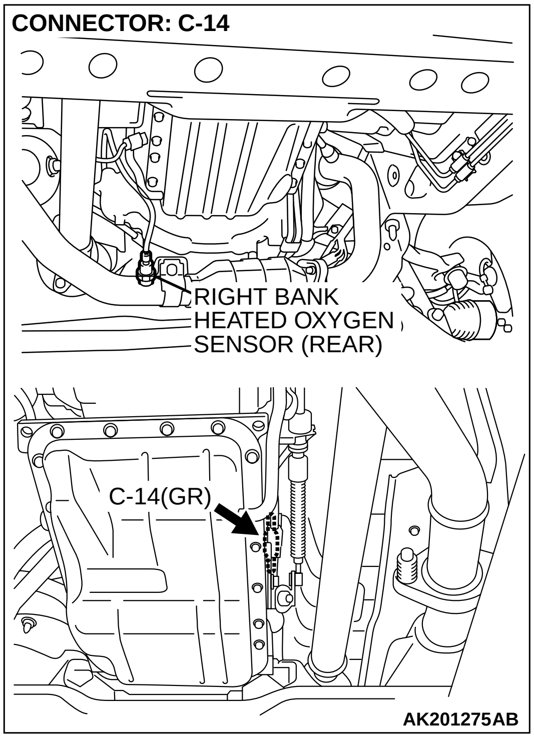
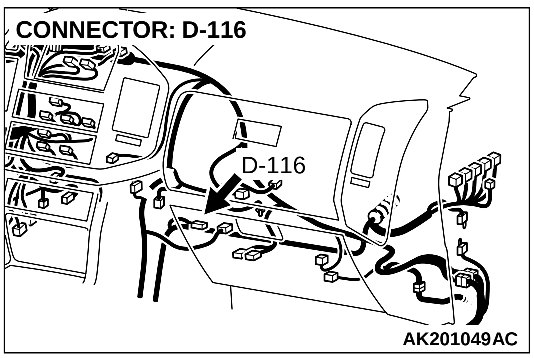
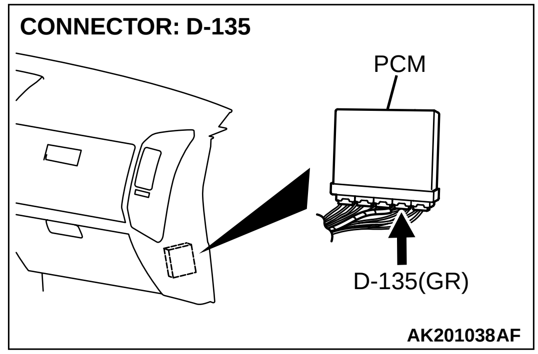
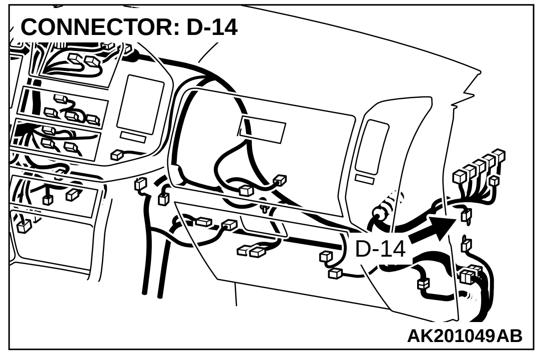
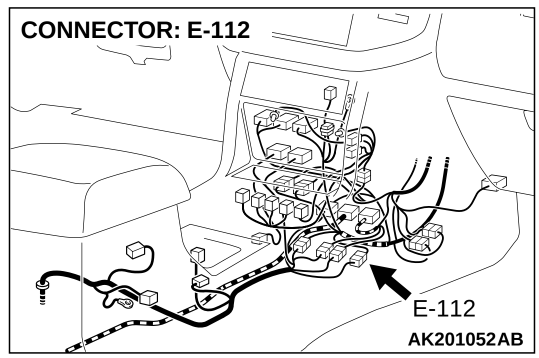










CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 117) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the right bank heated oxygen sensor (rear) output line via a resistor.
- The PCM monitors for this condition once during the drive cycle.

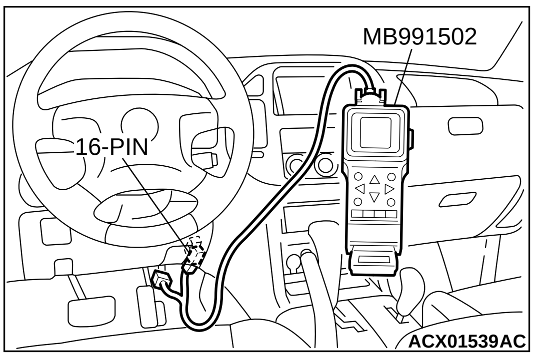
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

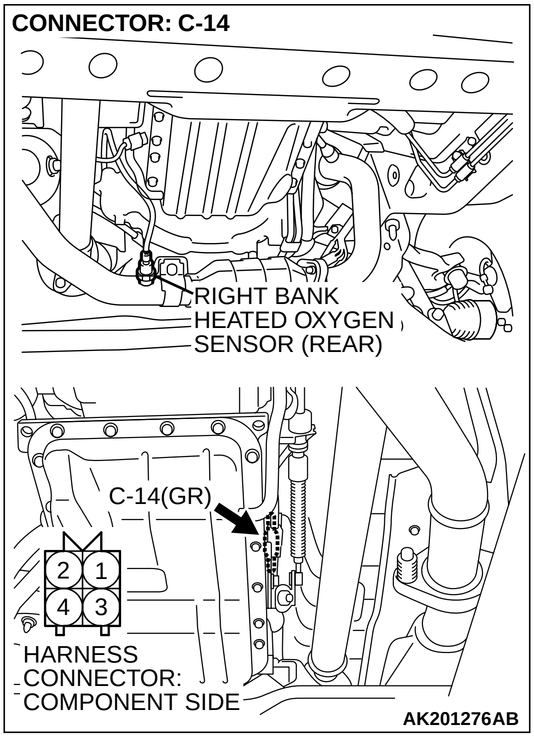
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

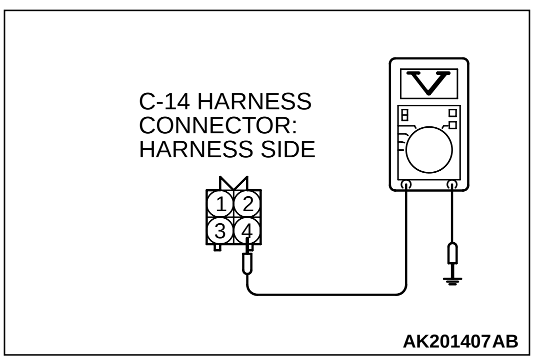
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at right bank heated oxygen sensor (rear) connector C-14 by backprobing



(1) Do not disconnect the connector C-14.
(2) Start the engine and run at idle.



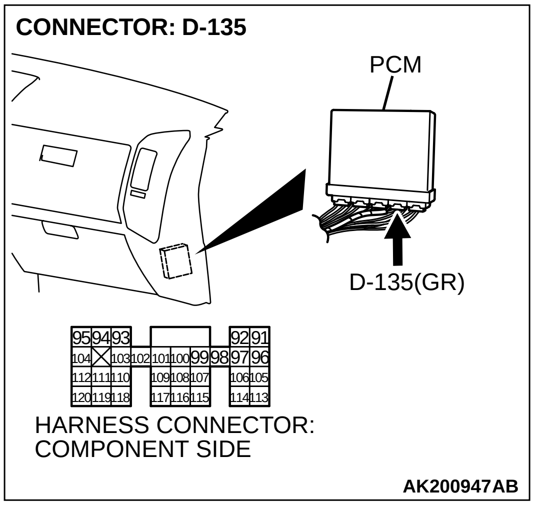
(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

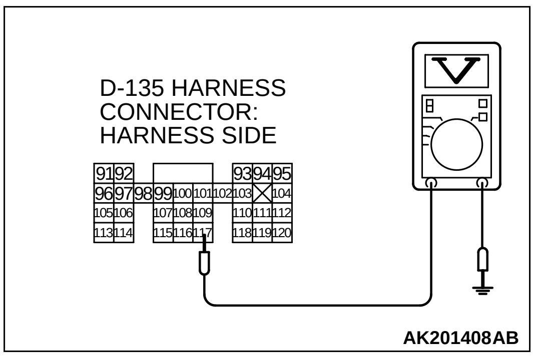
Q: Is the voltage normal?

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

STEP 3. Measure the sensor output voltage at PCM connector D-135 by backprobing



(1) Do not disconnect the connector D-135.
(2) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 117 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

Q: Is the voltage normal?

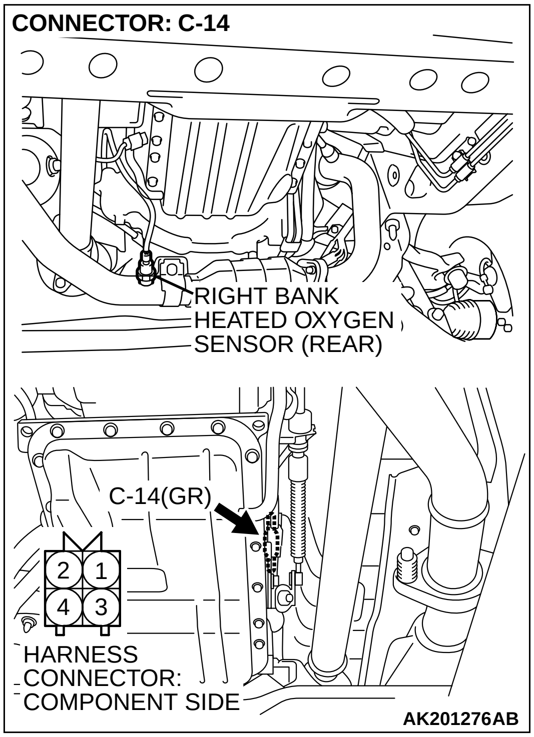
YES : Go to Step 4.
NO : Go to Step 6.

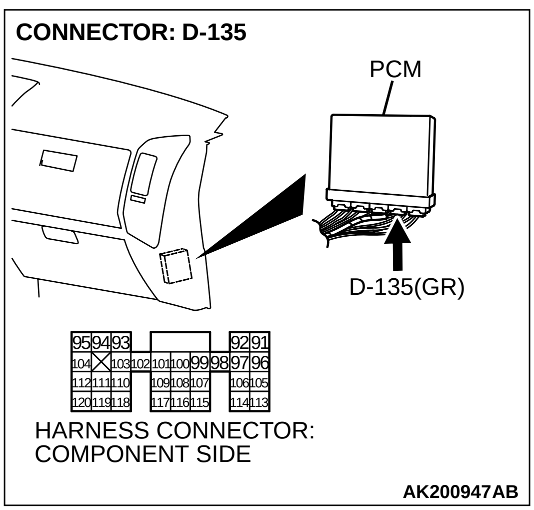
STEP 4. Check harness connector C-14 at right bank heated oxygen sensor (rear) and harness connector D-135 at PCM for damage.

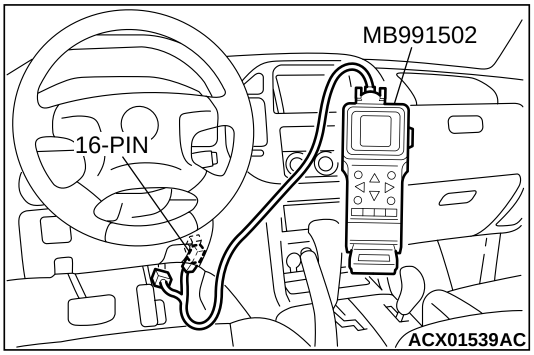
Q: Is the harness connector in good condition?

YES : Go to Step 5.

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







STEP 5. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ **CAUTION**

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

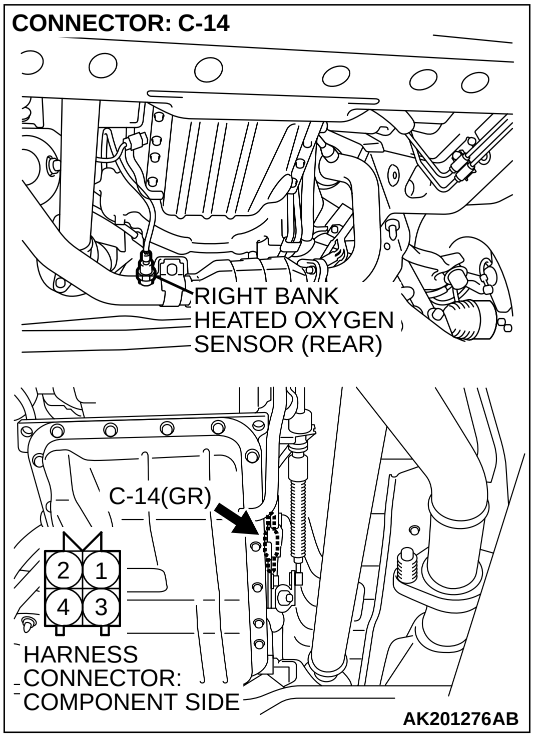
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

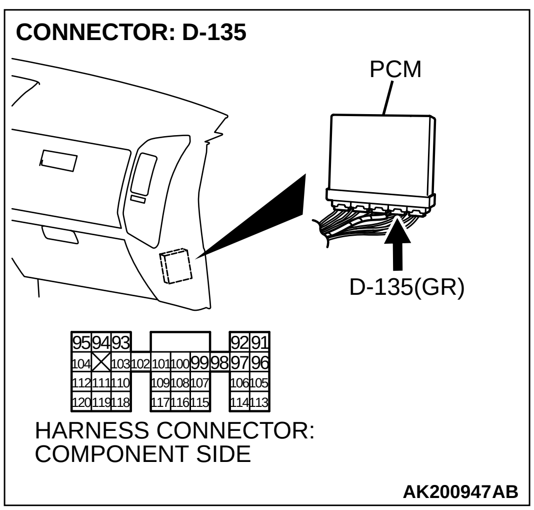
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

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



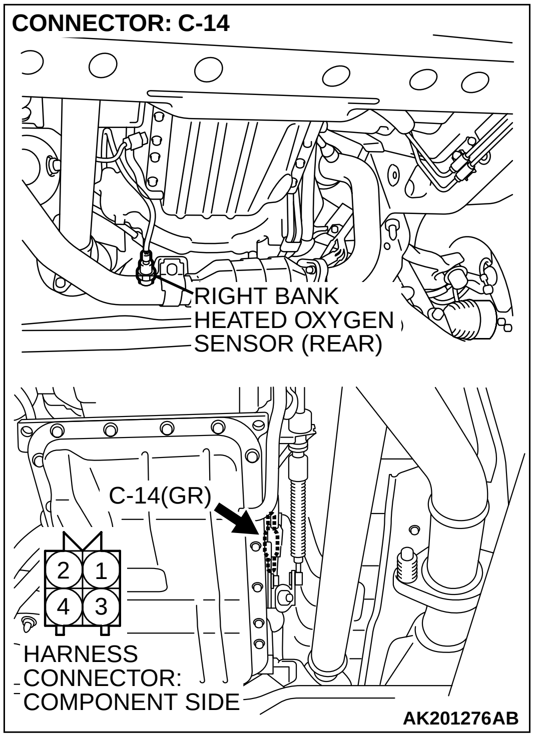


STEP 6. Check harness connector C-14 at right bank heated oxygen sensor (rear) and harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector E-112 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector E-112 is in good condition, repair harness wire between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 4) and PCM connector D-135 (terminal No. 117) because of open circuit or harness damage. Then go to Step 15.

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



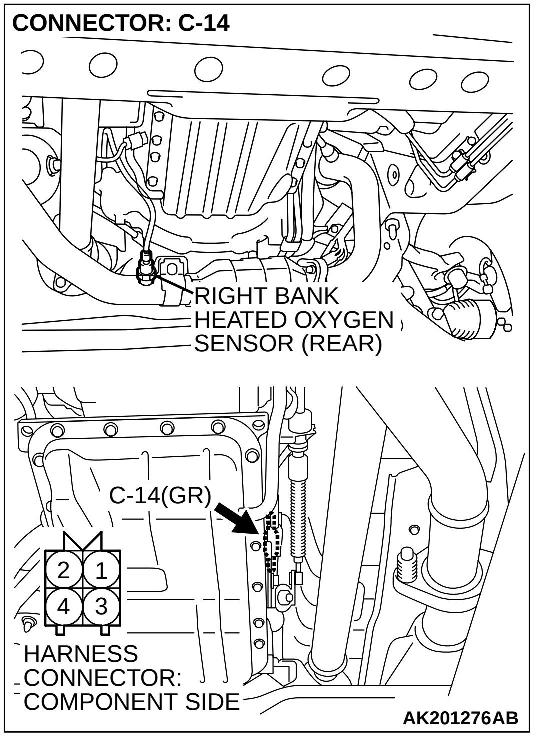
STEP 7. Check harness connector C-14 at right bank heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

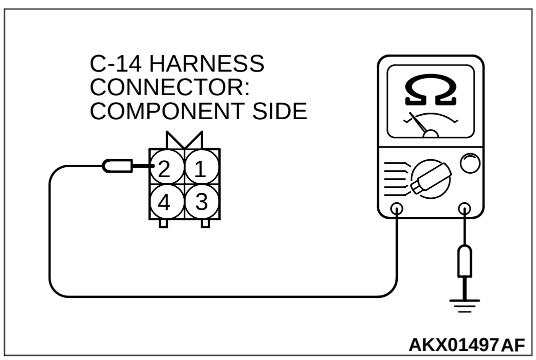
YES : Go to Step 8.

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

STEP 8. Check the continuity at right bank heated oxygen sensor (rear) harness side connector C-14.



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

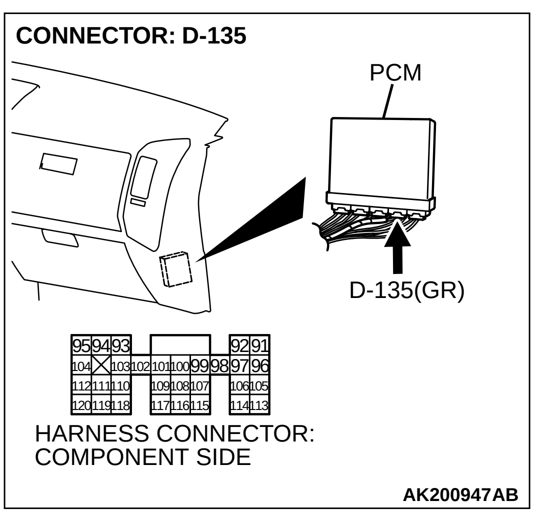


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

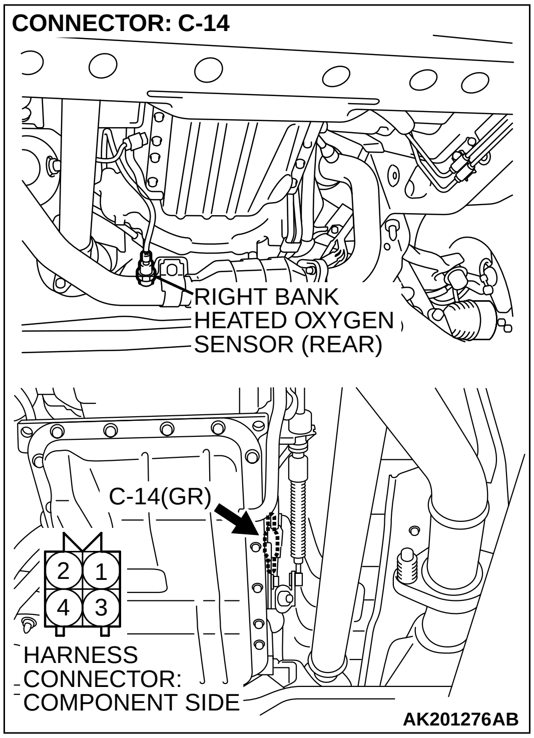
YES : Go to Step 11.
NO : Go to Step 9.

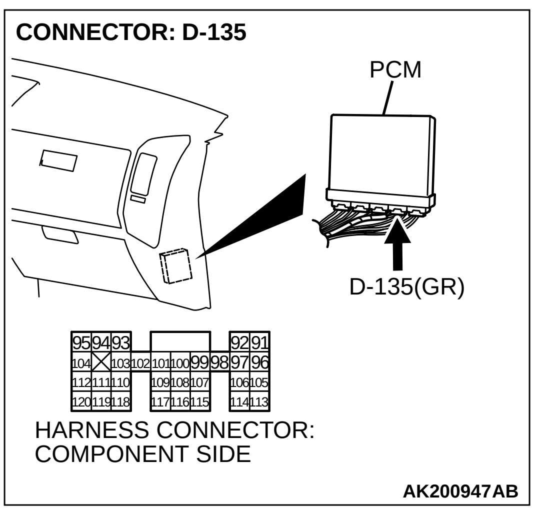
STEP 9. Check harness connector D-135 at PCM for damage.



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 15.





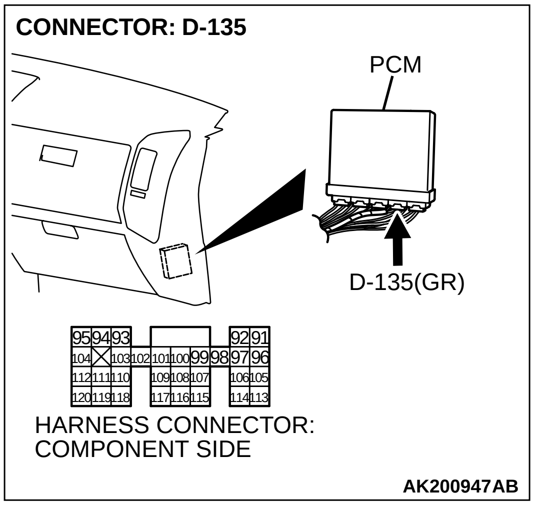
STEP 10. Check for open circuit and harness damage between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 15.

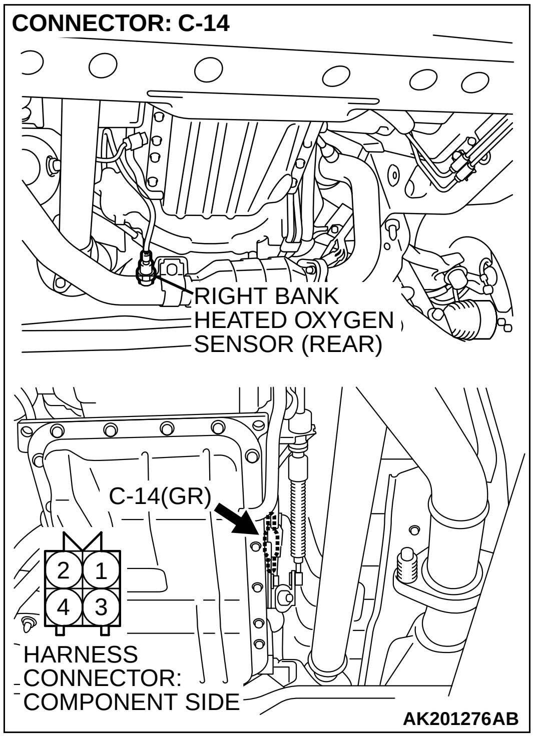


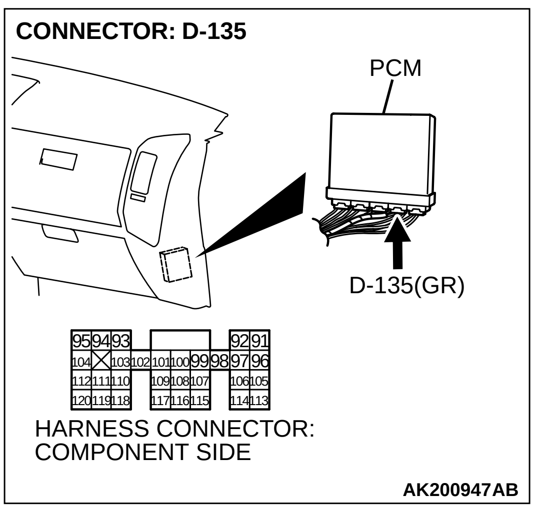
STEP 11. Check harness connector D-135 at PCM for damage.

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 15.





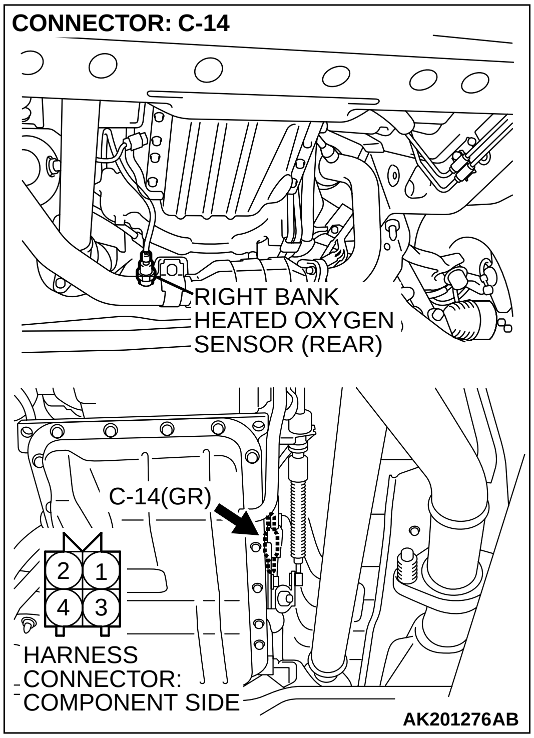
STEP 12. Check for harness damage between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

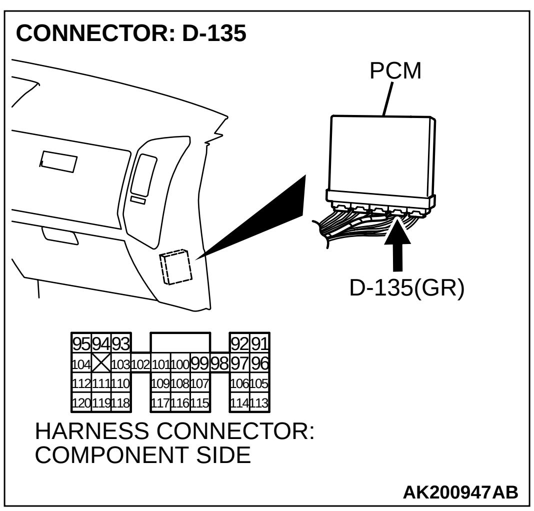
NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.





STEP 13. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 4) and PCM connector D-135 (terminal No. 117).

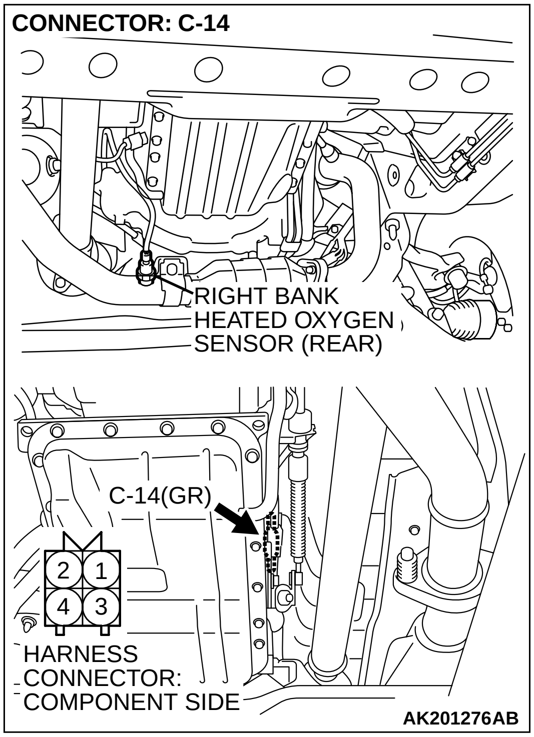
NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

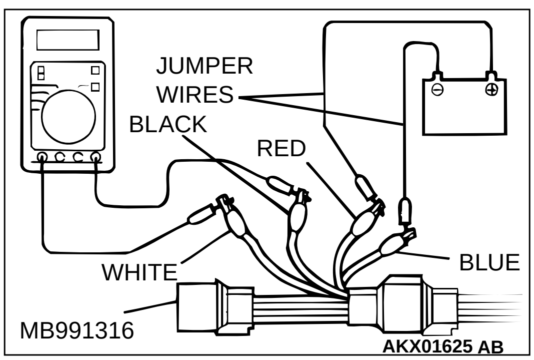
NO : Repair it. Then go to Step 15.

STEP 14. Check the right bank heated oxygen sensor (rear).



(1) Disconnect the right bank heated oxygen sensor (rear) connector C-14 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. Then go to Step 15.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

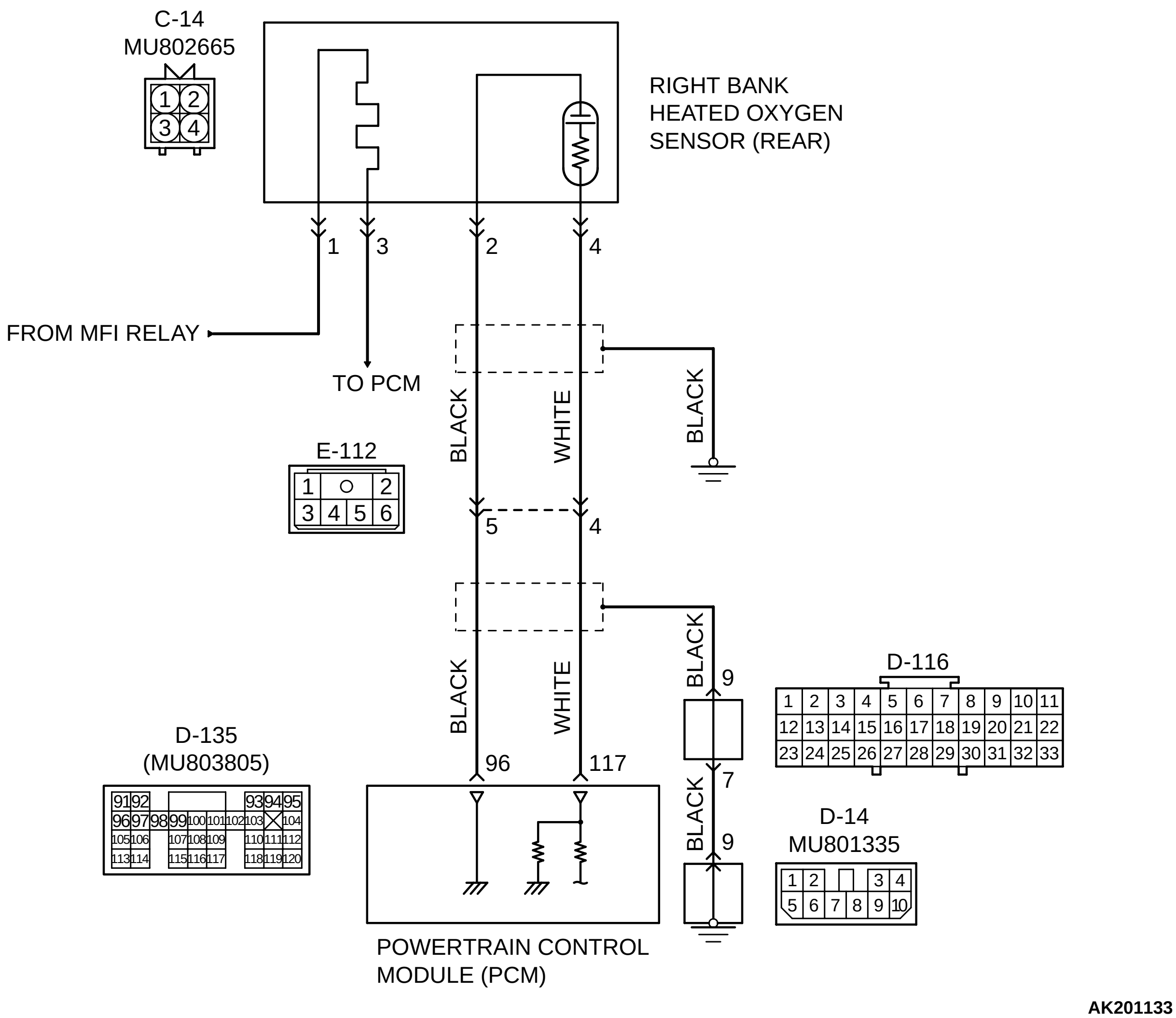
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

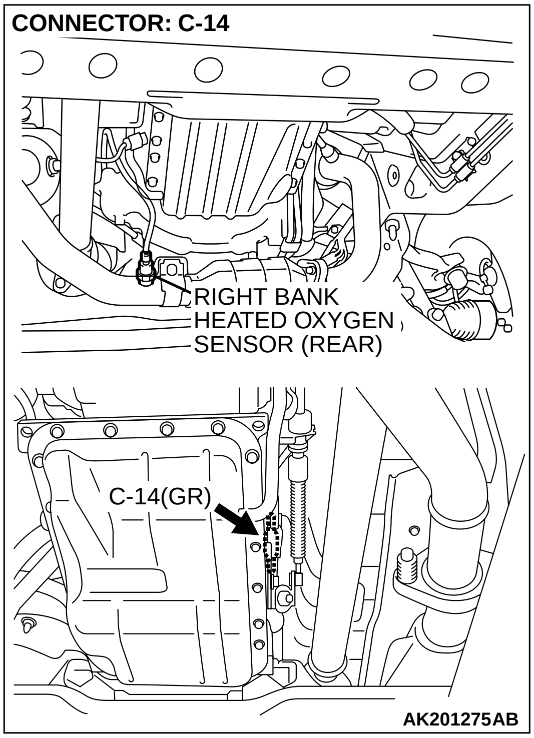
Q: Is DTC P0136 set?

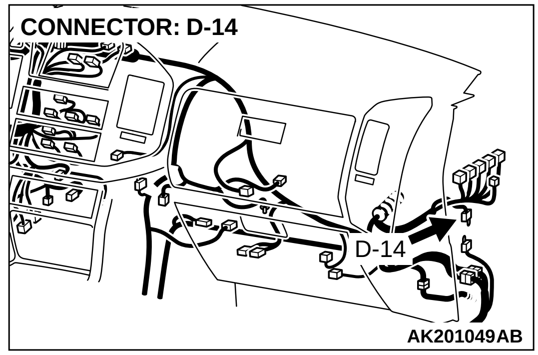
YES : Retry the troubleshooting.
NO : The inspection is complete.

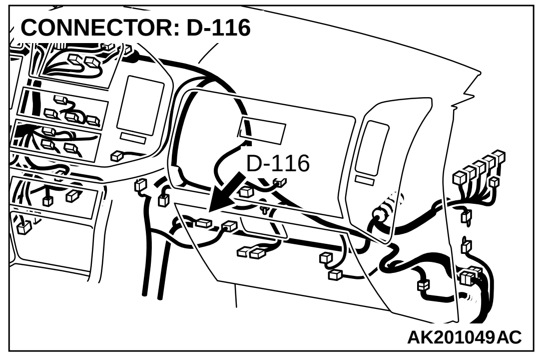
DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2)

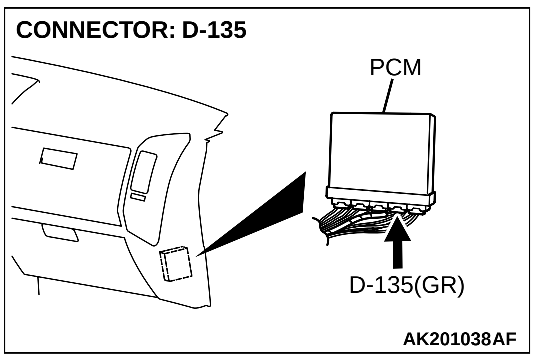
Right Bank Heated Oxygen Sensor (rear) Circuit

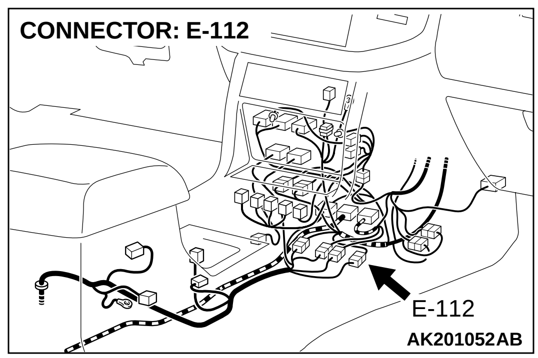












CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 117) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume airflow sensor output frequency is 100 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The right bank heated oxygen sensor (front) outputs 0.5 volts or more.
- After the ignition switch is turned ON, the changes in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the right bank heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The PCM monitors for this condition once during the drive cycle.

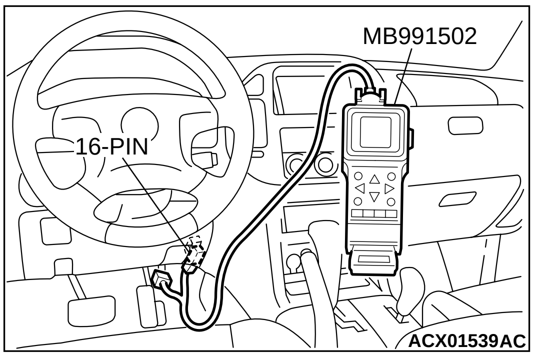
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) failed.
- Short circuit in right bank heated oxygen sensor (rear) output line.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness Set



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

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

(2) Start the engine and run at idle.

(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

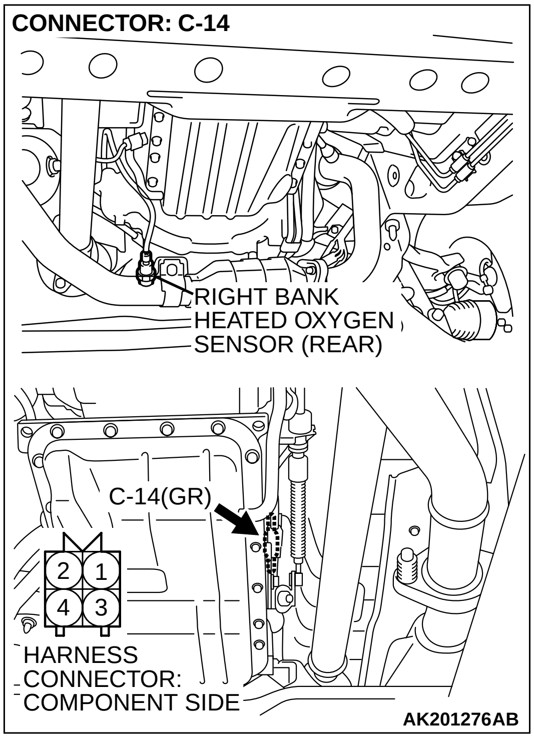
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

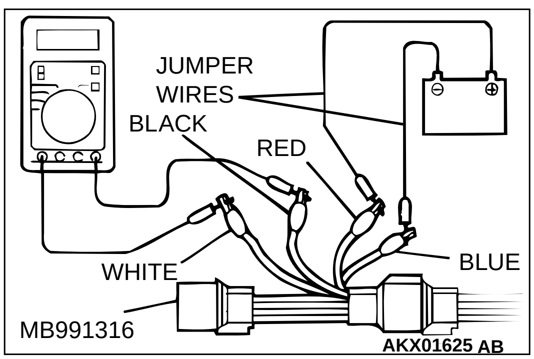
STEP 2. Check the right bank heated oxygen sensor (rear).



(1) Disconnect the right bank heated oxygen sensor (rear) connector C-14 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (rear) output voltage.

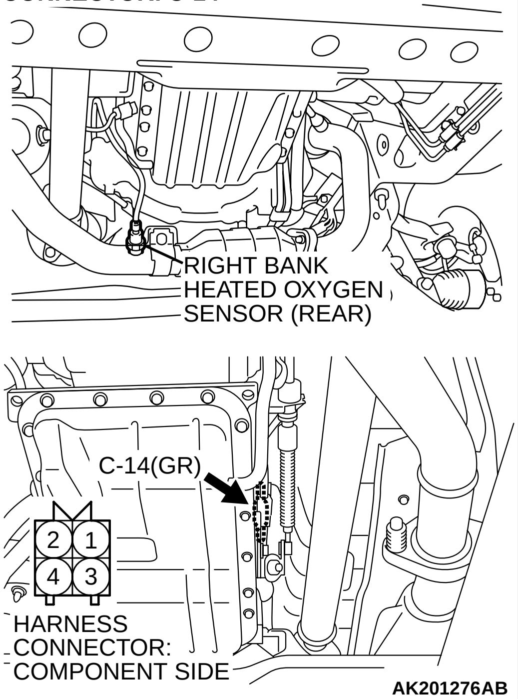
Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 3.

NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 5.

CONNECTOR: C-14



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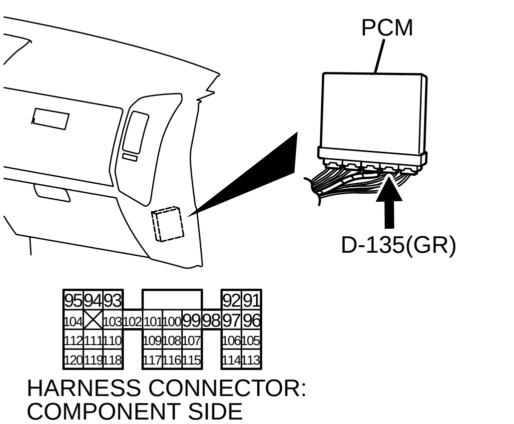
CONNECTOR: D-135



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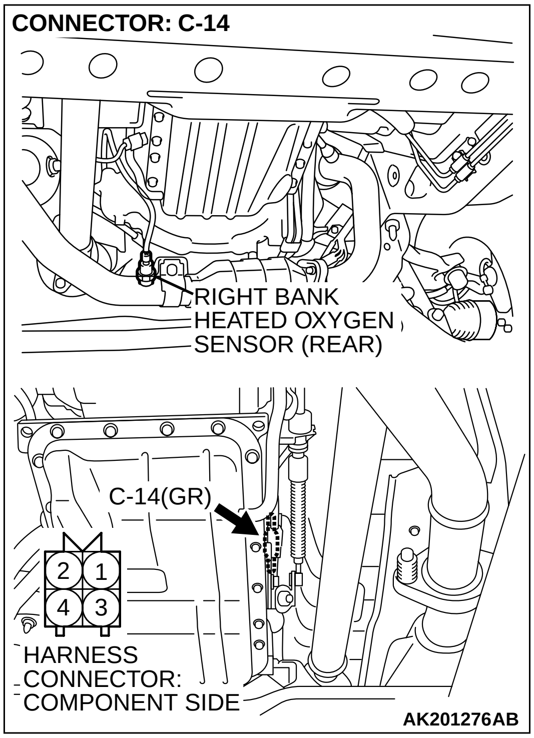
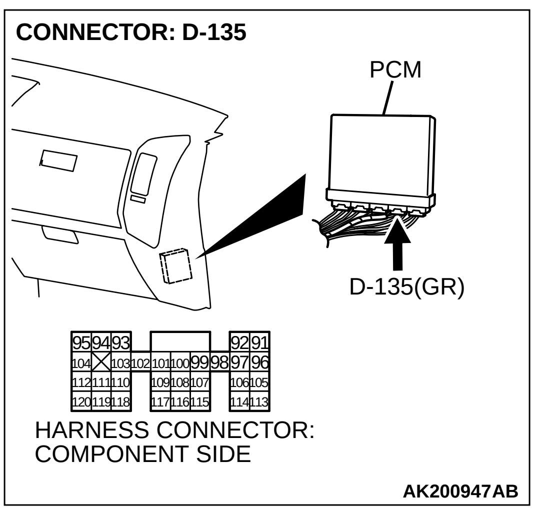
STEP 3. Check connector C-14 at right bank heated oxygen sensor (rear) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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





STEP 4. Check for short circuit to ground between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 4) and PCM connector D-135 (terminal No. 117).

NOTE: Check harness after checking intermediate connector, E-112. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the harness wire in good condition?

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

STEP 5. Test the OBD-II drive cycle.

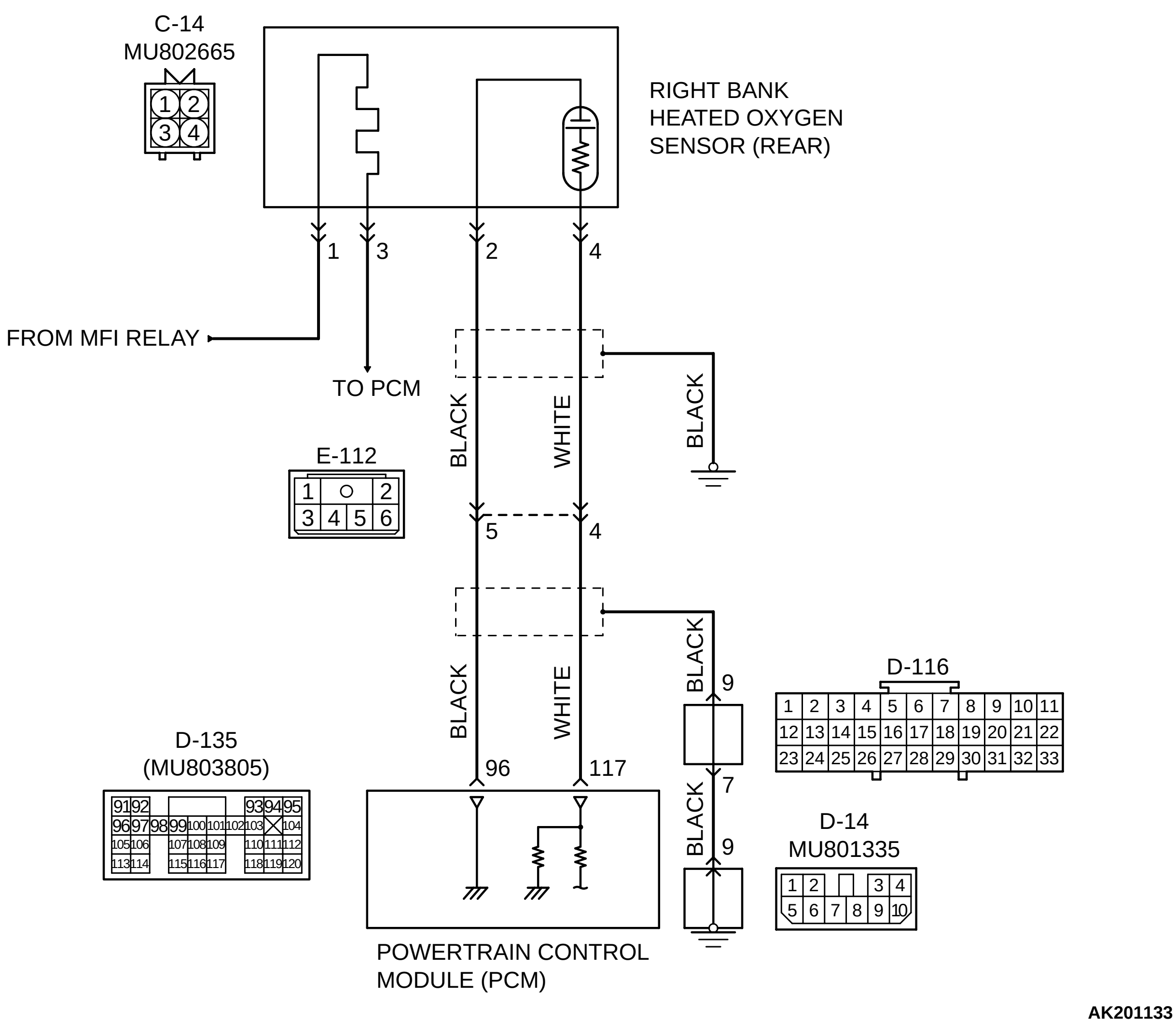
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

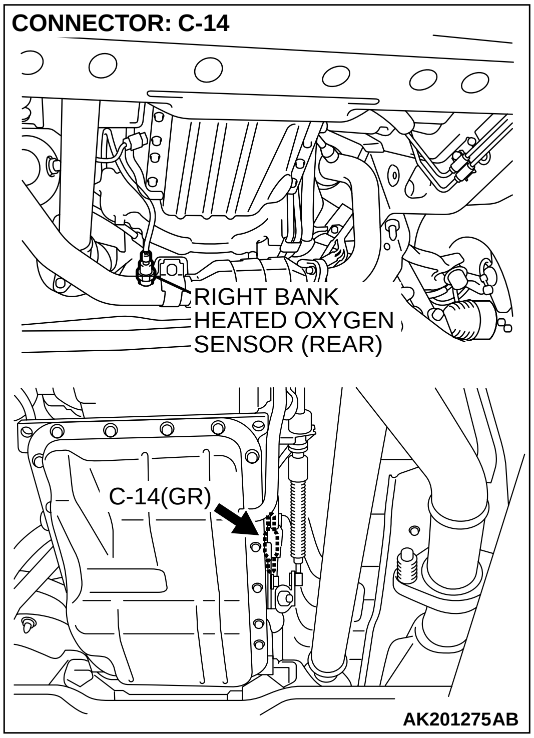
Q: Is DTC P0137 set?

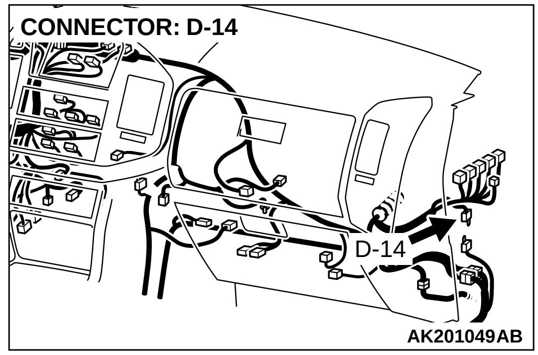
YES : Retry the troubleshooting.
NO : The inspection is complete.

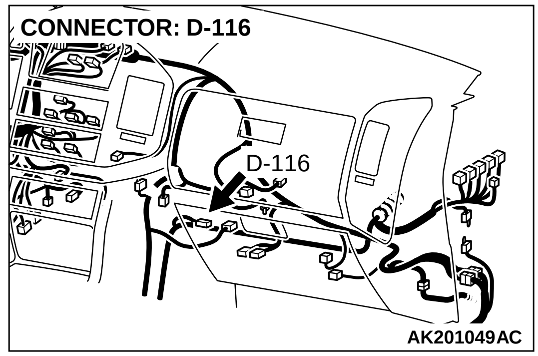
DTC P0138: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2)

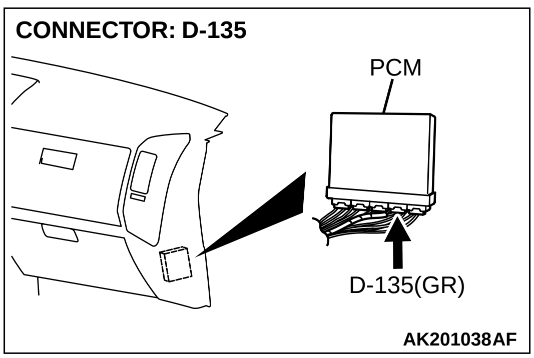
Right Bank Heated Oxygen Sensor (rear) Circuit

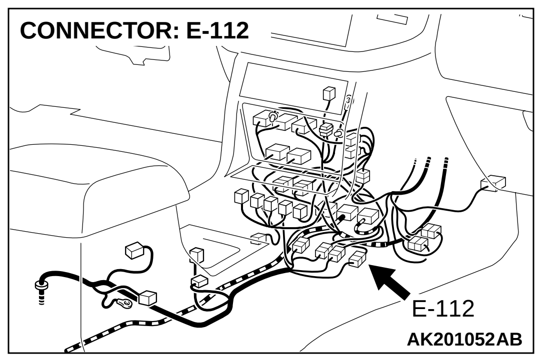












CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 117) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgment Criteria

- Right bank heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Short circuit in right bank heated oxygen sensor (rear) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

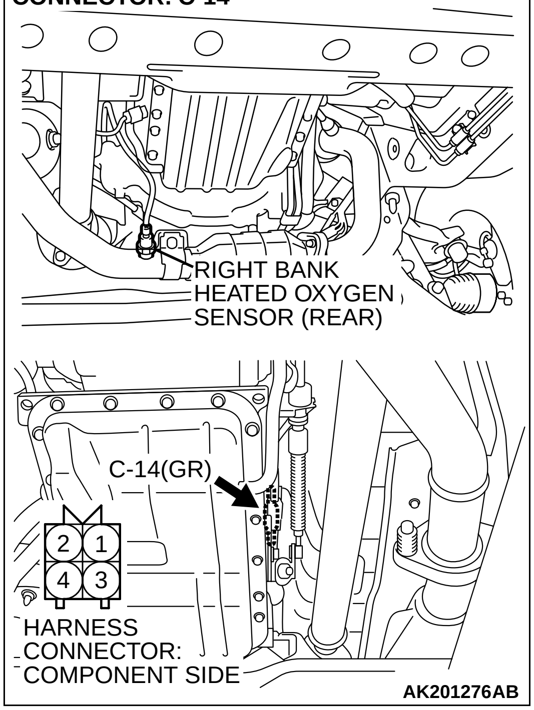
STEP 1. Check connector C-14 at right bank heated oxygen sensor (rear) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

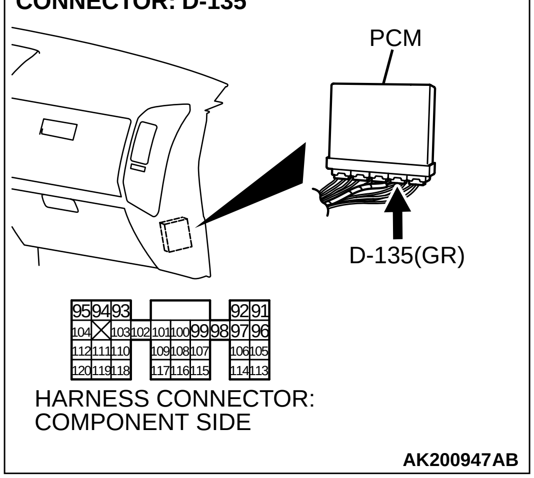
YES : Go to Step 2.

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

CONNECTOR: C-14

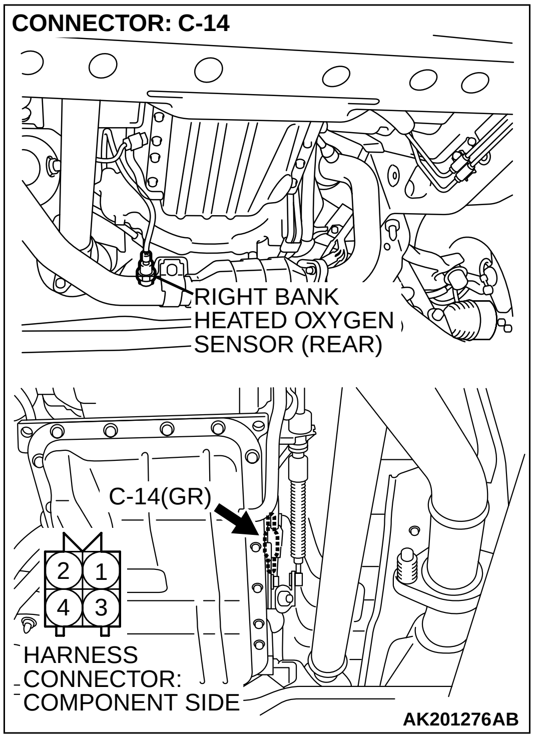


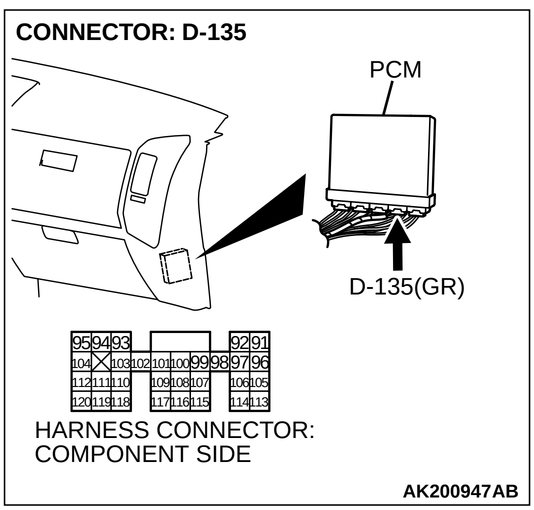
CONNECTOR: D-135



STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 4) and PCM connector D-135 (terminal No. 117).

NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.





Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.

STEP 3. Perform the OBD-II drive cycle.

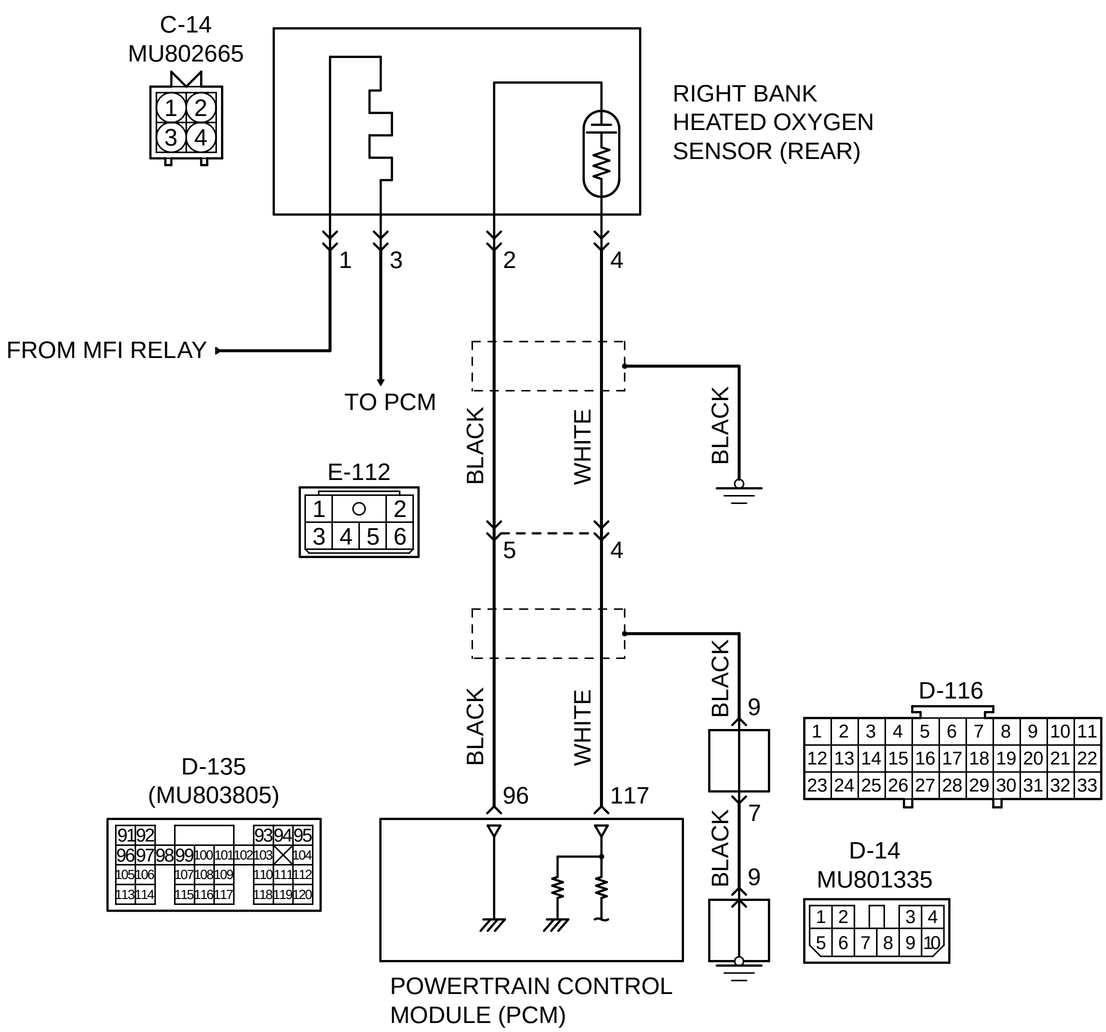
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0138 set?

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

DTC P0139: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



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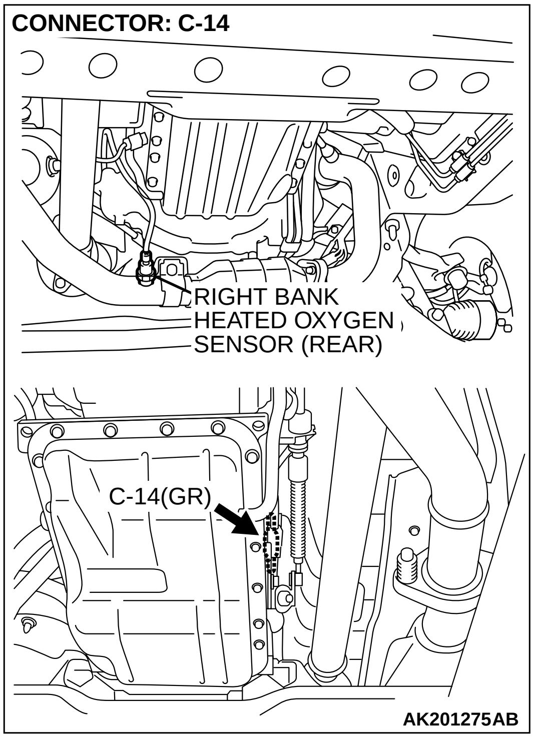
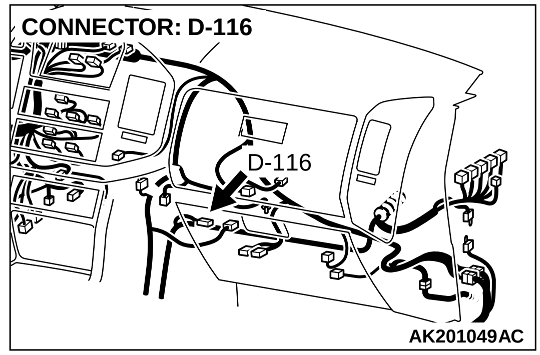
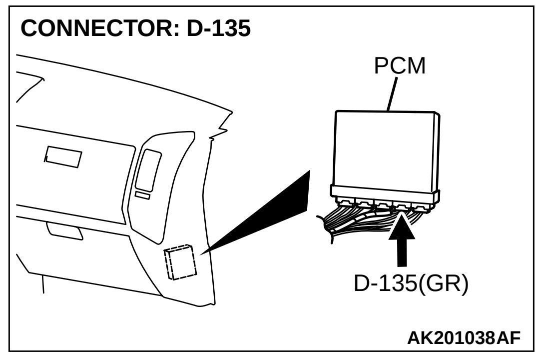
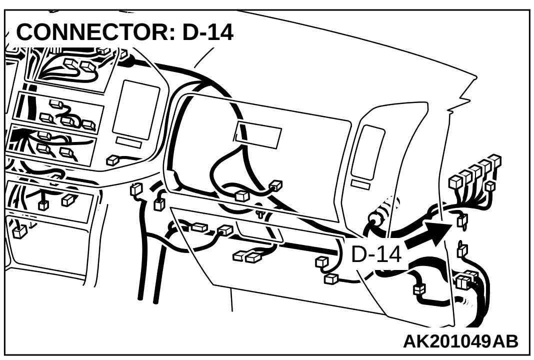
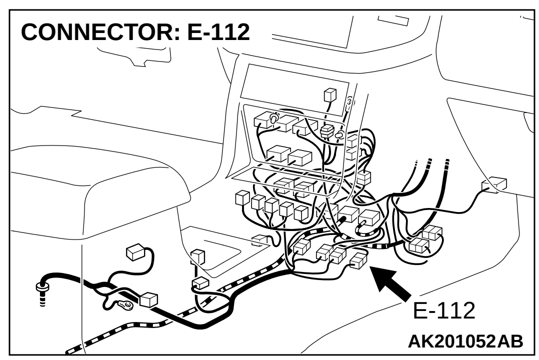










CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 117) from the output terminal (terminal No. 4) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The right bank heated oxygen sensor (front) is active.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
    - Engine speed is higher than 1,500 r/min.
    - Volumetric efficiency is higher than 40 percent.
    - Vehicle speed is higher than 30 km/h (18.7 mph).
    - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

Stop*2:

- Vehicle speed is lower than 1.5 km/h (0.9 mph).

Judgement Criteria

- Change in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.313 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

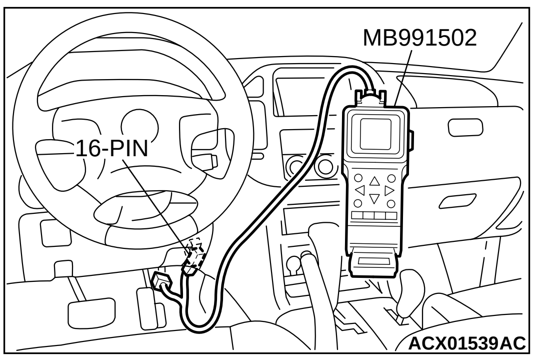
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
(4) Warm up the engine.
- After increasing the output voltage 0.15 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.15 volt or less within 3 seconds.

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

Q: Is the sensor operating properly?

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

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 4 – Heated Oxygen Sensor Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

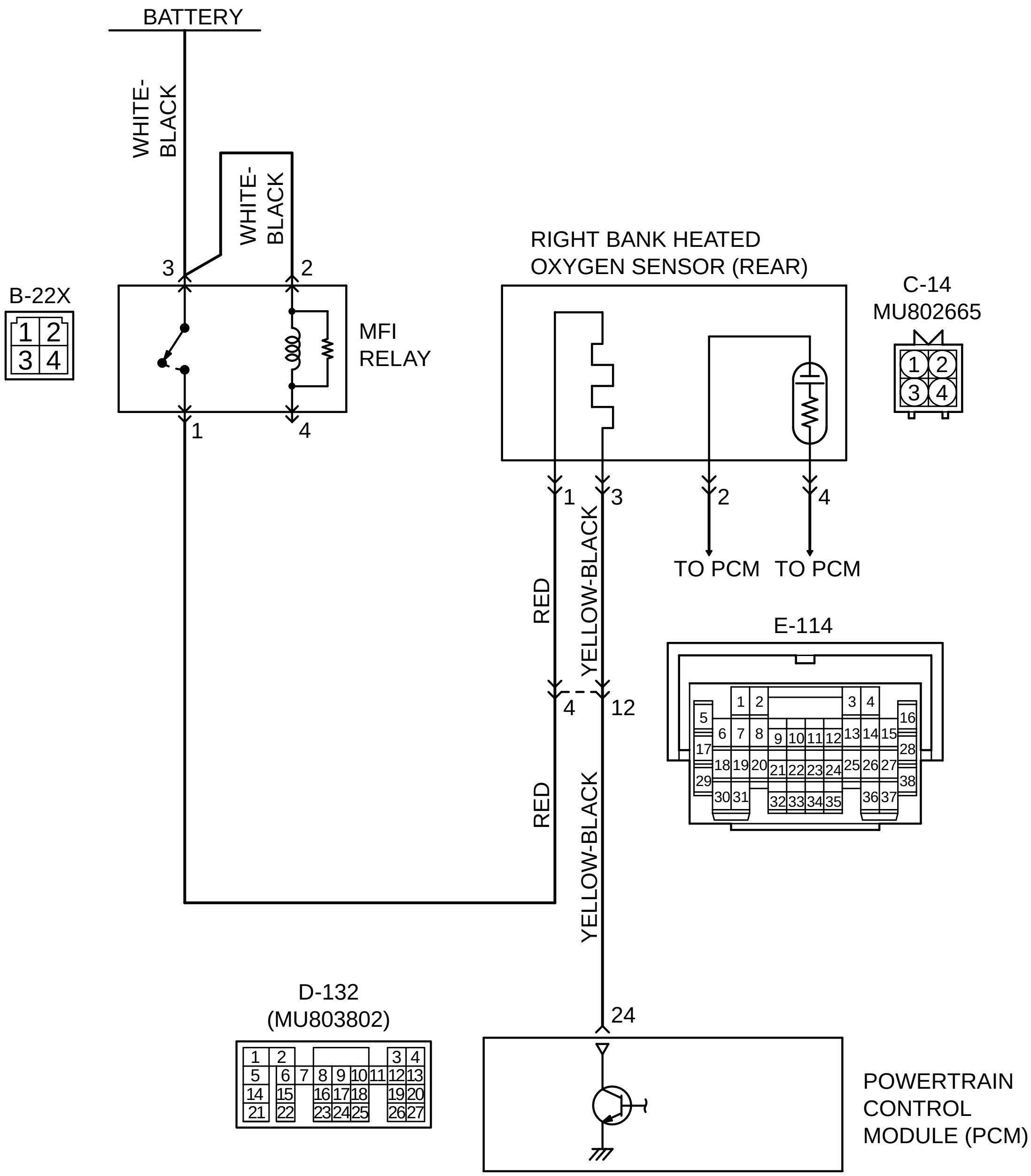
Q: Is DTC P0139 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0141: Heated Oxygen Sensor Heater Circuit (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Heater Circuit



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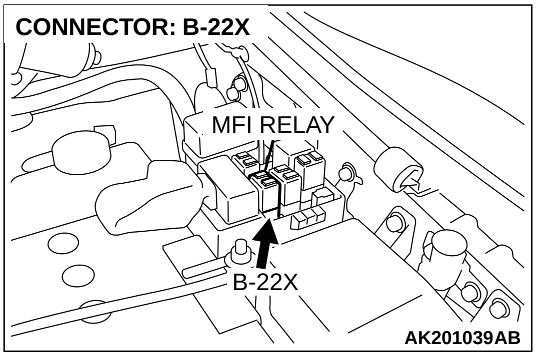
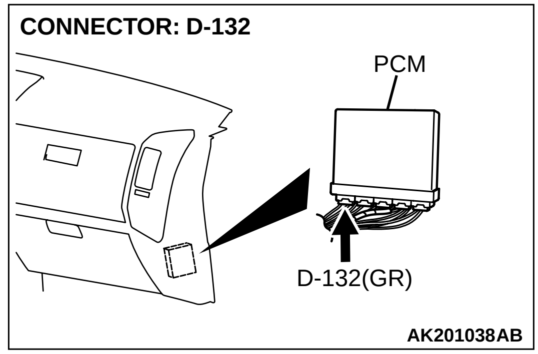
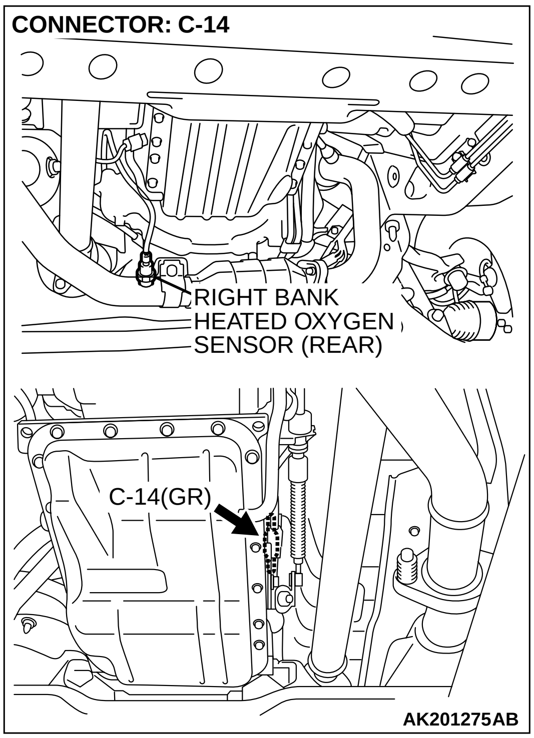
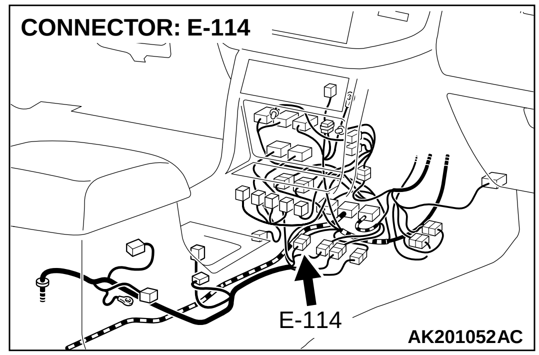








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 1) to the right bank heated oxygen sensor (rear) heater.
- The PCM (terminal No. 24) controls continuity to the right bank heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

BACKGROUND

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

DTC SET CONDITIONS

Check Conditions

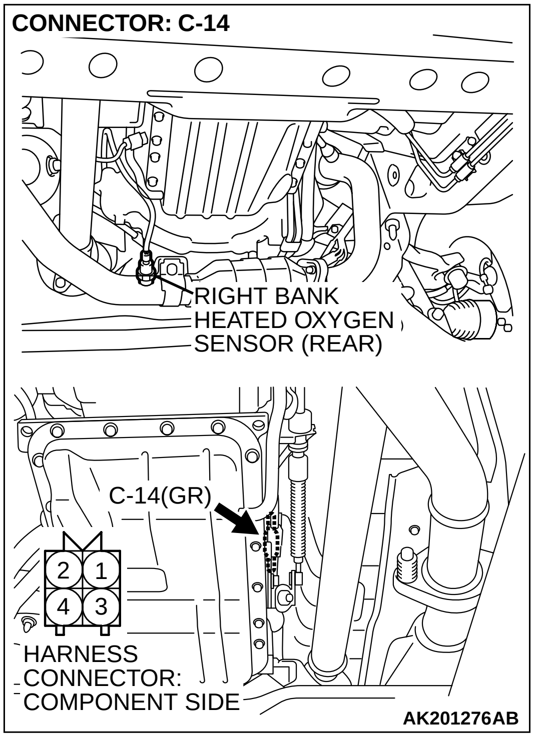
- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the right bank heated oxygen sensor (rear) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the right bank heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

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

- Open or shorted right bank heated oxygen sensor (rear) heater circuit.
- Open circuit in right bank heated oxygen sensor (rear) heater.
- PCM failed.



DIAGNOSIS

Required Special Tool:
- MB991316: Test Harness

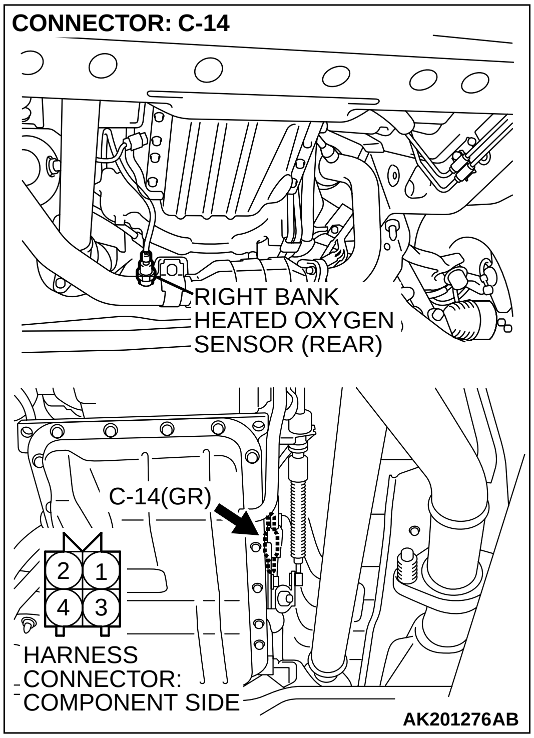
STEP 1. Check harness connector C-14 at the right bank heated oxygen sensor (rear) for damage.

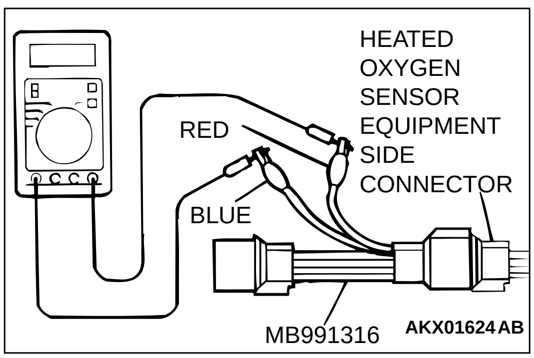
Q: Is the harness connector in good condition?

YES : Go to Step 2.

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

STEP 2. Check the right bank heated oxygen sensor (rear).





(1) Disconnect right bank heated oxygen sensor (rear) connector C-14 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen (rear) sensor side.
(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 ohms [at 20°C (68°F)]

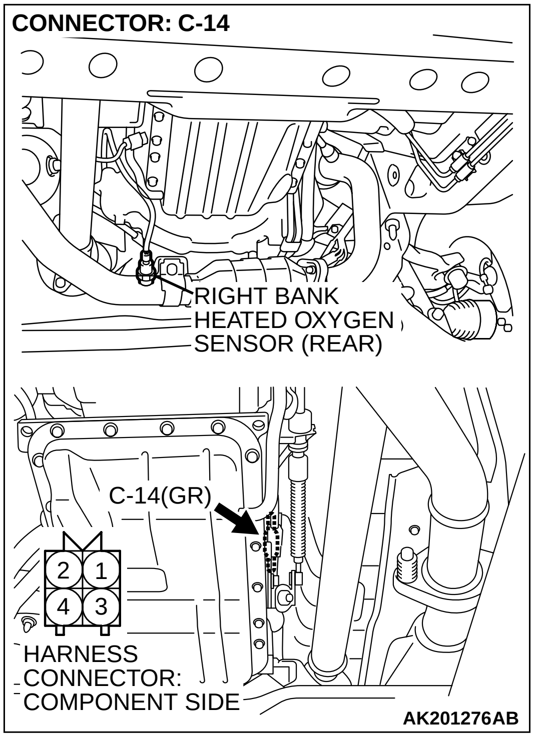
Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

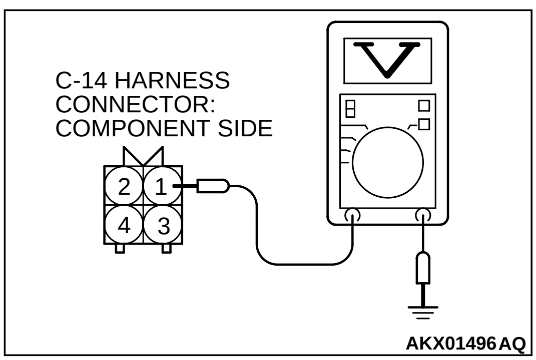
YES : Go to Step 3.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Measure the power supply voltage at right bank heated oxygen sensor (rear) harness side connector C-14.

(1) Disconnect the connector C-14 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 be battery positive voltage.

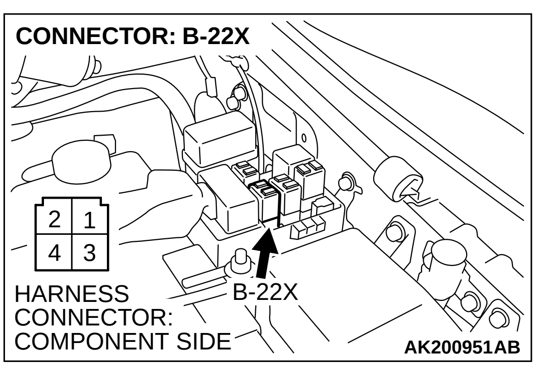
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 5.

NO : Go to Step 4.

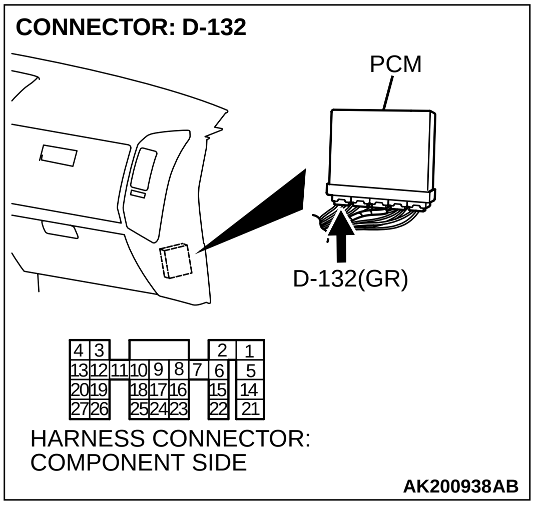
STEP 4. Check harness connector B-22X at the MFI relay for damage.



Q: Is the harness connector in good condition?

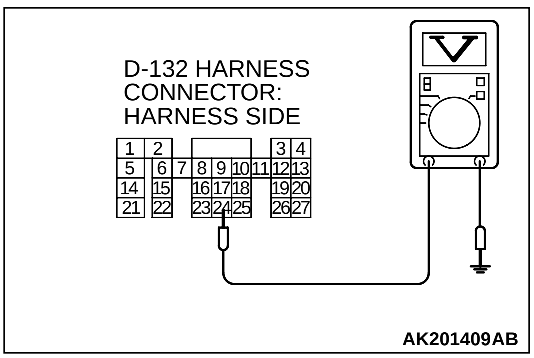
YES : Check harness connectors E-114 and D-116 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors E-114 and D-116 are in good condition, repair harness wire between MFI relay connector B-22X (terminal No. 1) and right bank heated oxygen sensor (rear) connector C-14 (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 5. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Turn the ignition switch to the "ON" position.

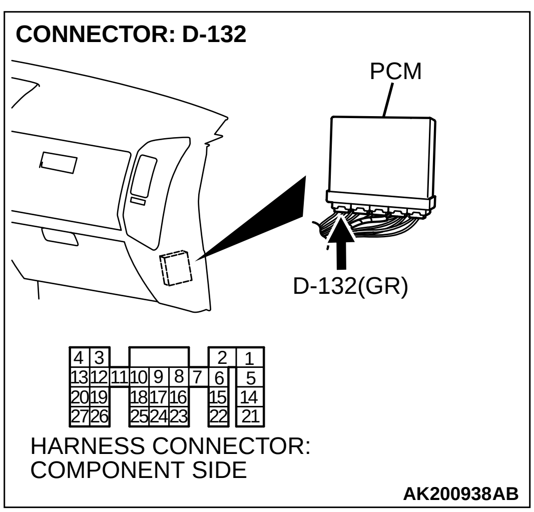


(3) Measure the voltage between terminal No. 24 and ground by backprobing.
- Voltage should be battery positive voltage.

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

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

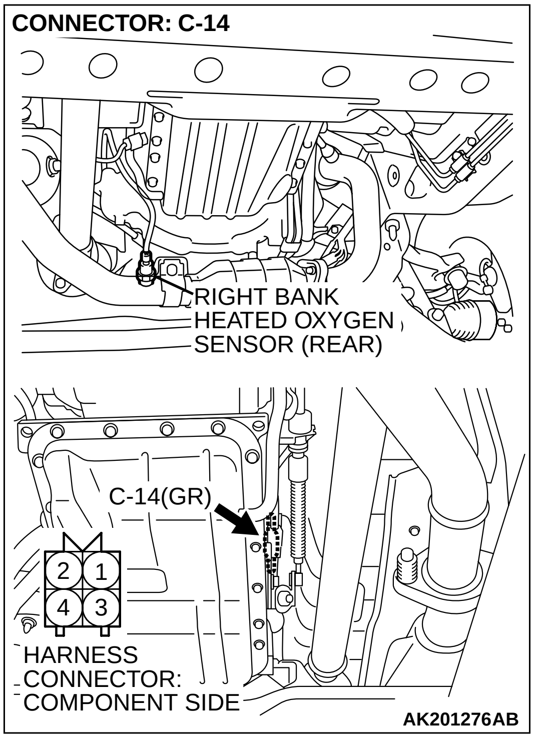
YES : Go to Step 8.
NO : Go to Step 6.

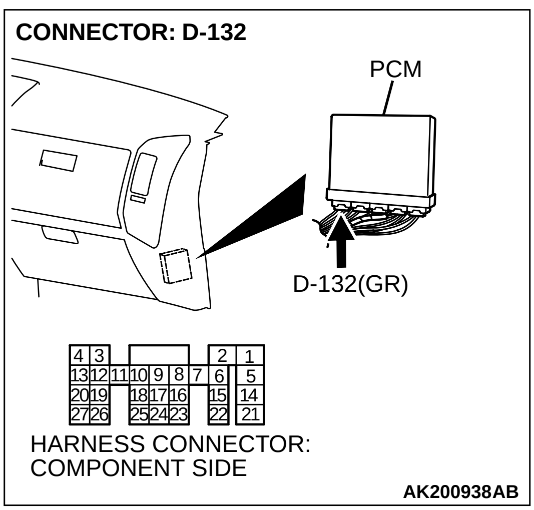


STEP 6. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





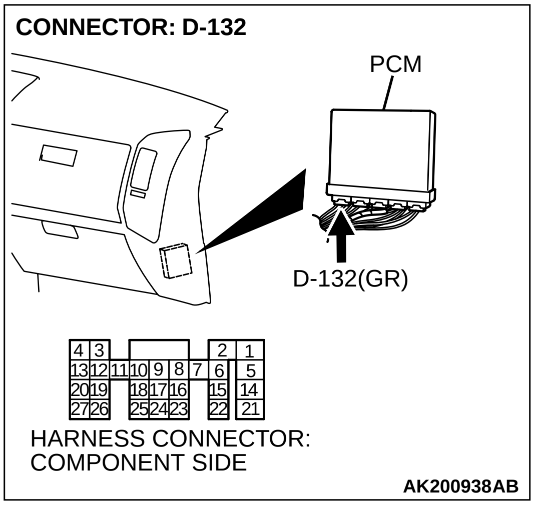
STEP 7. Check for open circuit or short circuit to ground between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 3) and PCM connector D-132 (terminal No. 24).

NOTE: Check harness after checking intermediate connector E-114. If intermediate connector E-114 is 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 PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

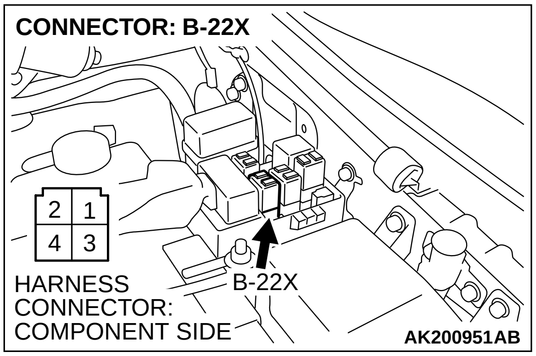


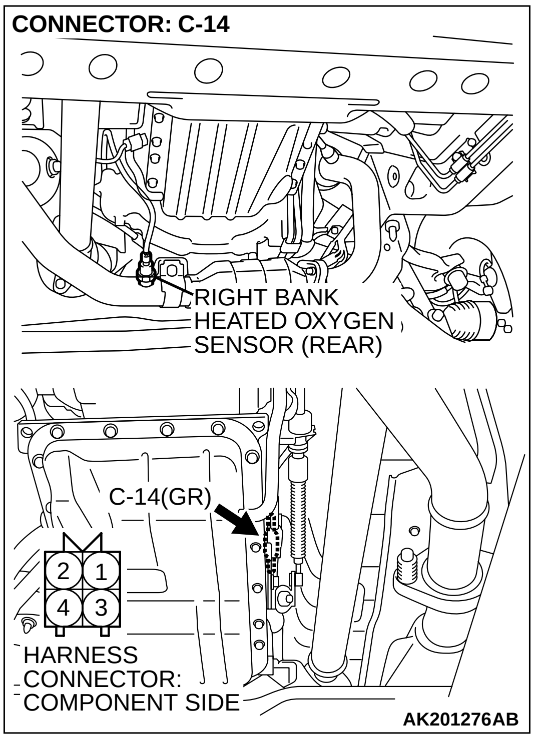
STEP 8. Check harness connector D-132 at PCM for damage.

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.





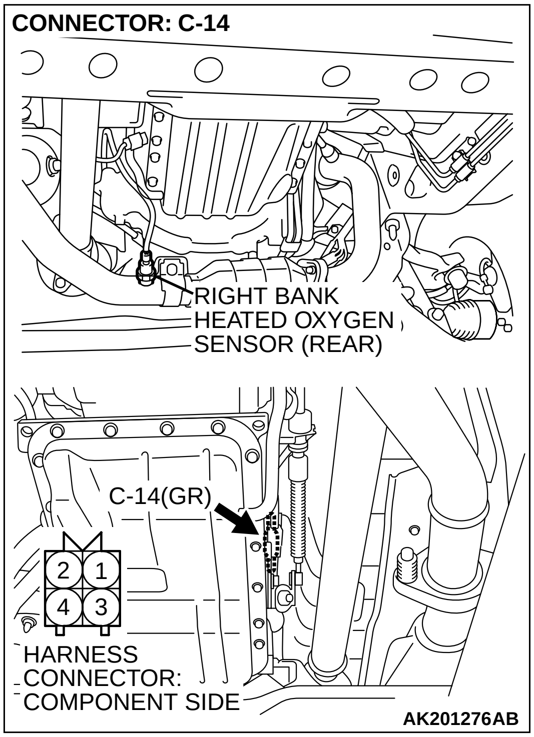
STEP 9. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and right bank heated oxygen sensor (rear) connector C-14 (terminal No. 1).

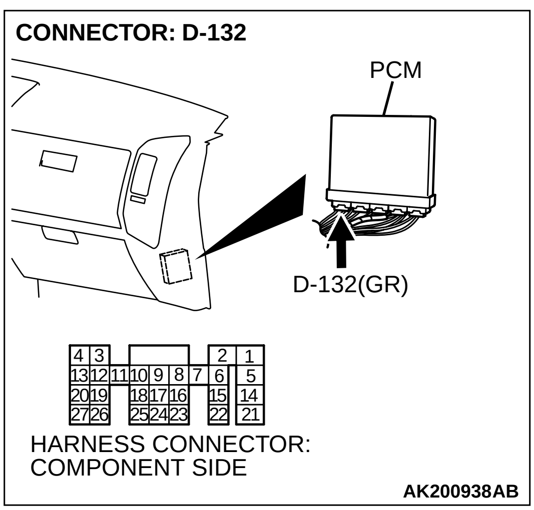
NOTE: Check harness after checking intermediate connectors E-114 and D-116. If intermediate connectors E-114 and D-116 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between right bank heated oxygen sensor (rear) connector C-14 (terminal No. 3) and PCM connector D-132 (terminal No. 24).

NOTE: Check harness after checking intermediate connector E-114. If intermediate connector E-114 is 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 : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

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

Q: Is DTC P0141 set?

YES : Replace the PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

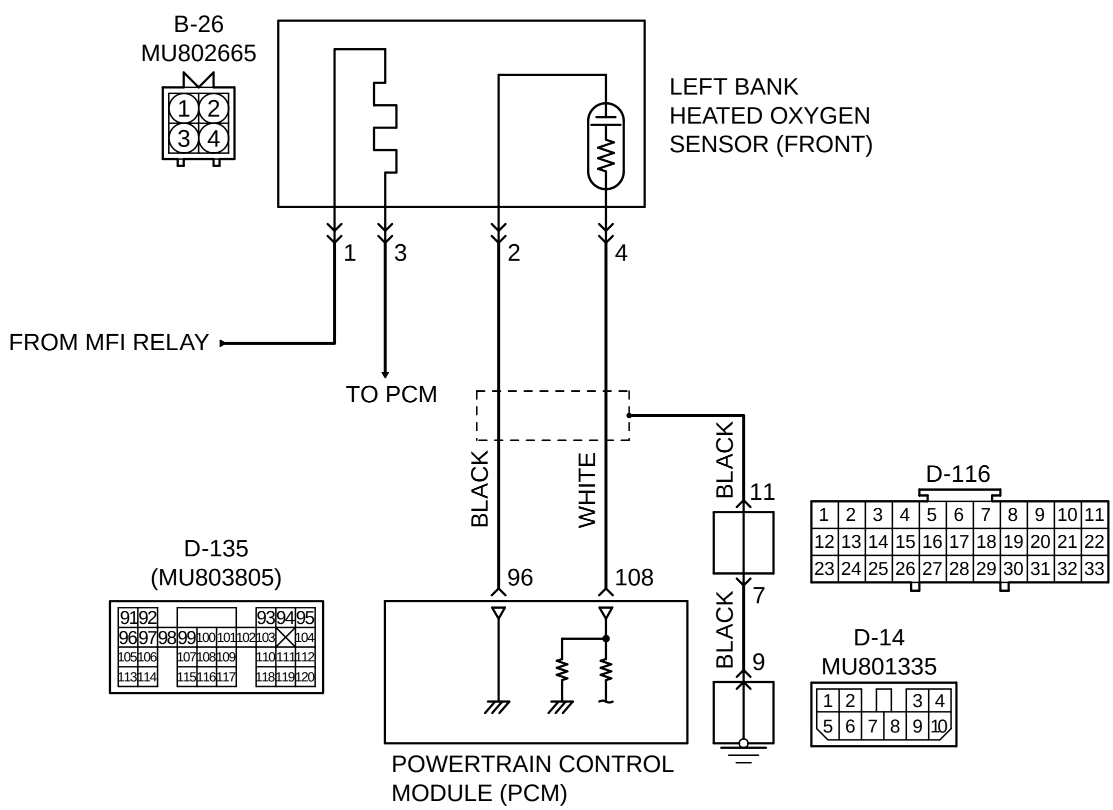
Q: Is DTC P0141 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0150: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



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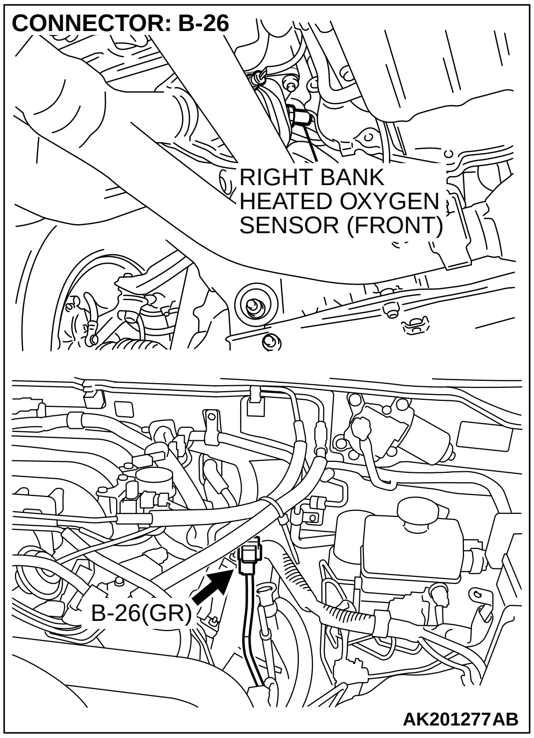
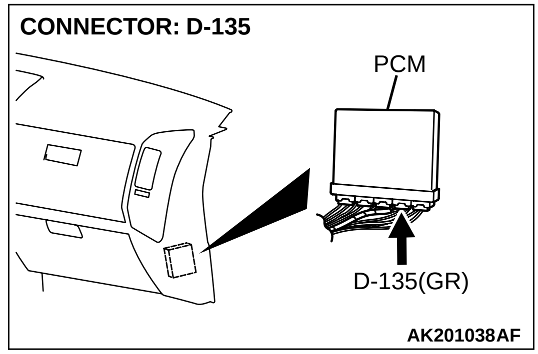
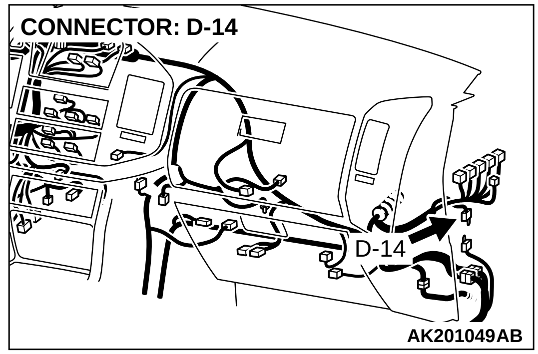
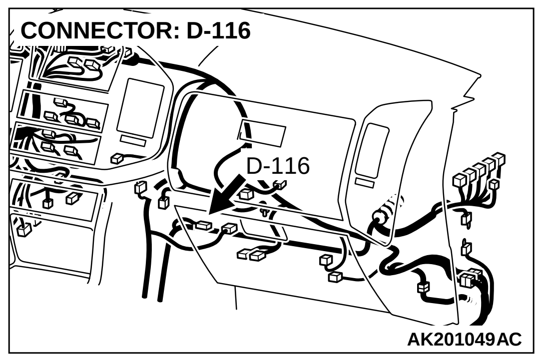








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 108) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with or PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the left bank heated oxygen sensor (front) output line.
- The PCM monitors for this condition once during the drive cycle.

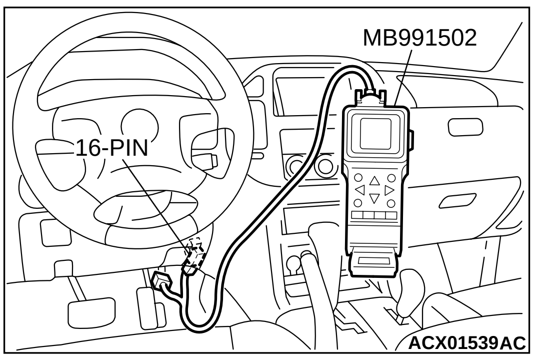
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

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

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

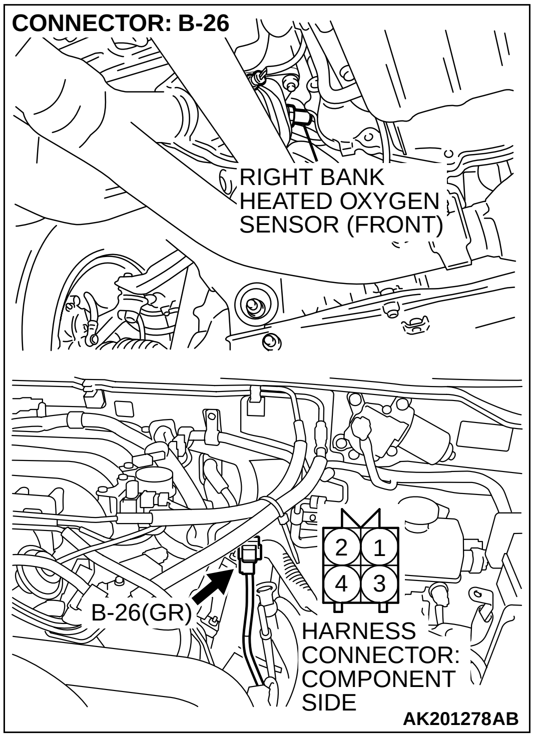
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

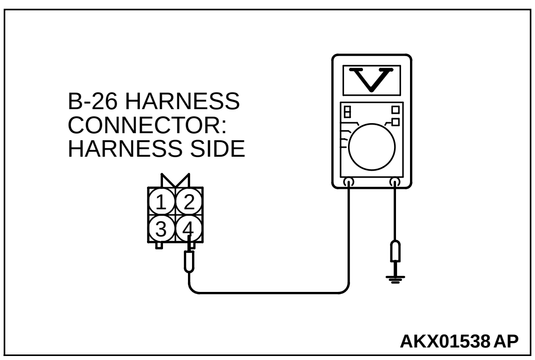
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at left bank heated oxygen sensor (front) connector B-26 by backprobing



(1) Do not disconnect the connector B-26.
(2) Start the engine and run at idle.

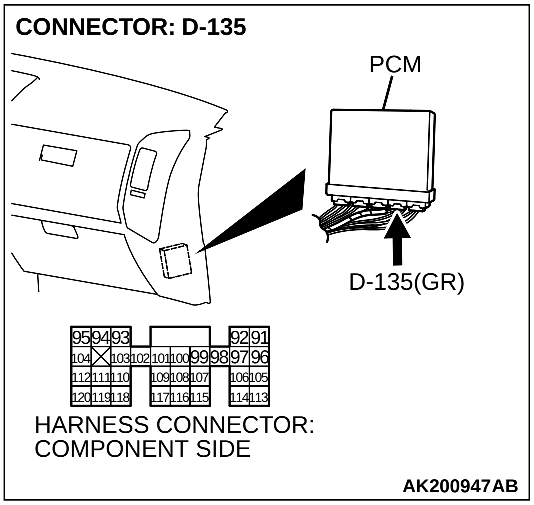


(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

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

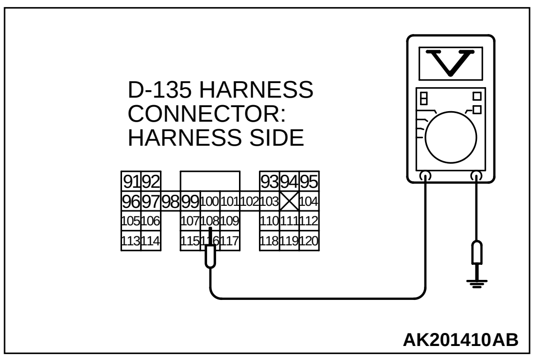
Q: Is the voltage normal?

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



STEP 3. Measure the sensor output voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect the connector D-135.
(2) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 108 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

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

Q: Is the voltage normal?

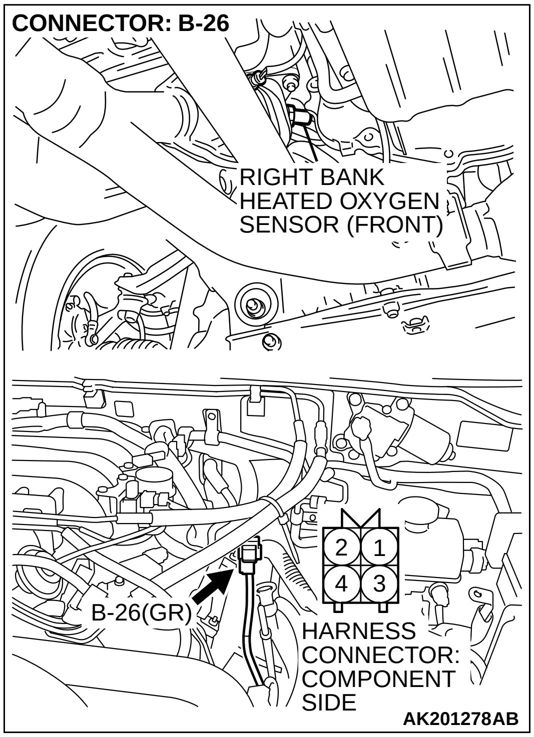
YES : Go to Step 4.
NO : Go to Step 6.

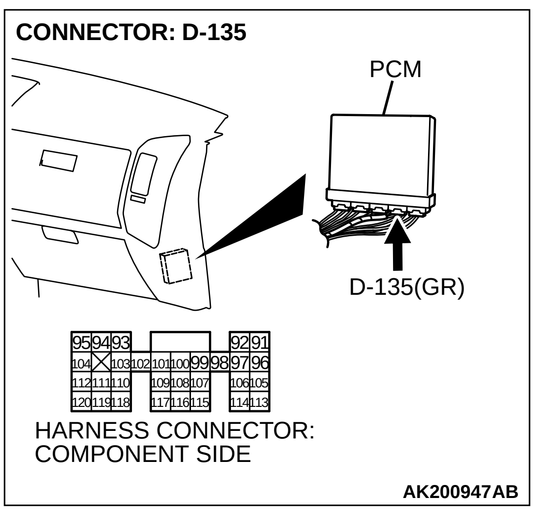
STEP 4. Check harness connector B-26 at left bank heated oxygen sensor (front) and harness connector D-135 at PCM for damage.

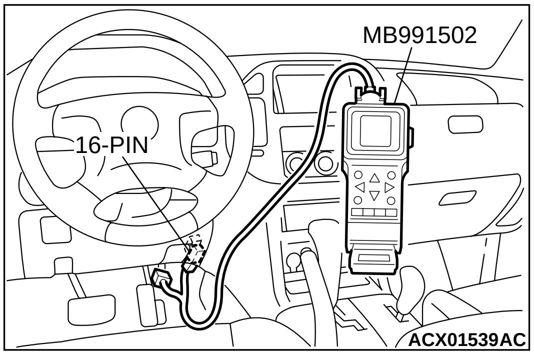
Q: Is the harness connector in good condition?

YES : Go to Step 5.

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







STEP 5. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

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

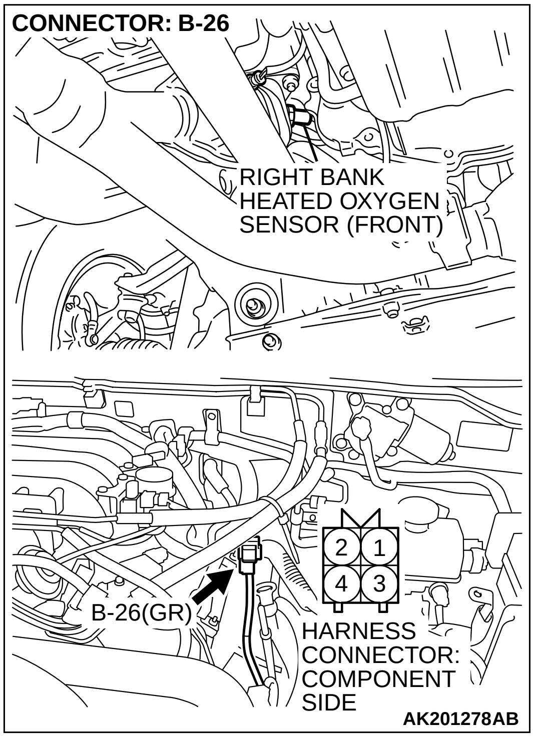
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to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

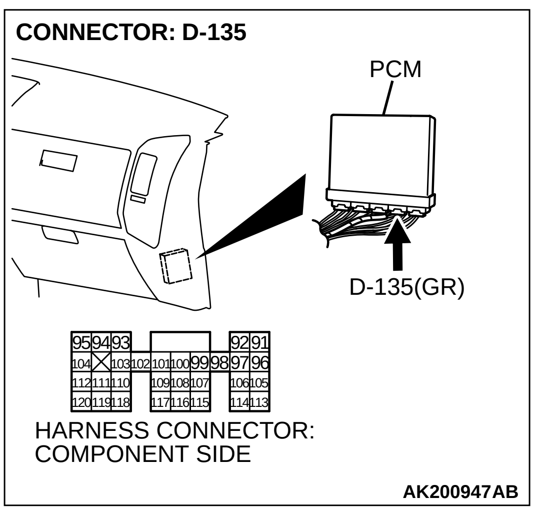
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

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



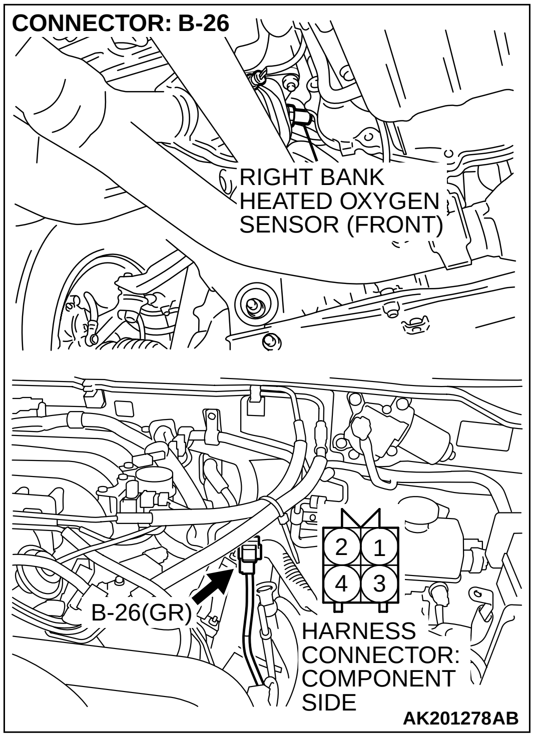


STEP 6. Check harness connector B-26 at left bank heated oxygen sensor (front) and harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-26 (terminal No. 4) and PCM connector D-135 (terminal No. 108) because of open circuit or harness damage. Then go to Step 15.

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



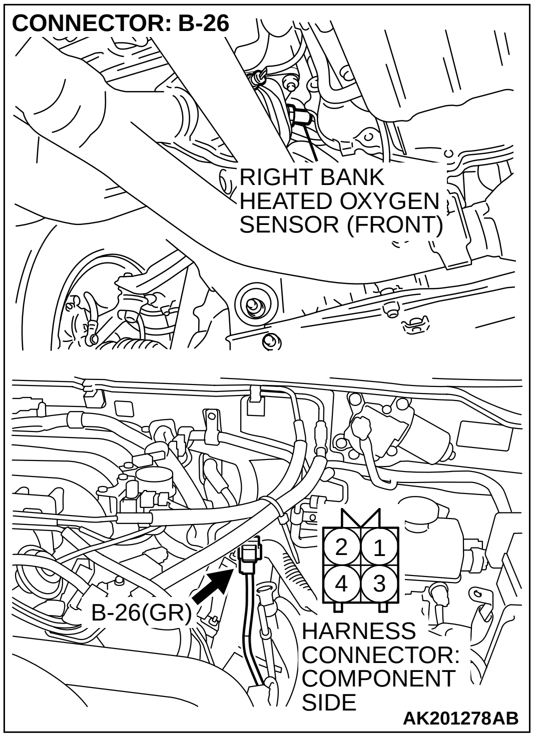
STEP 7. Check harness connector B-26 at left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

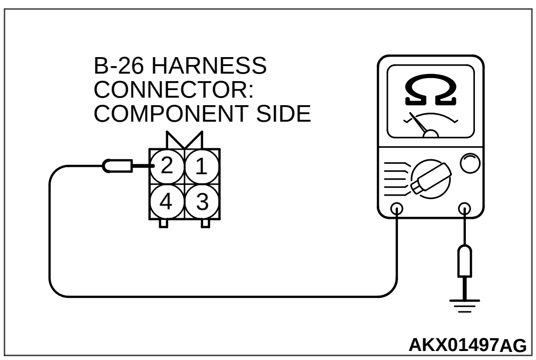
YES : Go to Step 8.

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

STEP 8. Check the continuity at left bank heated oxygen sensor (front) harness side connector B-26.



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

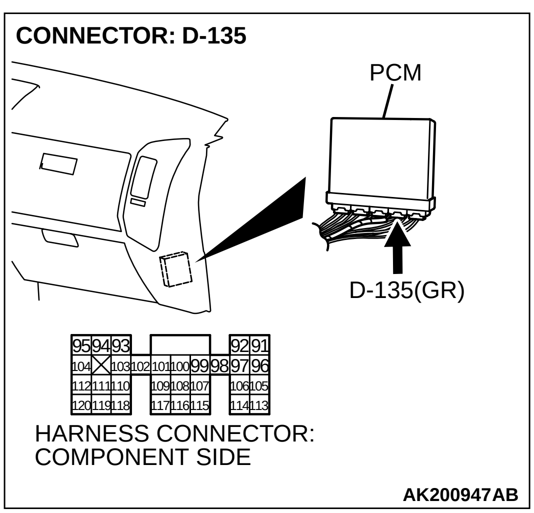


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

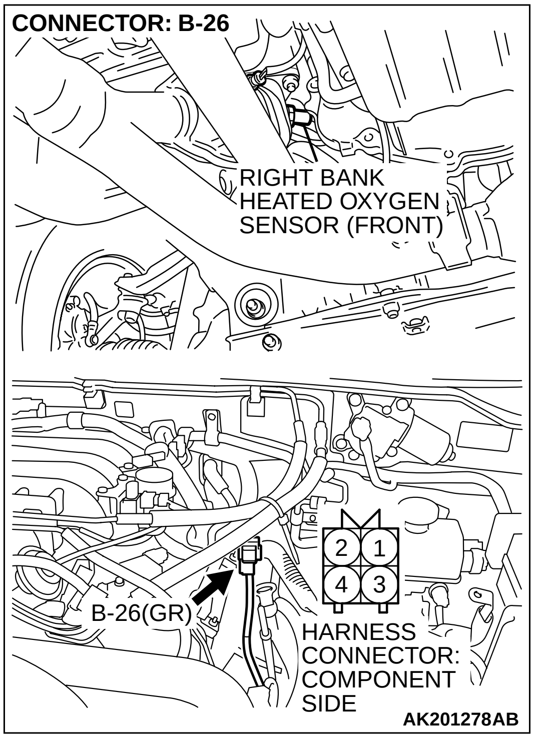
YES : Go to Step 11.
NO : Go to Step 9.

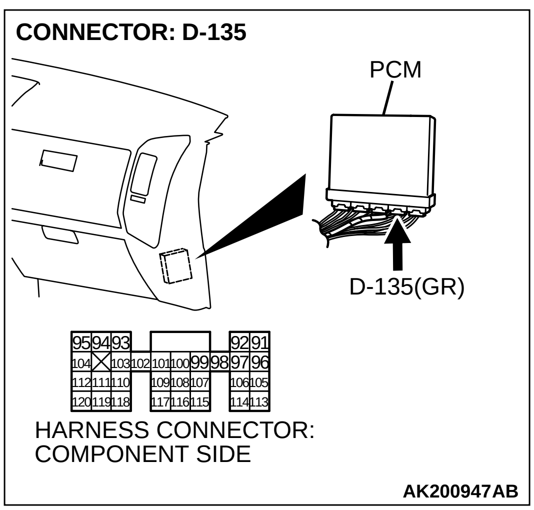
STEP 9. Check harness connector D-135 at PCM for damage.



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 15.



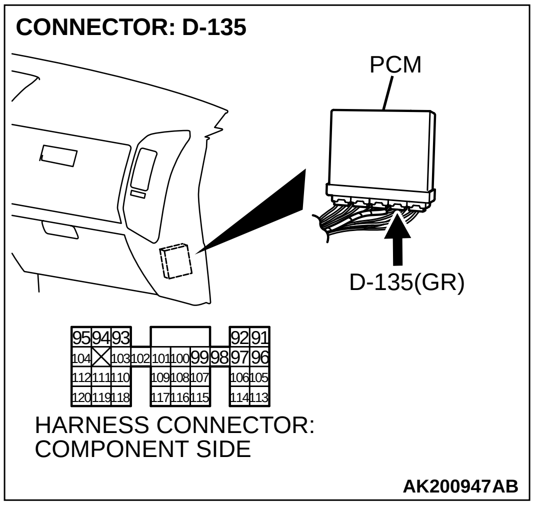


STEP 10. Check for open circuit and harness damage between left bank heated oxygen sensor (front) connector B-26 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 15.



STEP 11. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.

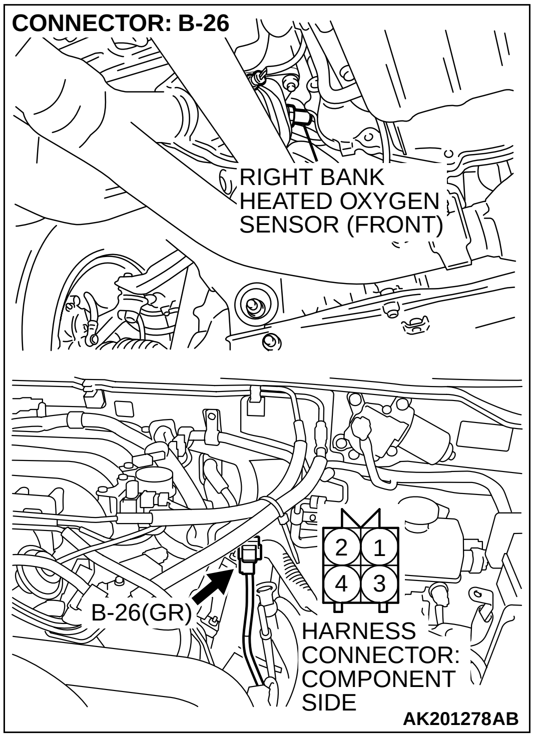
NO : Repair or replace it. Then go to Step 15.

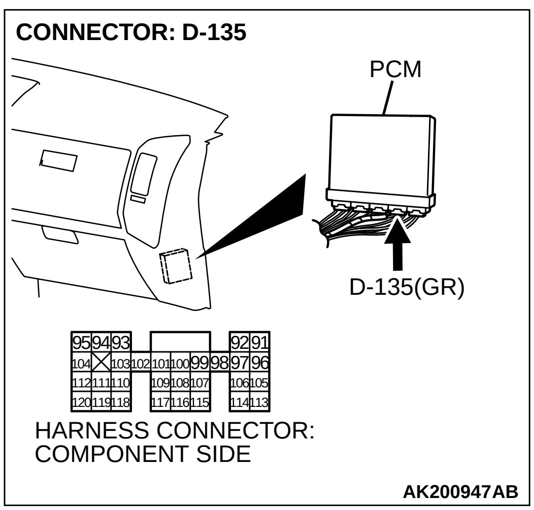
STEP 12. Check for harness damage between left bank heated oxygen sensor (front) connector B-26 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

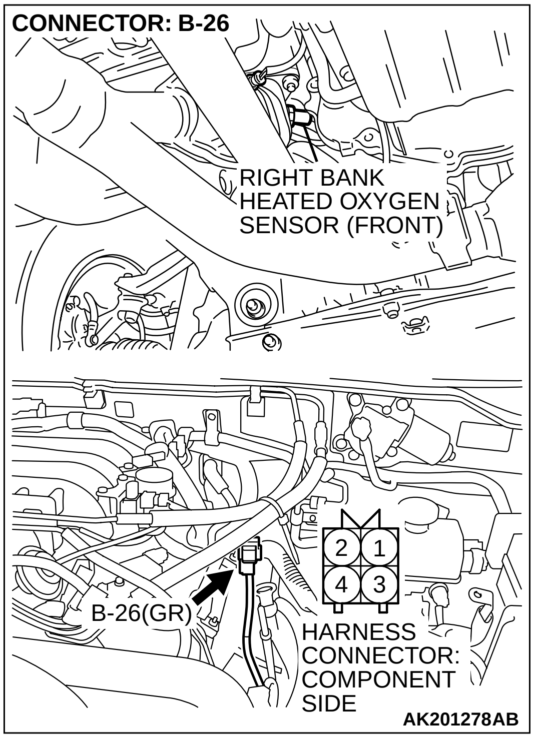
Q: Is the harness wire in good condition?

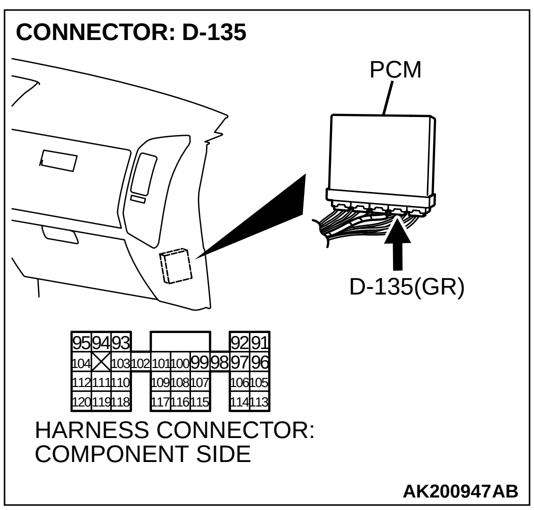
YES : Go to Step 13.

NO : Repair it. Then go to Step 15.







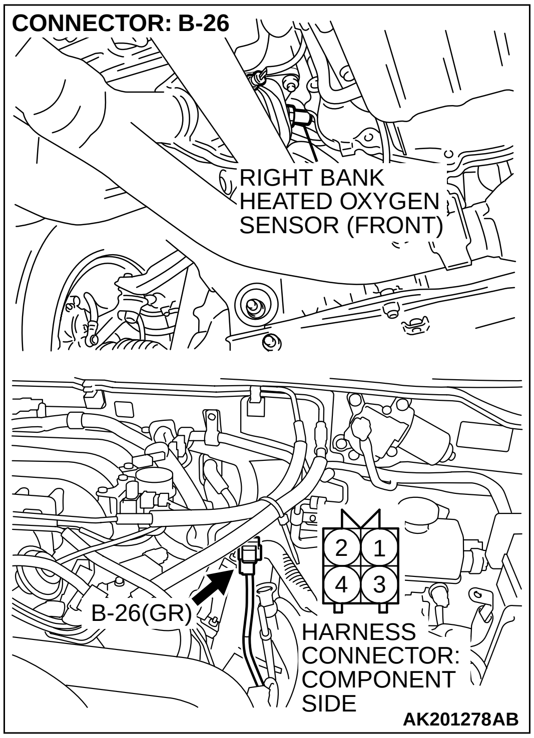


STEP 13. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (front) connector B-26 (terminal No. 4) and PCM connector D-135 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to Step 15.



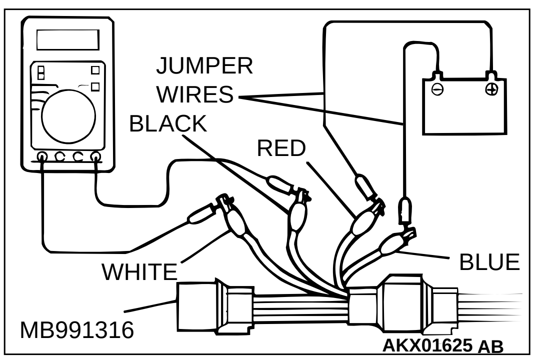
STEP 14. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-26 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

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

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

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

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

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

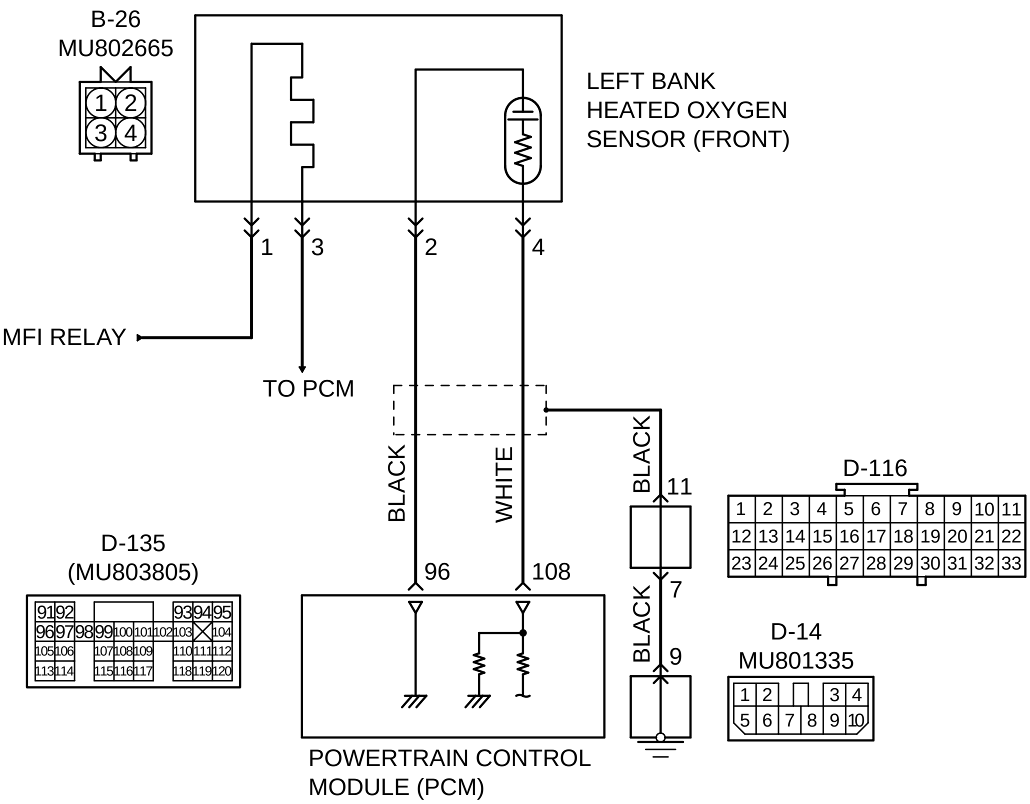
Q: Is DTC P0150 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0151: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



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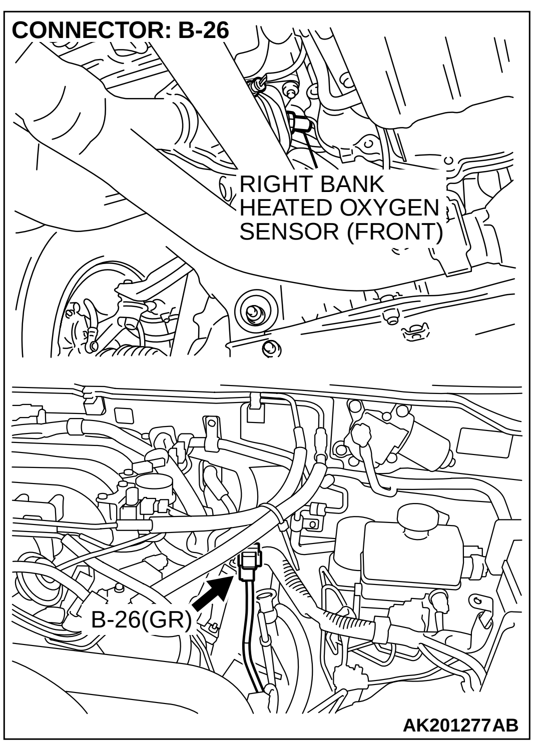
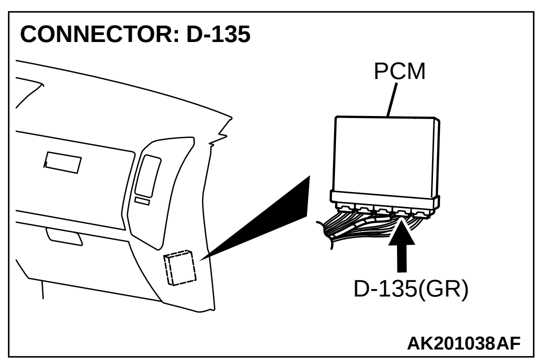
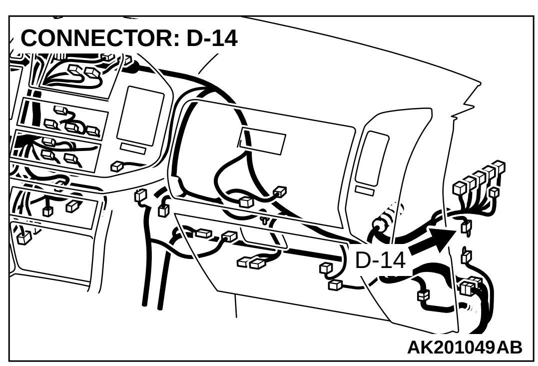
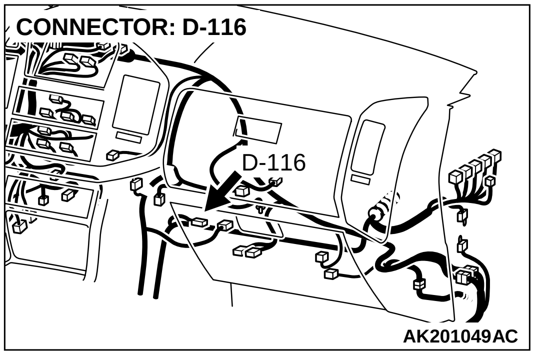








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 108) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume airflow sensor output frequency is 100 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned "ON" position, the changes in the output voltage of the left bank heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.15 volt.
- The PCM monitors for this condition once during the drive cycle.

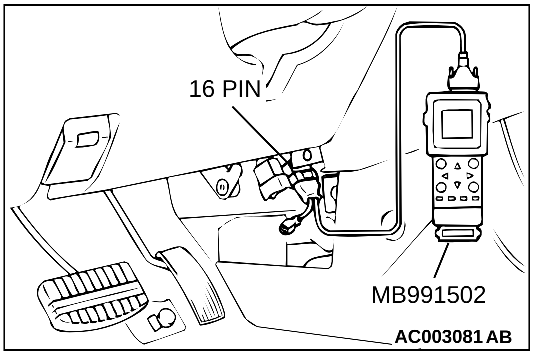
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) failed.
- Short circuit in left bank heated oxygen sensor (front) output line.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

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

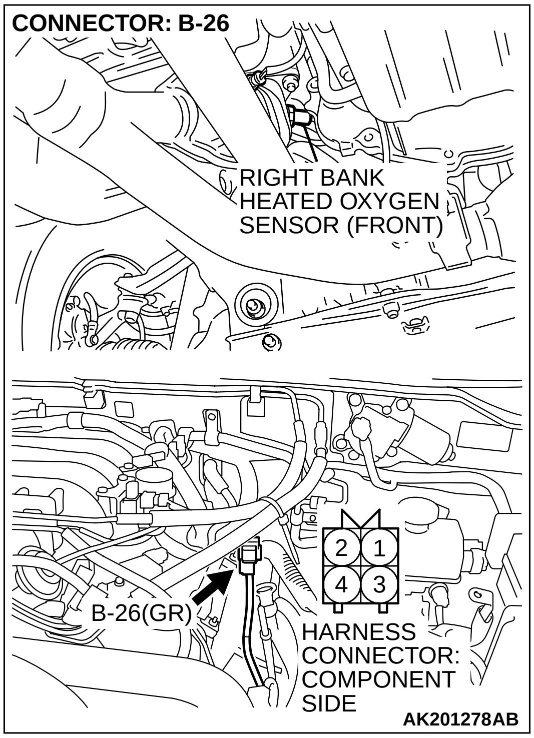
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6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

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

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



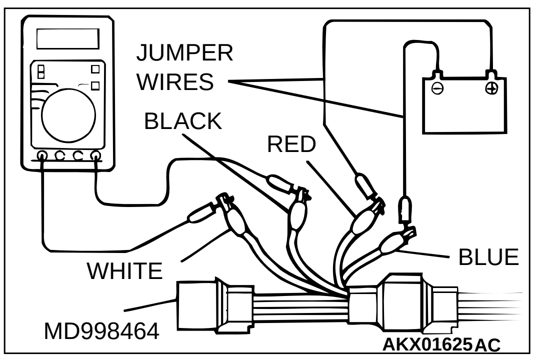
STEP 2. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-26 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

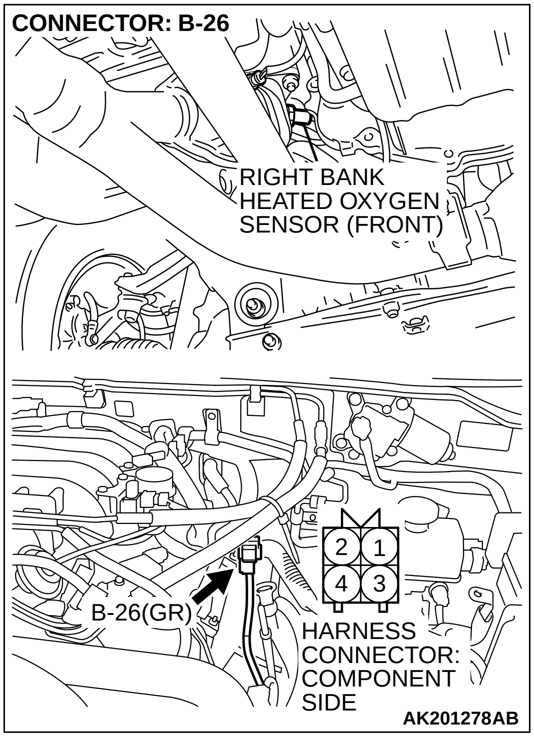
(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

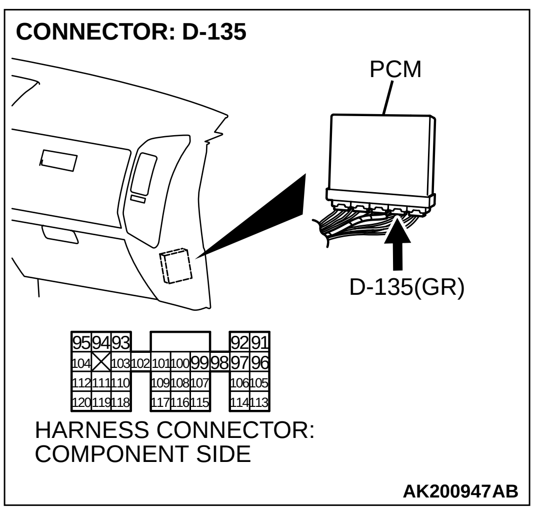
Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (front). Then go to Step 5.



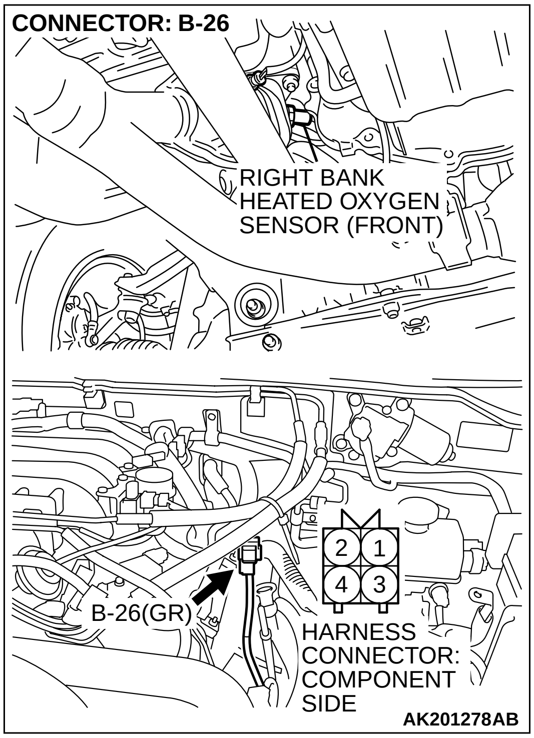


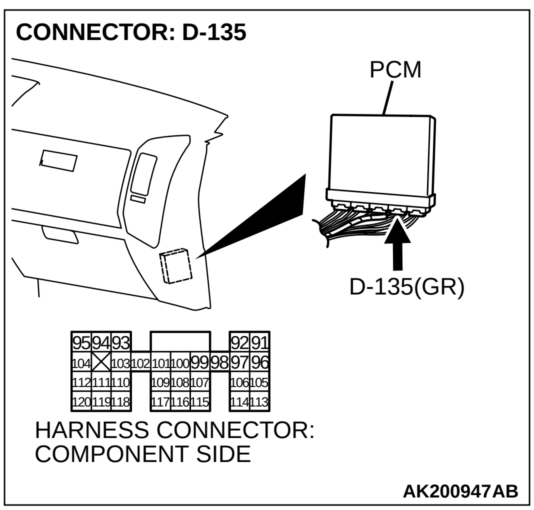
STEP 3. Check connector B-26 at left bank heated oxygen sensor (front) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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





STEP 4. Check for short circuit to ground between left bank heated oxygen sensor (front) connector B-26 (terminal No. 4) and PCM connector D-135 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Replace the PCM. 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, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.

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

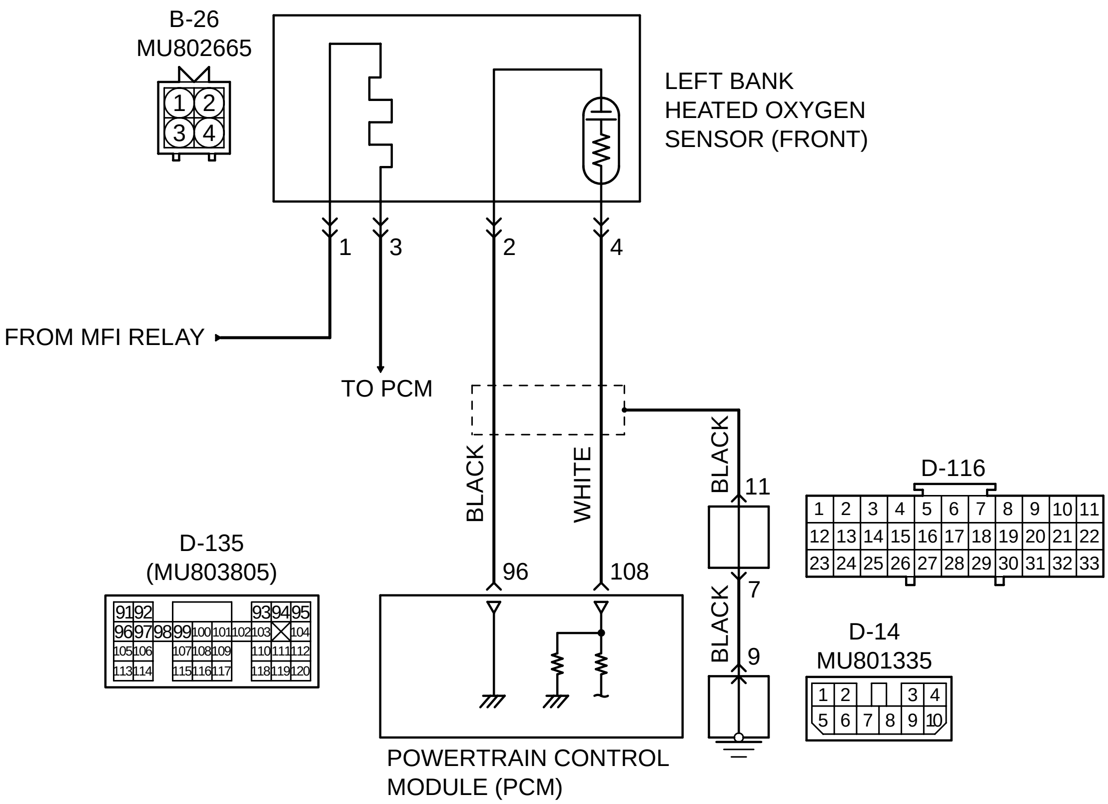
Q: Is DTC P0151 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0152: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



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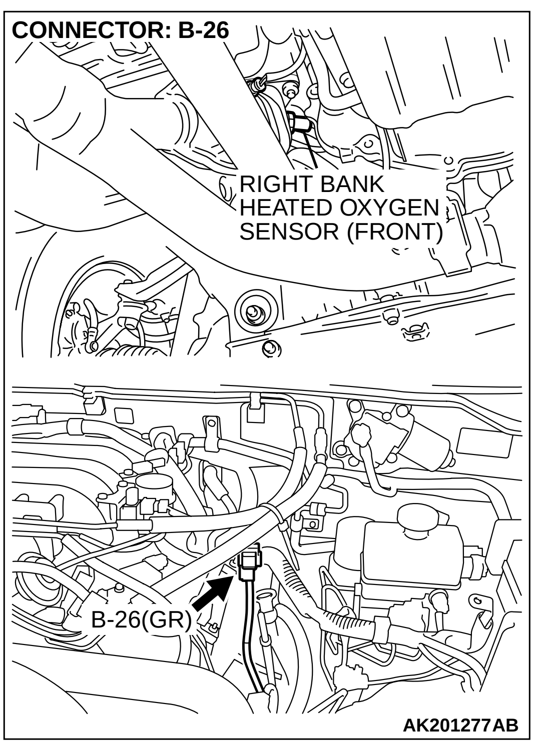
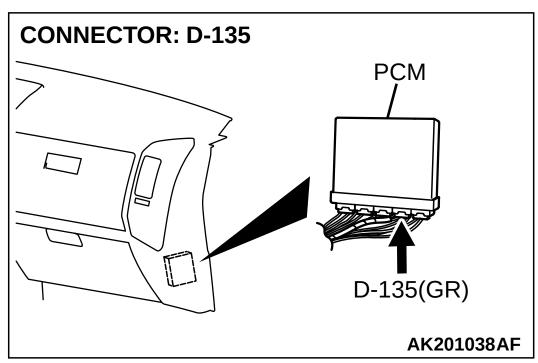
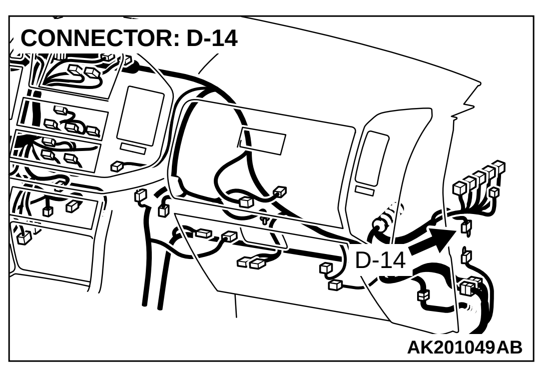
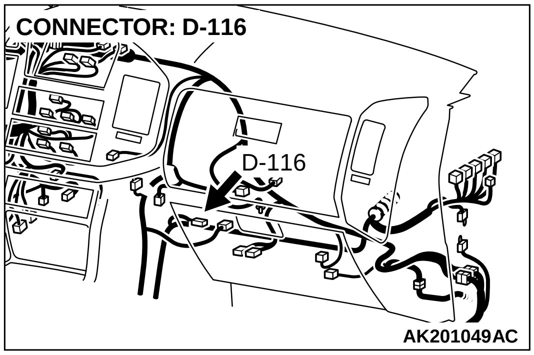








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 108) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

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

Judgment Criteria

- Left bank heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Short circuit in left bank heated oxygen sensor (front) output line.
- PCM failed.

DIAGNOSIS

Required Special Tool:

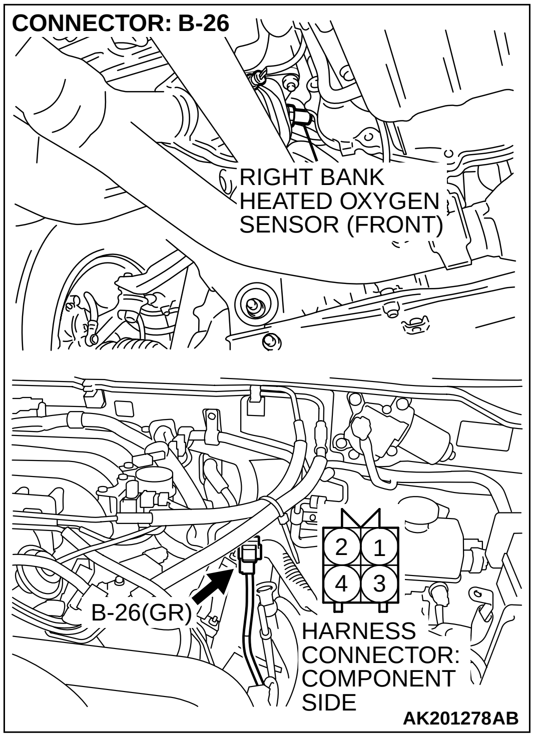
- MB991502: Scan Tool (MUT-II)

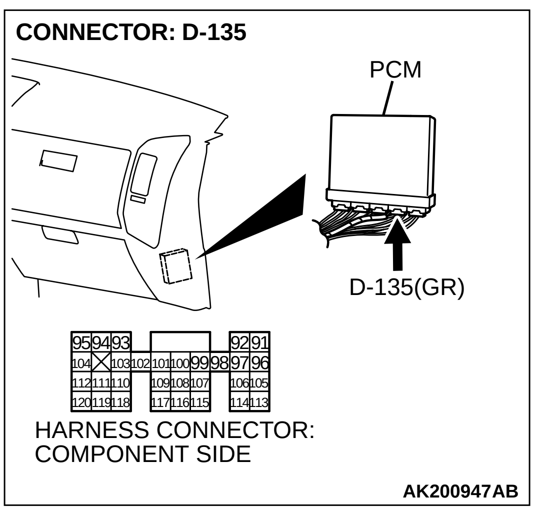
STEP 1. Check connector B-26 at left bank heated oxygen sensor (front) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

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

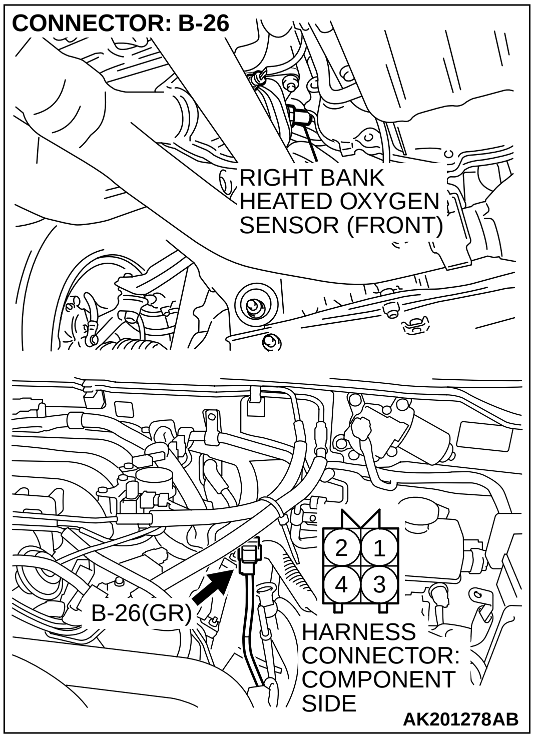


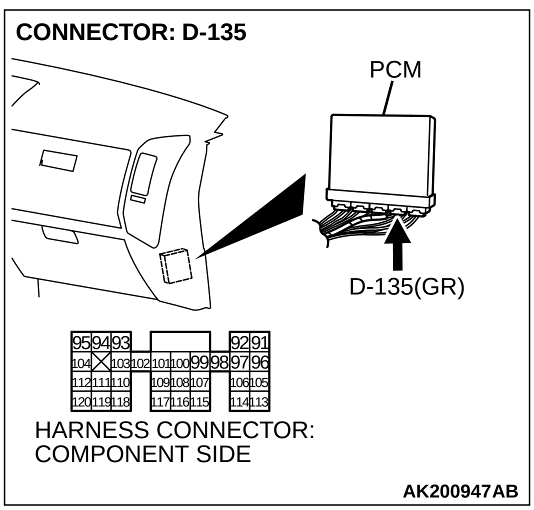


STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-26 (terminal No. 4) and PCM connector D-135 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Perform the OBD-II drive cycle.

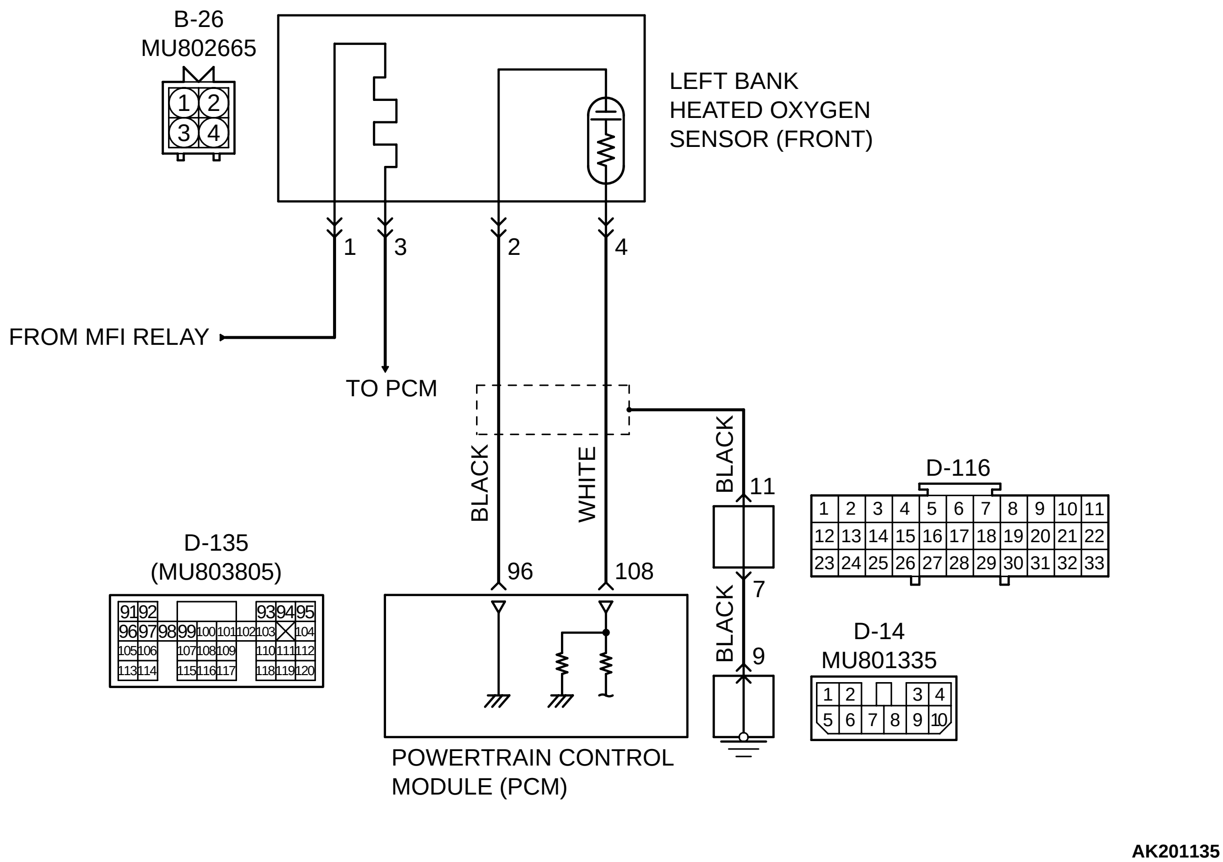
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

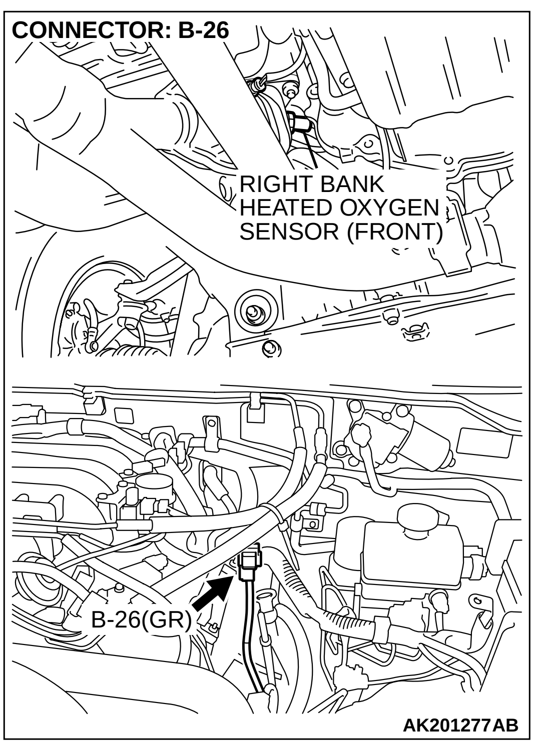
Q: Is DTC P0152 set?

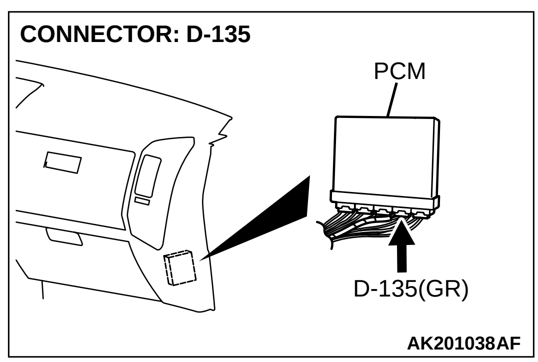
YES : Repeat the troubleshooting.
NO : The procedure is complete.

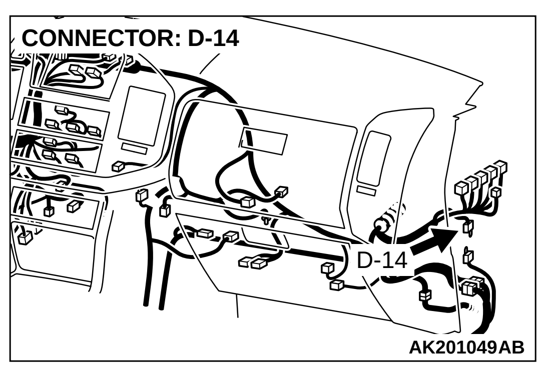
DTC P0153: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 1)

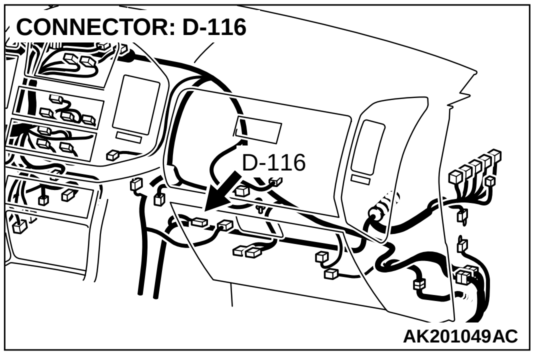
Left Bank Heated Oxygen Sensor (front) Circuit











CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 108) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is at between 1,250 and 3,000 r/min.
- Volumetric efficiency is at between 24 and 65 percent.
- Under the closed loop air/fuel control.
- The throttle valve is open.
- Short-term fuel trim is at between –30 and +25 percent.
- More than 3 seconds have elapsed after the abovementioned conditions have been met.
- The PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.

Judgment Criteria

- The left bank heated oxygen sensor (front) sends "lean" and "rich" signals alternately 11 times or less for 12 seconds.

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

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

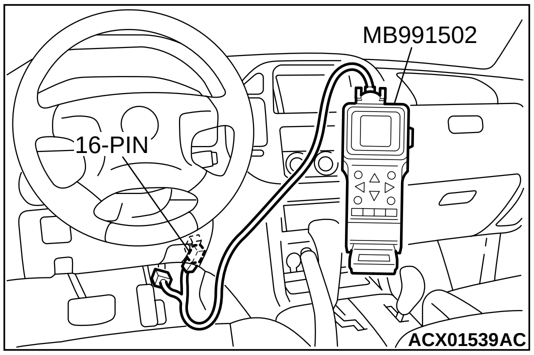
- Left bank heated oxygen sensor (front) deteriorated.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
(4) Warm up the engine, 2,500 r/min.
   - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Replace the heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 4 – Heated Oxygen Sensor Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0153 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0154: Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1)

Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1) Circuit

- Refer to, DTC P0150 – Left Bank Heated Oxygen Sensor (Front) Circuit P.13Ac-189.
- Refer to, DTC P0201, P0202, P0203, P0204, P0205, P0206 – Injector Circuit P.13Ac-318.

CIRCUIT OPERATION

- Refer to, DTC P0152 – Left Bank Heated Oxygen Sensor (Front) Circuit P.13Ac-210.
- Refer to, DTC P0201, P0202, P0203, P0204, P0205, P0206 – Injector Circuit P.13Ac-318.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the left bank heater oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P0154 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DTC SET CONDITIONS

- Engine coolant temperature is higher than 76°C (169° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 80 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgment Criteria

- Left bank heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

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

- Left bank heated oxygen sensor (front) deteriorated.
- Open circuit in left bank heated oxygen sensor (front) output line.
- Open circuit in left black heated oxygen sensor (front) ground line.
- Left bank heated oxygen sensor (rear) deteriorated.

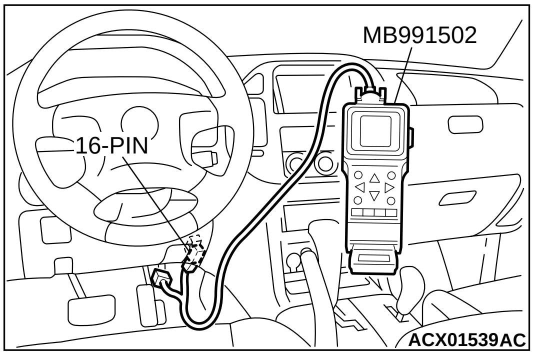
  NOTE: When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the left bank heated oxygen sensor (rear).
  If the left bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the left bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the left bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0154 becoming registered.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness

STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).



⚠ CAUTION

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

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

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0156 – Heated Oxygen Sensor Circuit (bank 2, sensor 2) P.13Ac-235, DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13Ac-250, DTC P0158-Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13Ac-256, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13Ac-260.

STEP 2. Check the exhaust leaks.

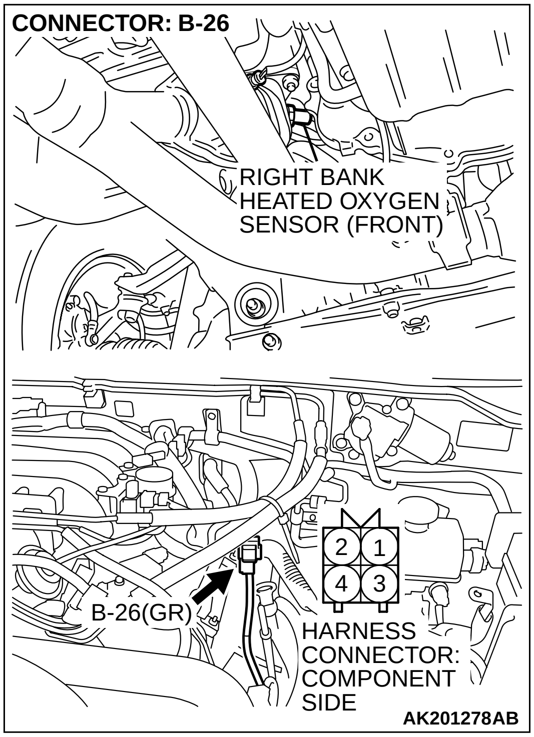
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 3.

STEP 3. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 4.
NO : Repair it. Then go to Step 14.



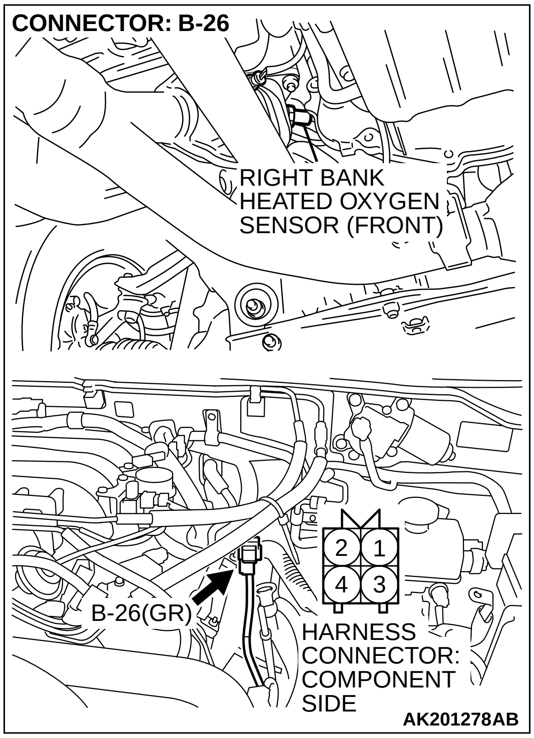
STEP 4. Check connector B-26 at the left bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

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

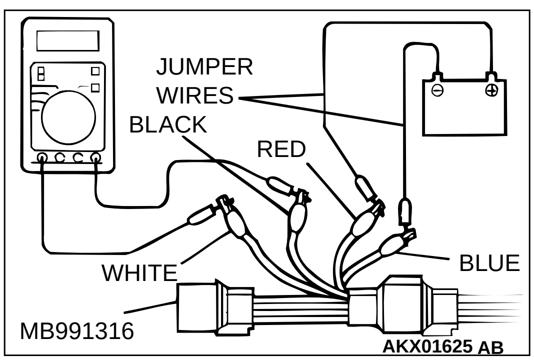
STEP 5. Check the left bank heated oxygen sensor (front).



(1) Disconnect the left bank heated oxygen sensor (front) connector B-26 and connect test harness special tool, MB991316 to the connector on the left bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ **CAUTION**

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



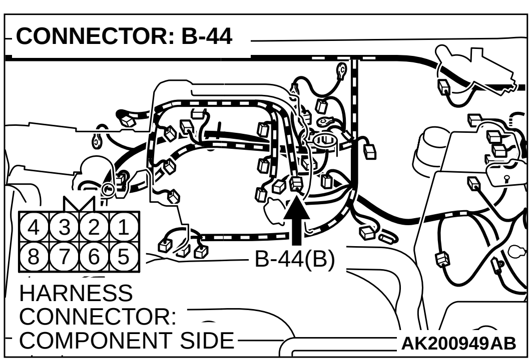
(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminalNo. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 14.

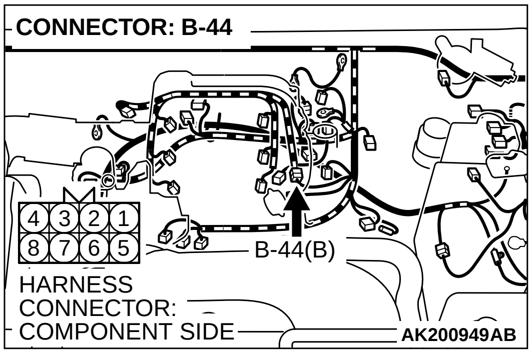
STEP 6. Check connector B-44 at injector intermediate connector for damage.



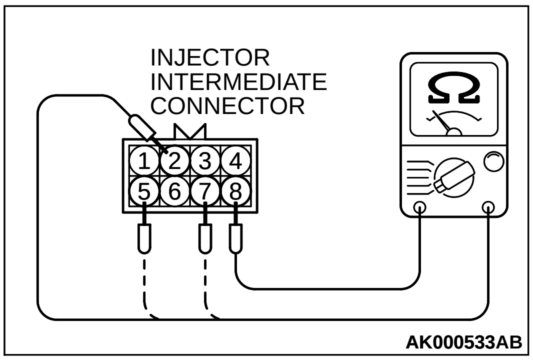
Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 7. Check the left bank injector resistance at intermediate connector B-44.



(1) Disconnect the injector intermediate connector B-44.

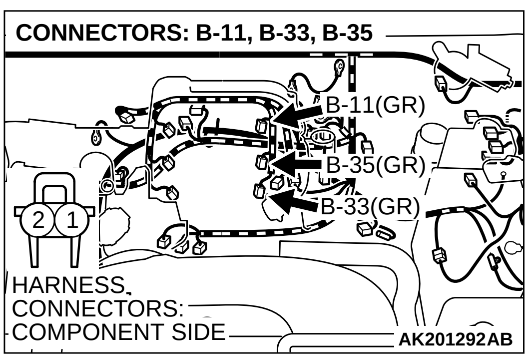


(2) Measure the resistance between each injector side connector terminal.
   a. Measure the resistance between terminal No. 2 and No. 8 when measuring No. 2 cylinder.
   b. Measure the resistance between terminal No. 7 and No. 8 when measuring No. 4 cylinder.
   c. Measure the resistance between terminal No. 5 and No. 8 when measuring No. 6 cylinder.
   - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

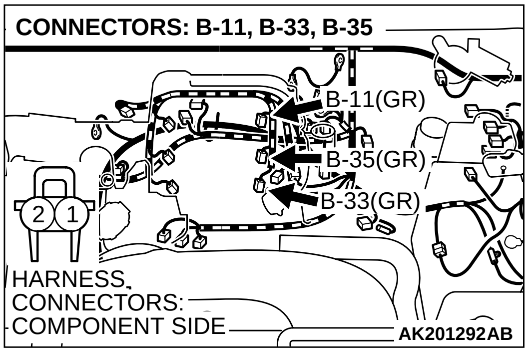
STEP 8. Check connector B-33, B-35, B-11 at left bank injector for damage.



(1) Remove the intake manifold.
(2) Check the left bank injector connector, which deviates from the standard value at Step 7.

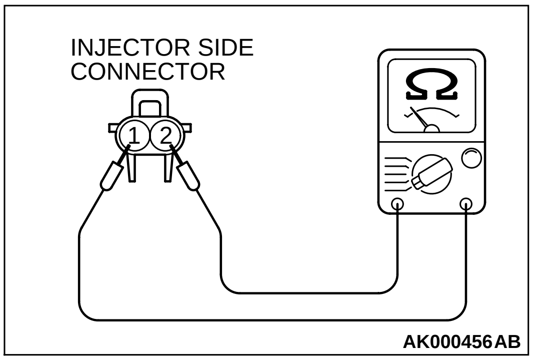
Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 9. Check the left bank injector.

(1) Check the left bank injector connector, which deviates from the standard value at Step 7.



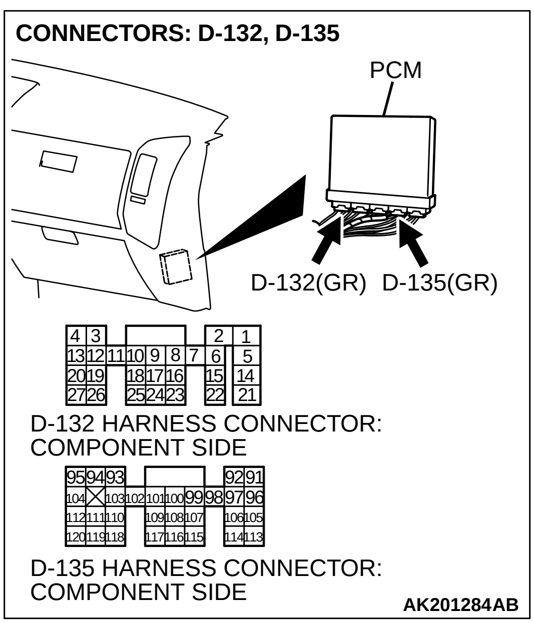
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Repair harness wire between injector intermediate connector and left bank injector connector because of harness damage. Then go to Step 14.

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

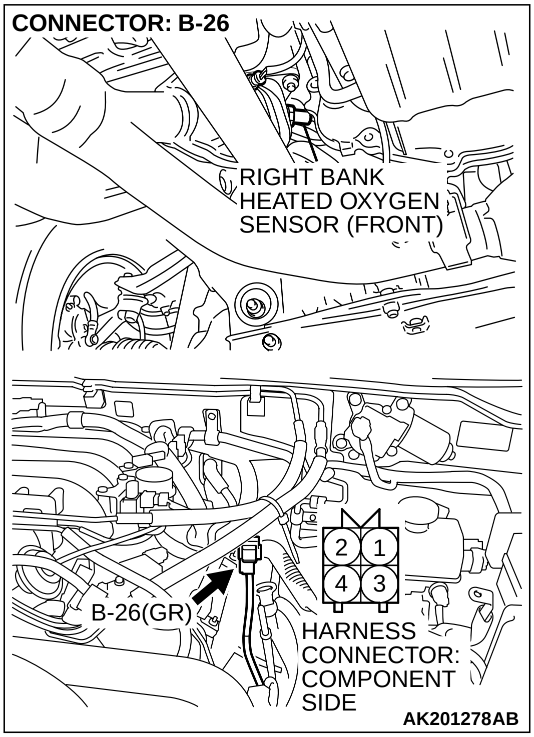


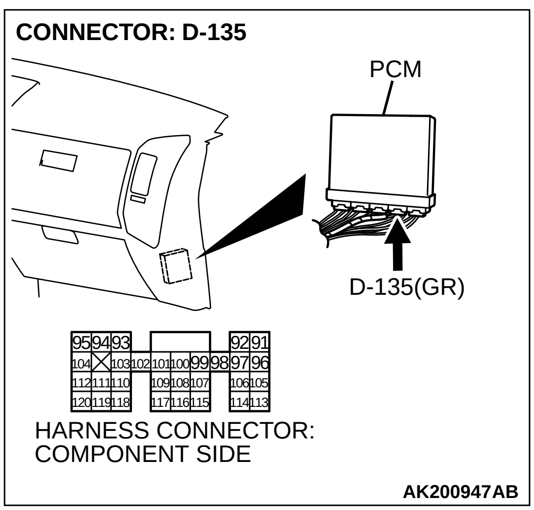
STEP 10. Check connector D-132, D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

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



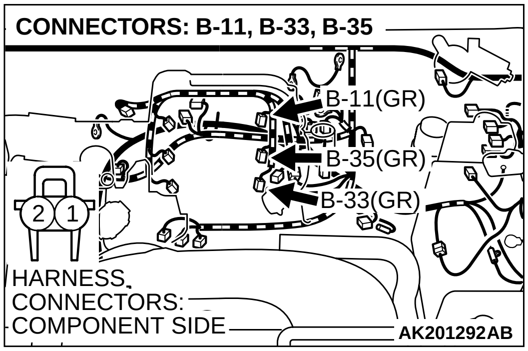


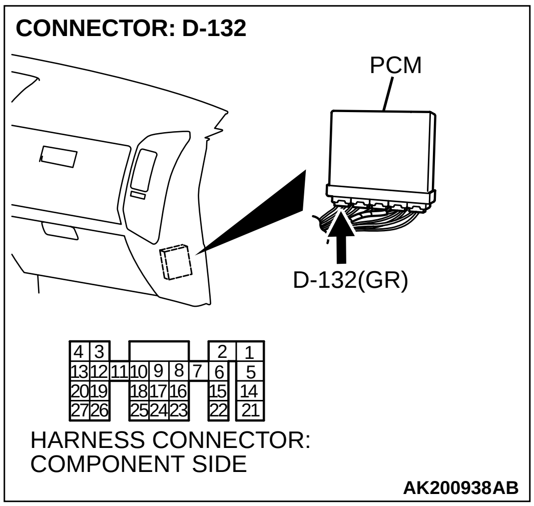
STEP 11. Check for harness damage between left bank heated oxygen sensor (front) connector B-26 (terminal No. 4) and PCM connector D-135 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.





STEP 12. Check for harness damage between left bank injector connector and PCM connector.

a. Check the harness wire between left bank injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 5) when checking No. 2 cylinder.

b. Check the harness wire between left bank injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 21) when checking No. 4 cylinder.

c. Check the harness wire between left bank injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 6) when checking No. 6 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

Q: Is the fuel pressure normal?

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

STEP 14. Test the OBD-II drive cycle.

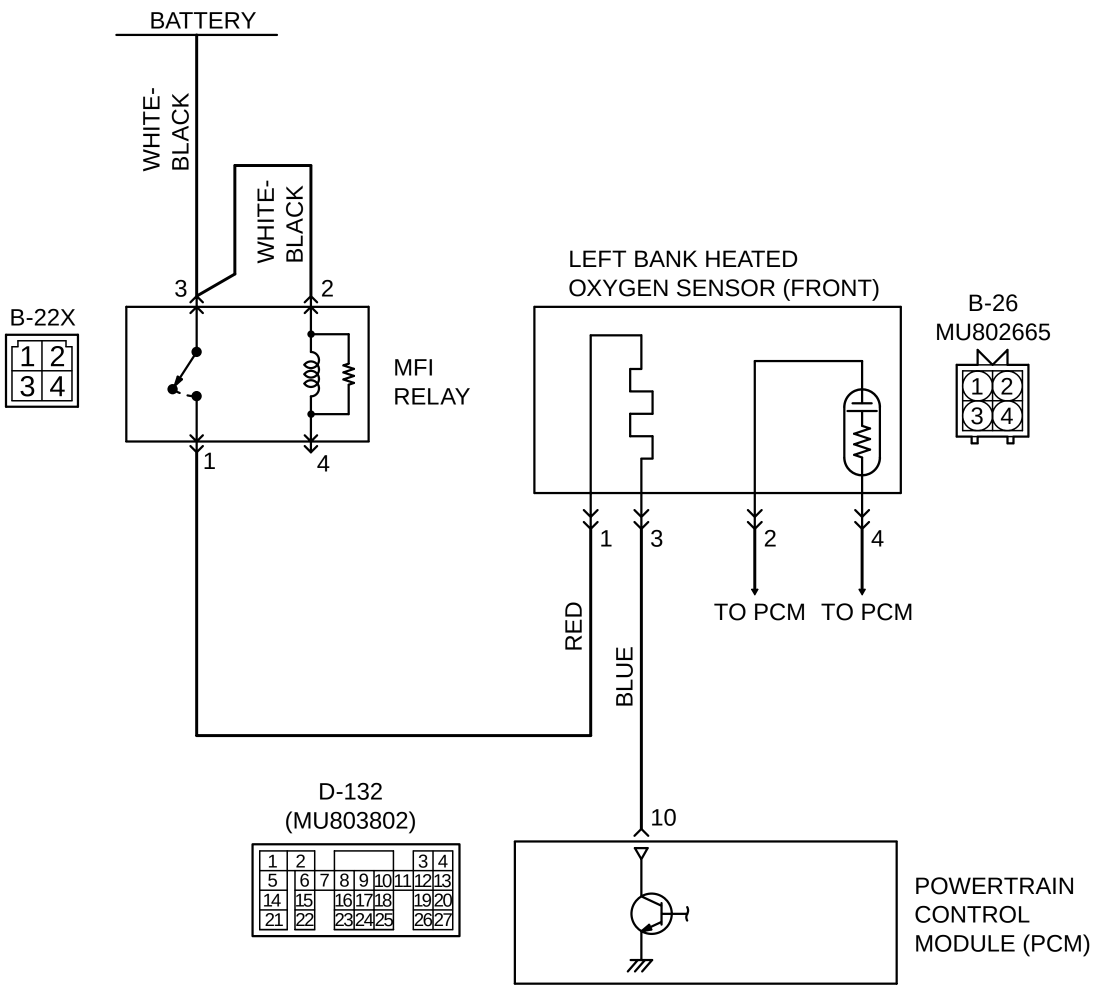
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0154 set?

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

DTC P0155: Heated Oxygen Sensor Heater Circuit (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Heater Circuit



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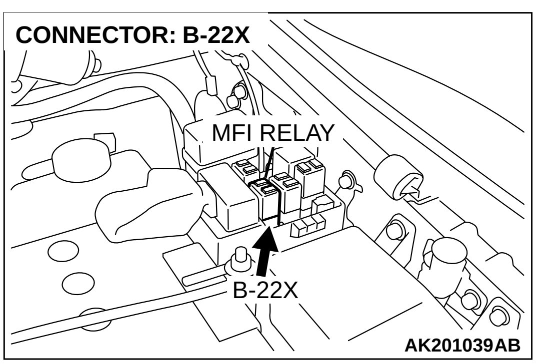

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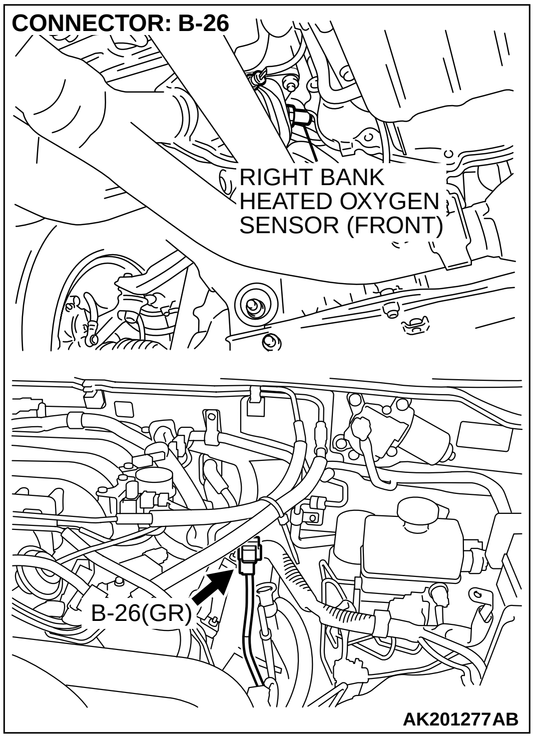
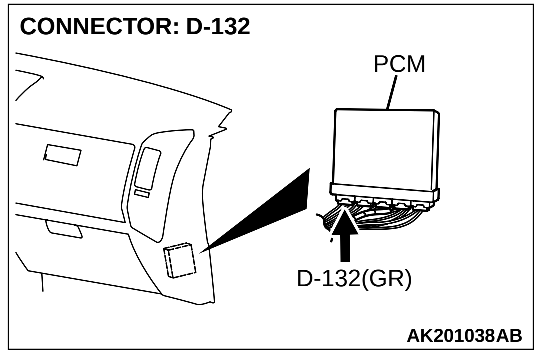




CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 1) to the left bank heated oxygen sensor (front) heater.
- The PCM (terminal No. 10) controls continuity to the left bank heated oxygen sensor (front) heater by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

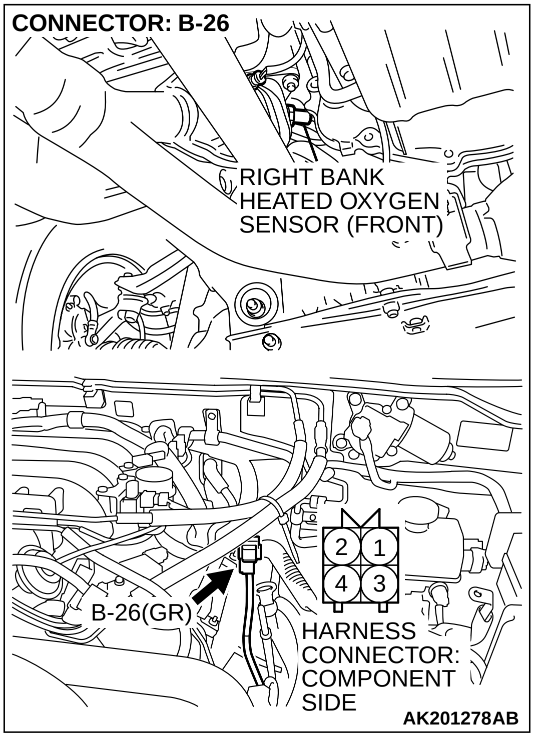
- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the left bank heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the left bank heated oxygen sensor (front) heater has continued to be lower than 0.6 ampere or higher than 7.5 ampere for 4 seconds.

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

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



DIAGNOSIS

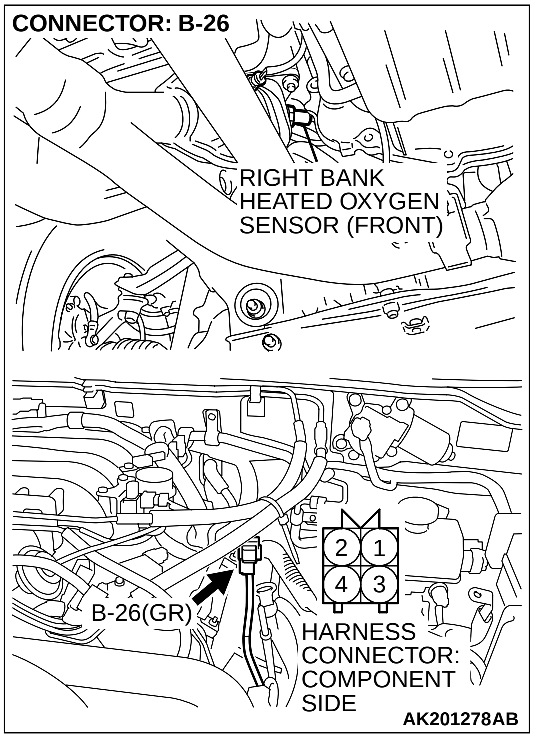
Required Special Tool:
- MB991316: Test Harness Set

STEP 1. Check harness connector B-26 at the left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

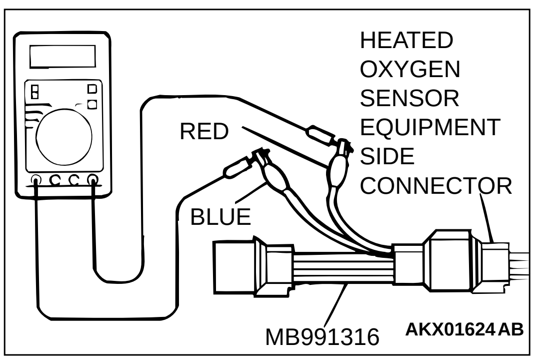
YES : Go to Step 2.

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



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

(1) Disconnect left bank heated oxygen sensor (front) connector B-26 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen (front) sensor side.



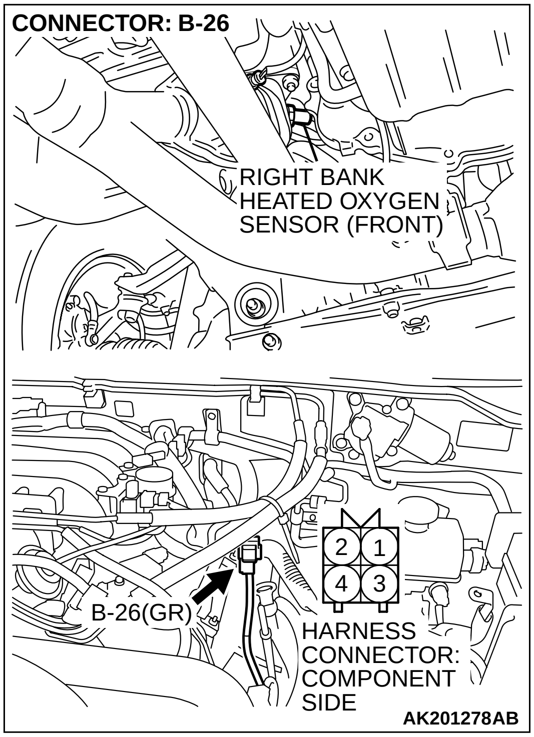
(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

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

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?

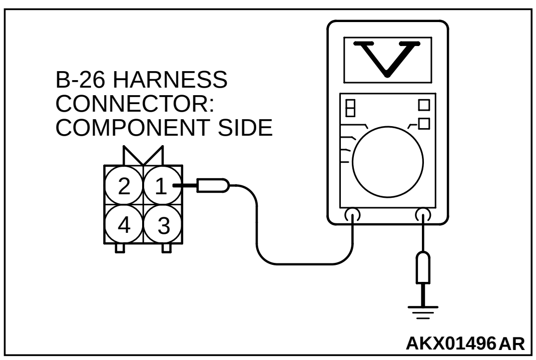
YES : Go to Step 3.

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



STEP 3. Measure the power supply voltage at left bank heated oxygen sensor (front) harness side connector B-26.

(1) Disconnect the connector B-26 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

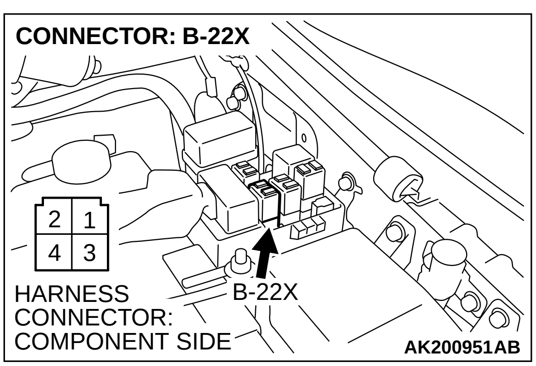


(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

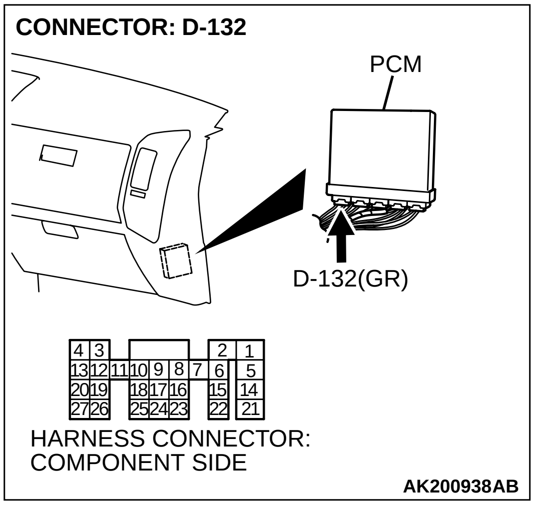
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check harness connector B-22X at the MFI relay for damage.

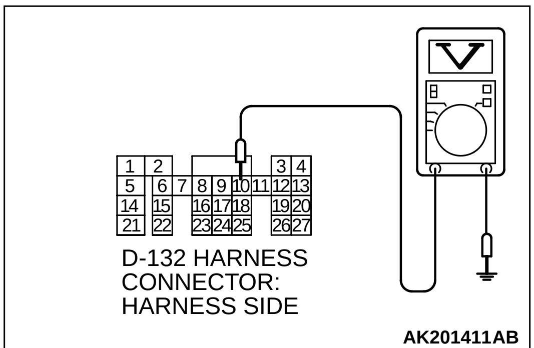
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and left bank heated oxygen sensor (front) 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 5. Meaure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Turn the ignition switch to the "ON" position.

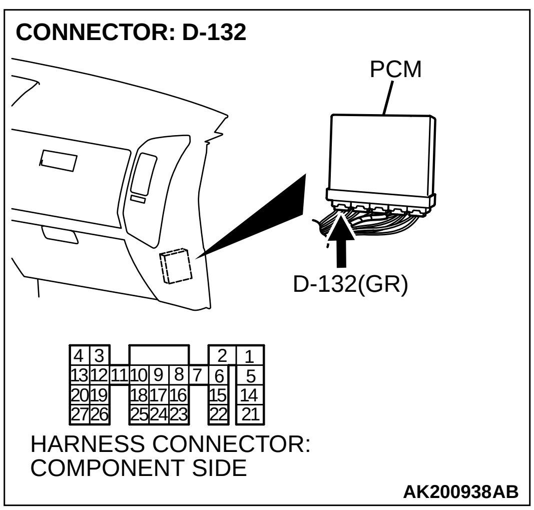


(3) Measure the voltage between terminal No. 10 and ground by backprobing.
- Voltage should be battery positive voltage.

(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 6.



STEP 6. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

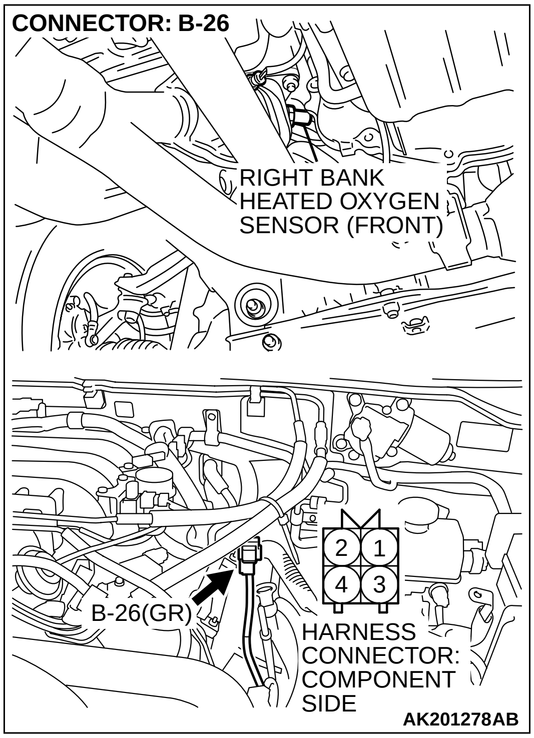
YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

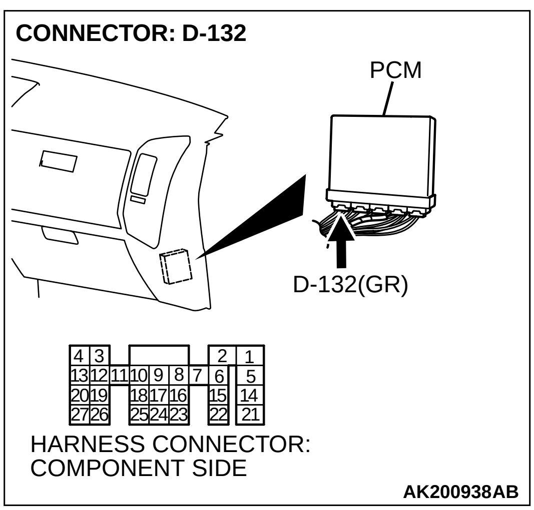
STEP 7. Check for open circuit or short circuit to ground between left bank heated oxygen sensor (front) connector B-26 (terminal No. 3) and PCM connector D-132 (terminal No. 27).

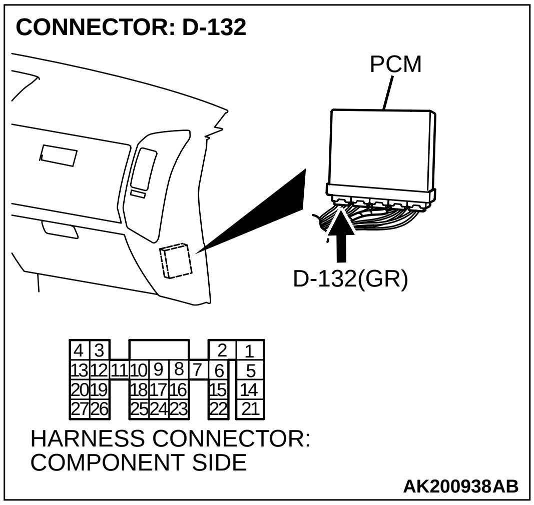
Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.





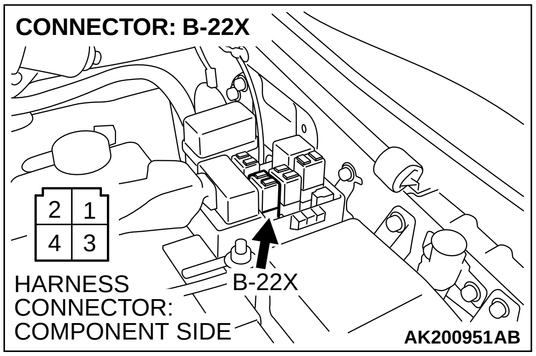


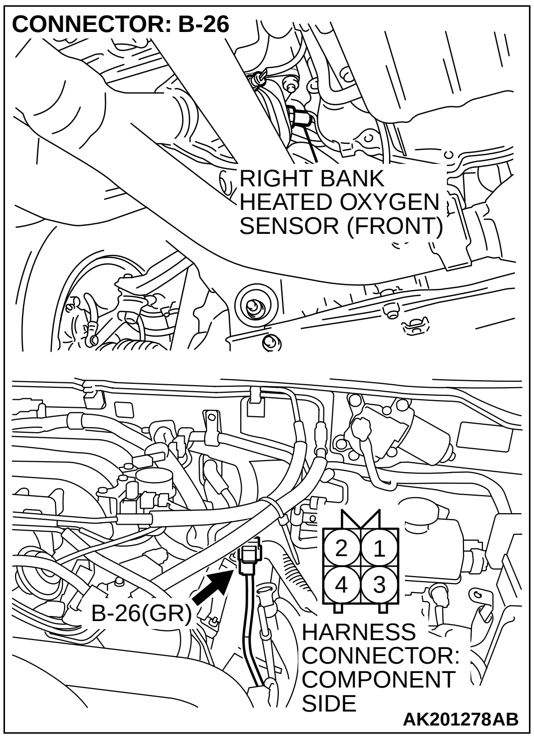
STEP 8. Check harness connector D-132 at PCM for damage.

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 harness damage between MFI relay connector B-22X (terminal No. 1) and left bank heated oxygen sensor (front) connector B-26 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

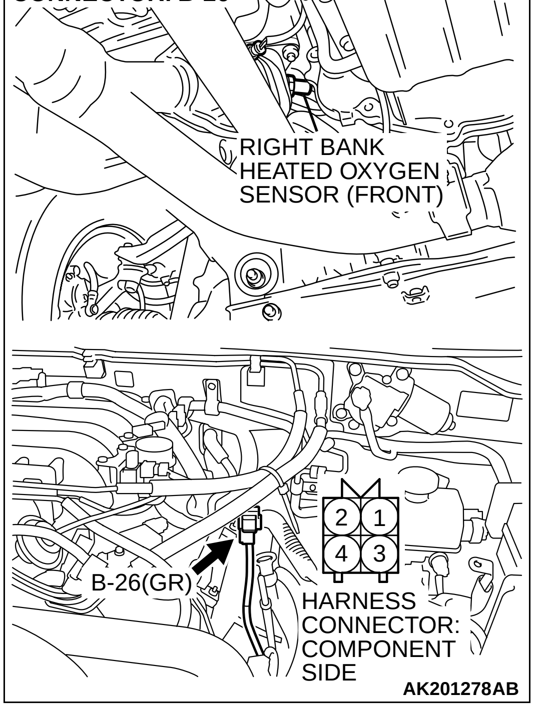
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between left bank heated oxygen sensor (front) connector B-26 (terminal No. 3) and PCM connector D-132 (terminal No. 10).

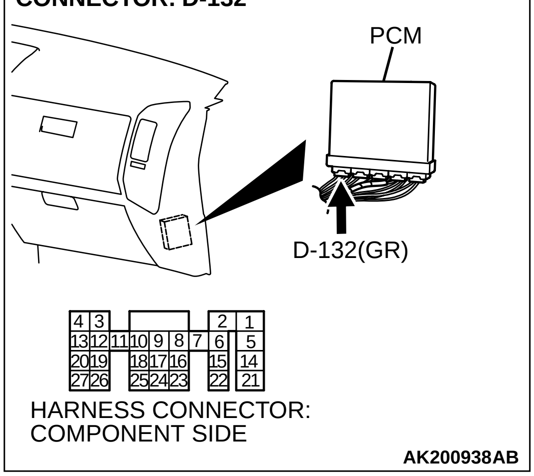
Q: Is the harness wire in good condition?

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

CONNECTOR: B-26



CONNECTOR: D-132



STEP 11. Check the trouble symptoms.

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

Q: Is DTC P0155 set?

YES : Replace the PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6 .

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

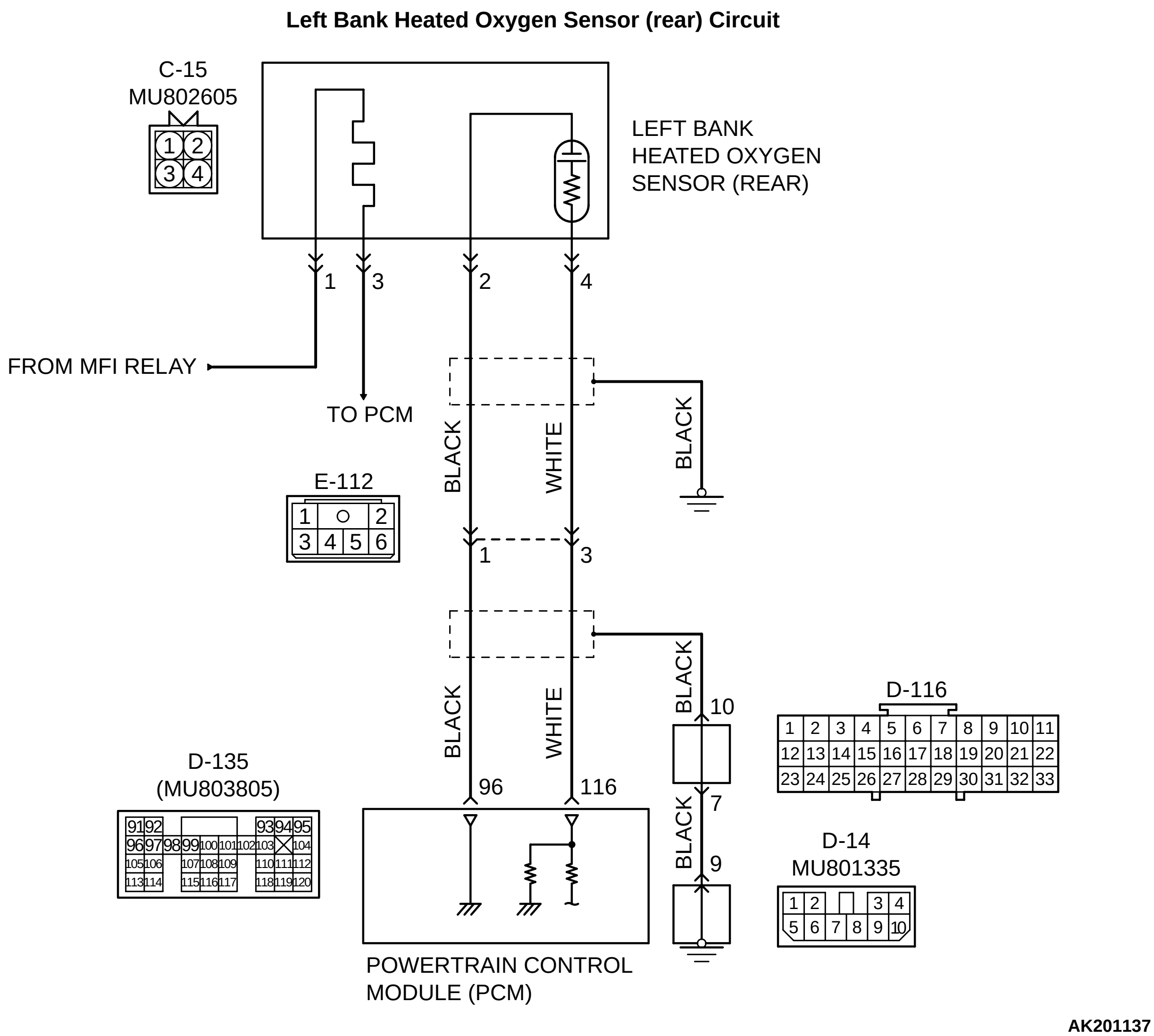
(2) Check the diagnostic trouble code (DTC).

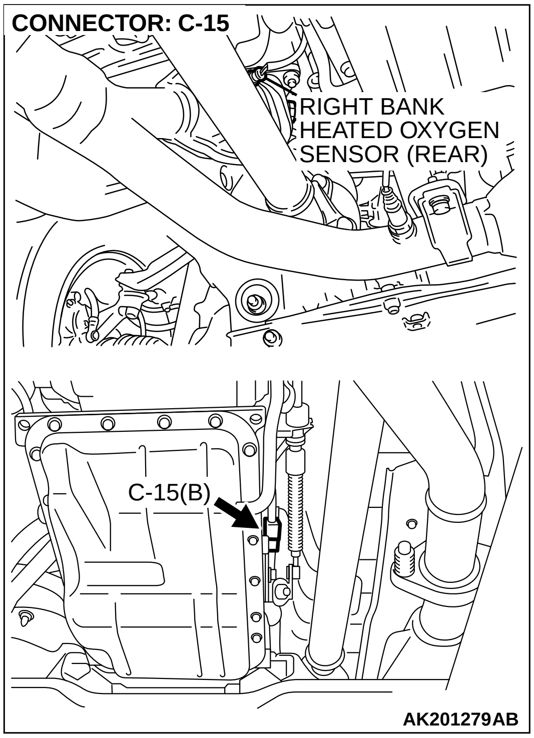
Q: Is DTC P0155 set?

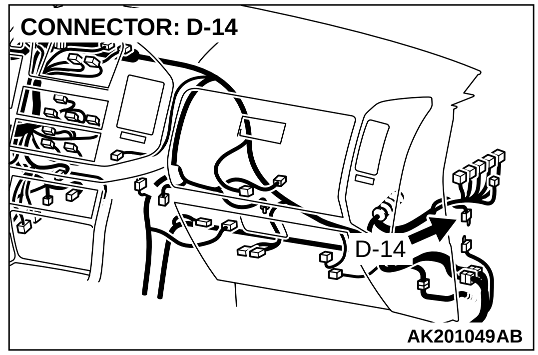
YES : Retry the troubleshooting.

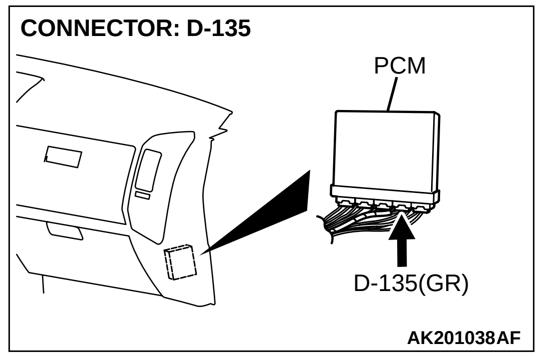
NO : The inspection is complete.

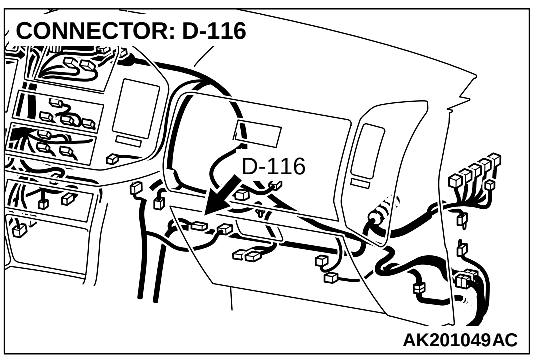
DTC P0156: Heated Oxygen Sensor Circuit (bank 2, sensor 2)

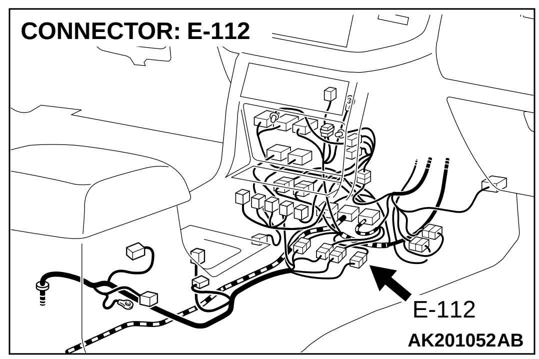












CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 116) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the PCM interface circuit is higher than 4.5 volts when 5 volts is applied to the left bank heated oxygen sensor (rear) output line via a resistor.
- The PCM monitors for this condition once during the drive cycle.

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

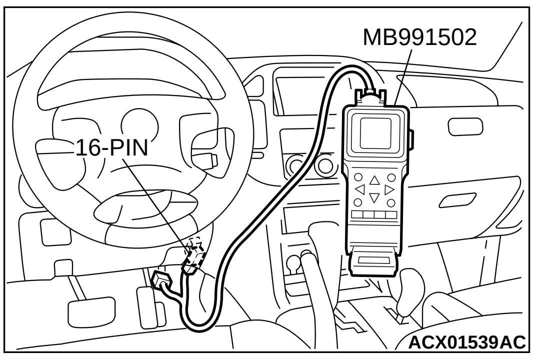
- Left bank heated oxygen sensor (rear) failed.
- Open circuit in left bank heated oxygen sensor (rear) output line.
- Open circuit in left bank heated oxygen sensor (rear) ground line.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991502, check data list item 59: Left Bank Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).



⚠ CAUTION

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

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

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

Q: Is the sensor operating properly?

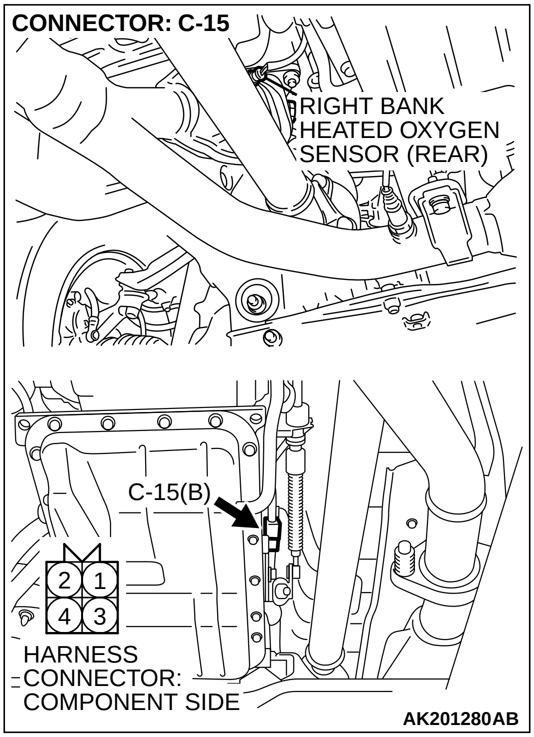
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

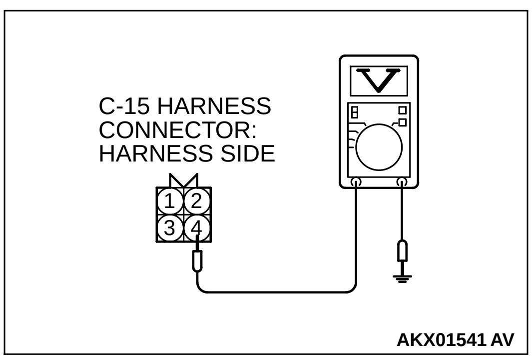
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at left bank heated oxygen sensor (rear) connector C-15 by backprobing.

(1) Do not disconnect the connector C-15.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

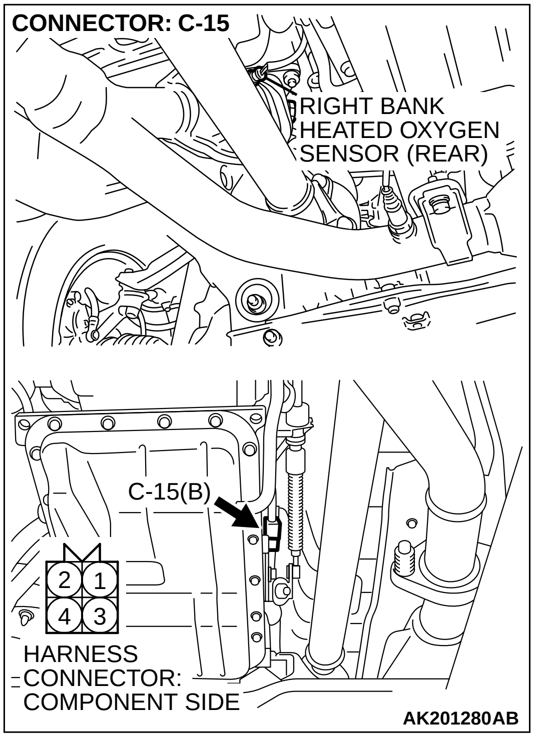
(4) Turn the ignition switch to the "LOCK" (OFF) position.

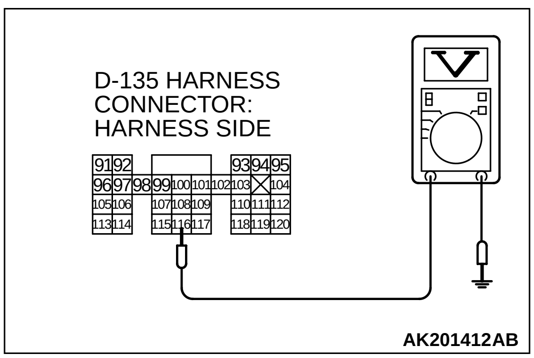
Q: Is the voltage normal?

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

STEP 3. Measure the sensor output voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect the connector D-135.
(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 116 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

Q: Is the voltage normal?

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

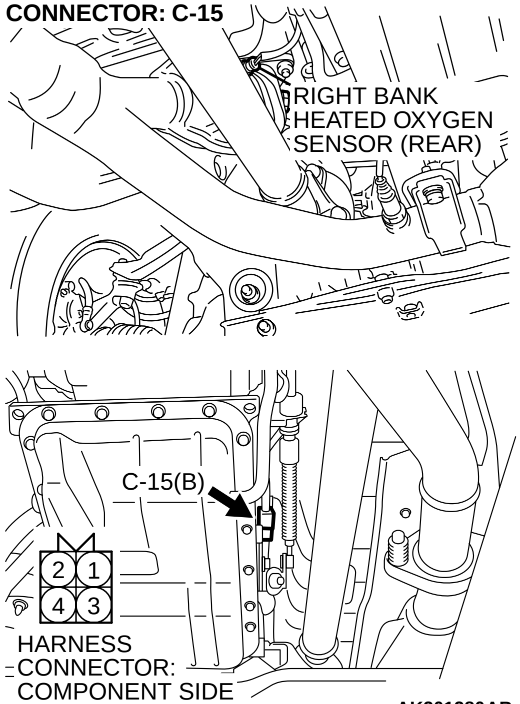
STEP 4. Check harness connector C-15 at left bank heated oxygen sensor (rear) and harness connector D-135 at PCM for damage.

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 15.

CONNECTOR: C-15



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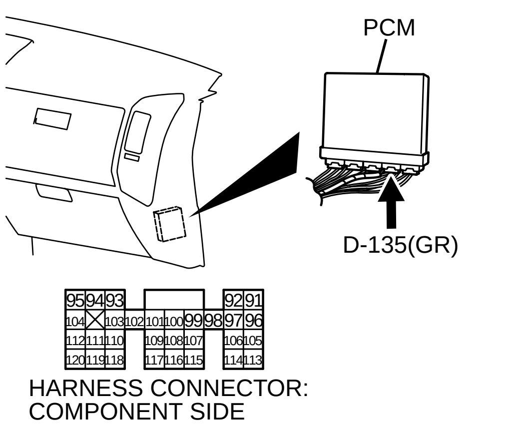
CONNECTOR: D-135



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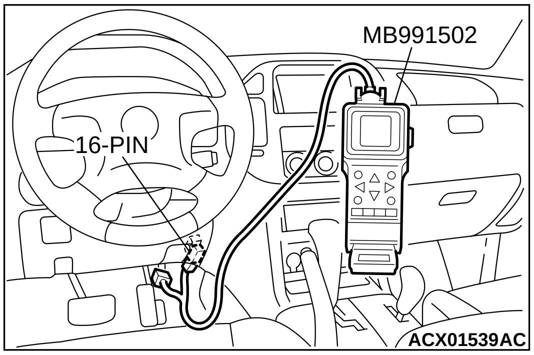


STEP 5. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

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

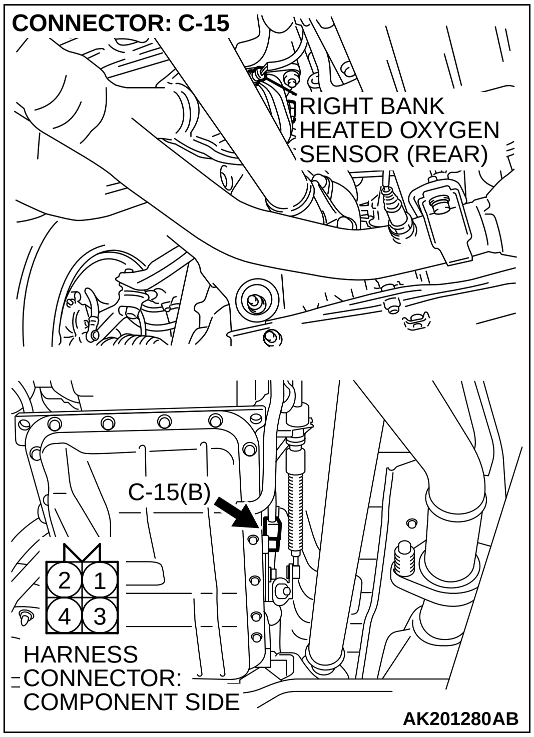
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt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

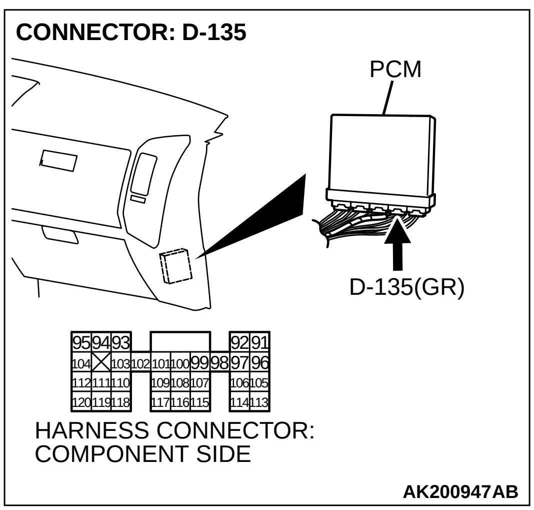
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

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



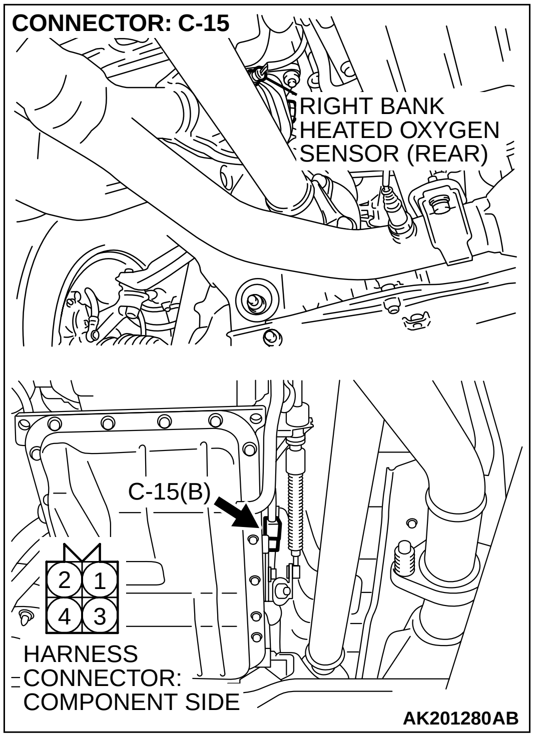


STEP 6. Check harness connector C-15 at left bank heated oxygen sensor (rear) and harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector E-112 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection. If intermediate connector E-112 is in good condition, repair harness wire between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 4) and PCM connector D-135 (terminal No. 116) because of open circuit or harness damage. Then go to Step 15.

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

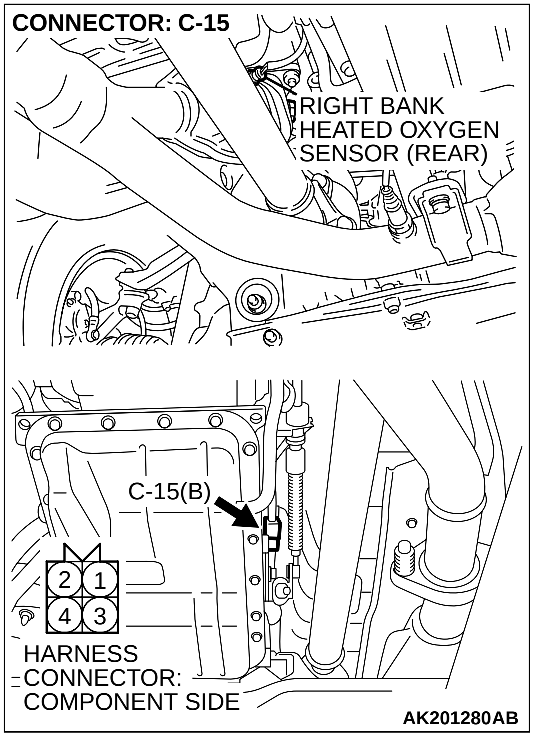


STEP 7. Check harness connector C-15 at left bank heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

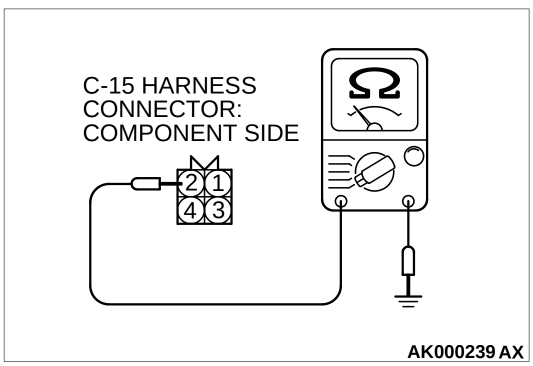
YES : Go to Step 8.

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



STEP 8. Check the continuity at left bank heated oxygen sensor (rear) harness side connector C-15.

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



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

- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 11.

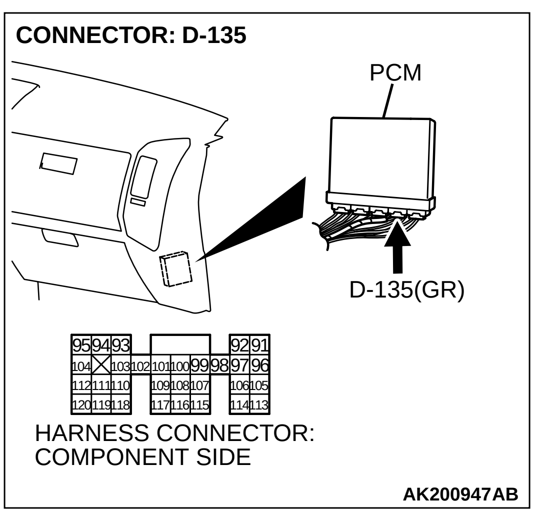
NO : Go to Step 9.

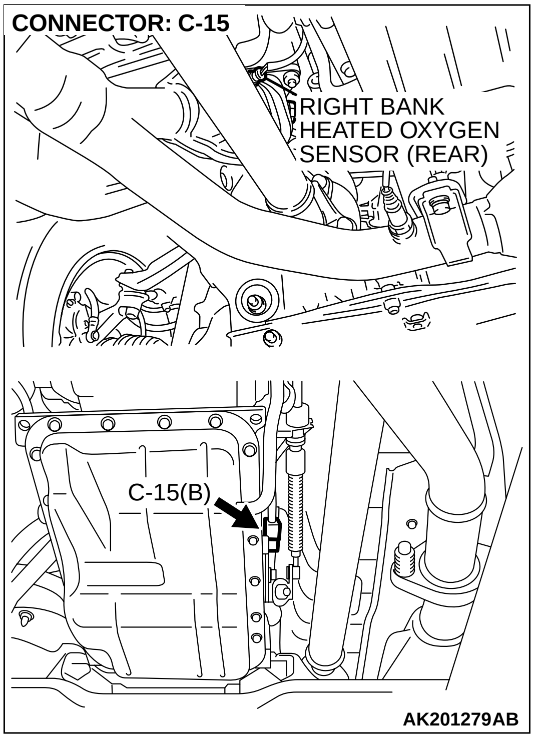
STEP 9. Check harness connector D-135 at PCM for damage.

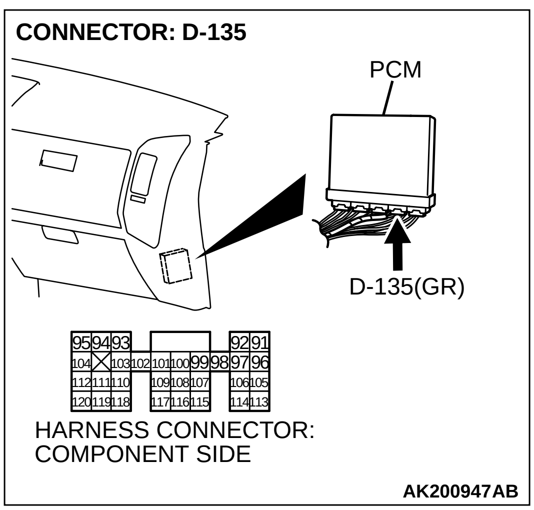
Q: Is the harness connector in good condition?

YES : Go to Step 10.

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







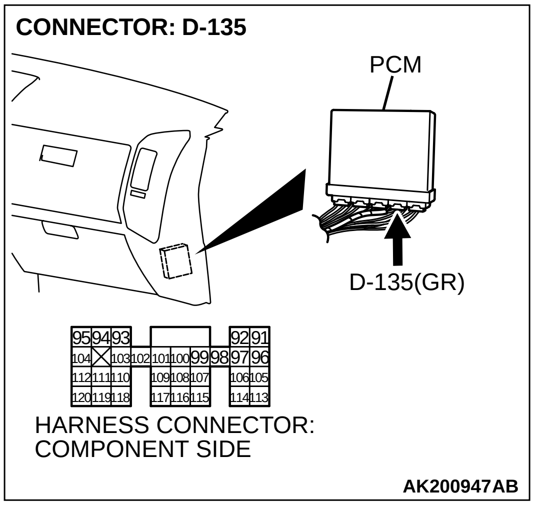
STEP 10. Check for open circuit and harness damage between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 15.

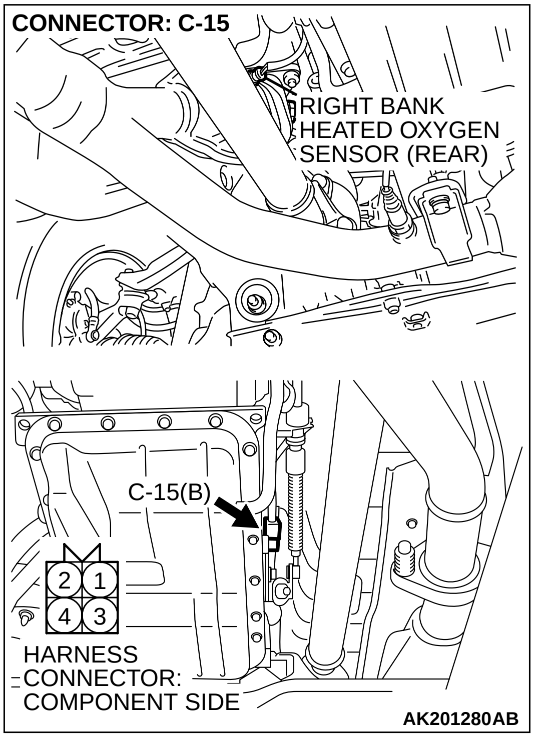


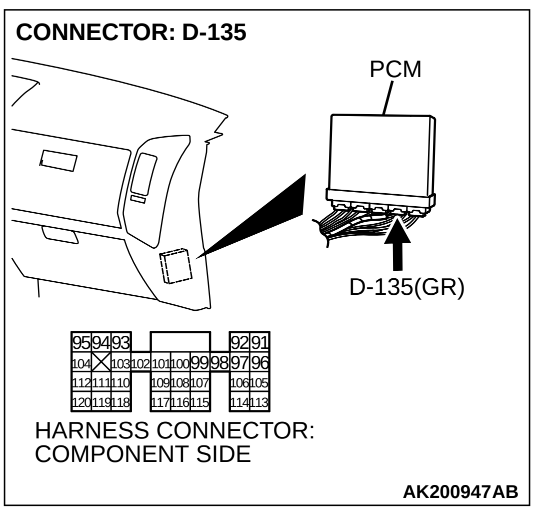
STEP 11. Check harness connector D-135 at PCM for damage.

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 15.





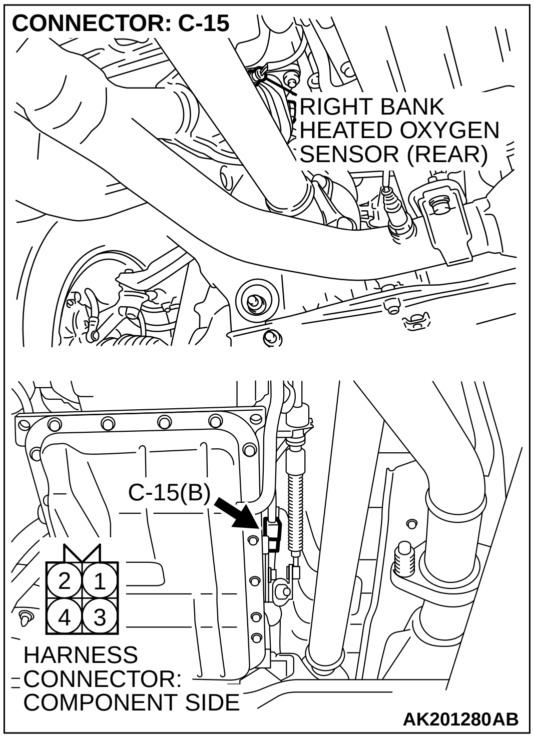
STEP 12. Check for harness damage between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

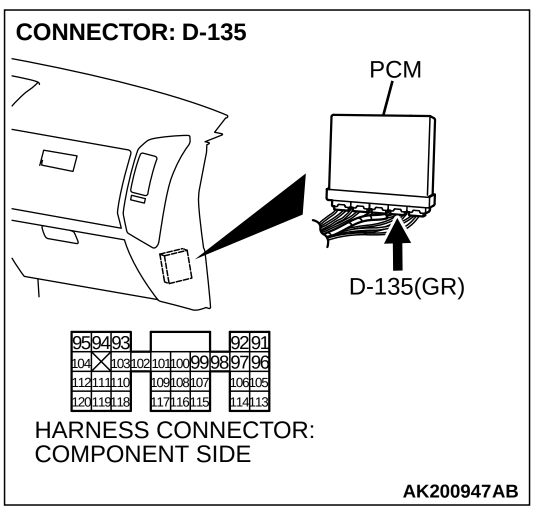
NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.





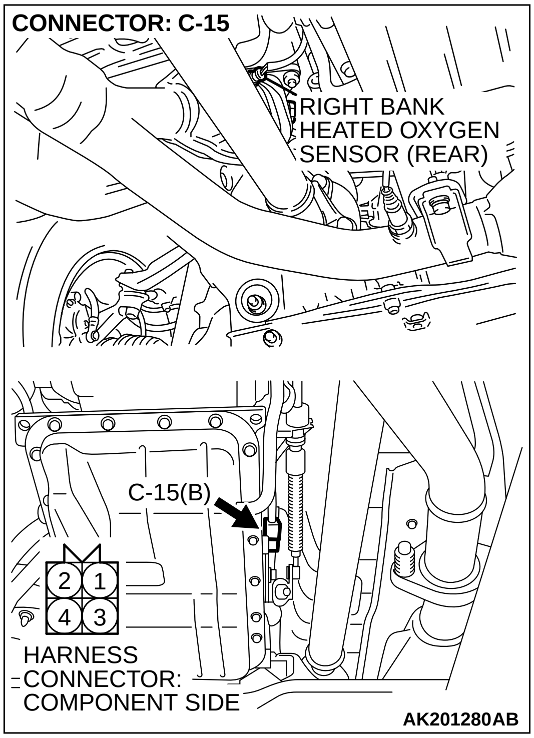
STEP 13. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 4) and PCM connector D-135 (terminal No. 116).

NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to Step 15.



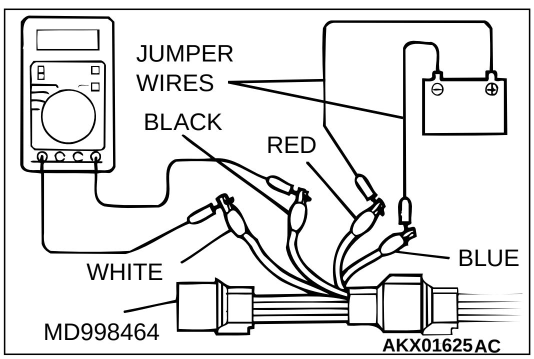
STEP 14. Check the left bank heated oxygen sensor (rear).

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

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

⚠ **CAUTION**

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



(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

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

Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. Then go to Step 15.
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

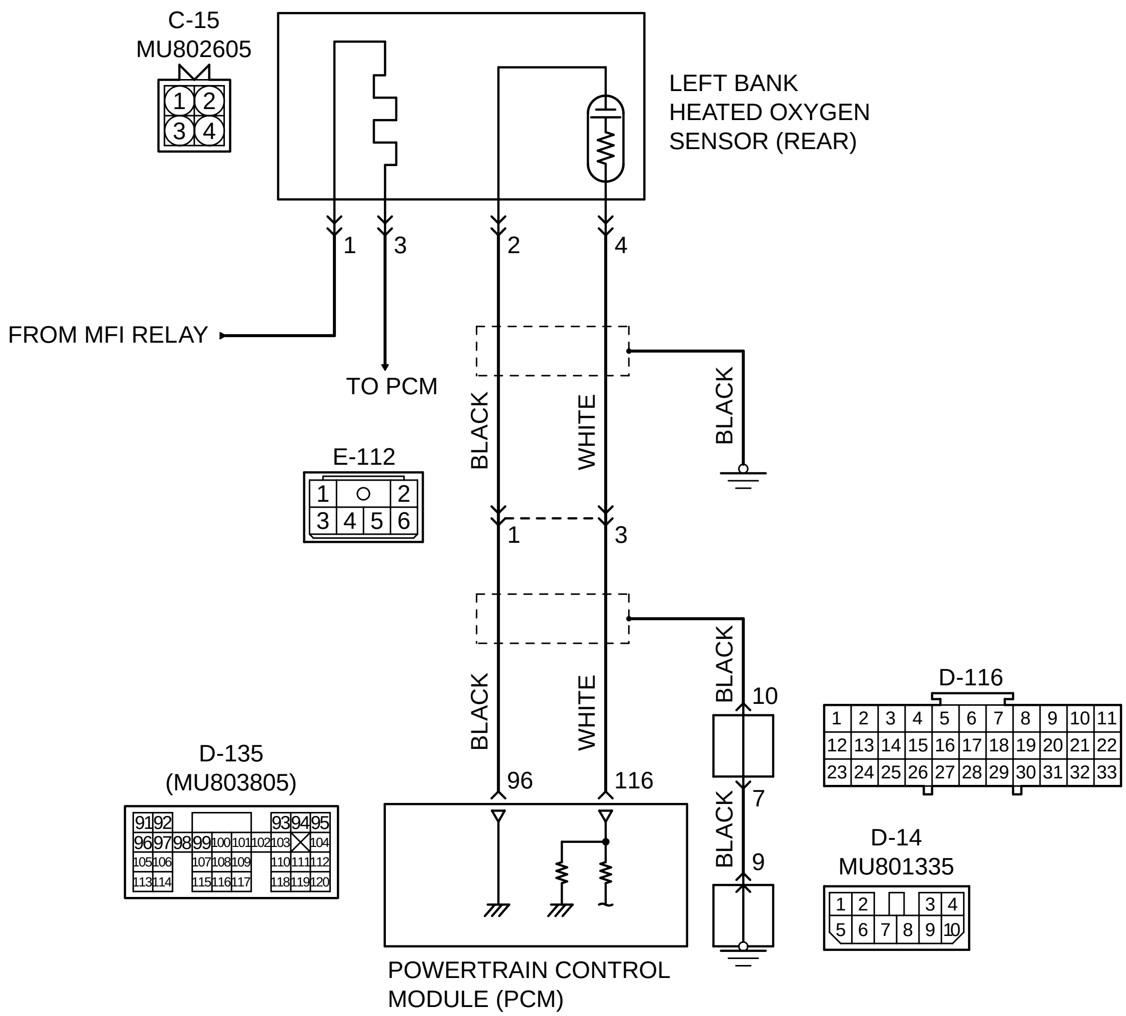
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0156 set?

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

DTC P0157: Heated Oxygen Sensor Circuit Low Voltag (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



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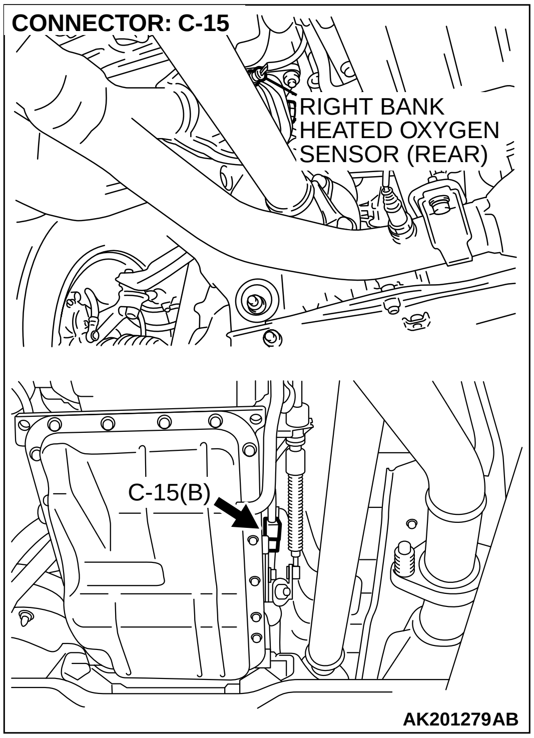
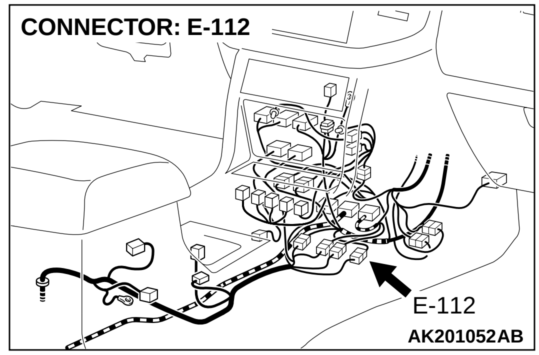
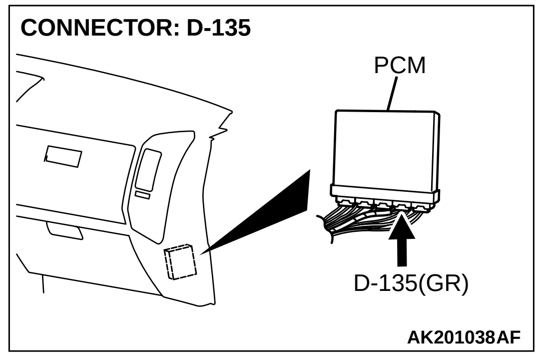
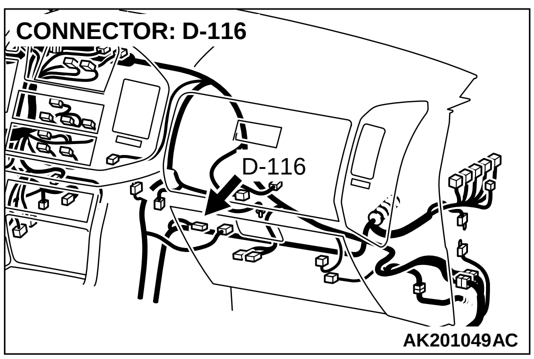
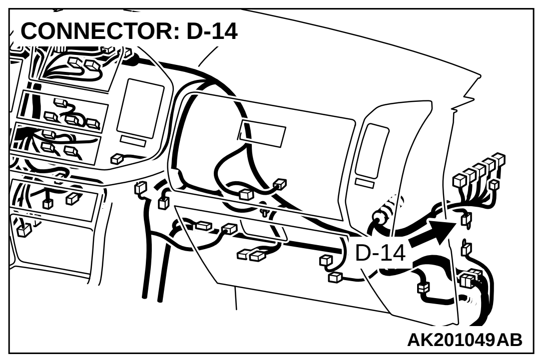










CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 116) from the output terminal (terminalNo. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume airflow sensor output frequency is 100 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The left bank heated oxygen sensor (front) outputs 0.5 volts or more.
- After the ignition switch is turned ON, the changes in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.078 volt.

- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the left bank heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The PCM monitors for this condition once during the drive cycle.

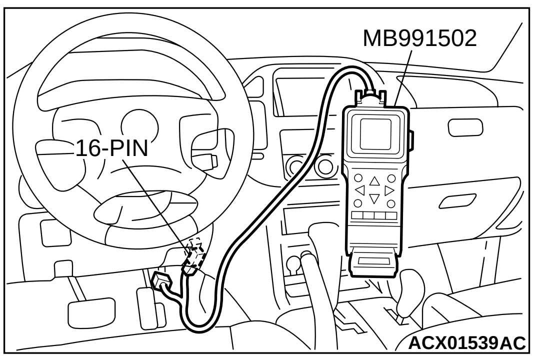
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) failed.
- Short circuit in left bank heated oxygen sensor (rear) output line.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB998464: Test Harness Set



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left bank).

⚠ CAUTION

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

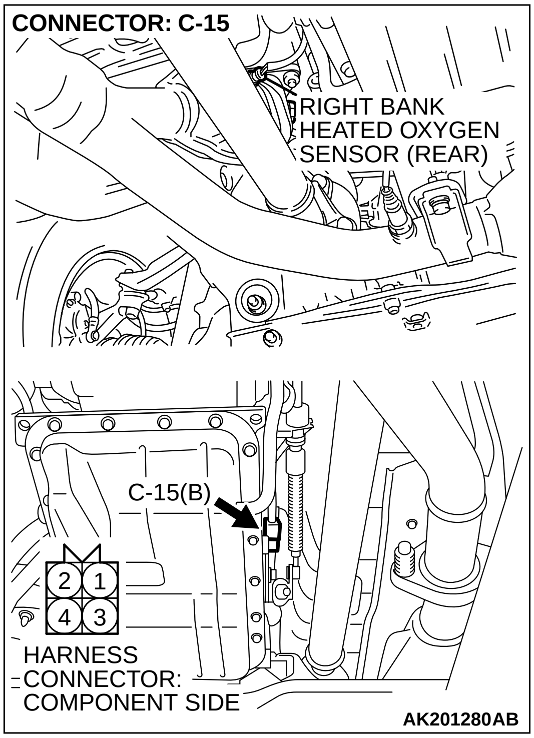
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt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

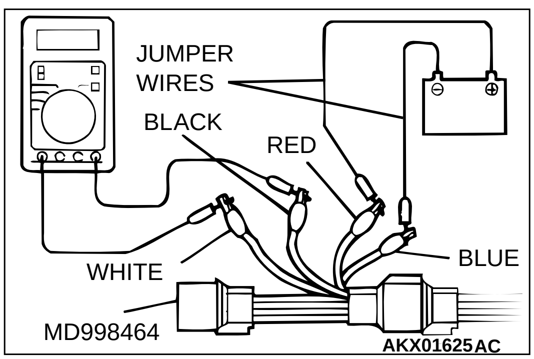
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector C-15 and connect test harness special tool, MB998464, to the connector on the left bank heated oxygen sensor (front) side.

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

⚠ CAUTION

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

(3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

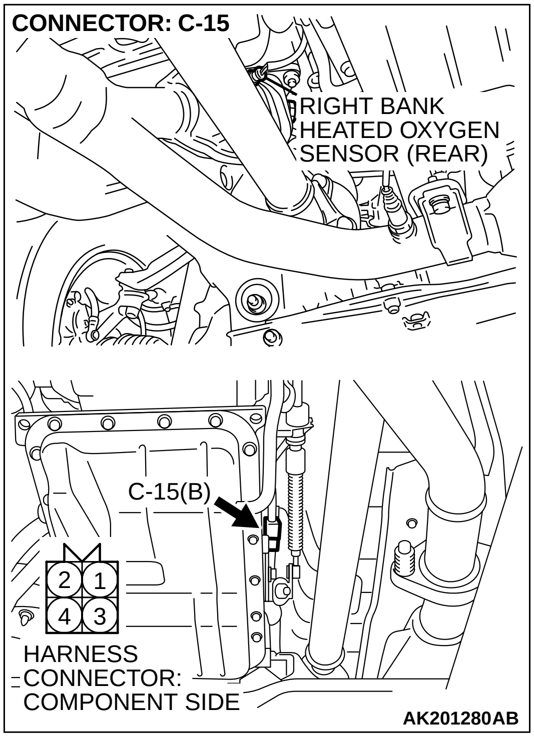
(5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

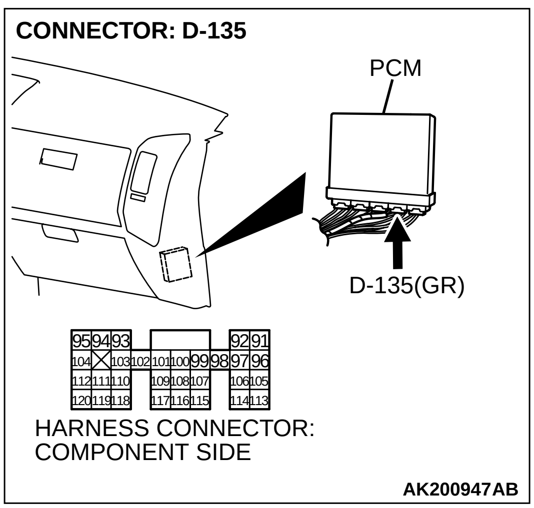
Standard value: 0.6 – 1.0 volt

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 5.



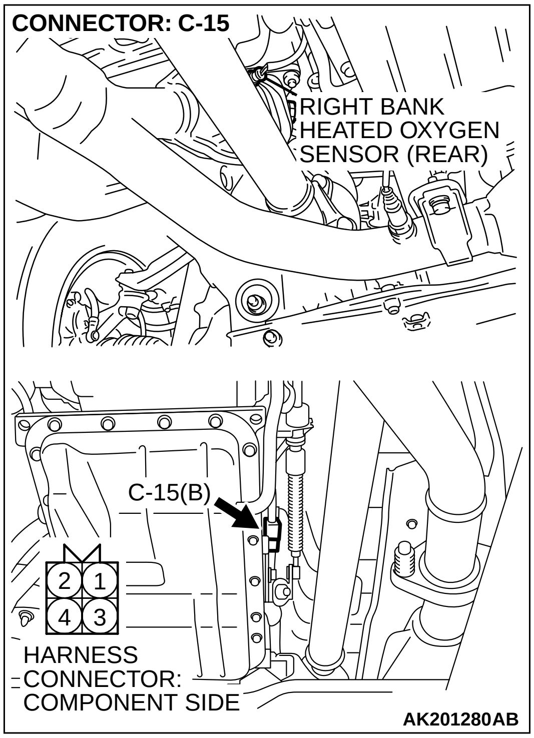


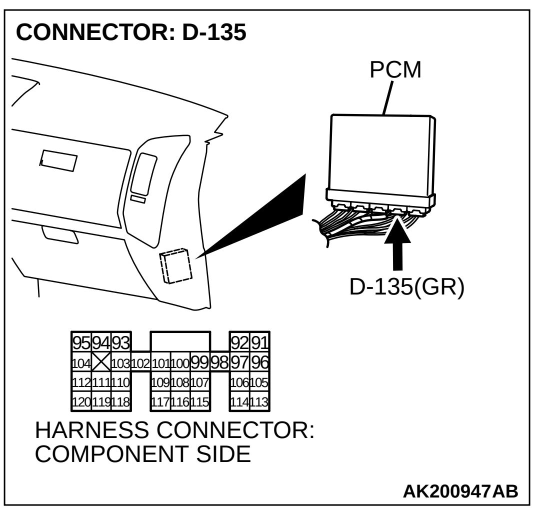
STEP 3. Check connector C-15 at left bank heated oxygen sensor (rear) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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





STEP 4. Check for short circuit to ground between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 4) and PCM connector D-135 (terminal No. 116).

NOTE: Check harness after checking intermediate connector E-112. IF intermediate connector is damaged, repair or replace it. Refer to Group 00E, Harness Connector Inspection P.00E-2
.

Q: Is the harness wire in good condition?

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

STEP 5. Test the OBD-II drive cycle.

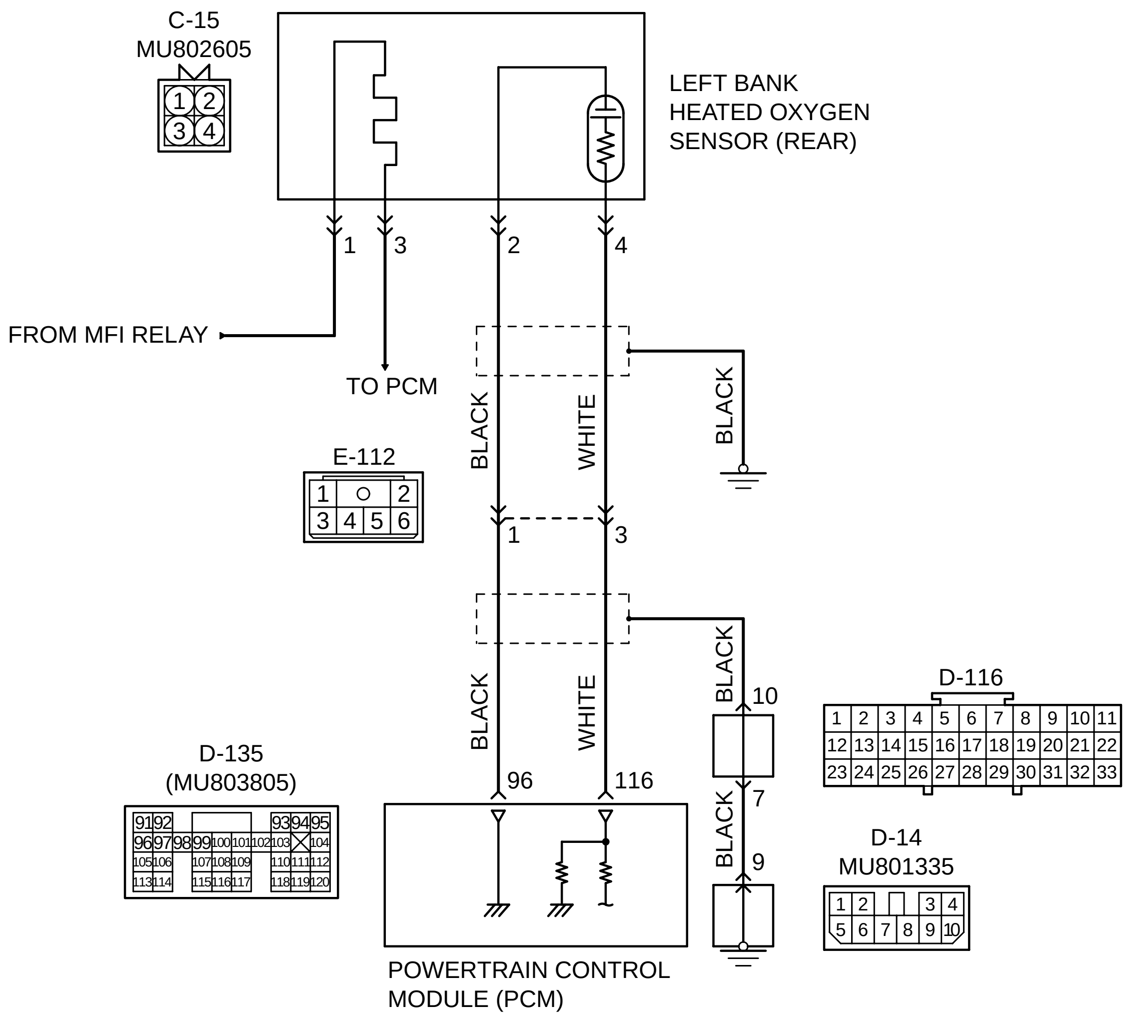
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0157 set?

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

DTC P0158: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



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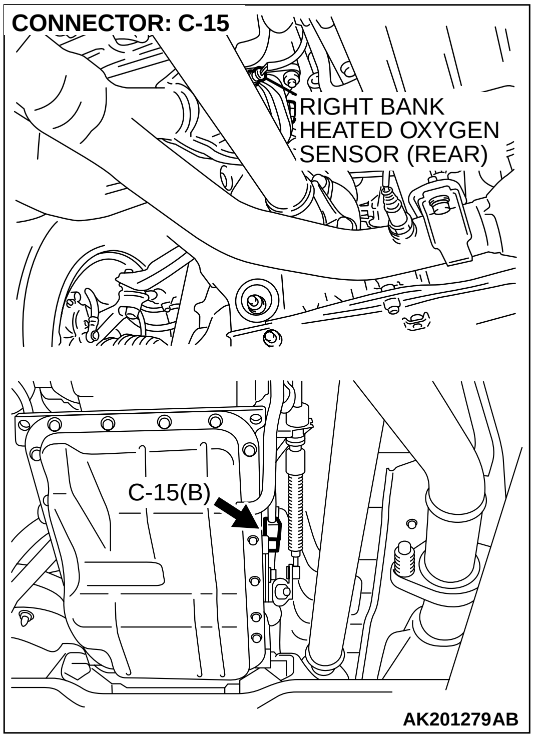
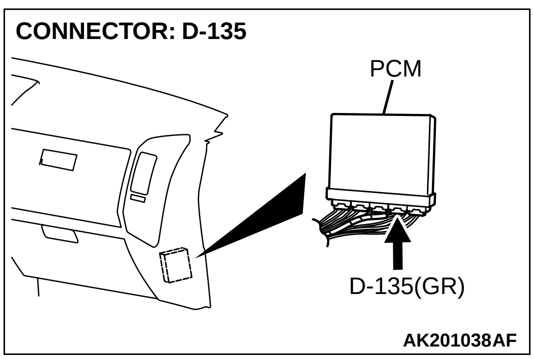
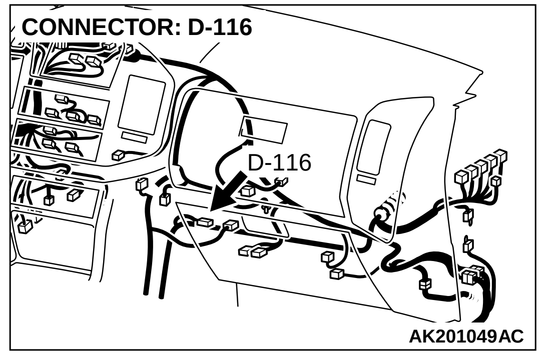
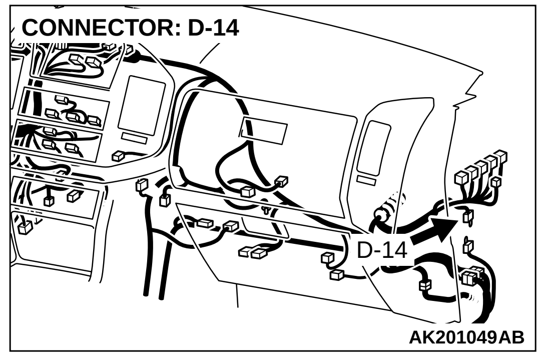
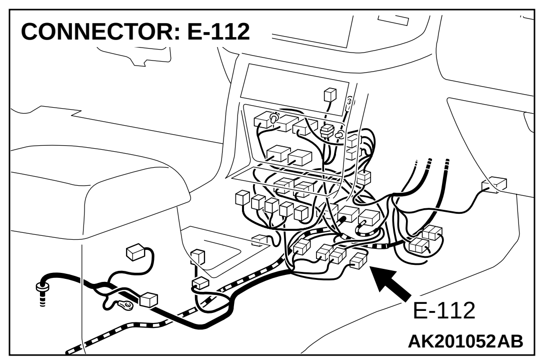










CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 116) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

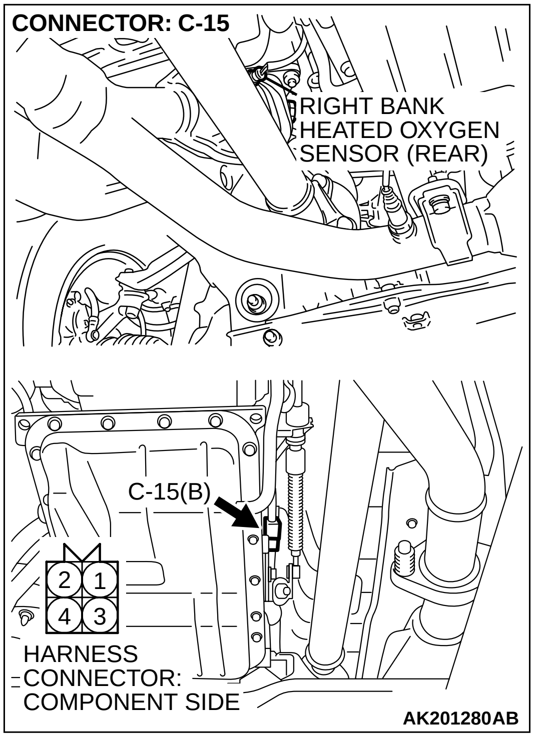
- 2 seconds or more have passed since the starting sequence was completed.

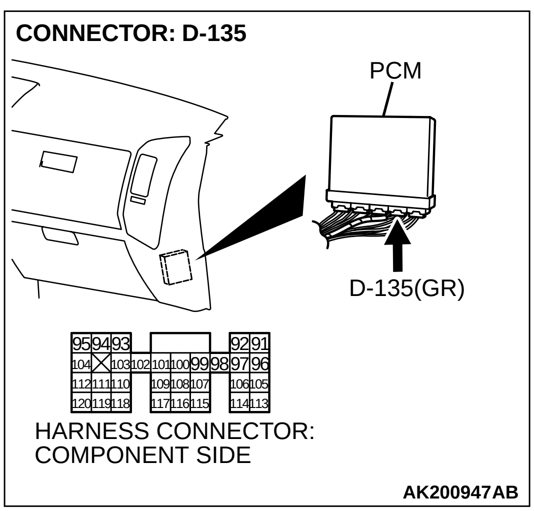
Judgment Criteria

- Left bank heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Short circuit in left bank heated oxygen sensor (rear) output line.
- PCM failed.





DIAGNOSIS

Required Special Tool:

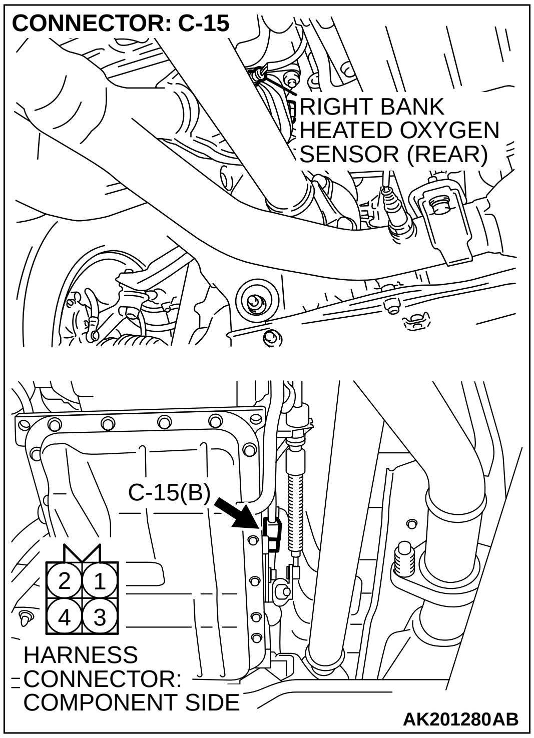
- MB991502: Scan Tool (MUT-II)

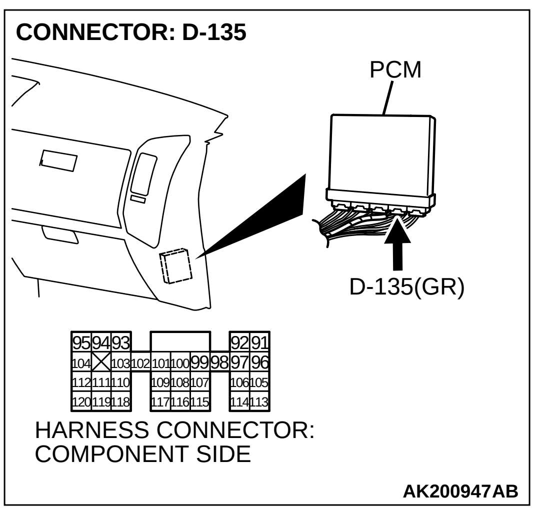
STEP 1. Check connector C-15 at left bank heated oxygen sensor (rear) and connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

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





STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 4) and PCM connector D-135 (terminal No. 116).

NOTE: Check harness after checking intermediate connector E-112. If intermediate connector E-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.

STEP 3. Perform the OBD-II drive cycle.

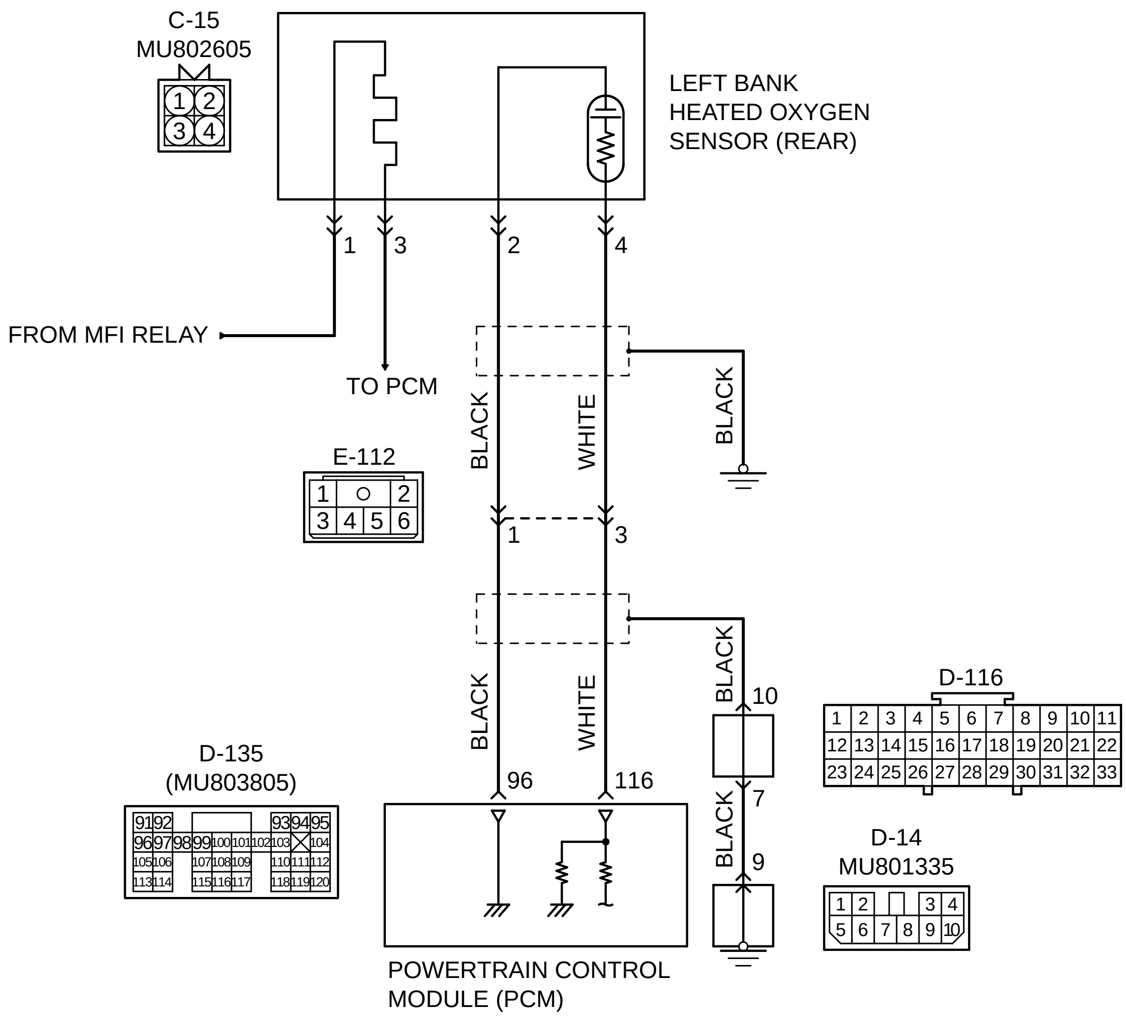
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0158 set?

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

DTC P0159: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



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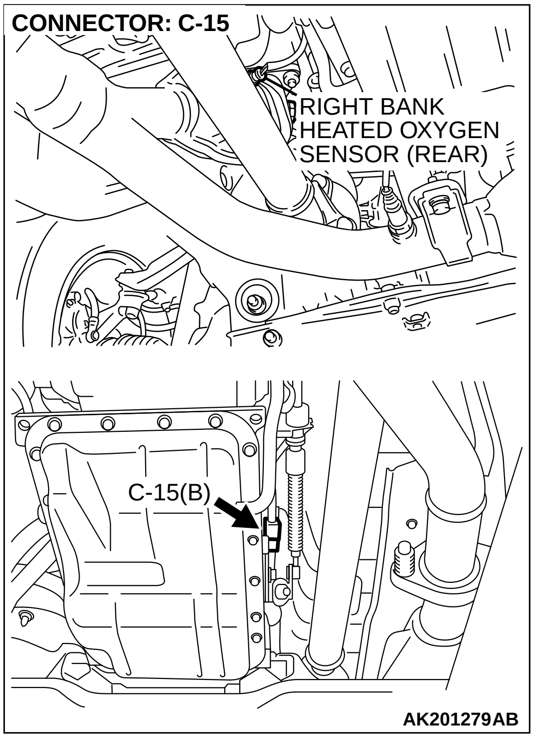
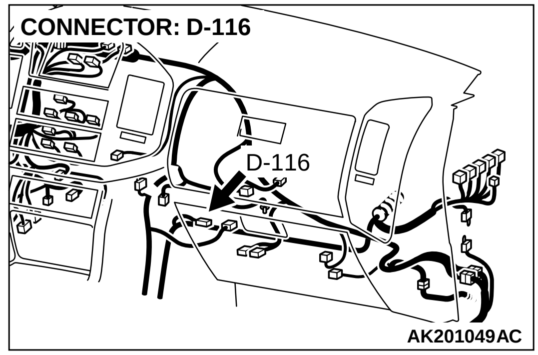
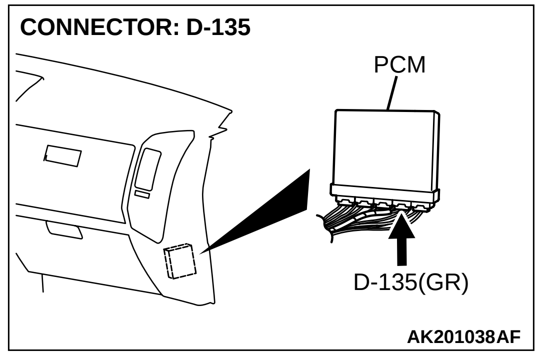
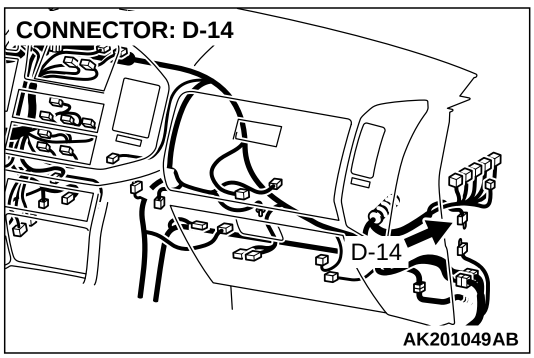
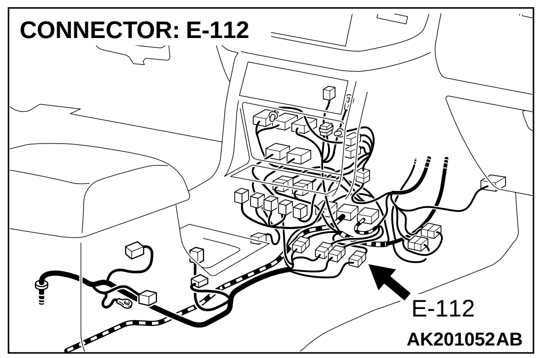










CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 116) from the output terminal (terminal No. 4) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with PCM (terminal No. 96) .

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The left bank heated oxygen sensor (front) is active.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.
- Repeat 3 or more times: drive*1, stop*2.

  Drive*1:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (18.7 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

Stop*2:

- Vehicle speed is lower than 1.5 km/h (0.9 mph).

Judgement Criteria

- Change in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.313 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

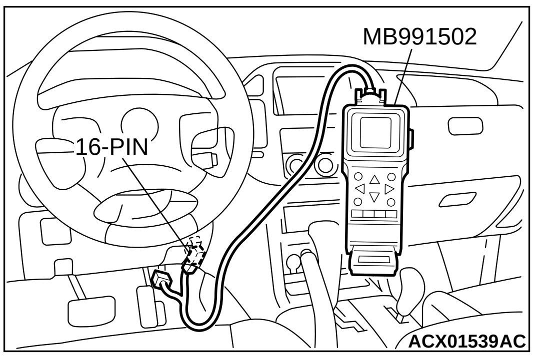
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
(4) Warm up the engine.
- After increasing the output voltage 0.15 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.15 volt or less within 3 seconds.

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

Q: Is the sensor operating properly?

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

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 4 – Heated Oxygen Sensor Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

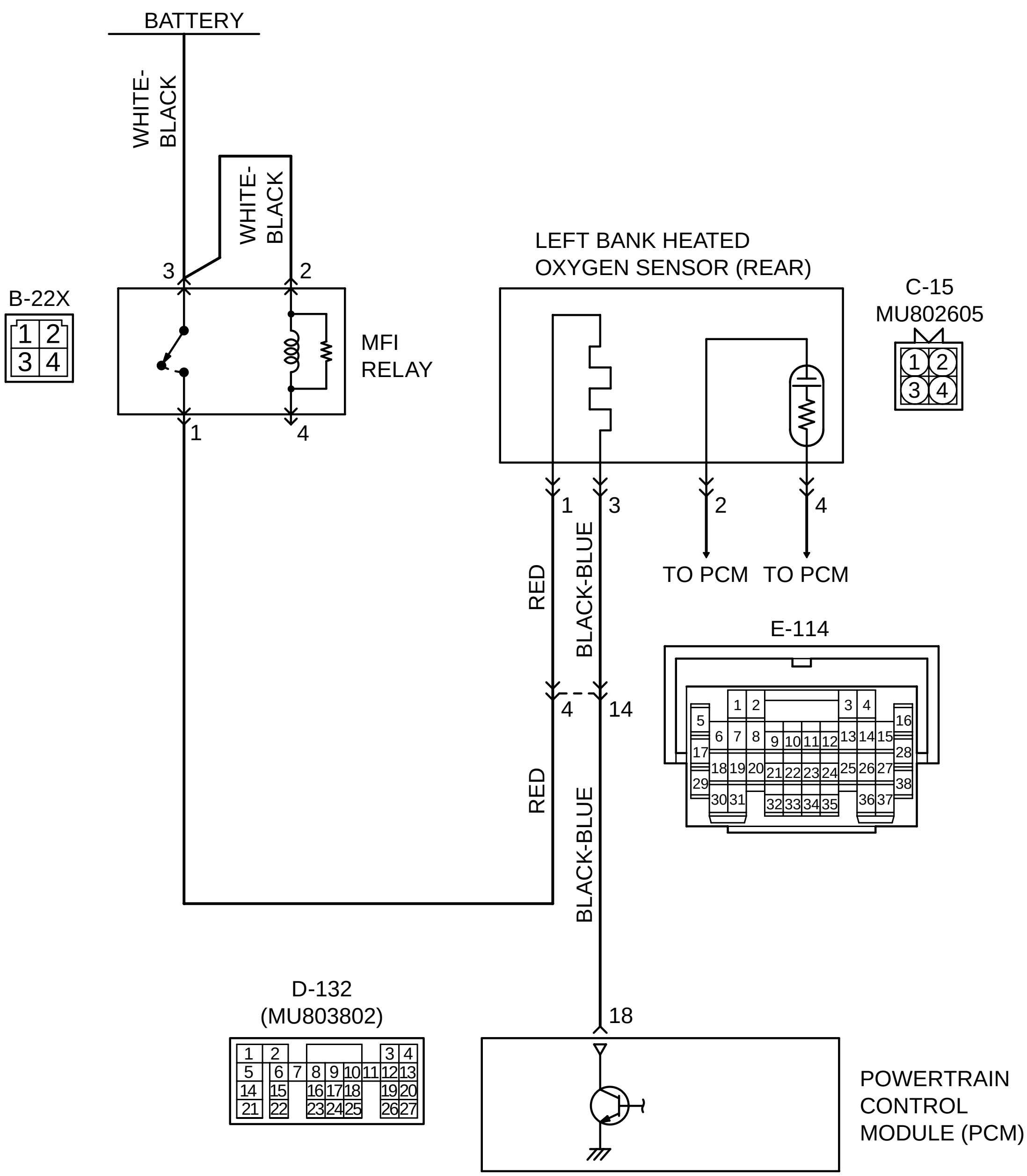
Q: Is DTC P0159 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0161: Heated Oxygen Sensor Heater Circuit (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Heater Circuit



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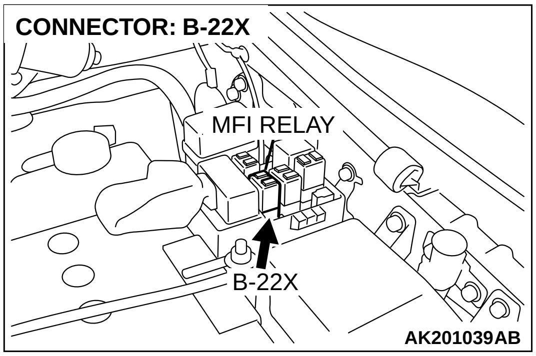
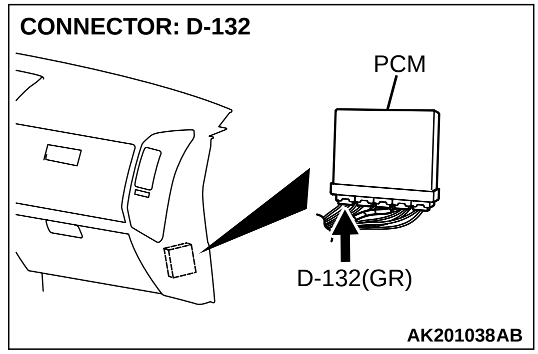
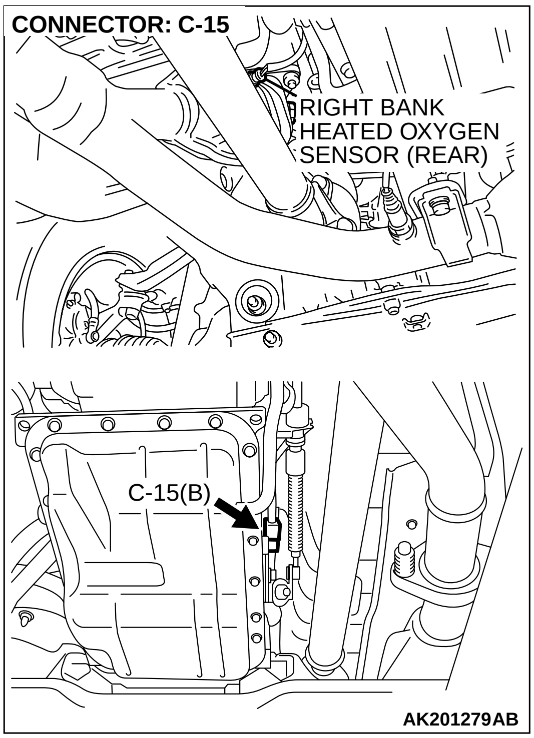
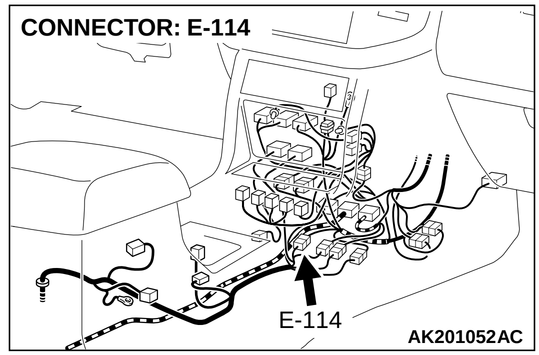








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 1) to the left bank heated oxygen sensor (rear) heater.
- The PCM (terminal No. 18) controls continuity to the left bank heated oxygen sensor (rear) heater by turning the power transistor in the PCM "ON" and "OFF".

BACKGROUND

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

DTC SET CONDITIONS

Check Conditions

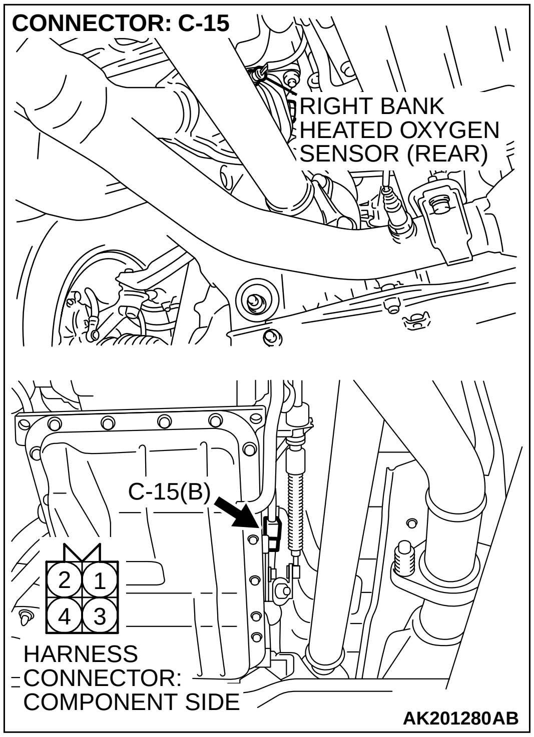
- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the left bank heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16 volts.

Judgment Criteria

- Heater current of the left bank heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

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

- Open or shorted left bank heated oxygen sensor (rear) heater circuit.
- Open circuit in left bank heated oxygen sensor (rear) heater.
- PCM failed.



DIAGNOSIS

Required Special Tool:

- MD998464: Test Harness Set

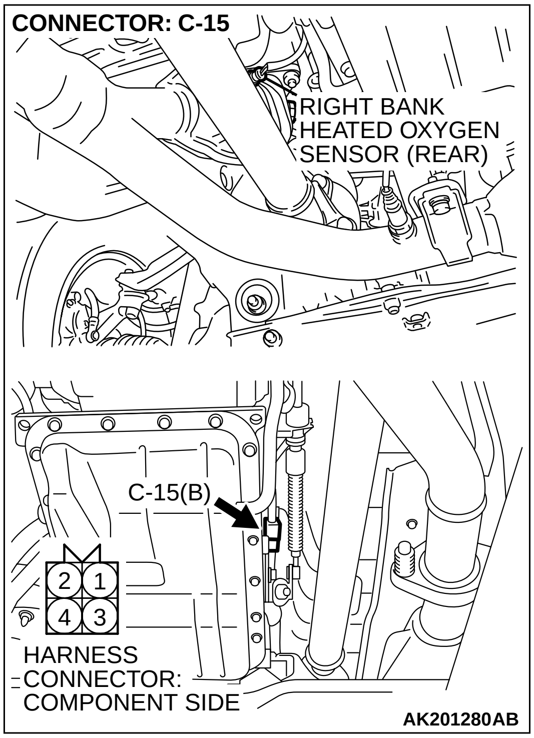
STEP 1. Check harness connector C-15 at the left bank heated oxygen sensor (rear) for damage.

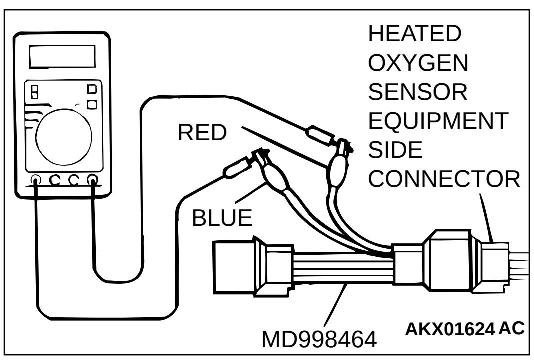
Q: Is the harness connector in good condition?

YES : Go to Step 2.

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

STEP 2. Check the left bank heated oxygen sensor (rear).





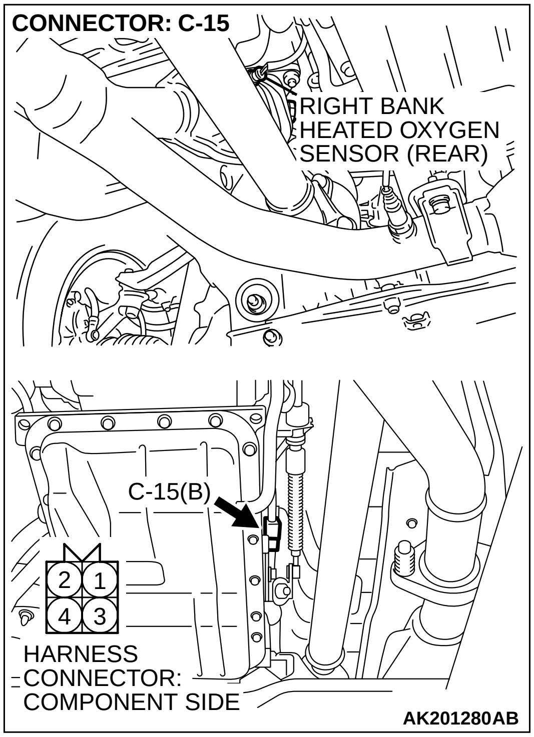
(1) Disconnect left bank heated oxygen sensor (rear) connector C-15 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen (rear) sensor side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 11 – 18 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20°C (68°F)]?

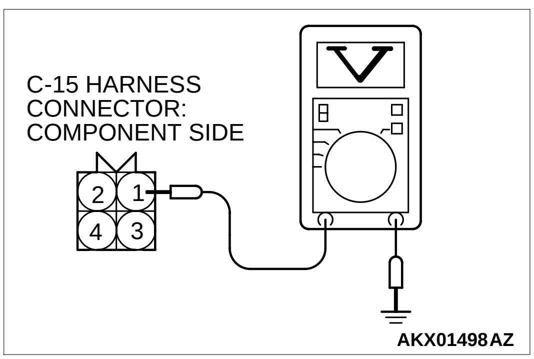
YES : Go to Step 3.
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 12.



STEP 3. Measure the power supply voltage at left bank heated oxygen sensor (rear) harness side connector C-15.

(1) Disconnect the connector C-15 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.

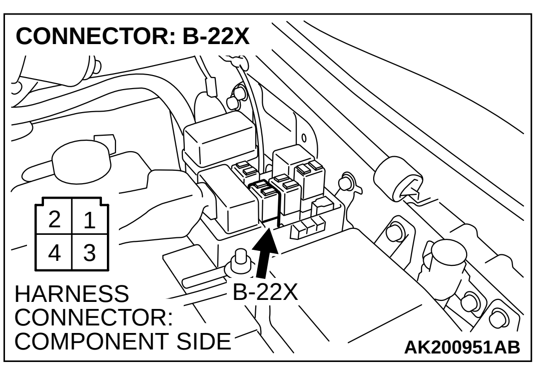
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 5.

NO : Go to Step 4.

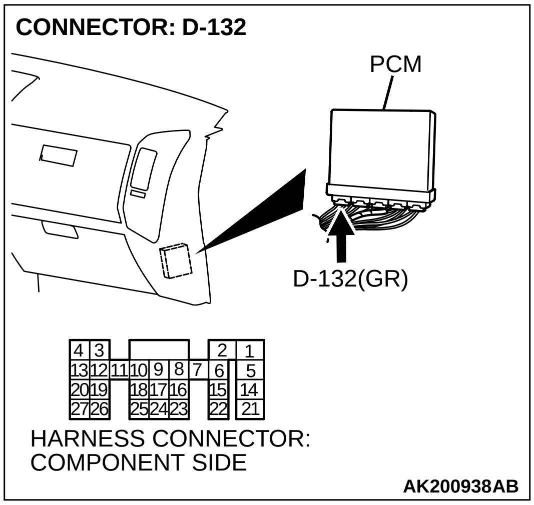


STEP 4. Check harness connector B-22X at the MFI relay for damage.

Q: Is the harness connector in good condition?

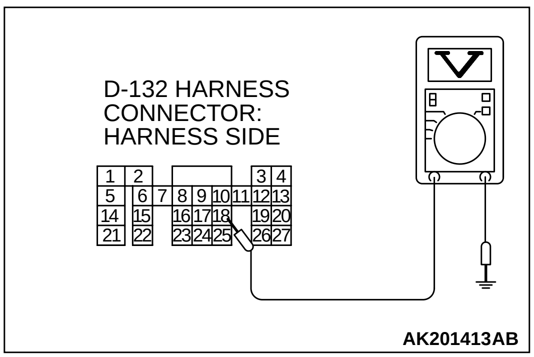
YES : Check harness connectors E-114 and D-116 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection. If intermediate connectors E-114 and D-116 are in good condition, repair harness wire between MFI relay connector B-22X (terminal No. 1) and left bank heated oxygen sensor (rear) connector C-15 (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 5. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Turn the ignition switch to the "ON" position.

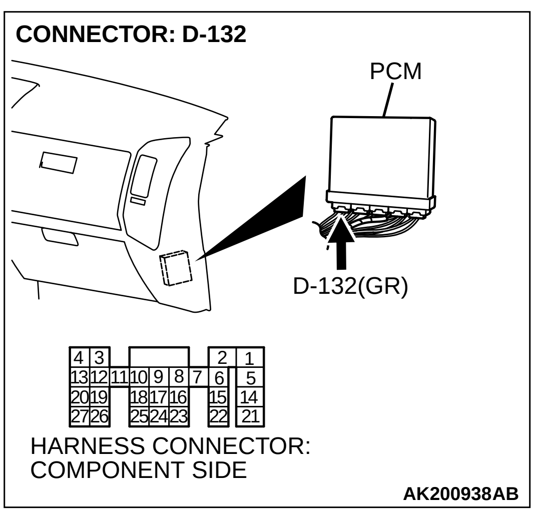


(3) Measure the voltage between terminal No. 18 and ground by backprobing.
- Voltage should be battery positive voltage.

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

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

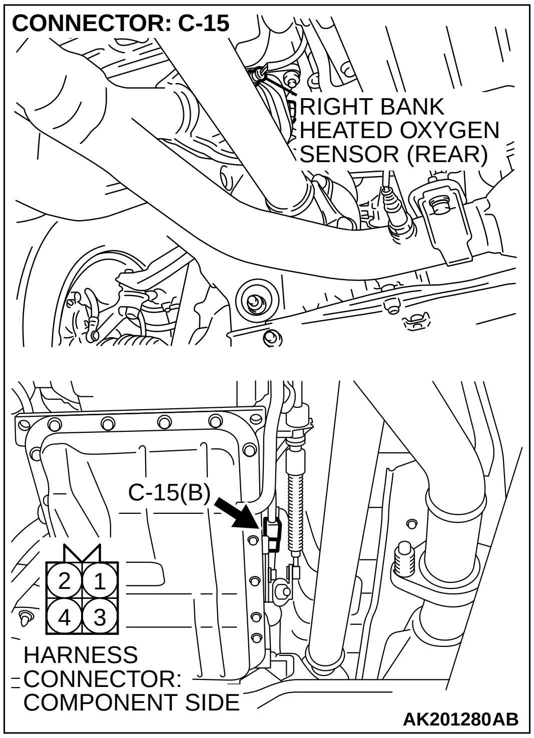
YES : Go to Step 8.
NO : Go to Step 6.

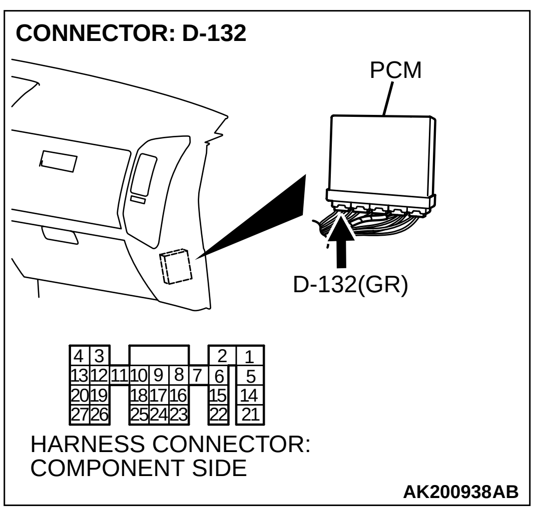


STEP 6. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





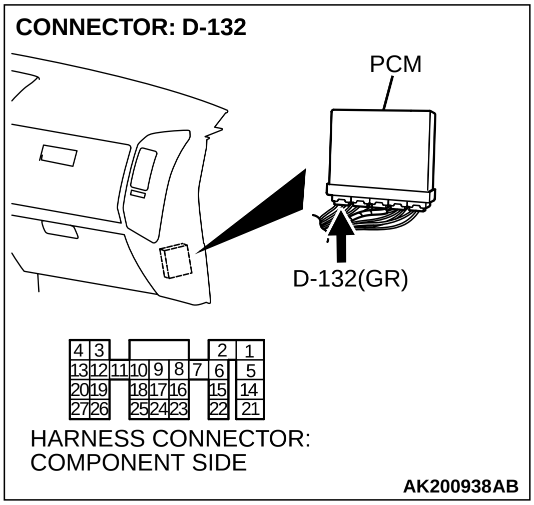
STEP 7. Check for open circuit or short circuit to ground between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 3) and PCM connector D-132 (terminal No. 18).

NOTE: Check harness after checking intermediate connector E-114. If intermediate connector E-114 is 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 PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

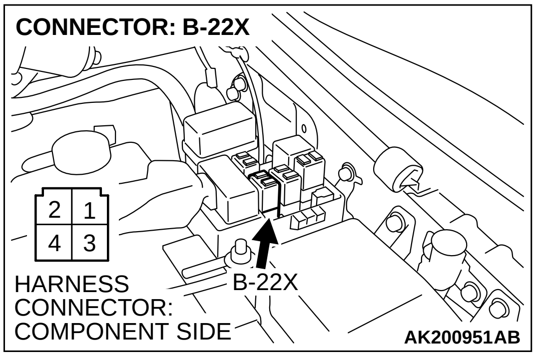


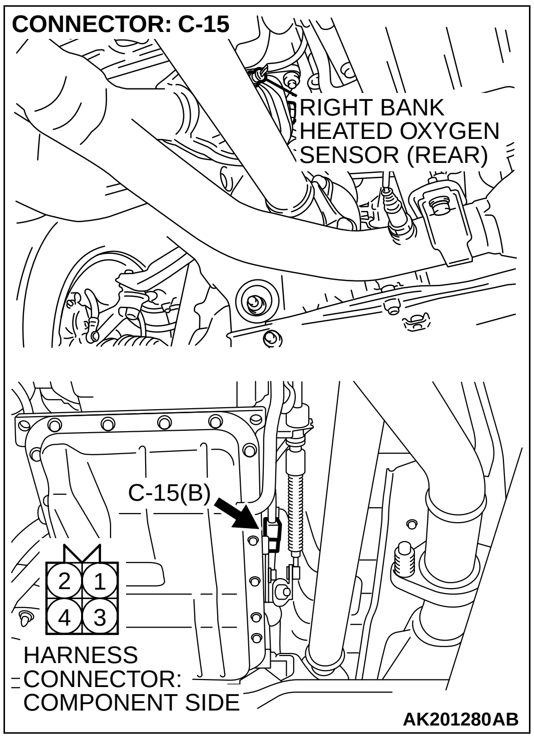
STEP 8. Check harness connector D-132 at PCM for damage.

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.





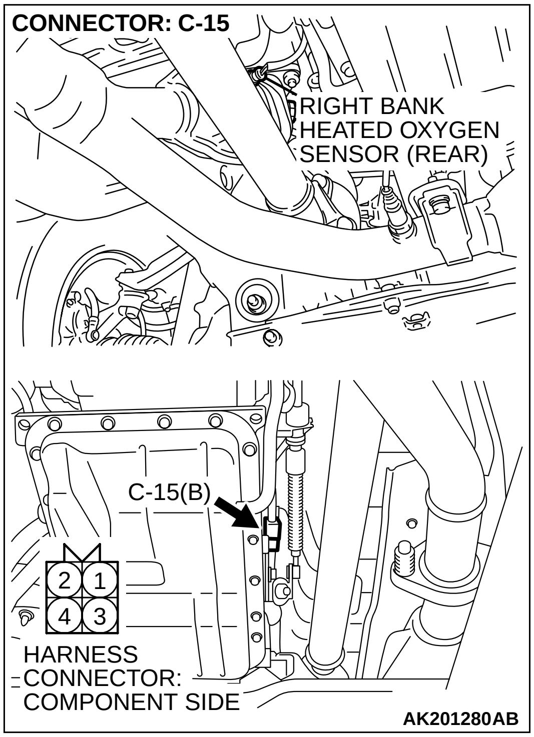
STEP 9. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and left bank heated oxygen sensor (rear) connector C-15 (terminal No. 1).

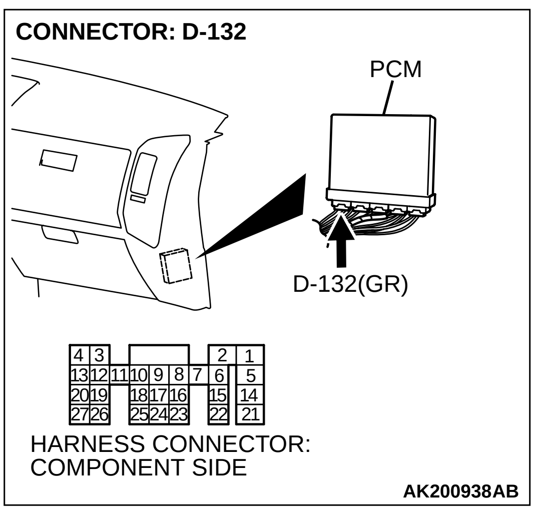
NOTE: Check harness after checking intermediate connectors E-114 and D-116. If intermediate connectors E-114 and D-116 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between left bank heated oxygen sensor (rear) connector C-15 (terminal No. 3) and PCM connector D-132 (terminal No. 18).

NOTE: Check harness after checking intermediate connector E-114. If intermediate connector E-114 is 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 : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

Q: Is DTC P0161 set?

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

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

Q: Is DTC P0161 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0171: System too Lean (bank 1)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent or 5 seconds.

or

- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent or 5 seconds.

or

- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria

- Long-term fuel trim has continued to be +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

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

- Volume airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

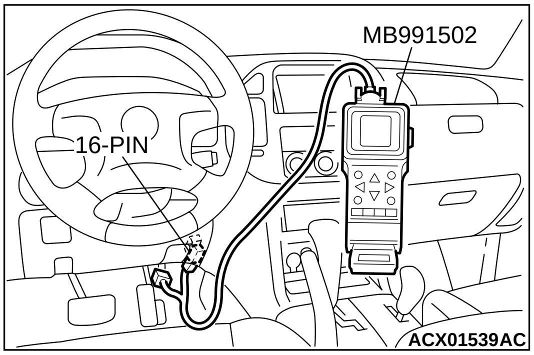
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 16.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 16.



STEP 3. Using scan tool MB991502, check data list item 12: Volume Airflow Sensor.

⚠ **CAUTION**

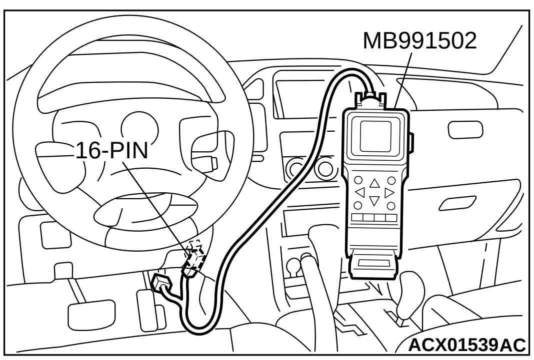
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 4.
NO : Refer to , DTC P0101 – Volume Airflow Circuit Range/ Performance Problem P.13Ac-2, DTC P0102 – Volume Airflow Circuit Low Input P.13Ac-9.



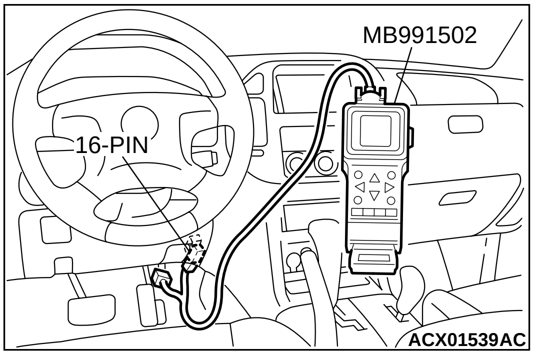
STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to , DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13Ac-44, DTC P0112 – Intake Air Temperature Circuit Low Input P.13Ac-50, DTC P0113 – Intake Air Temperature Circuit High Input P.13Ac-54.



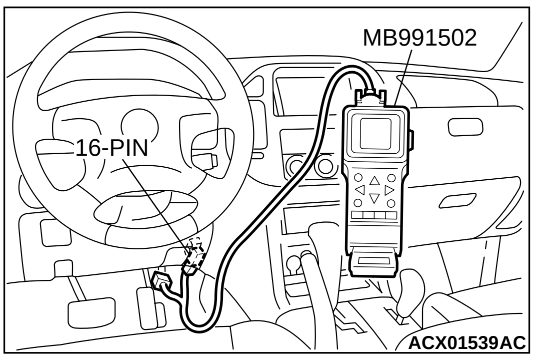
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to , DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13Ac-60, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13Ac-70, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13Ac-74.



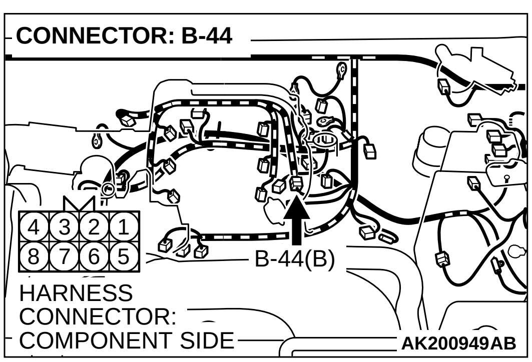
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

Q: Is the sensor operating properly?

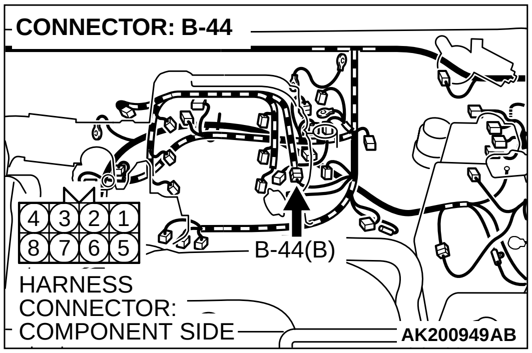
YES : Go to Step 7.
NO : Refer to , DTC P0106 – Barometric Pressure Circuit Range/Performance ProblemP.13Ac-17, DTC P0107 – Barometric Pressure Temperature Circuit Low Input P.13Ac-22, DTC P0108 – Barometric Pressure Temperature Circuit High Input P.13Ac-35.



STEP 7. Check harness connector B-44 at injector intermediate connector for damage.

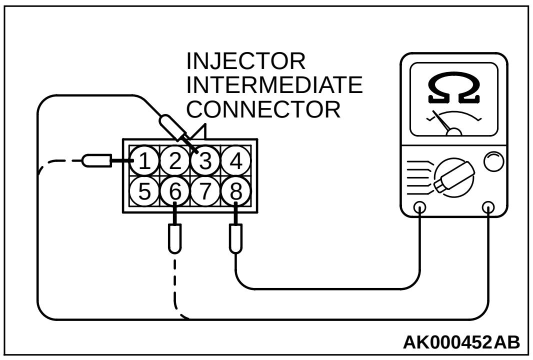
Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 8. Check the right bank injector resistance at intermediate connector B-44.

(1) Disconnect the injector intermediate connector B-44.



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

a. Measure the resistance between terminal No. 8 and No. 3 when measuring No. 1 cylinder injector.

b. Measure the resistance between terminal No. 8 and No. 1 when measuring No .3 cylinder injector.

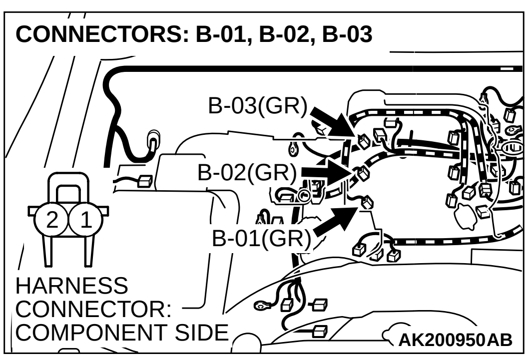
c. Measure the resistance between terminal No. 8 and No. 6 when measuring No. 5 cylinder injector.

- Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check harness connector B-01, B-02, B-03 at right bank injector for damage.

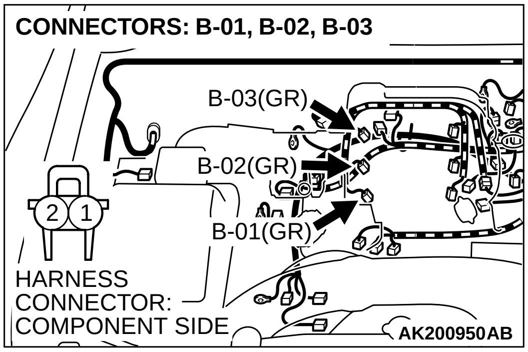
(1) Check the injector connector, which deviates from the standard value at Step 8.

Q: Is the harness connector in good condition?

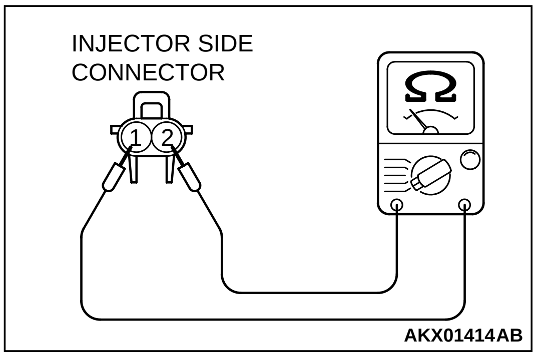
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 10. Check the right bank injector.



(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 8.



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

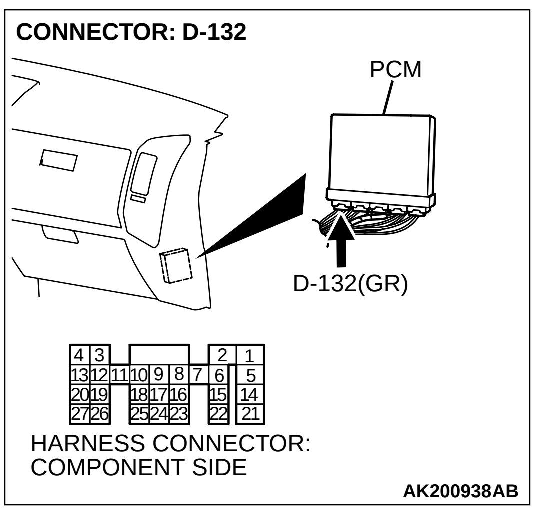
Standard value: 13 – 16 ohms [at 20°C (68°F)]

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 16.

NO : Replace the injector. Then go to Step 16.

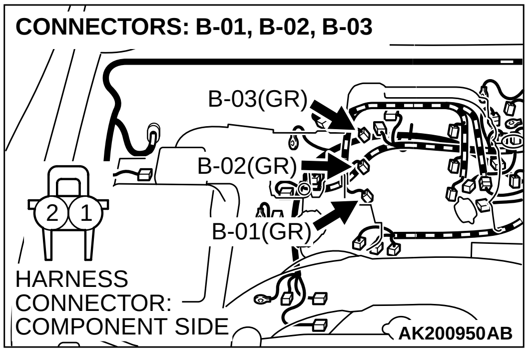
STEP 11. Check harness connector D-132 at PCM for damage.

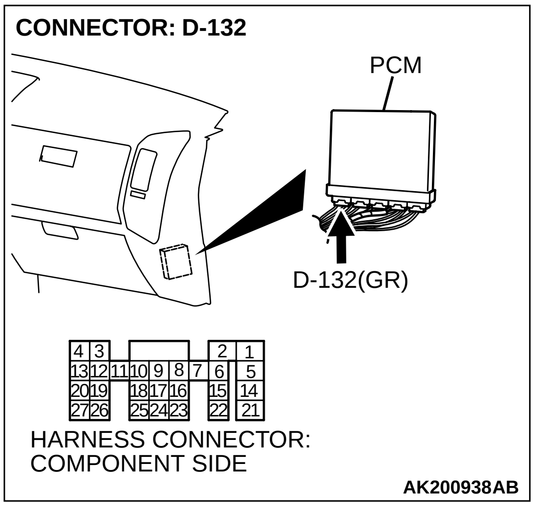


Q: Is the harness connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.





STEP 12. Check for harness damage between right bank injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) when checking No. 1 cylinder injector.

b. Check the harness wire between injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 24) when checking No. 3 cylinder injector.

c. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 10) when checking No. 5 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 16.

STEP 13. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

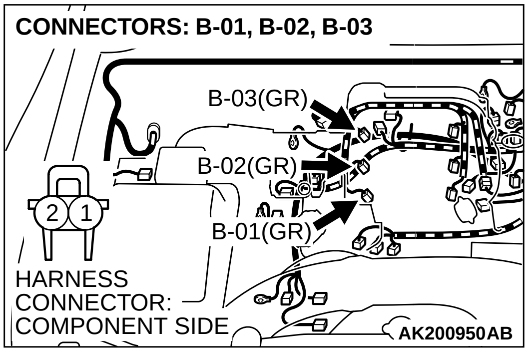
Q: Are there any abnormalities?

YES : Go to Step 14.
NO : Repair or replace it. Then go to Step 16.

STEP 14. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Go to Step 15.
NO : Replace the fuel. Then go to Step 16.



STEP 15. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monitor P.13Ab-2.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the PCM. Then go to Step 16.
NO : The inspection is complete.

STEP 16. Test the OBD-II drive cycle.

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

Q: Is the DTC P0171 is output?

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

DTC P0172: System too Rich (bank 1)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –7.4 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria

- Long-term fuel trim has continued to be –12.5 percent for 5 seconds.

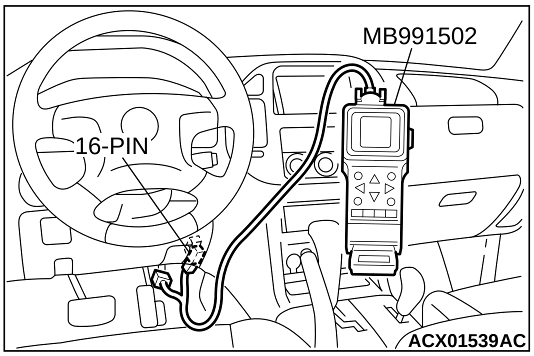
or

- Short-term fuel trim has continued to be –30.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

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



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

⚠ CAUTION

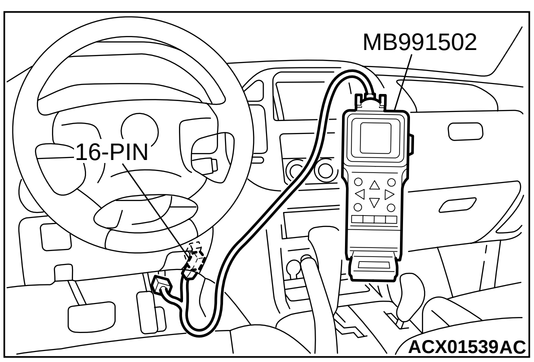
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to , DTC P0101 – Volume Airflow Circuit Range/ Performance Problem P.13Ac-2, DTC P0102 – Volume Airflow Circuit Low Input P.13Ac-9.



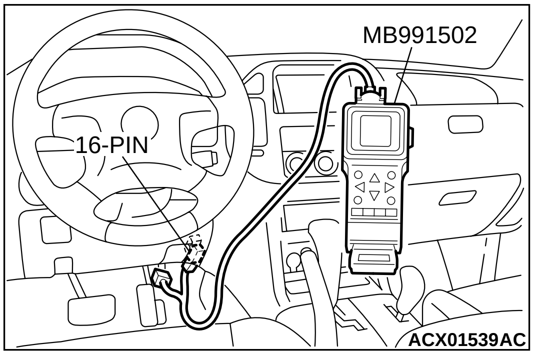
STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to , DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13Ac-44, DTC P0112 – Intake Air Temperature Circuit Low Input P.13Ac-50, DTC P0113 – Intake Air Temperature Circuit High Input P.13Ac-54.



STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

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

(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.

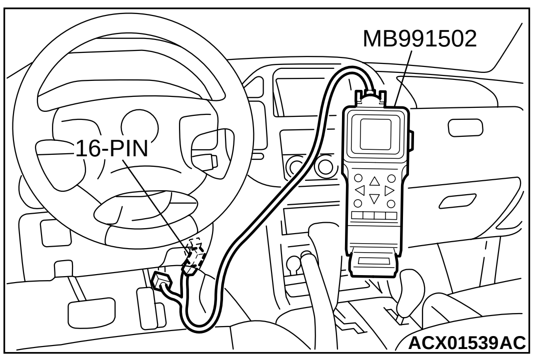
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to , DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13Ac-60, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13Ac-70, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13Ac-74.



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

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

(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.

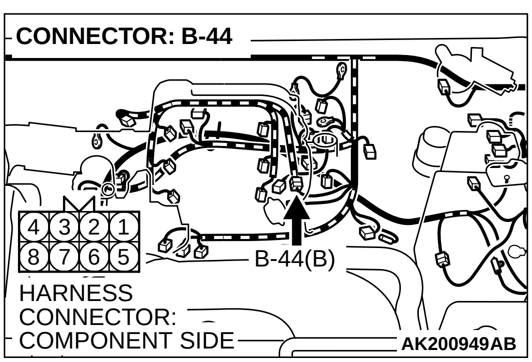
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

Q: Is the sensor operating properly?

YES : Go to Step 5.

NO : Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13Ac-17, DTC P0107 – Barometric Pressure Temperature Circuit Low Input P.13Ac-22, DTC P0108 – Barometric Pressure Temperature Circuit High Input P.13Ac-35.



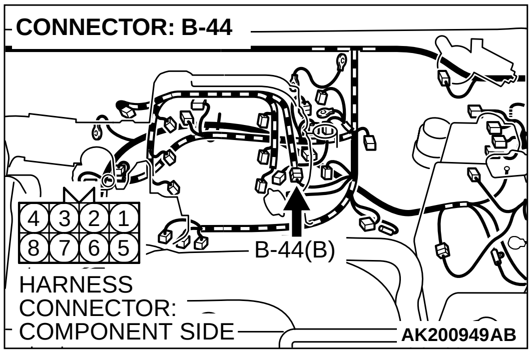
STEP 5. Check harness connector B-44 at injector intermediate connector for damage.

Q: Is the harness connector in good condition?

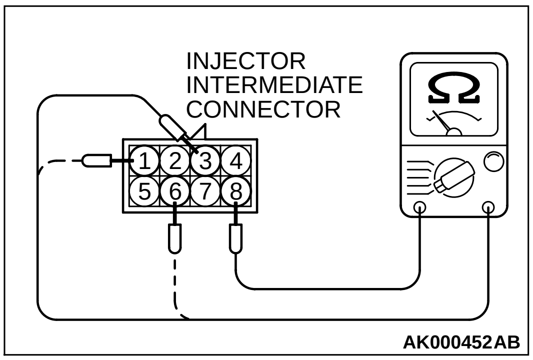
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check the right bank injector resistance at intermediate connector B-44.



(1) Disconnect the injector intermediate connector B-44.

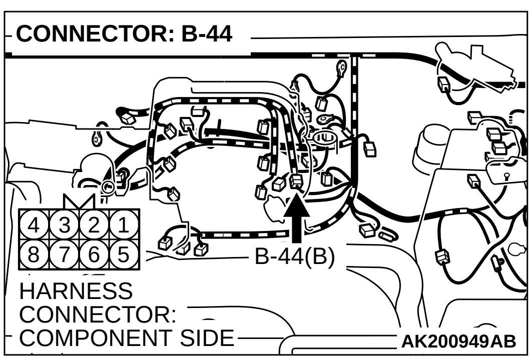


(2) Measure the resistance between each injector side connector terminal.
   a. Measure the resistance between terminal No. 8 and No. 3 when measuring No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 8 and No. 1 when measuring No. 3 cylinder injector.
   c. Measure the resistance between terminal No. 8 and No. 6 when measuring No. 5 cylinder injector.
   - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

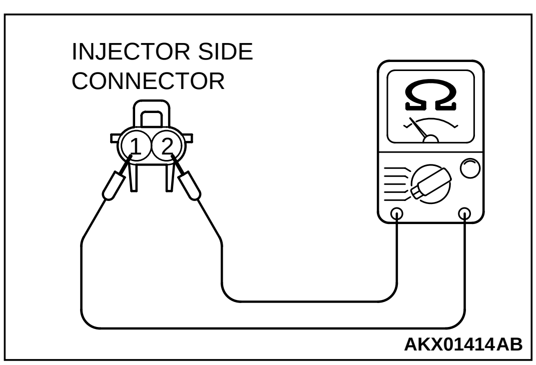
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

STEP 7. Check the right bank injector.



(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 6.



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

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

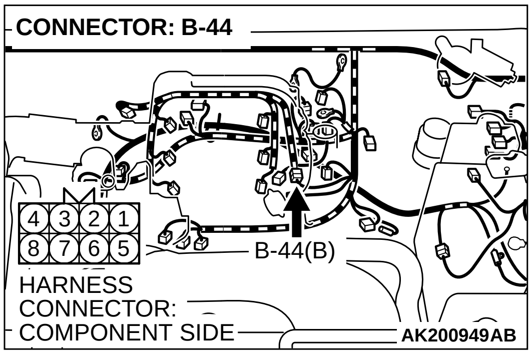
YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 10.
NO : Replace the injector. Then go to Step 10.

STEP 8. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

Q: Are there any abnormalities?

YES : Go to Step 9.
NO : Repair or replace it. Then go to Step 10.



STEP 9. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monitor P.13Ab-2.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the PCM. Then go to Step 10.
NO : The inspection is complete.

STEP 10. Test the OBD-II drive cycle.

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

Q: Is DTC P0172 set?

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

DTC P0174: System too Lean (bank 2)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria
- Long-term fuel trim has continued to be +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

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

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

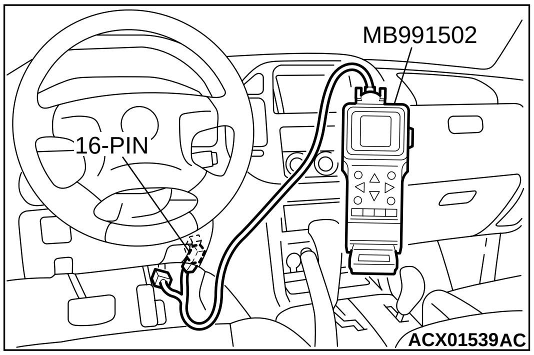
YES : Go to Step 2.
NO : Repair it. Then go to Step 16.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 16.

STEP 3. Using scan tool MB991502, check data list item 12: Volume Airflow Sensor.



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

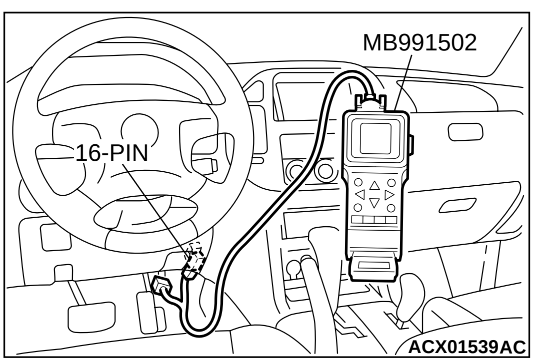
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 4.
NO : Refer to, DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13Ac-2, DTC P0102 – Volume Airflow Circuit Low Input P.13Ac-9.

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

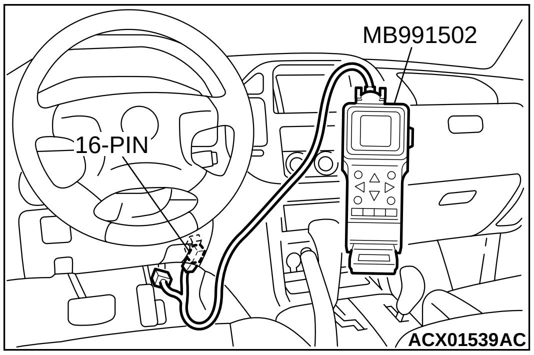


(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13Ac-44, DTC P0112 – Intake Air Temperature Circuit Low Input P.13Ac-50, DTC P0113 – Intake Air Temperature Circuit High Input P.13Ac-54.



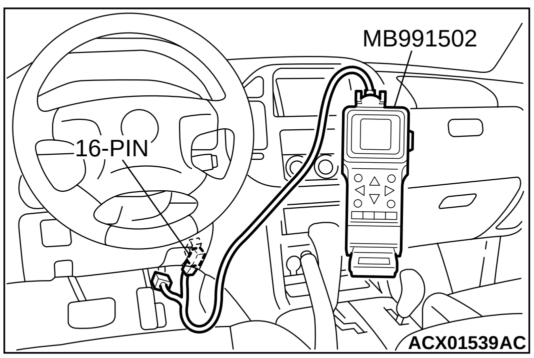
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13Ac-60, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13Ac-70, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13Ac-74.



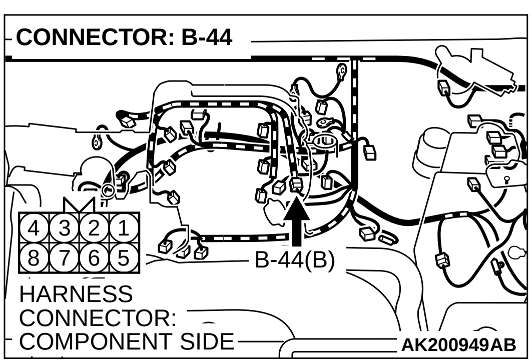
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg.).

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

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13Ac-17, DTC P0107 – Barometric Pressure Temperature Circuit Low Input P.13Ac-22, DTC P0108 – Barometric Pressure Temperature Circuit High Input P.13Ac-35.



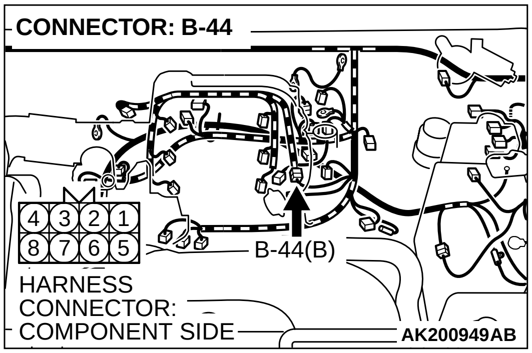
STEP 7. Check harness connector B-44 at injector intermediate connector for damage.

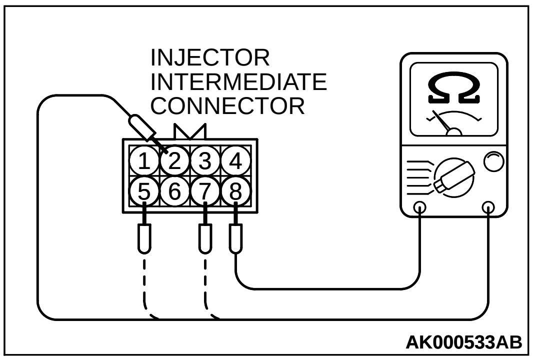
Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 8. Check the left bank injector resistance at intermediate connector B-44.

(1) Disconnect the injector intermediate connector B-44.



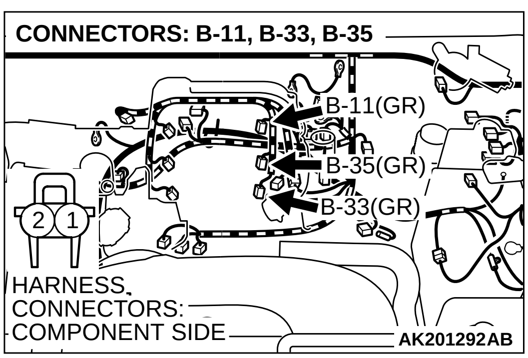


(2) Measure the resistance between each injector side connector terminal.
a. Measure the resistance between terminal No. 8 and No. 2 when measuring No. 2 cylinder injector.
b. Measure the resistance between terminal No. 8 and No. 7 when measuring No. 4 cylinder injector.
c. Measure the resistance between terminal No. 8 and No. 5 when measuring No. 6 cylinder injector.
- Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Go to Step 11.
NO : Go to Step 9.

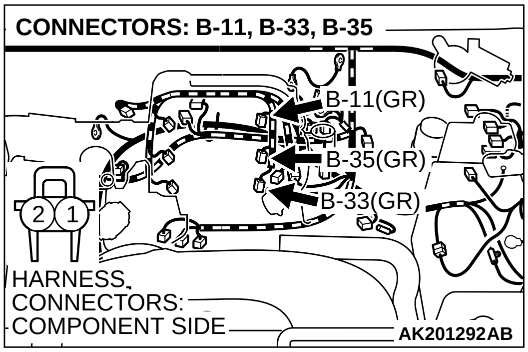
STEP 9. Check harness connector B-33, B-35, B-11 at left bank injector for damage.



(1) Check the injector connector, which deviates from the standard value at Step 8.

Q: Is the harness connector in good condition?

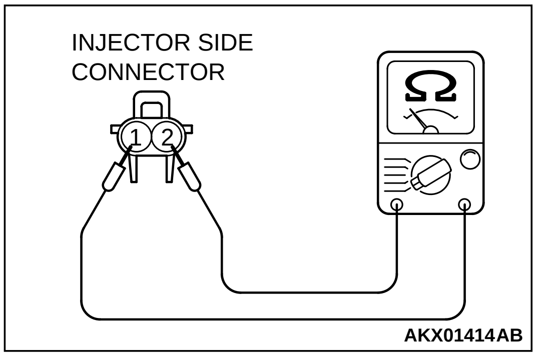
YES : Then go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 10. Check the left bank injector.

(1) Remove the intake manifold.

(2) Disconnect the left bank injector connector, which deviates from the standard value at Step 8.



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

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Repair harness wire between injector intermediate connector and left bank injector connector because of harness damage. Then go to Step 16.

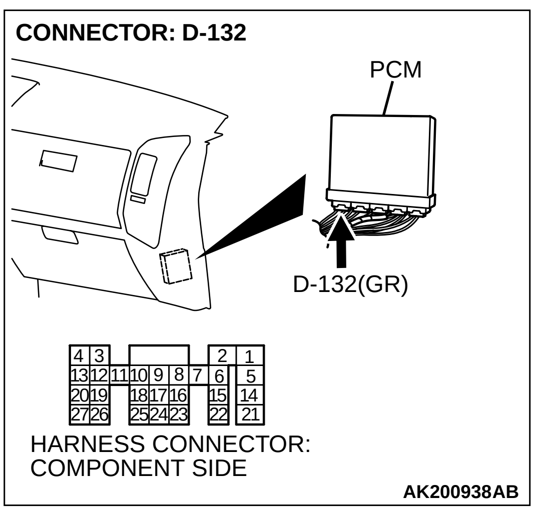
NO : Replace the injector. Then go to Step 16.

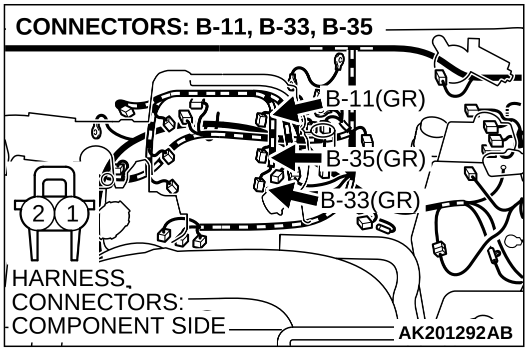
STEP 11. Check harness connector D-132 at PCM for damage.

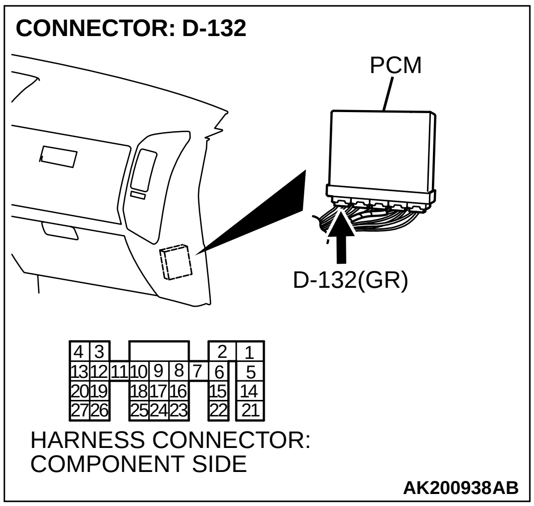
Q: Is the harness connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.







STEP 12. Check for harness damage between left bank injector connector and PCM connector.

a. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 9) when checking No. 2 cylinder injector.
b. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 2) when checking No. 4 cylinder injector.
c. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 25) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 16.

STEP 13. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

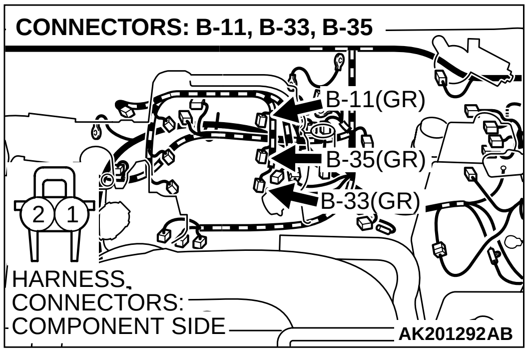
Q: Are there any abnormalities?

YES : Go to Step 14.
NO : Repair or replace it. Then go to Step 16.

STEP 14. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Go to Step 15.
NO : Replace the fuel. Then go to Step 16.



STEP 15. Replace the left bank injector.

(1) Replace the left bank injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monitor P.13Ab-2.

(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

YES : Replace the PCM. Then go to Step 16.

NO : The inspection is complete.

STEP 16. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monito P.13Ab-2r.

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

Q: Is DTC P0174 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0175: System too Rich (bank 2)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –7.4 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume airflow sensor output frequency is 100 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria

- Long-term fuel trim has continued to be –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be –30.0 percent for 5 seconds.

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

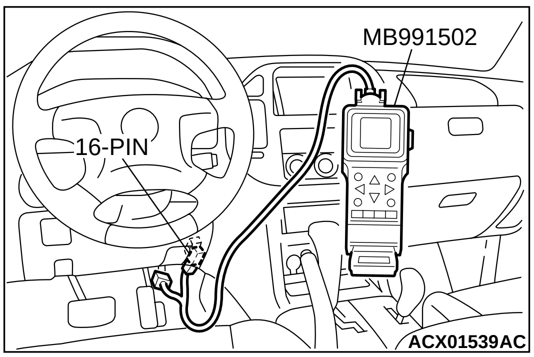
- Volume airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

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



⚠ CAUTION

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

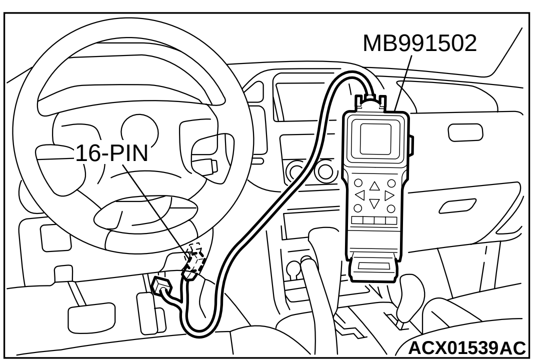
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to , DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13Ac-2, DTC P0102 – Volume Airflow Circuit Low Input P.13Ac-9.

STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

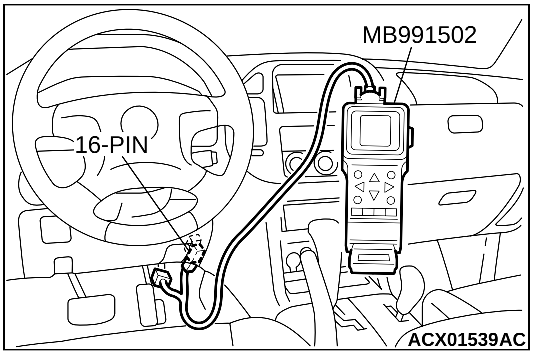


(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to , DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13Ac-44 DTC P0112 – Intake Air Temperature Circuit Low Input P.13Ac-50, DTC P0113 – Intake Air Temperature Circuit High Input P.13Ac-54.



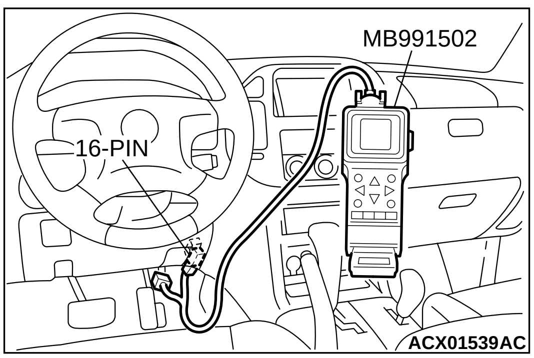
STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to , DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13Ac-60, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13Ac-70, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13Ac-74.



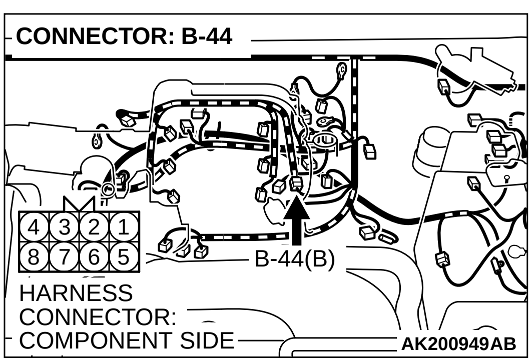
STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg.).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg.).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg.).
- When altitude is 1,800 m (5,906 feet), 81 kPa. (23.9 in.Hg.)

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to , DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13Ac-17, DTC P0107 – Barometric Pressure Temperature Circuit Low Input P.13Ac-22, DTC P0108 – Barometric Pressure Temperature Circuit High Input P.13Ac-35.

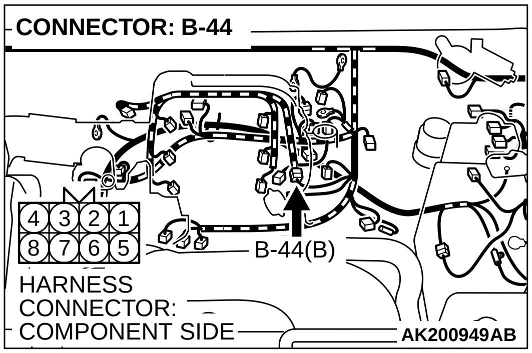


STEP 5. Check harness connector B-44 at injector intermediate connector for damage.

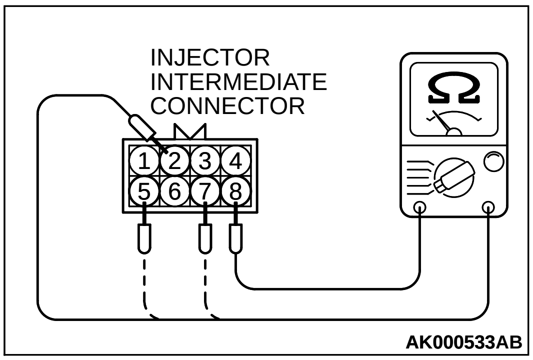
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check the left bank injector resistance at intermediate connector B-44.



(1) Disconnect the injector intermediate connector B-44.

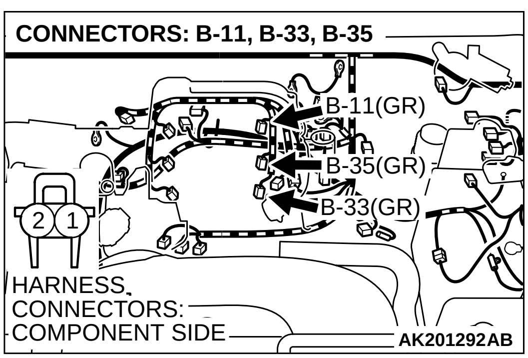


(2) Measure the resistance between each injector side connector terminal.
  a. Measure the resistance between terminal No. 8 and No. 2 when measuring No. 2 cylinder injector.
  b. Measure the resistance between terminal No. 8 and No. 7 when measuring No. 3 cylinder injector.
  c. Measure the resistance between terminal No. 8 and No. 5 when measuring No. 6 cylinder injector.
  - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

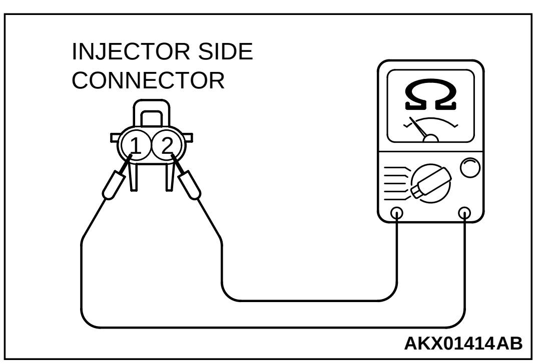
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

STEP 7. Check the left bank injector.



(1) Remove the intake manifold.
(2) Disconnect the left bank injector connector, which deviates from the standard value at Step 6.



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

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

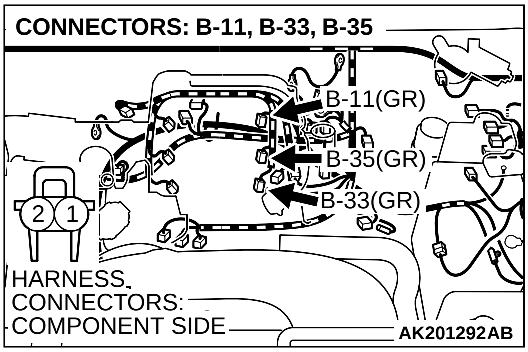
YES : Repair harness wire between injector intermediate connector and left bank injector connector because of harness damage. Then go to Step 10.
NO : Replace the injector. Then go to Step 10.

STEP 8. Check the fuel pressure.

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test P.13Aa-13.

Q: Are there any abnormalities?

YES : Go to Step 9.
NO : Repair or replace it. Then go to Step 10.



STEP 9. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monitor P.13Ab-2.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0175 set?

YES : Replace the PCM. Then go to Step 10.
NO : The inspection is complete.

STEP 10. Test the OBD-II drive cycle.

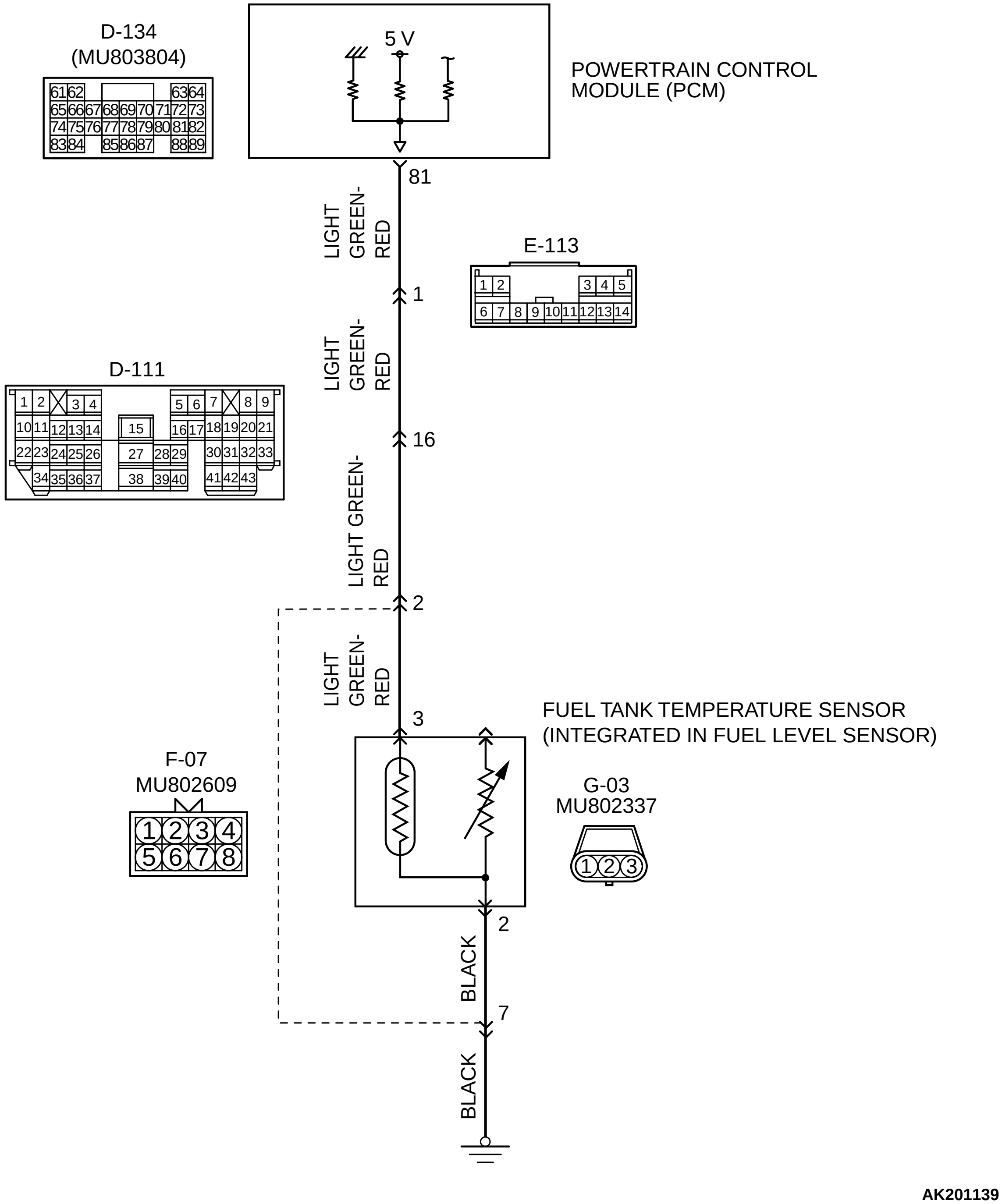
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 2 – Fuel Trim Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

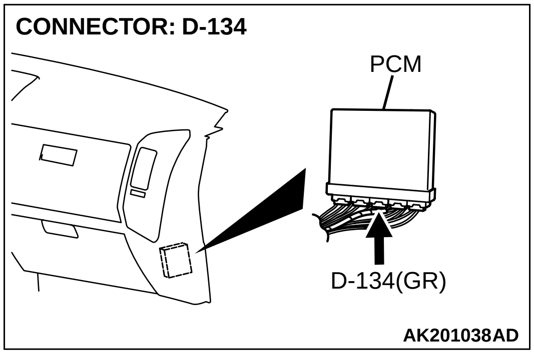
Q: Is DTC P0175 output?

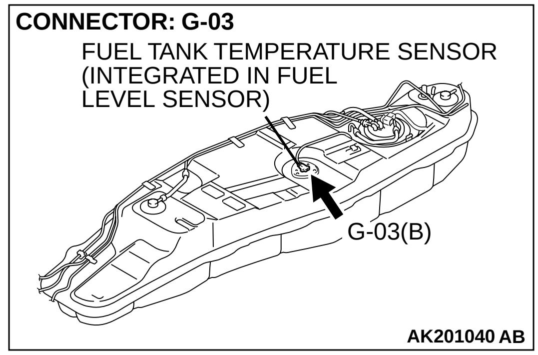
YES : Retry the troubleshooting.
NO : The inspection is complete.

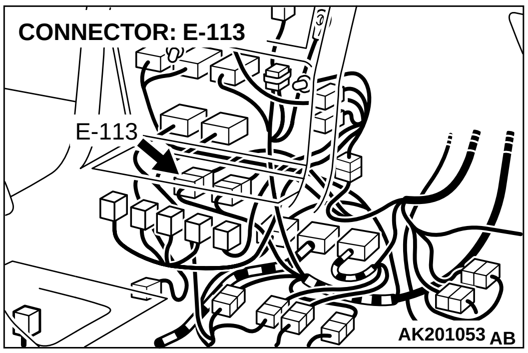
DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

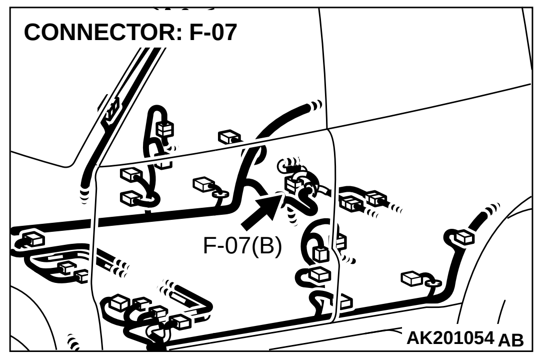
Fuel Tank Temperature Sensor Circuit

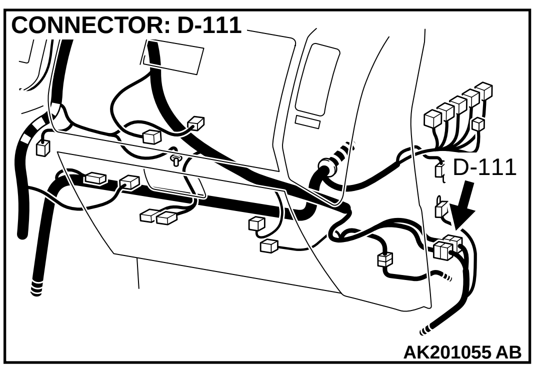












CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- 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 PCM 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.

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, or loose connector.
- PCM failed.

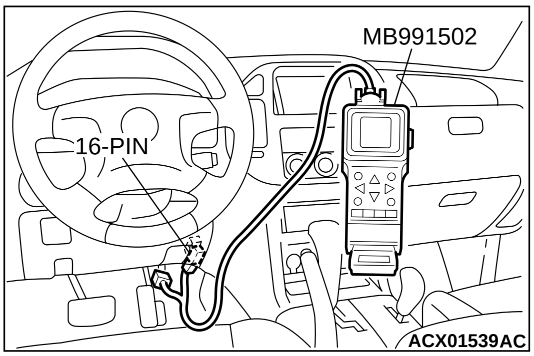
NOTE: A diagnostic trouble code (DTC) could be output if the engine coolant is changed as indicated below. Because this is not a failure, the DTC must be erased. Make sure to test drive the vehicle in accordance with the drive cycle pattern in order to verify that a DTC will not be output.

- *The engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel tank temperature was high).*

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

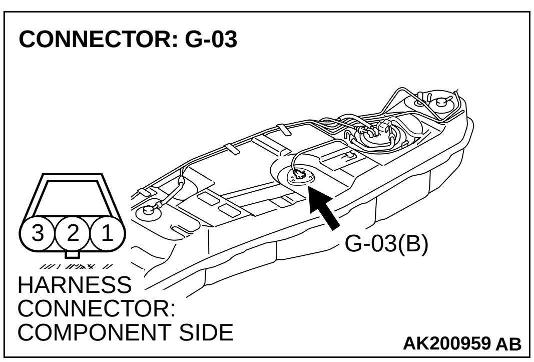
⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

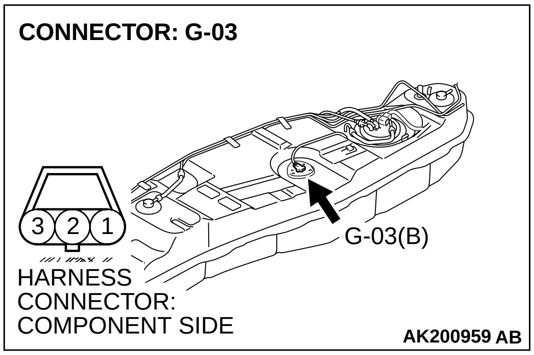
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector G-03 at the fuel tank temperature sensor for damage.

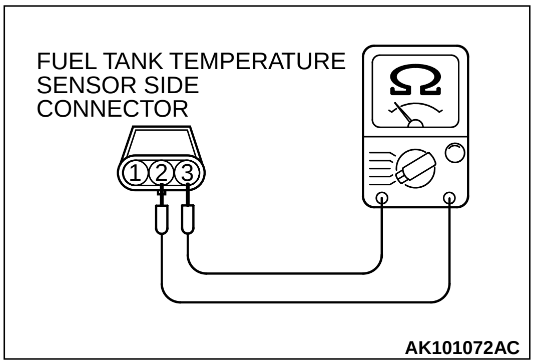
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector G-03.

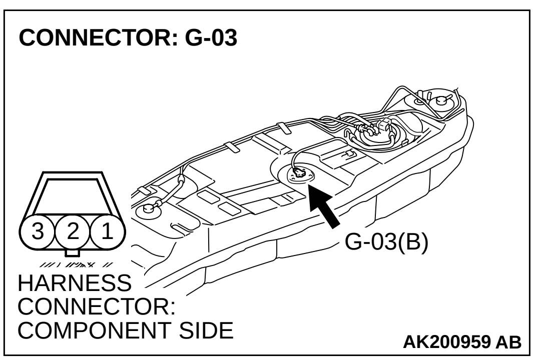


(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kiloohms

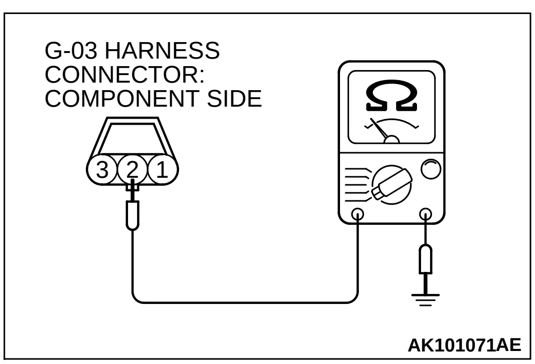
Q: Is the resistance between 0.5 and 12.0 kiloohms?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 12.



STEP 4. Check the continuity at fuel tank temperature sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.

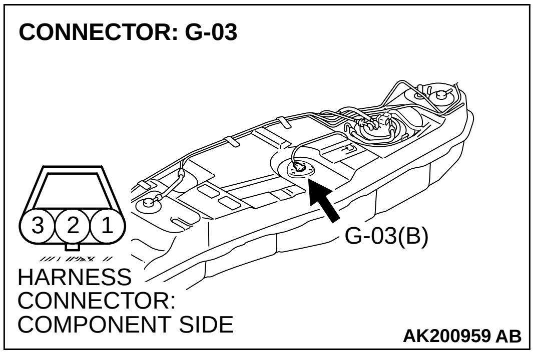


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

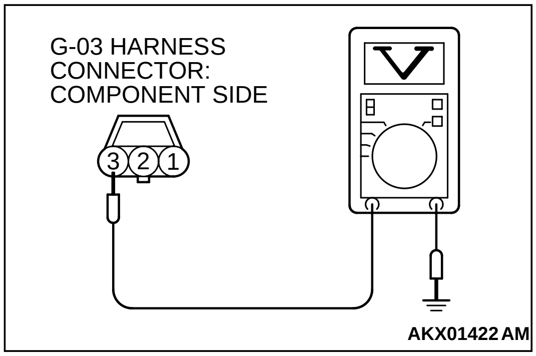
Q: Is the continuity normal?

YES : Go to Step 5.
NO : Check connector F-07 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 G-03 (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 G-03.



(1) Disconnect the connector G-03 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



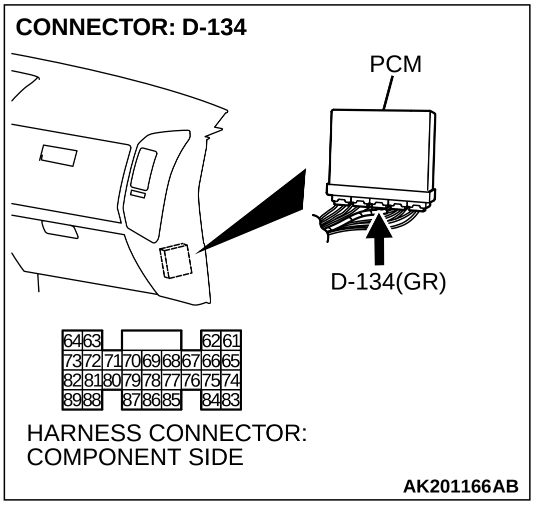
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts

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

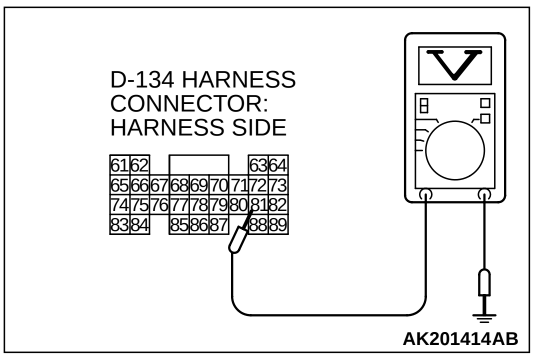
Q: Is the measured voltage between 4.5 and 4.9 volts?

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

STEP 6. Measure the sensor supply voltage at PCM connector D-134 by backprobing.



(1) Do not disconnect the PCM connector D-134.
(2) Turn the ignition switch to the "ON" position.



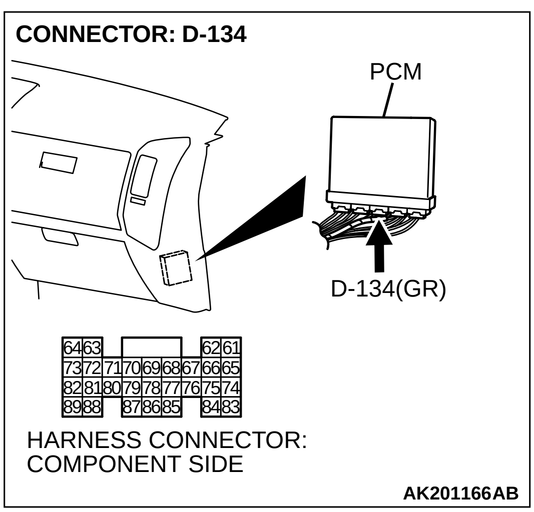
(3) Measure the voltage between terminal No. 81 and ground by backprobing.
- When fuel tank temperature is 0°C (32°F), voltage should be 2.7 and 3.1 volts.
- When fuel tank temperature is 20°C (68°F), voltage should be 2.1 and 2.5 volts.
- When fuel tank temperature is 40°C (104°F), voltage should be 1.6 and 2.0 volts.
- When fuel tank temperature is 80°C (176°F), voltage should be 0.8 and 1.2 volts.

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

Q: Is the voltage normal?

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

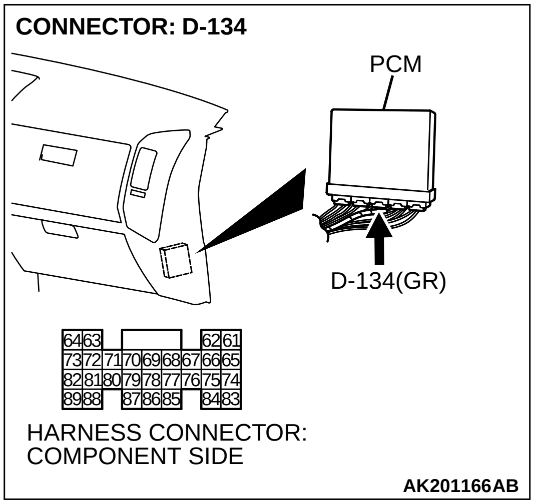
STEP 7. Check connector D-134 at PCM for damage.



Q: Is the connector in good condition?

YES : Check connector D-111 and F-07 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 level sensor connector G-03 (terminal No. 3) and PCM connector D-134 (terminal No. 81) 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.

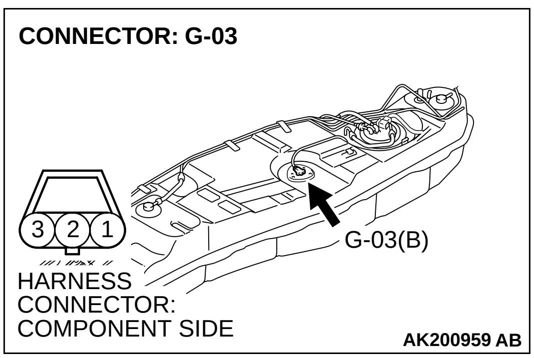


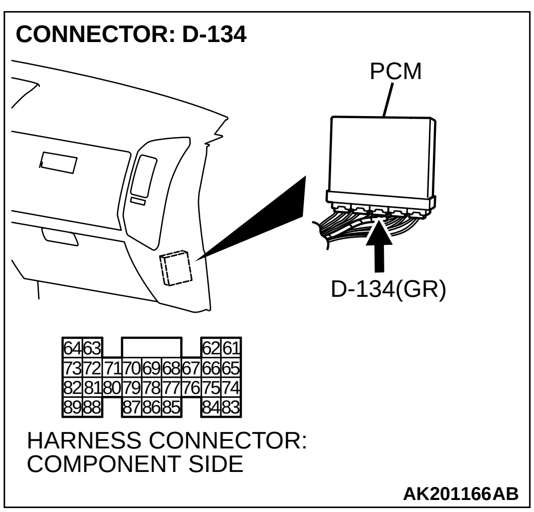
STEP 8. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

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



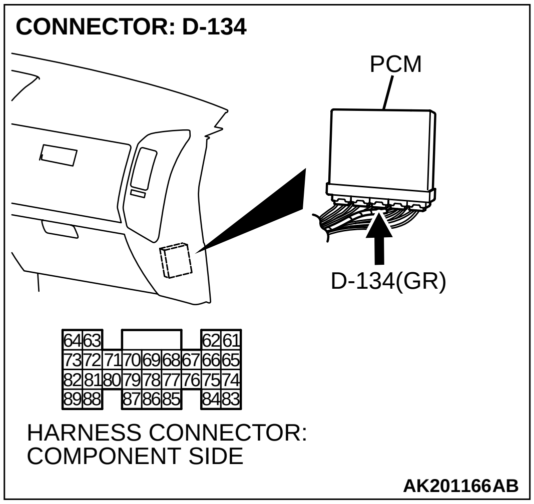


STEP 9. Check for short circuit to ground between fuel level sensor connector G-03 (terminal No. 3) and PCM connector D-134 (terminal No. 81).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.



STEP 10. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

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

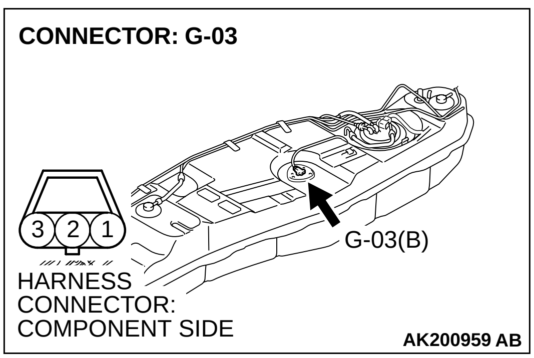
STEP 11. Check for harness damage between fuel tank temperature sensor connector G-03 (terminal No. 3) and PCM connector D-134 (terminal No. 81).

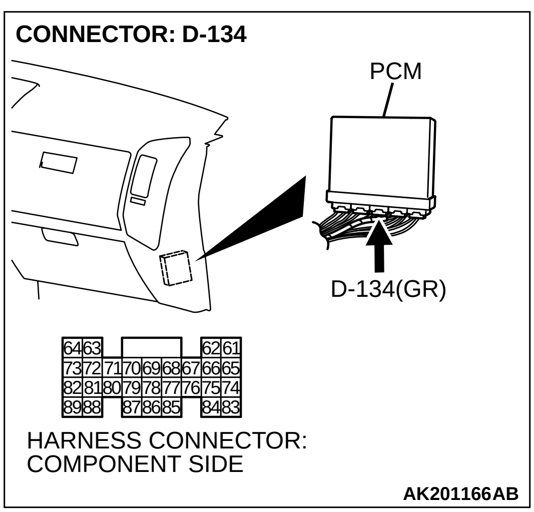
NOTE: Check harness after checking intermediate connector D-111, E-113 and F-07. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.





STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

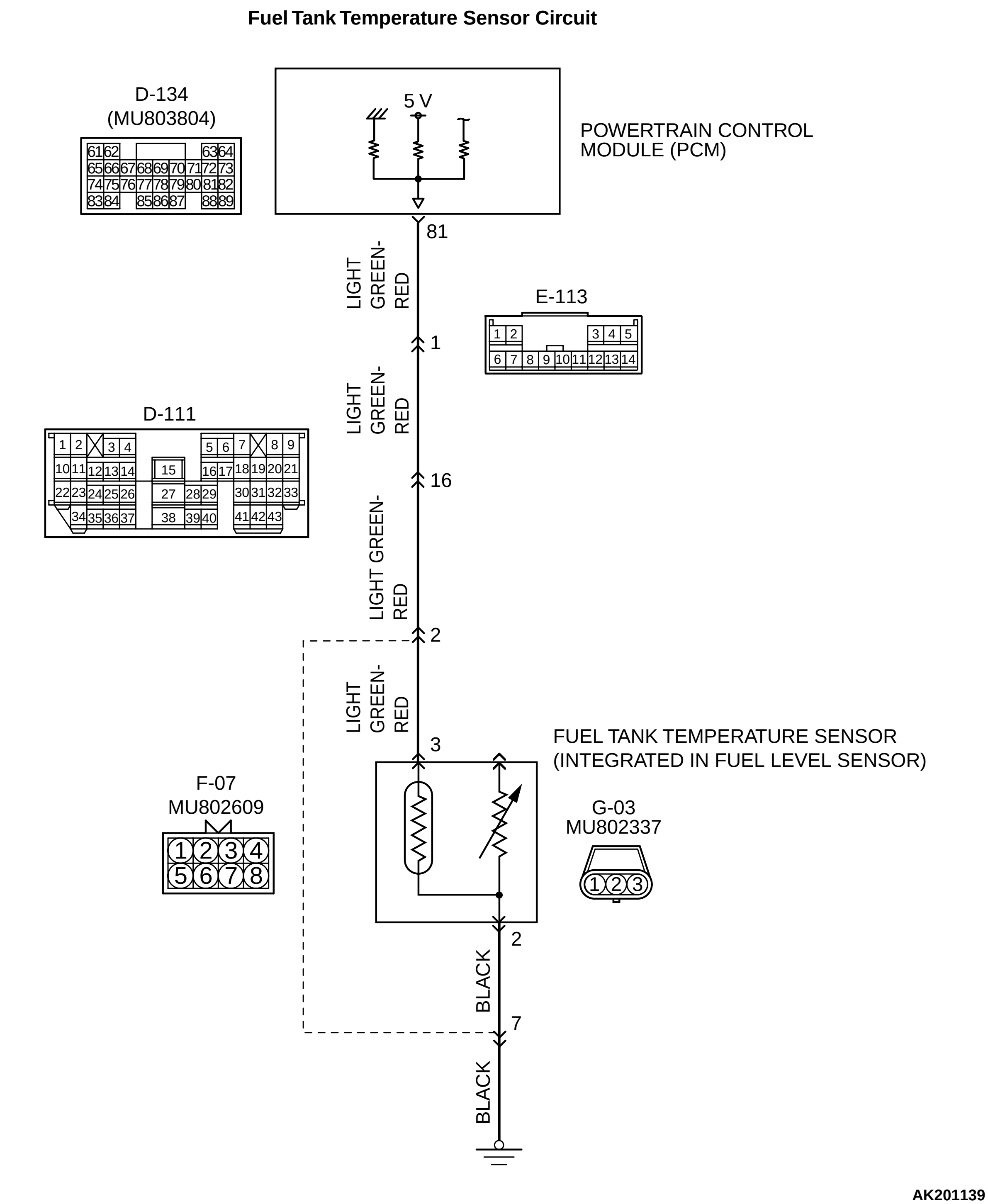
(2) Check the diagnostic trouble code (DTC).

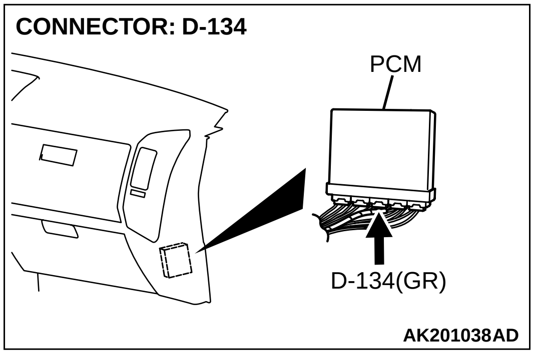
Q: Is DTC P0181 set?

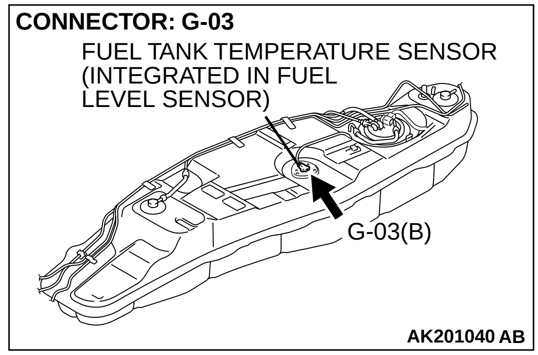
YES : Retry the troubleshooting.

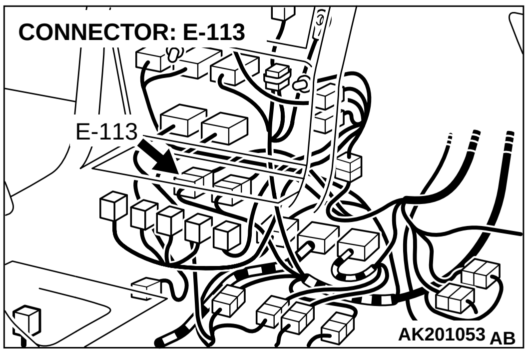
NO : The inspection is complete.

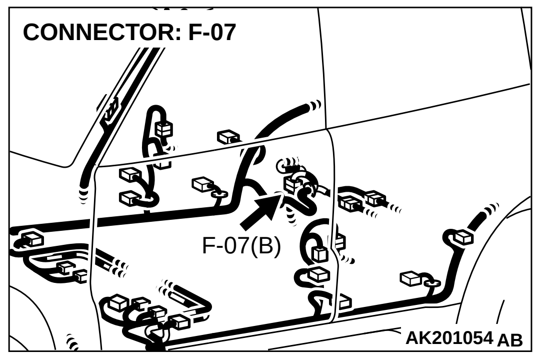
DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

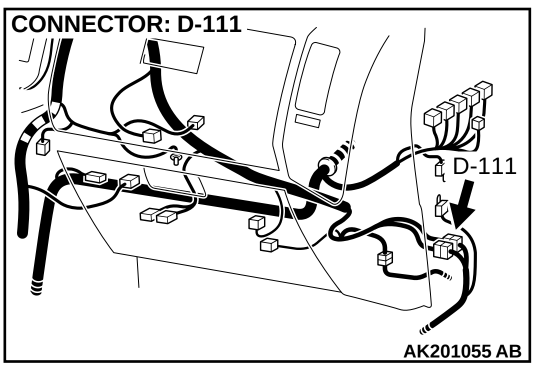












CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- 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 PCM 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

- Sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

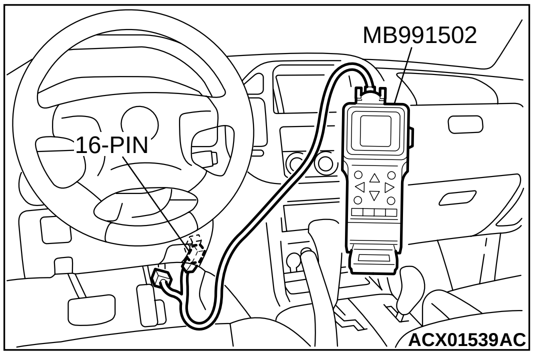
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

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

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



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

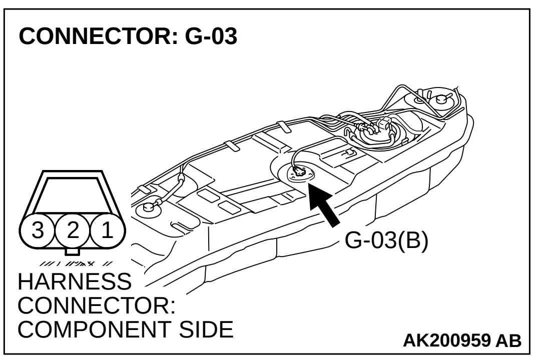
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

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

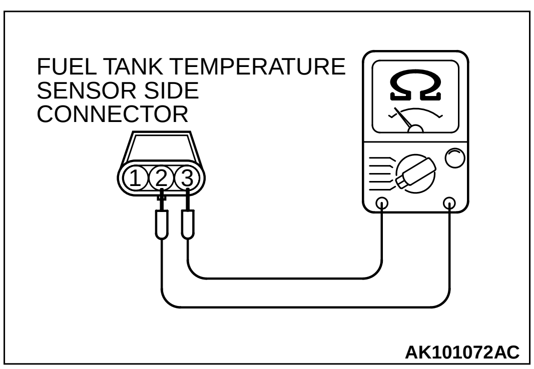
Q: Is the sensor operating properly?

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 G-03.



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

Standard value:
0.5 – 12.0 kiloohms

Q: Is the resistance between 0.5 and 12.0 kiloohms?

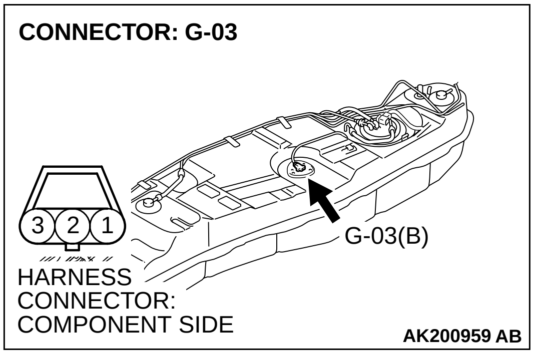
YES : Go to Step 3.
NO : Replace the fuel tank temperature sensor. Then go to Step 5.

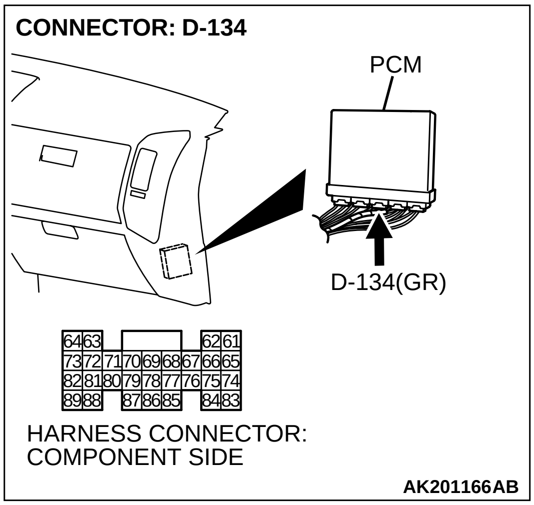
STEP 3. Check connector G-03 at the fuel tank temperature sensor and connector D-134 at PCM for damage.

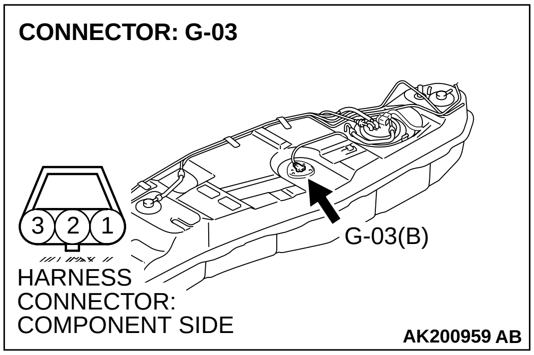
Q: Is the connector in good condition?

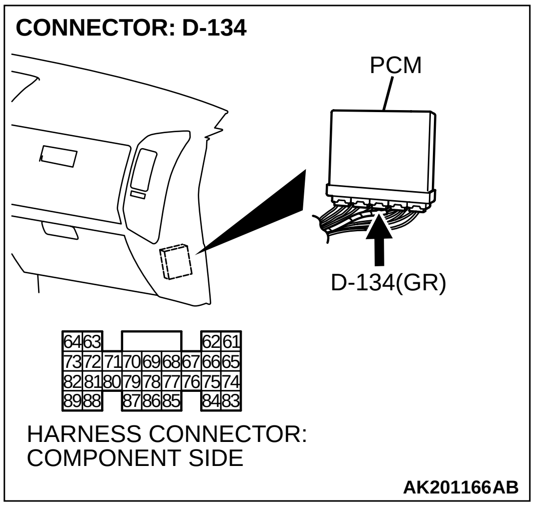
YES : Go to Step 4.

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









STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector G-03 and PCM connector D-134.

NOTE: Check harness after checking intermediate connector D-111, E-113 and F-07. If 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 PCM. Then go to Step 5.
NO : Repair it. Then go to Step 5.

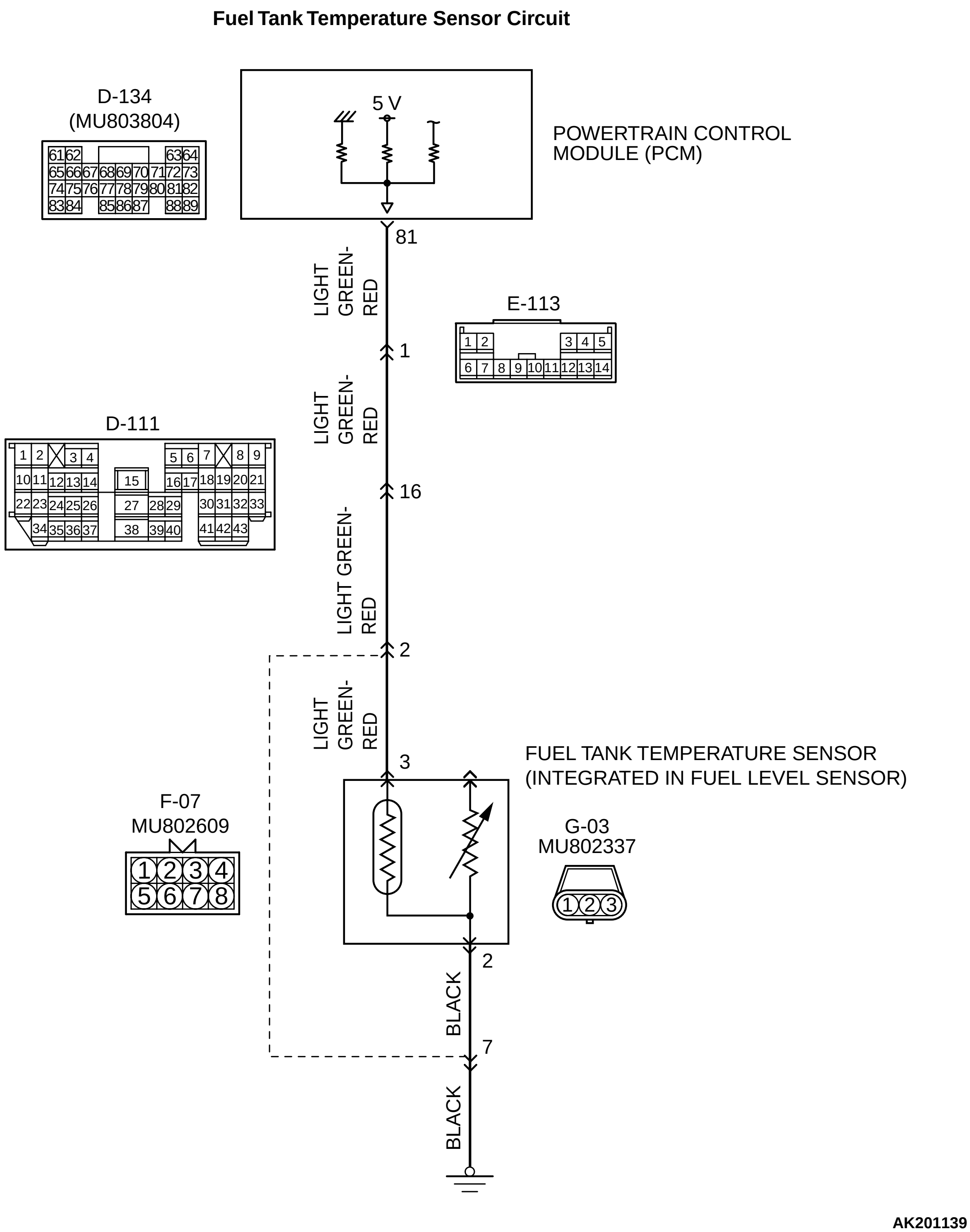
STEP 5. Test the OBD-II drive cycle.

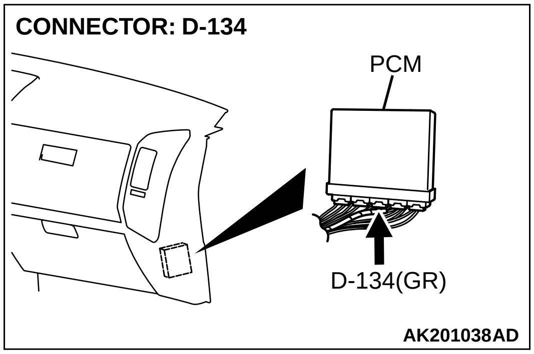
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

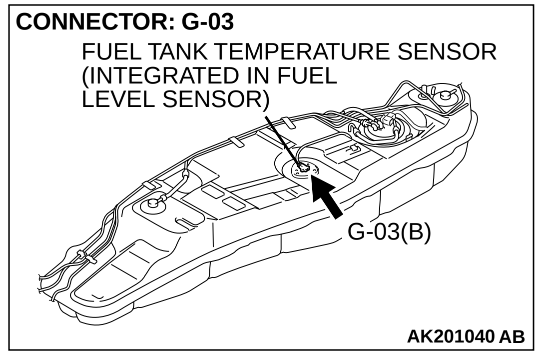
Q: Is DTC P0182 set?

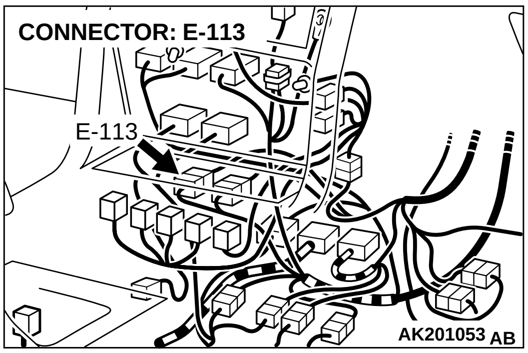
YES : Retry the troubleshooting.
NO : The inspection is complete.

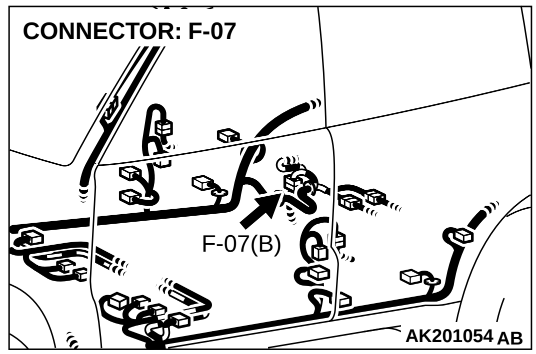
DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

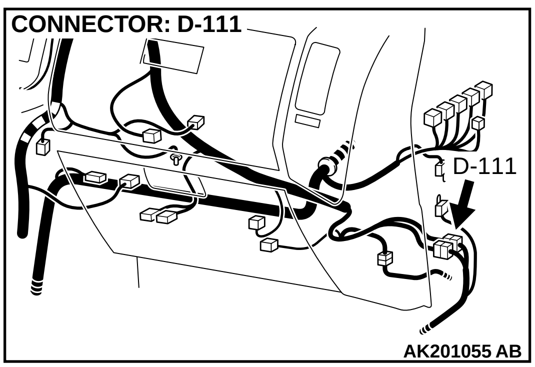












CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- 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 PCM 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

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

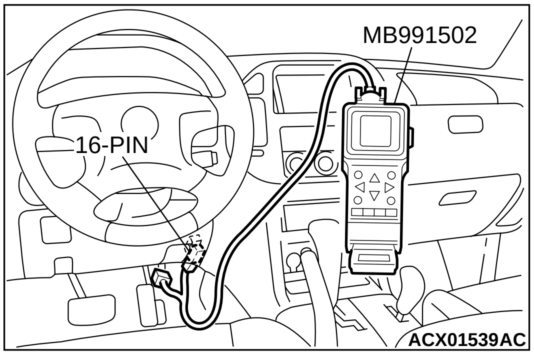
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

⚠ CAUTION

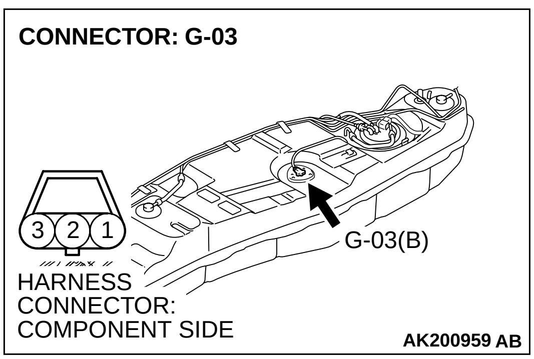
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

(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.

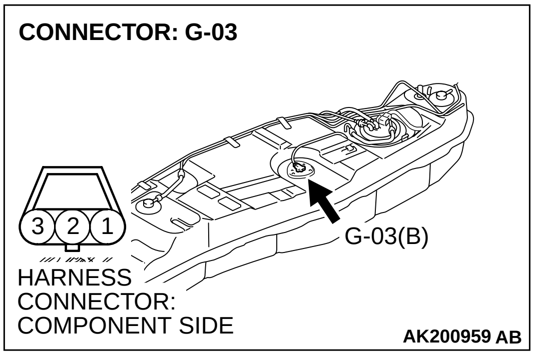


STEP 2. Check connector G-03 at the fuel tank temperature sensor for damage.

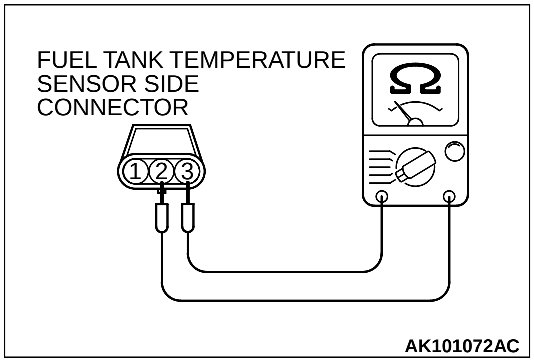
Q: Is the connector in good condition?

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

STEP 3. Check the fuel tank temperature sensor.



(1) Disconnect the fuel tank temperature sensor connector G-03



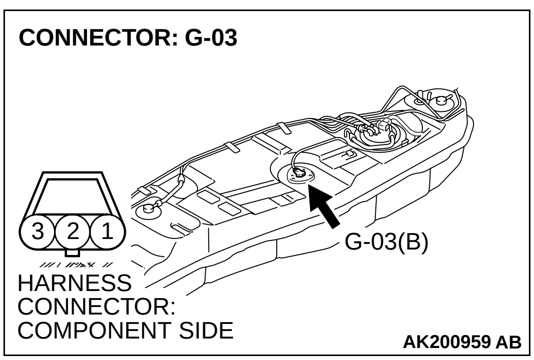
(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kiloohms

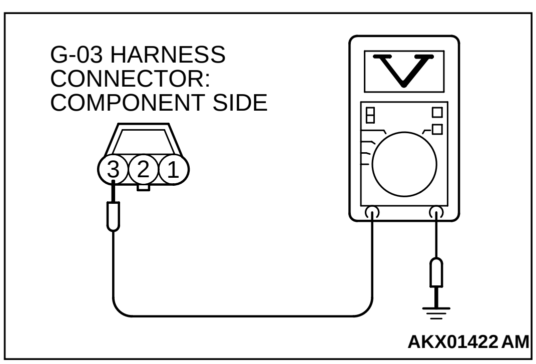
Q: Is the resistance between 0.5 and 12.0 kiloohms?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector G-03.



(1) Disconnect the connector G-03 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

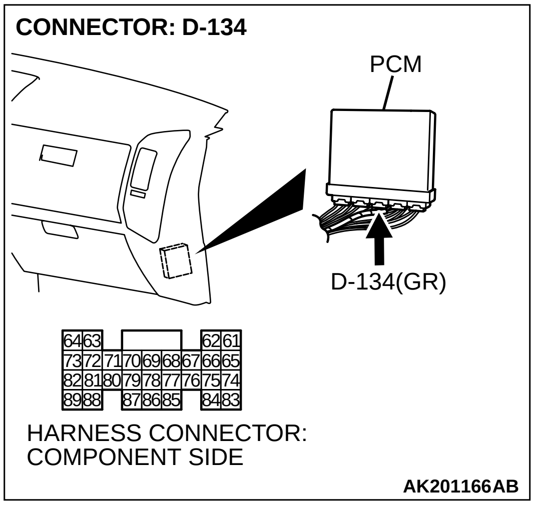


(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

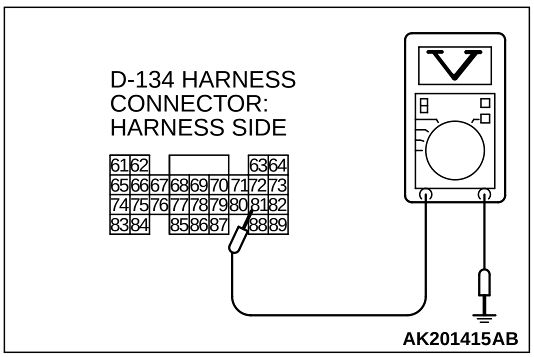
Q: Is the measured voltage between 4.5 and 4.9 volts?

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



STEP 5. Check the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the fuel tank temperature sensor connector G-03.
(3) Turn the ignition switch to the "ON" position.

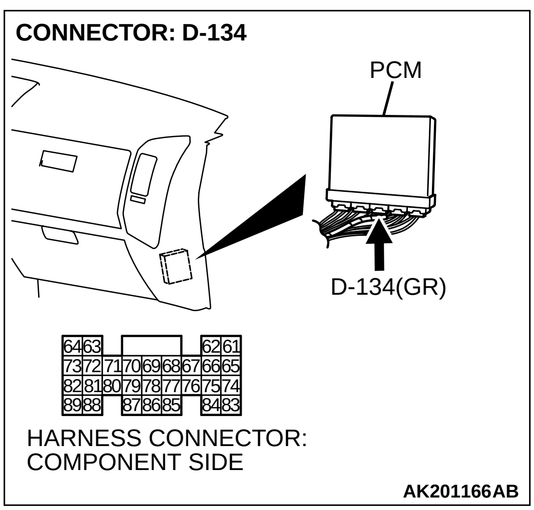


(4) Measure the voltage between terminal No. 81 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

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

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

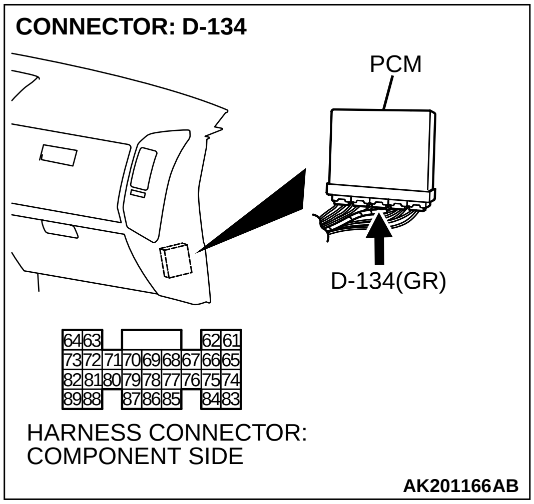


STEP 6. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Check connector D-111, E-113 and F-07 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 temperature sensor connector G-03 and PCM connector D-134 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.

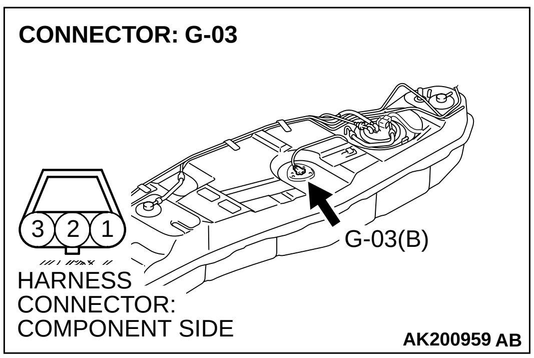


STEP 7. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

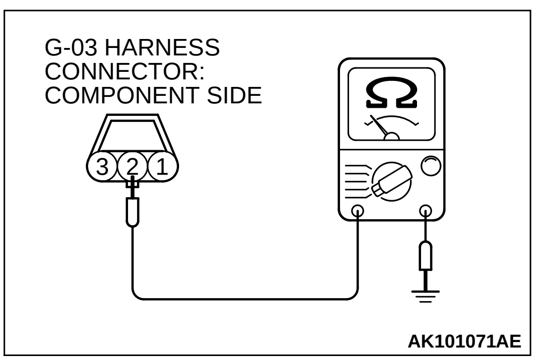
YES : Replace the PCM. Then go to Step 11.

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



STEP 8. Check the continuity at fuel tank temperature sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.



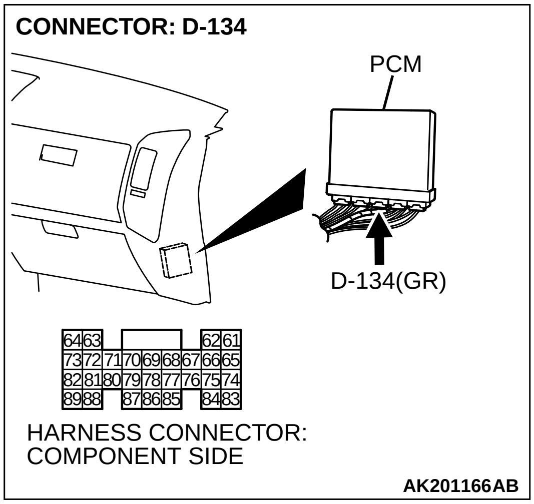
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Check connector F-07 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 G-03 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 11.

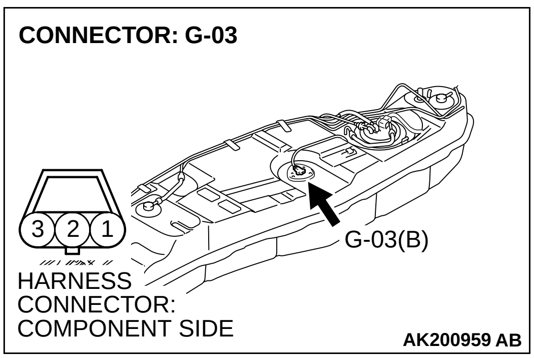


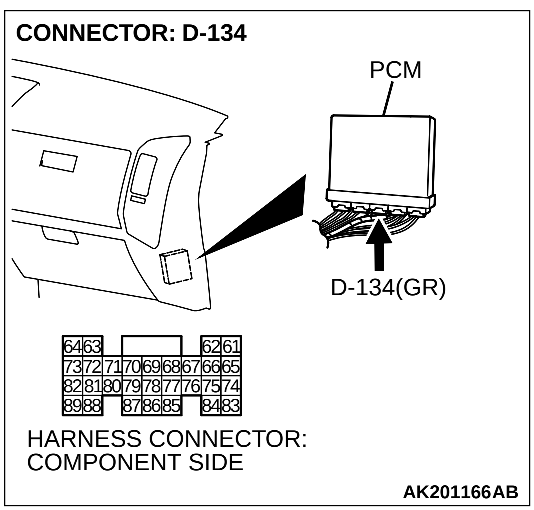
STEP 9. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check for open circuit and harness damage between fuel tank temperature sensor connector G-03 and PCM connector D-134.

NOTE: Check harness after checking intermediate connector E-113, D-111 and F-07. If 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 PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

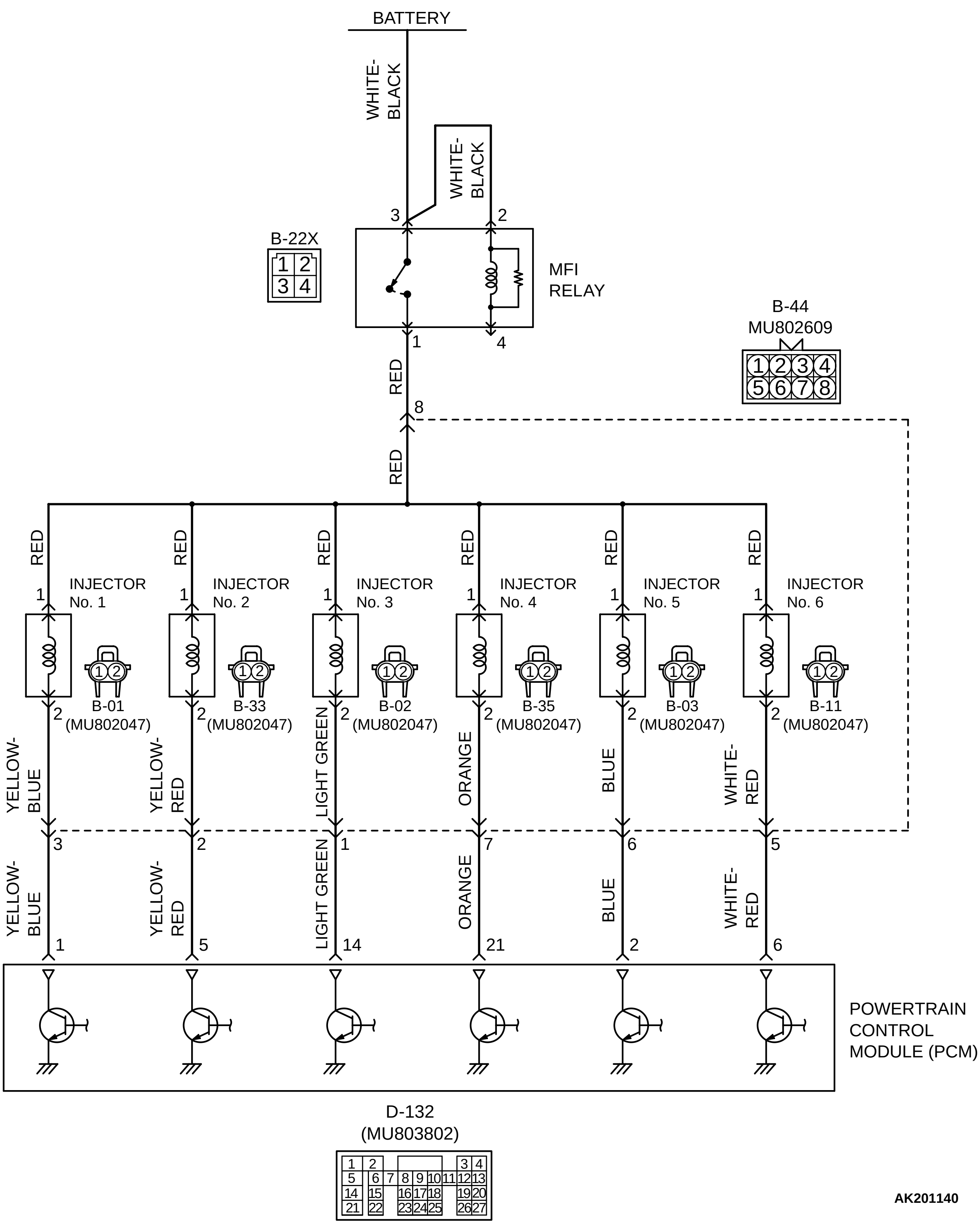
Q: Is DTC P0183 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0201: Injector Circuit Malfunction-Cylinder 1, DTC P0202: Injector Circuit Malfunction-Cylinder 2, DTC P0203: Injector Circuit Malfunction-Cylinder 3, DTC P0204: Injector Circuit Malfunction- Cylinder 4, DTC P0205: Injector Circuit Malfunction-Cylinder 5, DTC P0206: Injector Circuit Malfunction-Cylinder 6

Injector Circuit



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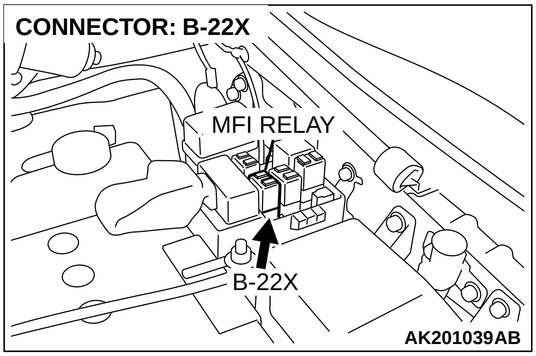
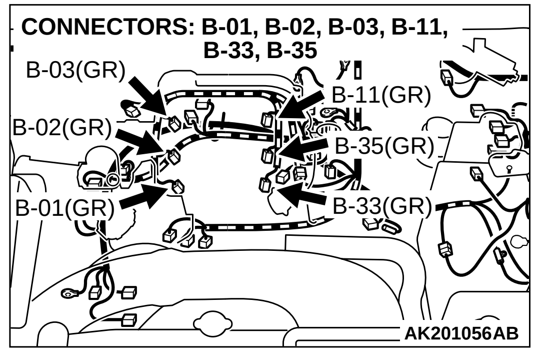
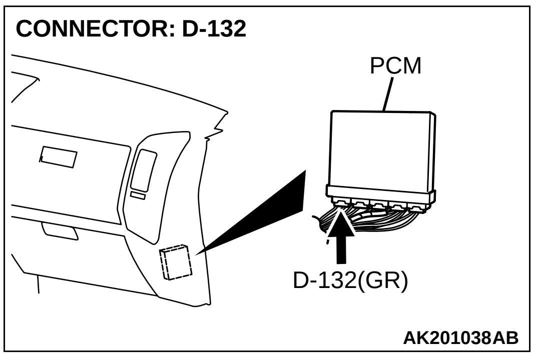
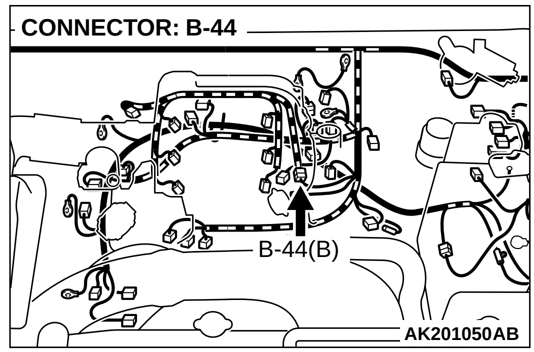








CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 1).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The PCM checks this surge voltage.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

Judgment Criteria

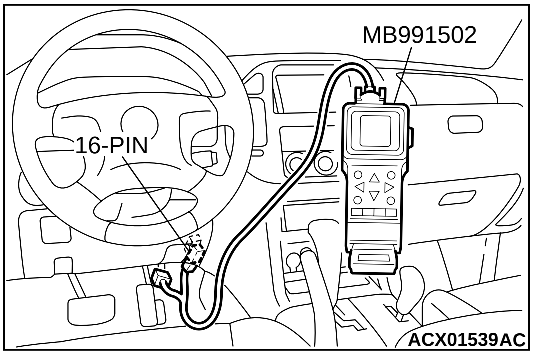
- Injector coil surge voltage (battery positive voltage + 2 volts) has not been detected for 2 seconds.

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

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MB991474: Test Harness



STEP 1. Using scan tool MB991502, check actuator test item 01, 02, 03, 04, 05, 06: Injectors.

⚠ CAUTION

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

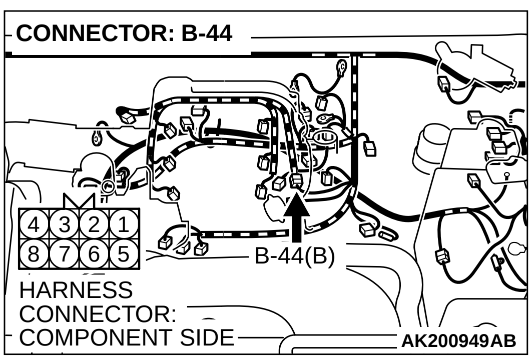
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the actuator testing mode for item 01, 02, 03, 04, 05, 06, Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- Does the idle state worsen when the injector is cut off? (Does idling become unstable or does the engine stall?)

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

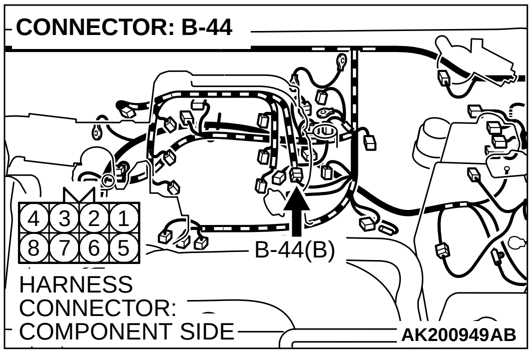


STEP 2. Check harness connector B-44 at injector intermediate connector for damage.

Q: Is the harness connector in good condition?

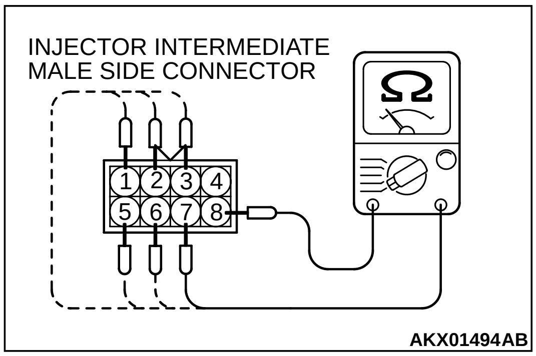
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



STEP 3. Check the injector resistance at injector intermediate connector B-44.

(1) Disconnect the injector intermediate connector B-44 and measure at the injector side.



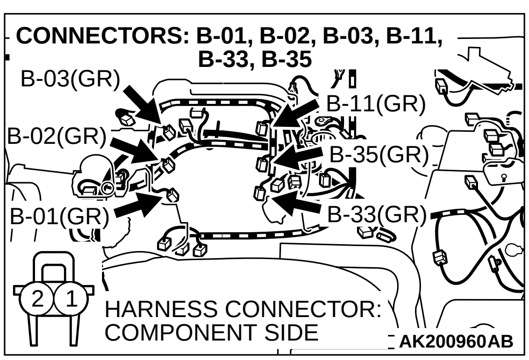
(2) Measure the resistance between each male connector side terminal.

a. Measure the resistance between terminal No. 8 and No. 3 when measuring No. 1 cylinder injector.
b. Measure the resistance between terminal No. 8 and No. 2 when measuring No. 2 cylinder injector.
c. Measure the resistance between terminal No. 8 and No. 1 when measuring No. 3 cylinder injector.
d. Measure the resistance between terminal No. 8 and No. 7 when measuring No. 4 cylinder injector.
e. Measure the resistance between terminal No. 8 and No. 6 when measuring No. 5 cylinder injector.
f. Measure the resistance between terminal No. 8 and No. 5 when measuring No. 6 cylinder injector.

- Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

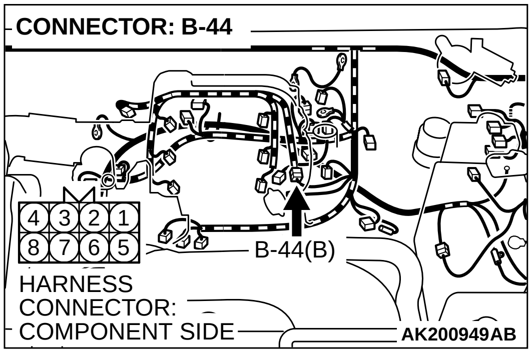


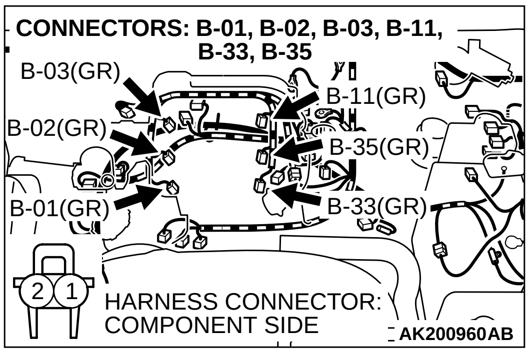
STEP 4. Check the injector connector for damage.

a. Check the harness connector B-01 when checking No. 1 cylinder injector.
b. Check the harness connector B-33 when checking No. 2 cylinder injector.
c. Check the harness connector B-02 when checking No. 3 cylinder injector.
d. Check the harness connector B-35when checking No. 4 cylinder injector.
e. Check the harness connector B-03 when checking No. 5 cylinder injector.
f. Check the harness connector B-11 when checking No. 6 cylinder injector.

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 17.





STEP 5. Check for open circuit and harness damage between injector intermediate connector and injector connector.

a. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-01 (terminal No. 1) and injector connector B-01 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 3) when checking No. 1 cylinder injector.

b. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-33 (terminal No. 1) and injector connector B-33 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 2) when checking No. 2 cylinder injector.

c. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-02 (terminal No. 1) and injector connector B-02 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 1) when checking No. 3 cylinder injector.

d. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-35 (terminal No. 1) and injector connector B-35 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 7) when checking No. 4 cylinder injector.

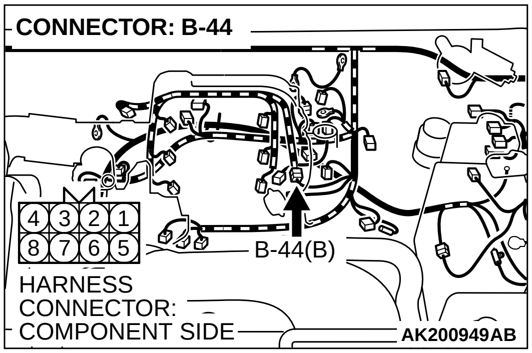
e. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-03 (terminal No. 1) and injector connector B-03 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 6) when checking No. 5 cylinder injector.

f. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-11 (terminal No. 1) and injector connector B-11 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 5) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Replace the injector. Then go to Step 17.

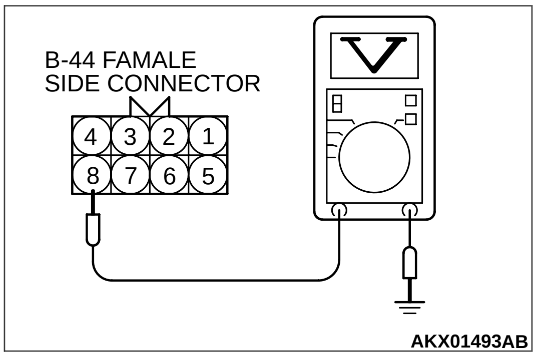
NO : Repair it. Then go to Step 17.



STEP 6. Measure the power supply voltage at injector intermediate connector B-44.

(1) Disconnect the connector B-44 and measure at the female connector relay side.

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



(3) Measure the voltage between terminal No. 8 and ground.

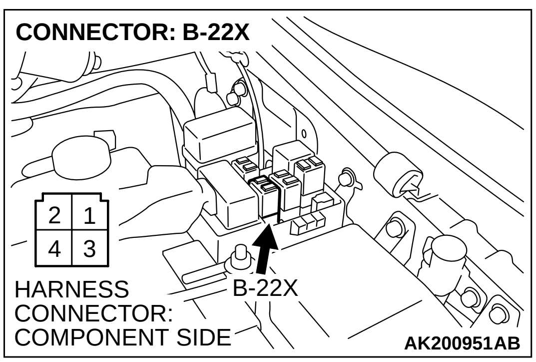
- Voltage should be battery positive voltage.

(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.

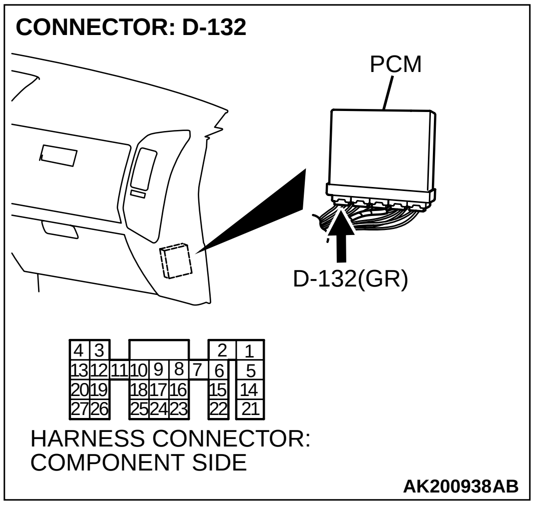


STEP 7. Check harness connector B-22X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and intermediate connector B-44 (terminal No. 8) because of open circuit or short circuit to ground or harness damage. Then go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

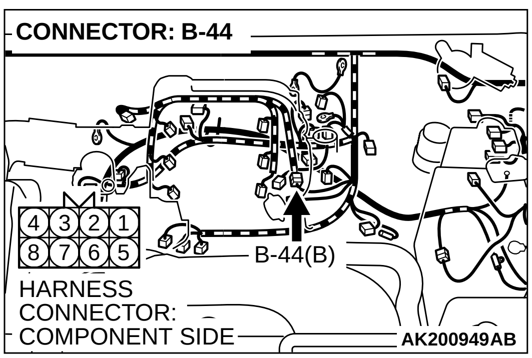


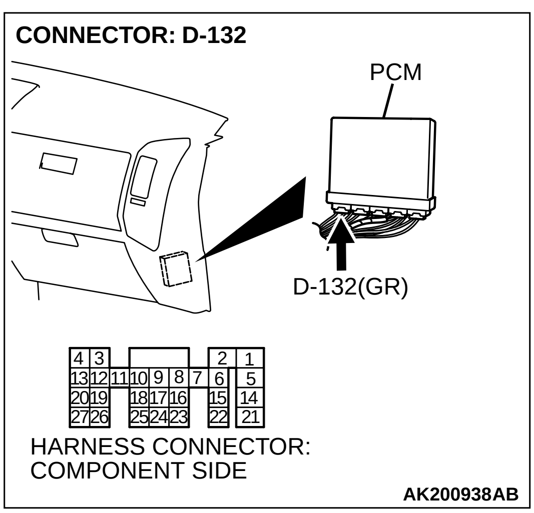
STEP 8. Check harness connector D-132 at PCM for damage.

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 17.





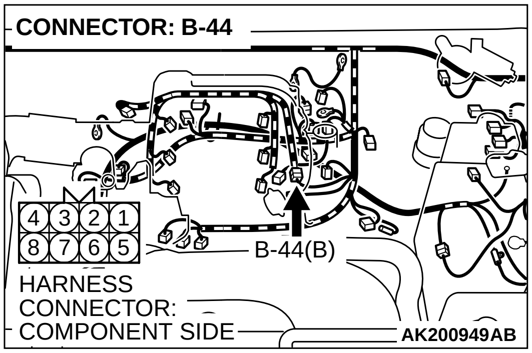
STEP 9. Check for open circuit and short circuit to ground and harness damage between injector intermediate connector and PCM connector.

a. Check the harness wire between injector intermediate connector B-44 (terminal No. 3) and PCM connector D-132 (terminal No. 1) when checking No. 1 cylinder injector.
b. Check the harness wire between injector intermediate connector B-44 (terminal No. 2) and PCM connector D-132 (terminal No. 5) when checking No. 2 cylinder injector.
c. Check the harness wire between injector intermediate connector B-44 (terminal No. 1) and PCM connector D-132 (terminal No. 14) when checking No. 3 cylinder injector.
d. Check the harness wire between injector intermediate connector B-44 (terminal No. 7) and PCM connector D-132 (terminal No. 21) when checking No. 4 cylinder injector.
e. Check the harness wire between injector intermediate connector B-44 (terminal No. 6) and PCM connector D-132 (terminal No. 2) when checking No. 5 cylinder injector.
f. Check the harness wire between injector intermediate connector B-44 (terminal No. 5) and PCM connector D-132 (terminal No. 6) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

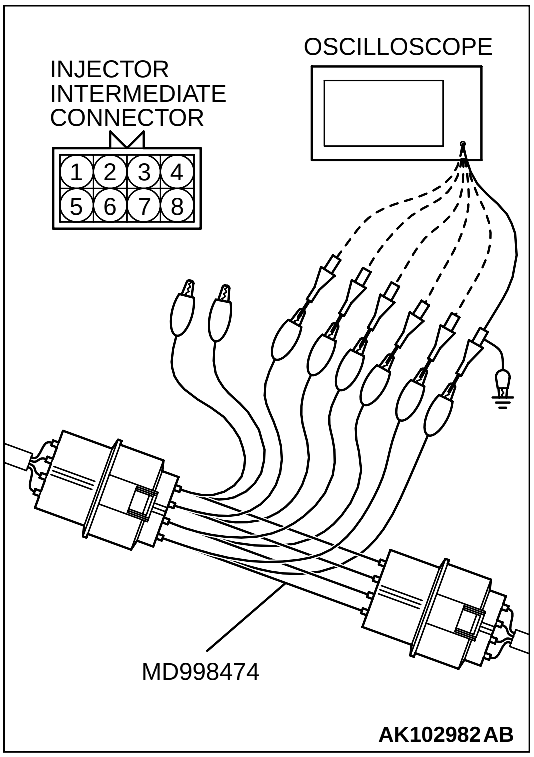
YES : Go to Step 10.

NO : Repair it. Then go to Step 17.



STEP 10. Using the oscilloscope, check the injector.

(1) Disconnect the injector intermediate connector B-44 and connect the test harness special tool (MB998474) inbetween.



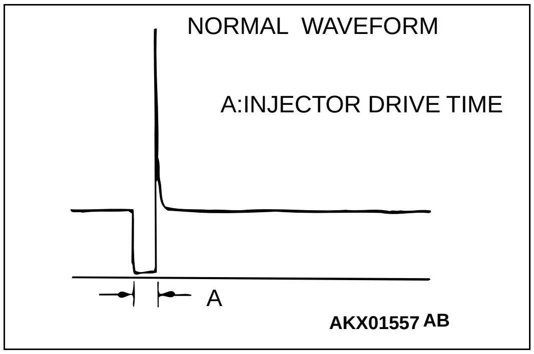
(2) Connect the oscilloscope probe to each injector intermediate connector terminal to oscilloscope each cylinder:

- Terminal No. 3 (green clip) when checking No. 1 cylinder injector.
- Terminal No. 2 (white clip) when checking No. 2 cylinder injector.
- Terminal No. 1 (blue clip) when checking No. 3 cylinder injector.
- Terminal No. 7 (yellow clip) when checking No. 4 cylinder injector.
- Terminal No. 6 (red clip) when checking No. 5 cylinder injector.
- Terminal No. 5 (black clip) when checking No. 6 cylinder injector.

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

- *PCM terminal No. 1 when checking No. 1 cylinder injector.*
- *PCM terminal No. 9 when checking No. 2 cylinder injector.*
- *PCM terminal No. 24 when checking No. 3 cylinder injector.*
- *PCM terminal No. 2 when checking No. 4 cylinder injector.*
- *PCM terminal No. 10 when checking No. 5 cylinder injector.*
- *PCM terminal No. 25 when checking No. 6 cylinder injector.*

(3) Start the engine and run at idle.

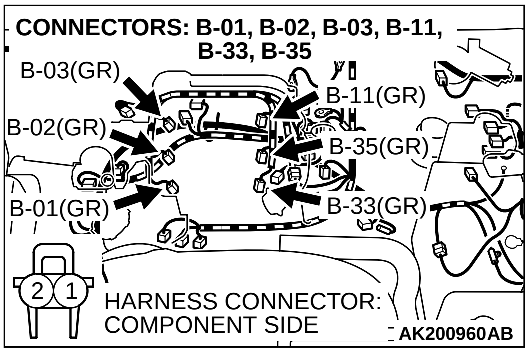


(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : Go to Step 13.
NO : Go to Step 11.

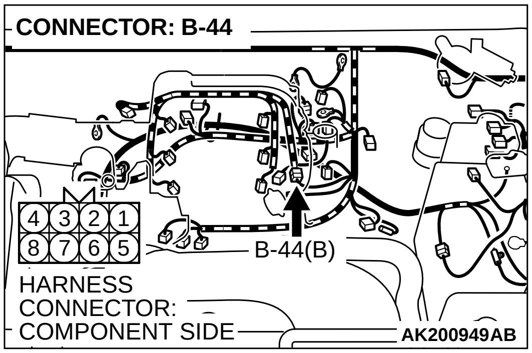


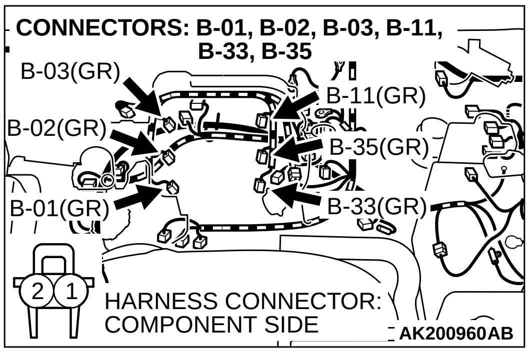
STEP 11. Check the injector connector for damage.

a. Check harness connector B-01 when checking No. 1 cylinder injector.
b. Check harness connector B-33 when checking No. 2 cylinder injector.
c. Check harness connector B-02 when checking No. 3 cylinder injector.
d. Check harness connector B-35 when checking No. 4 cylinder injector.
e. Check harness connector B-03 when checking No. 5 cylinder injector.
f. Check harness connector B-11 when checking No. 6 cylinder injector.

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 17.





STEP 12. Check for short circuit to ground between injector intermediate connector and injector connector.

a. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-01 (terminal No. 1) and injector connector B-01 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 3) when checking No. 1 cylinder injector.

b. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-33 (terminal No. 1) and injector connector B-33 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 2) when checking No. 2 cylinder injector.

c. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-02 (terminal No. 1) and injector connector B-02 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 1) when checking No. 3 cylinder injector.

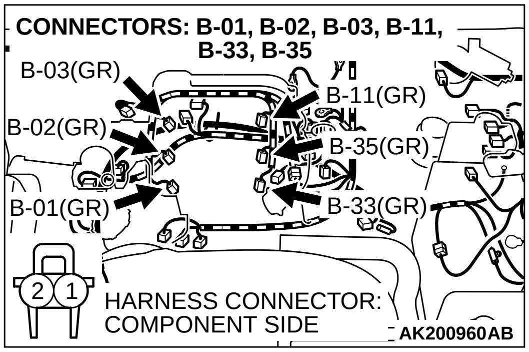
d. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-35 (terminal No. 1) and injector connector B-35 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 7) when checking No. 4 cylinder injector.

e. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-03 (terminal No. 1) and injector connector B-03 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 6) when checking No. 5 cylinder injector.

f. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-11 (terminal No. 1) and injector connector B-11 (terminal No. 2) and injector intermediate connector B-44 (terminal No. 5) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Replace the PCM Then go to Step 17.
NO : Repair it. Then go to Step 17.

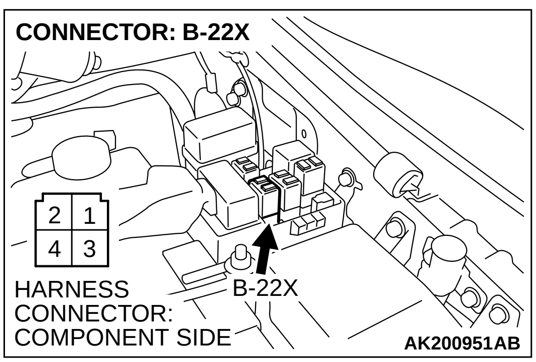


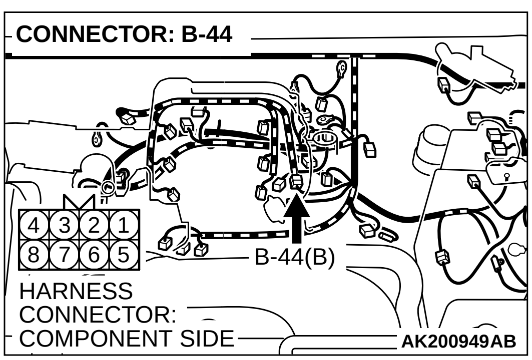
STEP 13. Check the injector connector for damage.

a. Check harness connector B-01 when checking No. 1 cylinder injector.
b. Check harness connector B-33 when checking No. 2 cylinder injector.
c. Check harness connector B-02 when checking No. 3 cylinder injector.
d. Check harness connector B-35 when checking No. 4 cylinder injector.
e. Check harness connector B-03 when checking No. 5 cylinder injector.
f. Check harness connector B-11 when checking No. 6 cylinder injector.

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 17.

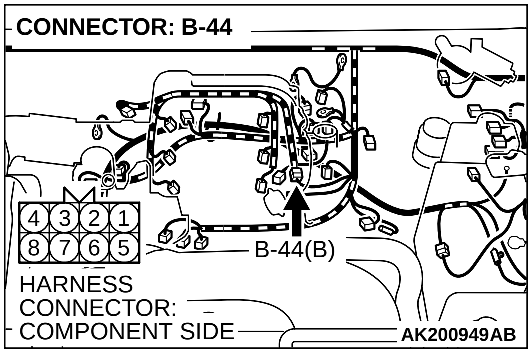




STEP 14. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and injector intermediate connector B-44 (terminal No. 8).

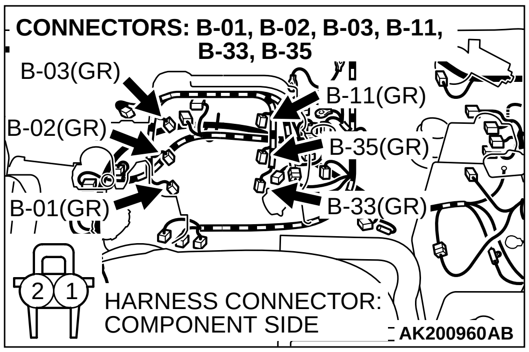
Q: Is the harness wire in good condition?

YES : Go to Step 15.
NO : Repair it. Then go to Step 17.



STEP 15. Check for harness damage between injector intermediate connector and injector connector.

a. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-01 (terminal No. 1) when checking No. 1 cylinder injector.
b. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-33 (terminal No. 1) when checking No. 2 cylinder injector.
c. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-02 (terminal No. 1) when checking No. 3 cylinder injector.
d. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-35 (terminal No. 1) when checking No. 4 cylinder injector.
e. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-03 (terminal No. 1) when checking No. 5 cylinder injector.
f. Check the harness wire between injector intermediate connector B-44 (terminal No. 8) and injector connector B-11 (terminal No. 1) when checking No. 6 cylinder injector.

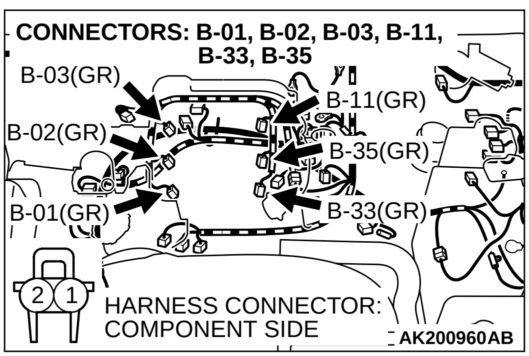


Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 17.

STEP 16. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(3) Read in the diagnostic trouble code (DTC).



Q: Is DTC P0201, P0202, P0203, P0204, P0205 and P0206 set?

YES : Replace the PCM. Then go to Step 17.
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 17. Test the OBD-II drive cycle.

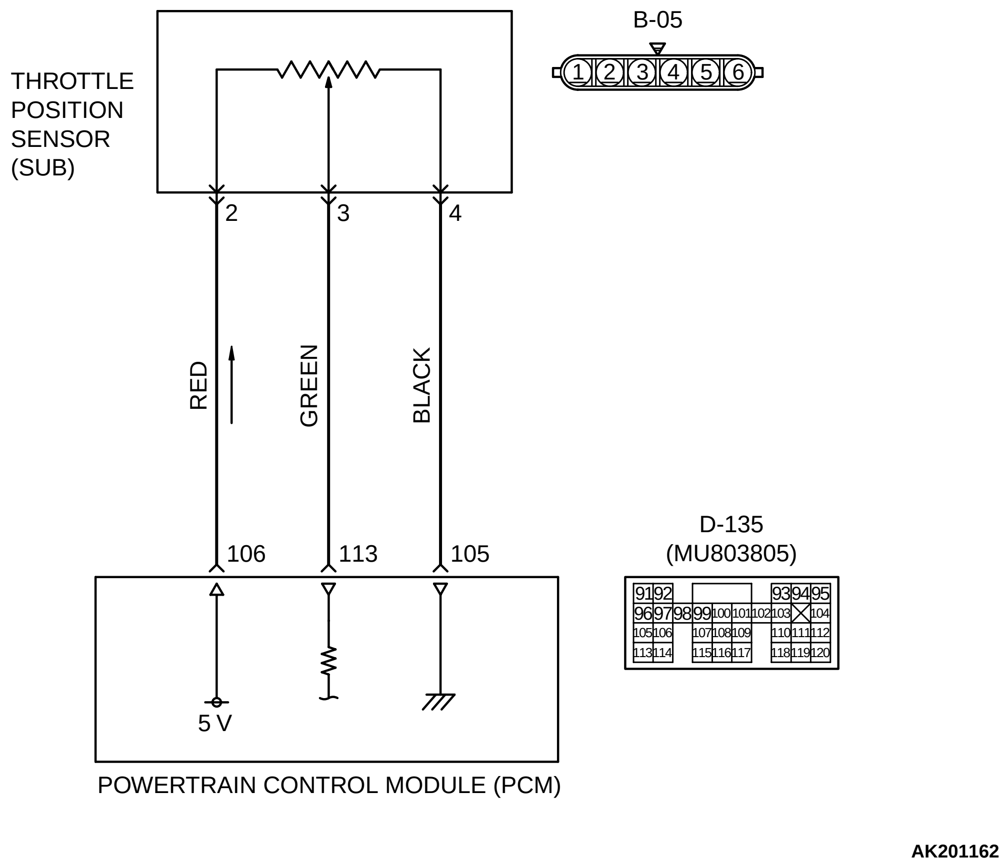
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

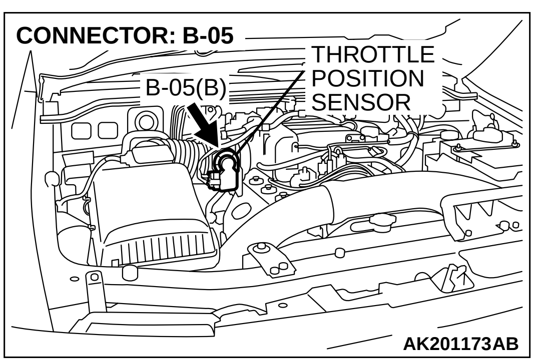
Q: Is DTC P0201, P0202, P0203, P0204, P0205 and P0206 set?

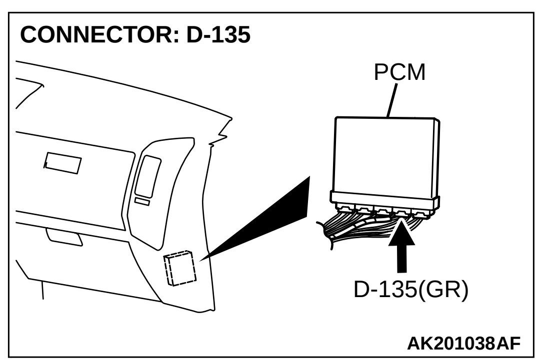
YES : Retry the troubleshooting.
NO : The inspection is complete.

P0222 Throttle Position Sensor (Sub) Circuit Low Input

Throttle Position Sensor (Sub) Circuit







CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS (sub) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resister between the TPS (sub) output terminal (terminal No. 3) and ground terminal will increase according to the rotation.

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

DTC SET CONDITIONS

Check Conditions
- Ignition switch "ON" position.

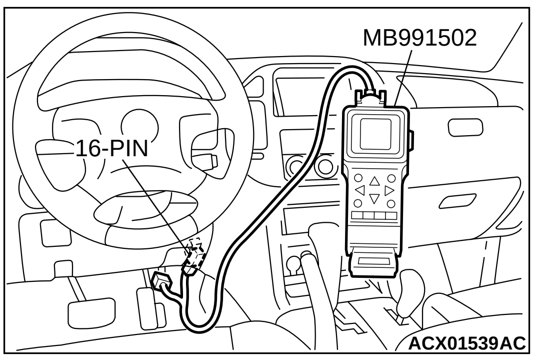
Judgement Criteria
- TPS (main) output voltage should be 2.25 volts or more for 0.5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- TPS failed or maladjusted.
- Open or shorted TPS (sub) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

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

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



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

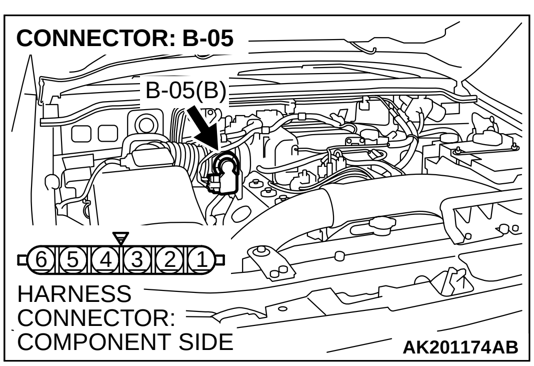
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
   - Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
   - Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.
(7) 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.

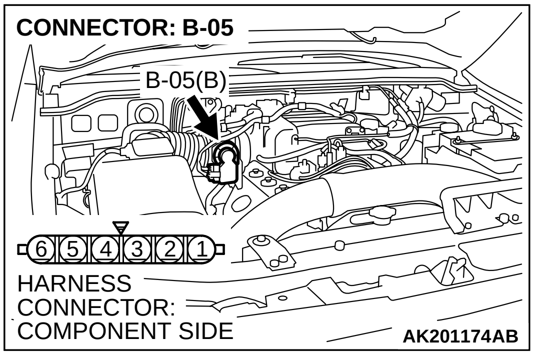
STEP 2. Check connector B-05 at throttle position sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.

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



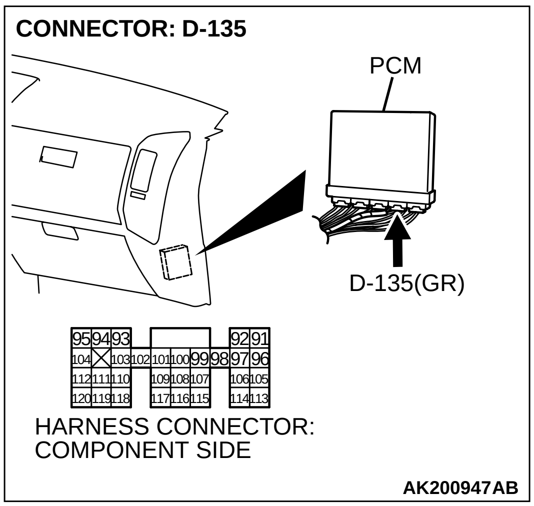
STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground
- Voltage should be between 4.8 and 5.2 volts.

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

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

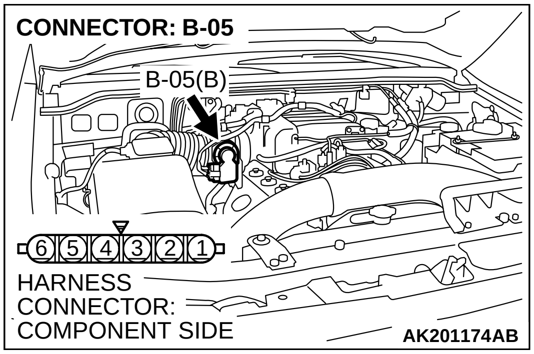
YES : Go to Step 7.
NO : Go to Step 4.

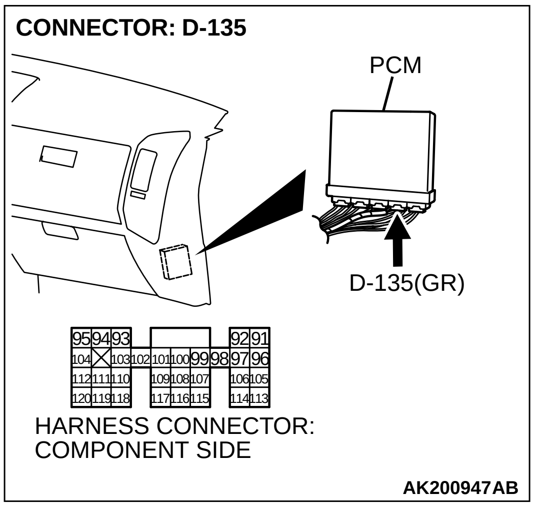


STEP 4. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





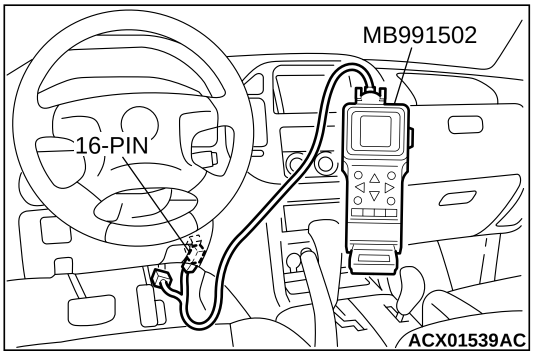
STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 12.

STEP 6. Using scan tool MB991502, check data list item 14: Throttle Position Sensor (sub).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

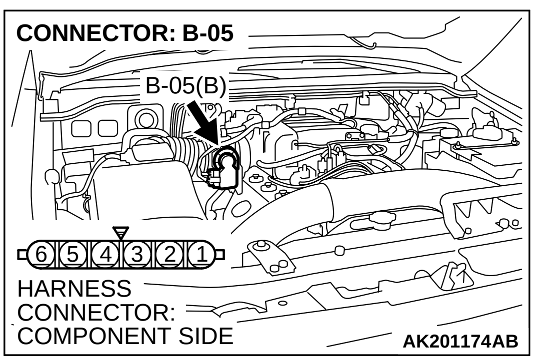
(7) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

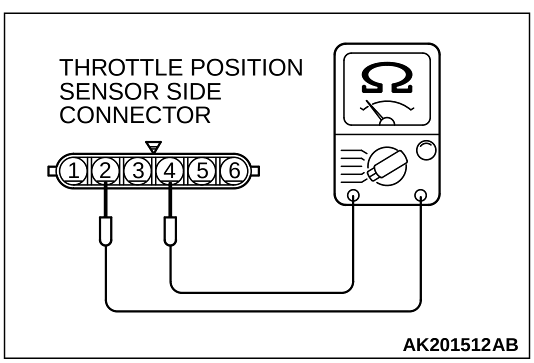
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

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

STEP 7. Check the throttle position sensor.



(1) Disconnect the connector B-05.



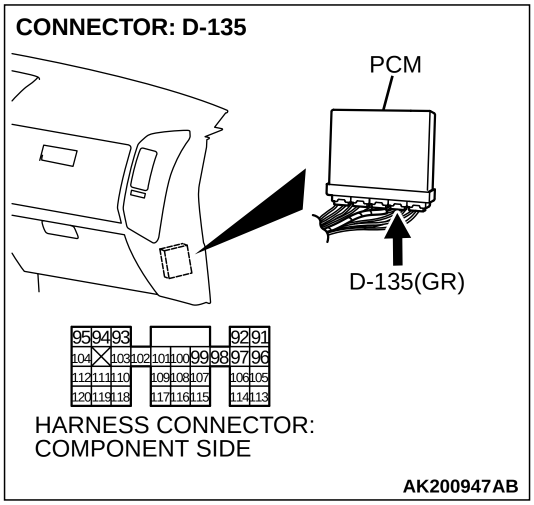
(2) Measure the resistance between throttle position sensor side connector terminals No. 2 and No. 4

Standard value: 2 – 4 kiloohms

Q: Is the measured resistance between 2 and 4 kiloohms?

YES : Go to Step 8.

NO : Replace the throttle body ASSY. Then go to Step 12.

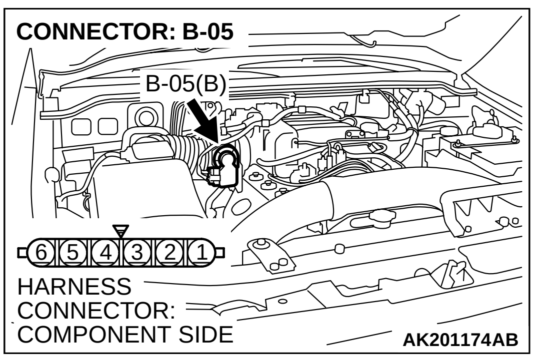


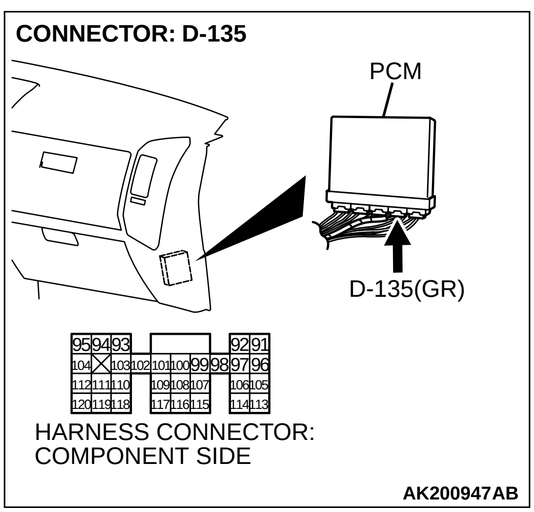
STEP 8. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

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





STEP 9. Check for harness damage between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

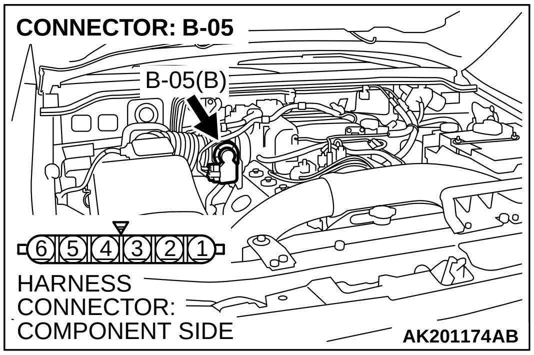
NO : Repair it. Then go to Step 12.

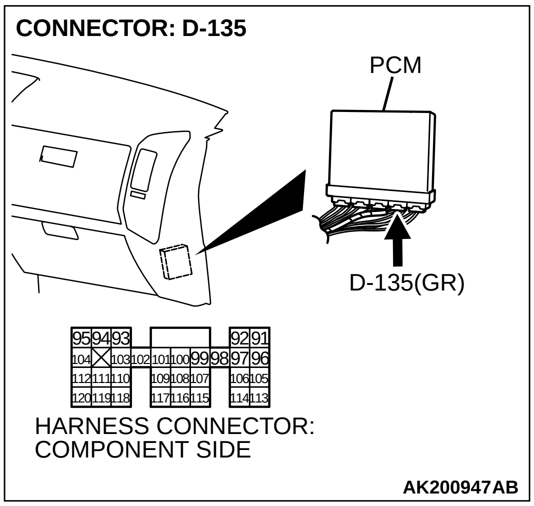
STEP 10. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-05 (terminal No. 3) and PCM connector D-135 (terminal No. 113).

Q: Is the harness wire in good condition?

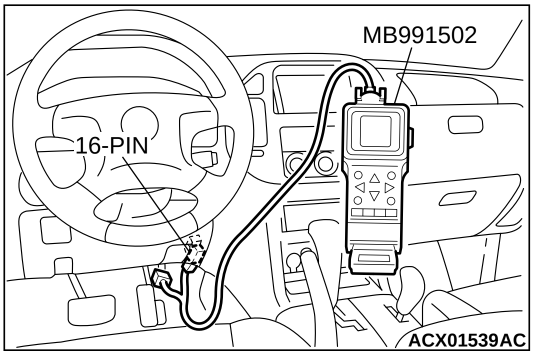
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Using scan tool MB991502, check data list item 14: Throttle Position Sensor (sub).



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

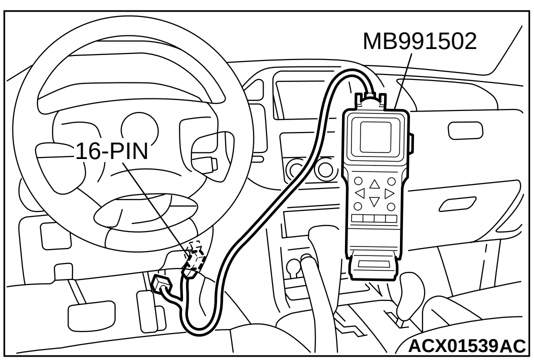
(7) Turn the ignition switch to the "LOCK"(OFF) position.

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 PCM. Then go to Step 12.

STEP 12. Using scan tool MB991502, read the diagnostic trouble code (DTC).



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

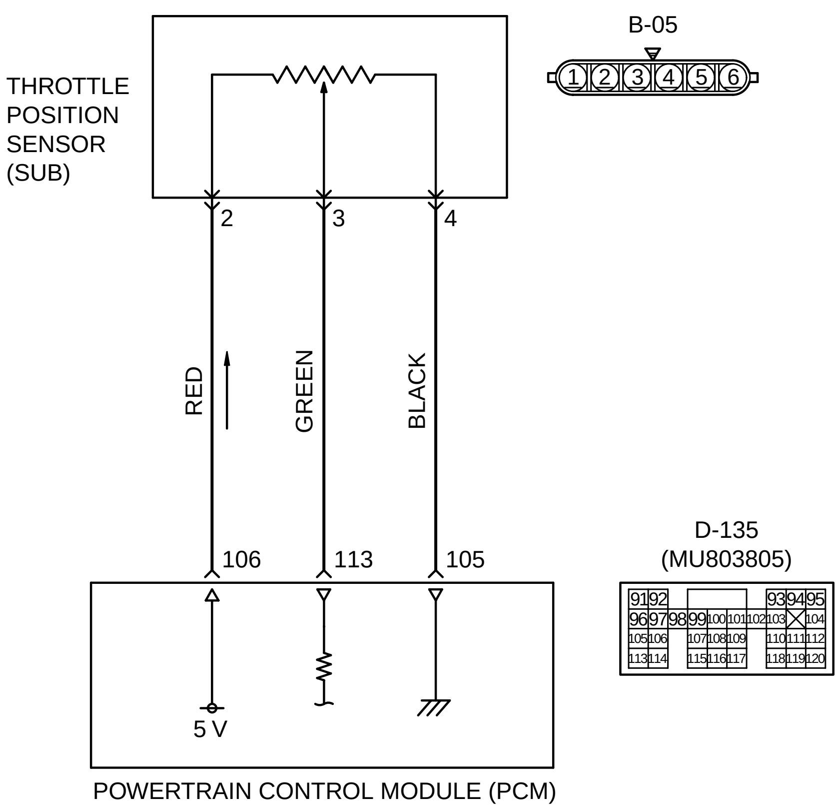
Q: Is DTC P0222 set?

YES : Retry the troubleshooting.

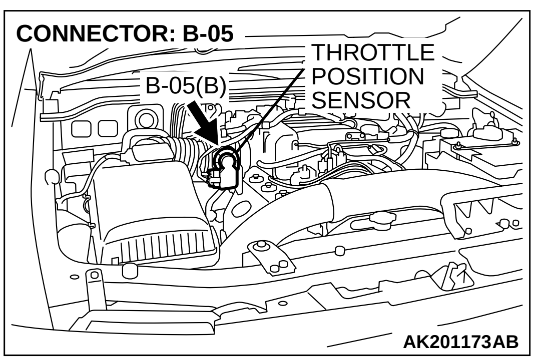
NO : The inspection is complete.

P0223 Throttle Position Sensor (Sub) Circuit High Input

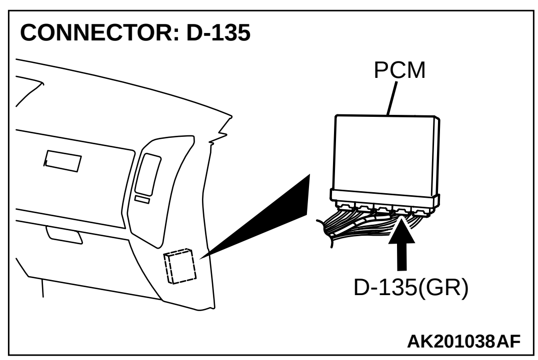
Throttle Position Sensor (Sub) Circuit



AK201162



AK201173AB



AK201038AF

CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS (sub) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded with PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resister between the TPS (sub) output terminal (terminal No. 3) and ground terminal will increase according to the rotation.

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

DTC SET CONDITIONS

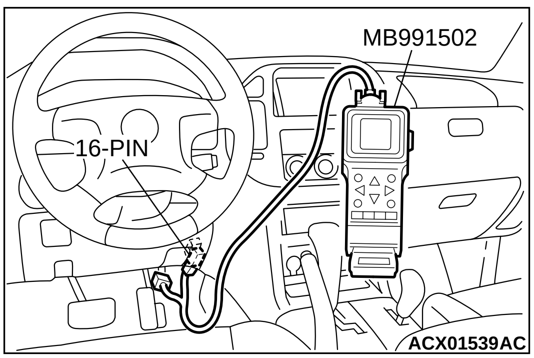
Check Conditions
- Ignition switch "ON" position.

Judgement Criteria
- TPS (sub) output voltage should be 4.8 volts or more for 0.5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- TPS failed or maladjusted.
- Open or shorted TPS (sub) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

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



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

⚠ CAUTION

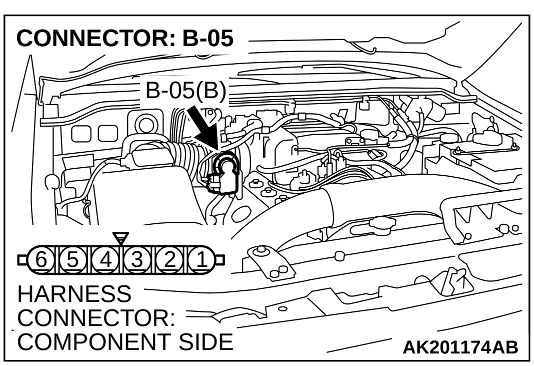
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
  - Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
  - Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.
(7) 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.



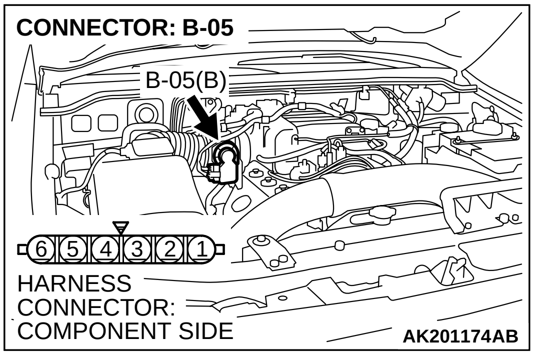
STEP 2. Check connector B-05 at throttle position sensor for damage.

Q: Is the connector in good condition?

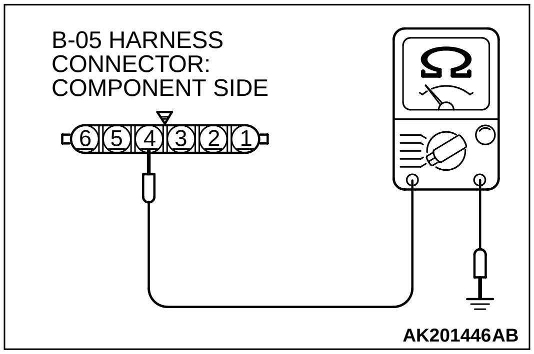
YES : Go to Step 3.

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

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



(1) Disconnect the connector B-05 and measure at the harness side.

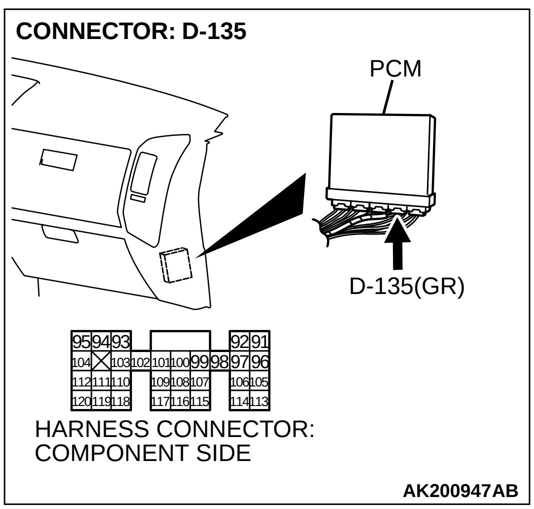


(2) Measure the continuity between terminal No. 4 and ground
- Should be less than 2 ohms.

Q: Is the continuity normal?

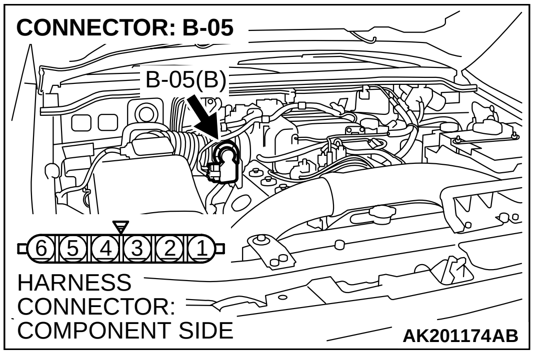
YES : Go to Step 7.
NO : Go to Step 4.

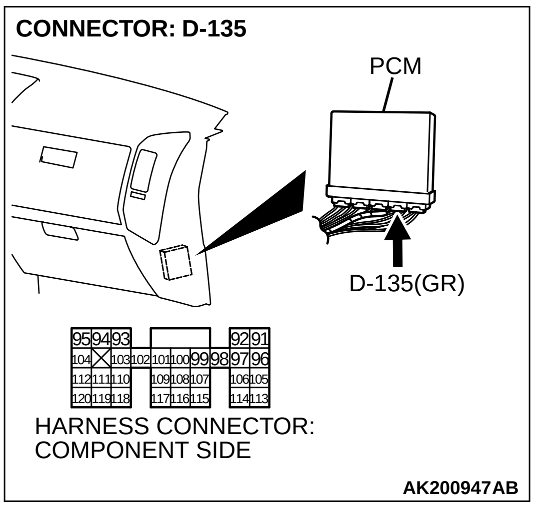
STEP 4. Check connector D-135 at PCM for damage.



Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



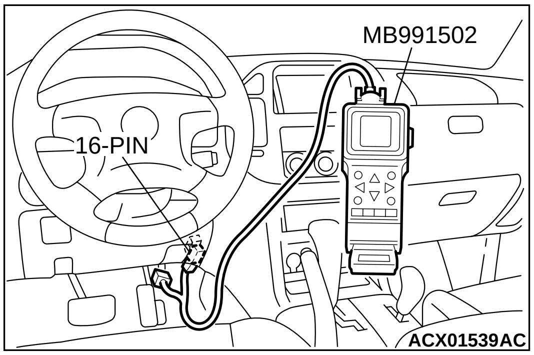


STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-05 (terminal No. 4) and PCM connector D-135 (terminal No. 105).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 9.



STEP 6. Using scan tool MB991502, check data list item 14: Throttle Position Sensor (sub).

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

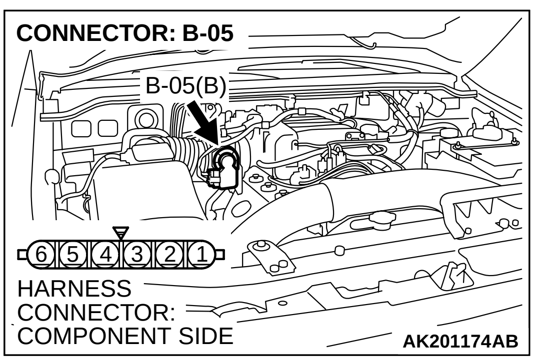
(7) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

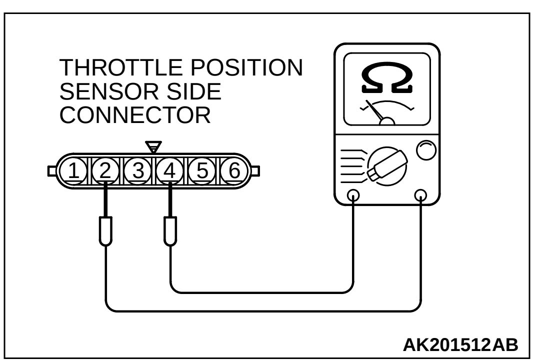
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

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

STEP 7. Check the throttle position sensor.



(1) Disconnect the connector B-05.



(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 4.

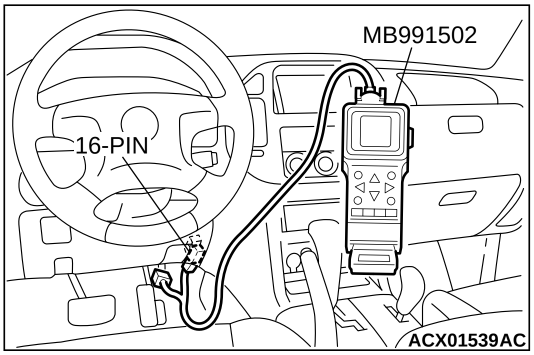
Standard value: 2 – 4 kiloohms

Q: Is the measured resistance between 2 and 4 kiloohms?

YES : Go to Step 8.

NO : Replace the throttle body ASSY. Then go to Step 9.

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



⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991348) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be between 3.8 and 4.9 volts when the throttle valve is fully open with your finger.

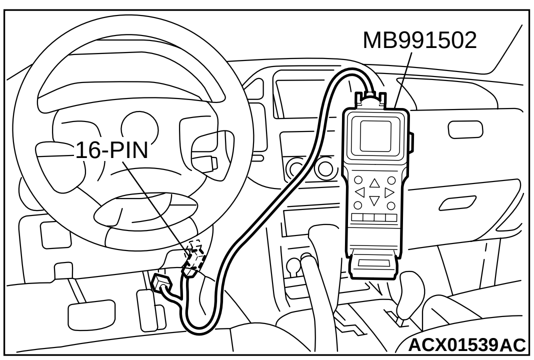
(7) Turn the ignition switch to the "LOCK"(OFF) position.

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 PCM. Then go to Step 9.

STEP 9. Using scan tool MB991502, read the diagnostic trouble code (DTC).



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0223 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

Random Misfire Circuit

- Refer to DTC P0335 – Crankshaft Position Sensor Circuit. P.13Ac-360
- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0335 – Crankshaft Position Sensor Circuit. P.13Ac-360
- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 30 and 60 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. Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).
- The throttle deviation is –0.059 V/10 ms to +0.059 V/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 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

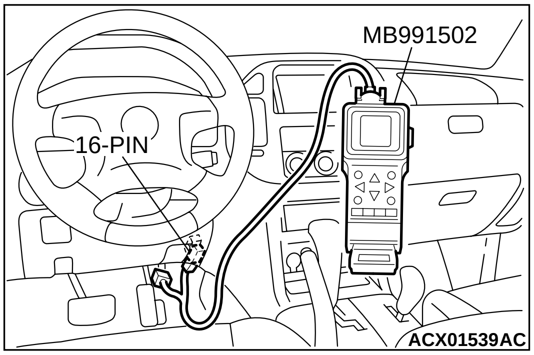
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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

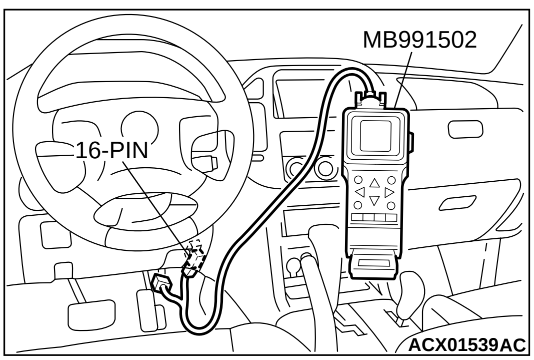
⚠ CAUTION

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

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to , DTC P0335 – Crankshaft Position Sensor Circuit Malfunction. P.13Ac-360

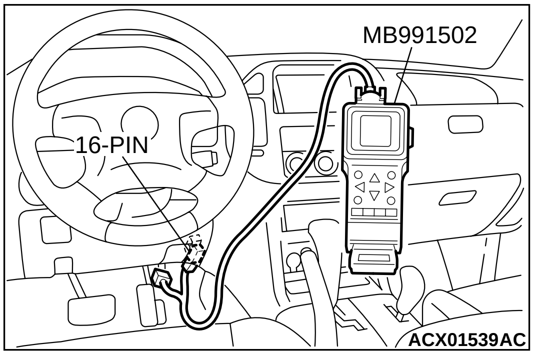


STEP 2. Using scan tool MB991502, check data list item 81 <bank 1> and 83 <bank2>: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 81<bank 1> and 83 <bank2>, Long-Term Fuel 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.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to, DTC P0171 – System too Lean (bank 1) P.13Ac-273, DTC P0172 – System too Rich (bank 1) P.13Ac-280, DTC P0174 – System too Lean (bank 2) P.13Ac-284, DTC P0175 – System too Rich (bank 2) P.13Ac-291.

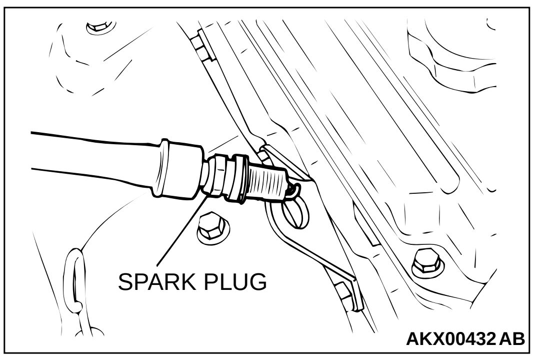


STEP 3. Using scan tool MB991502, check data list item 82 <bank 1> and 84 <bank2>: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 82<bank 1> and 84 <bank2>, Short-Term Fuel 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.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 – System too Lean (bank 1) P.13Ac-273, DTC P0172 – System too Rich (bank 1) P.13Ac-280, DTC P0174 – System too Lean (bank 2) P.13Ac-284, DTC P0175 – System too Rich (bank 2) P.13Ac-291.

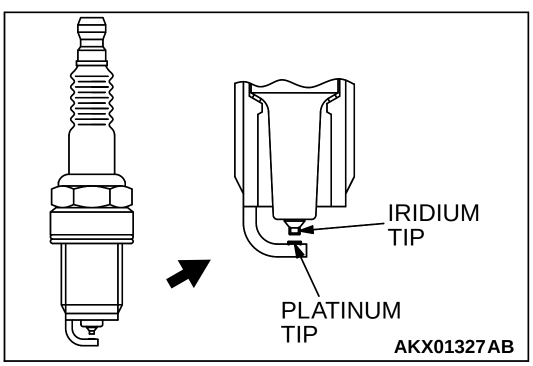


STEP 4. Check the ignition coil spark.

(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

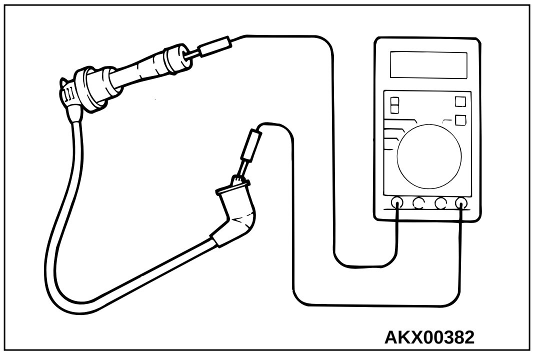
Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

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

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)
Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 6.
NO : Replace the faulty spark plug. Then go to Step 13.



STEP 6. Check the spark plug cable.

(1) Check the cap and coating for cracks.

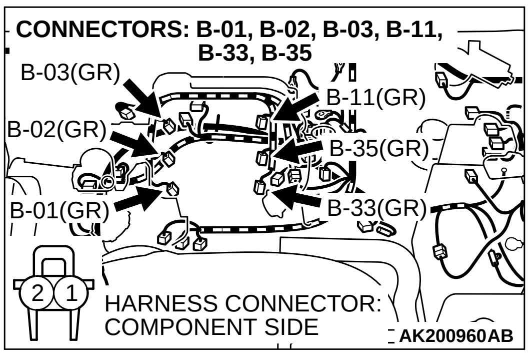
(2) Measure the resistance.

Limit: maximum 9 kiloohms

Q: Is the resistance normal?

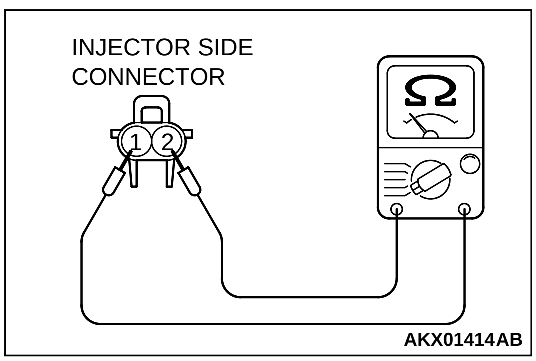
YES : Refer to , INSPECTION PROCEDURE 31 – Ignition Circuit System P.13Ad-99.

NO : Replace the faulty spark plug cable. Then go to Step 13.



STEP 7. Check the injector.

(1) Disconnect the injector connector.



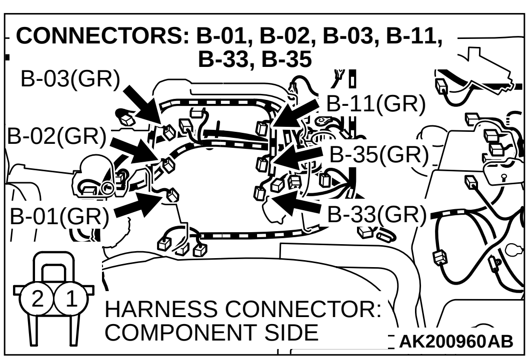
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Go to Step 8.

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

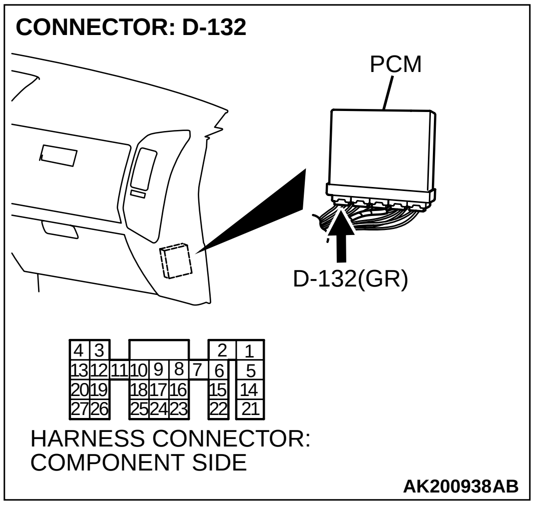


STEP 8. Check harness connector B-01, B-33, B-02, B-35, B-03, B-11 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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

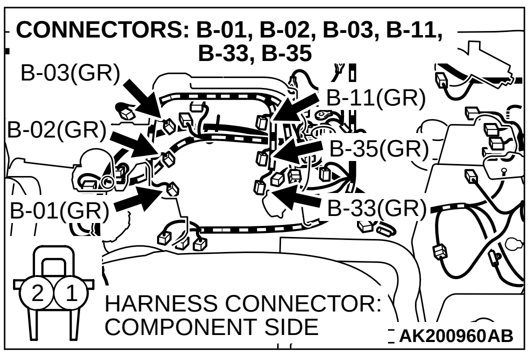


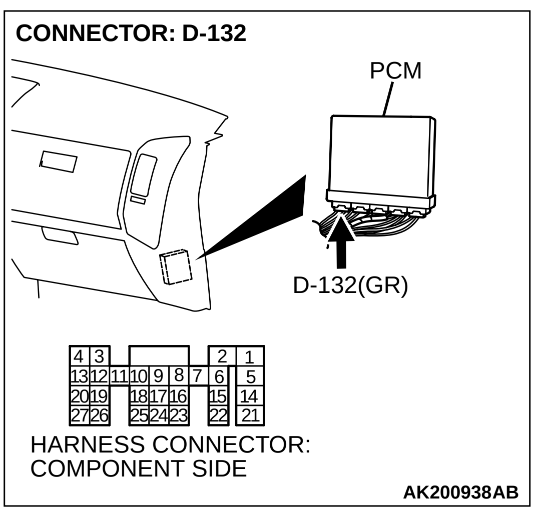
STEP 9. Check harness connector D-132 at PCM for damage.

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 13.





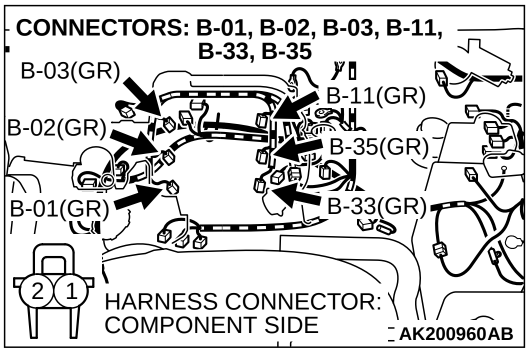
STEP 10. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) when checking No. 1 cylinder injector.
b. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 5) when checking No. 2 cylinder injector.
c. Check the harness wire between injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 14) when checking No. 3 cylinder injector.
d. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 21) when checking No. 4 cylinder injector.
e. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 2) when checking No. 5 cylinder injector.
f. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 6) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 13.



STEP 11. Check the following items.

(1) Check the following items, and repair or replace the defective component.

a. Check for skipped timing belt teeth.

b. Check compression.

c. EGR valve failed.

Q: Are there any abnormalities?

YES : Go to Step 12.

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

STEP 12. Replace the injector.

(1) Replace the injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

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

NO : The inspection is complete.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

Q: Is DTC P0300 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected, DTC P0305: Cylinder 5 Misfire Detected, DTC P0306: Cylinder 6 Misfire Detected

Misfire Detected Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13Ac-318

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 30 and 60 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 V/10 ms to +0.059 V/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 (1,742°F)].

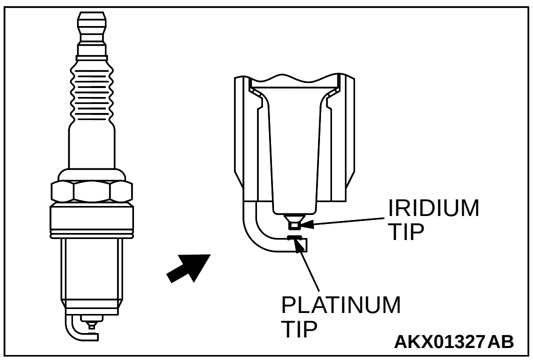
or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

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

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

DIAGNOSIS



STEP 1. Check the spark plugs.

⚠ CAUTION

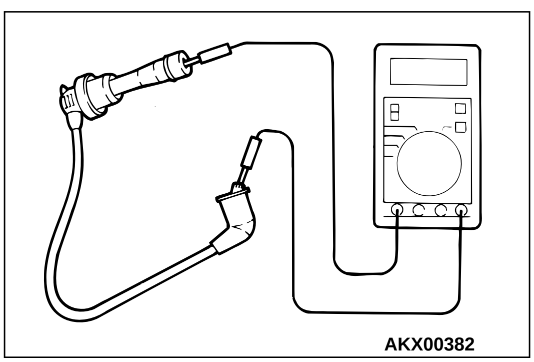
Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

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

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)
Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 2.
NO : Replace the spark plug. Then go to Step 9.



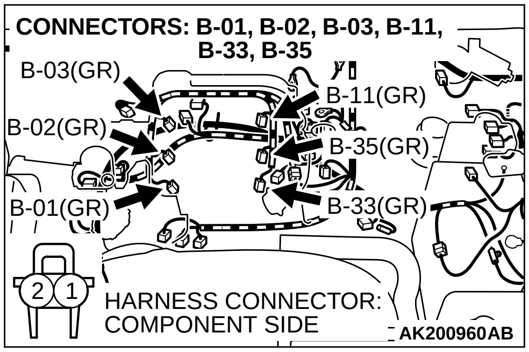
STEP 2. Check the spark plug cable.

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

Limit: maximum 9 kiloohms

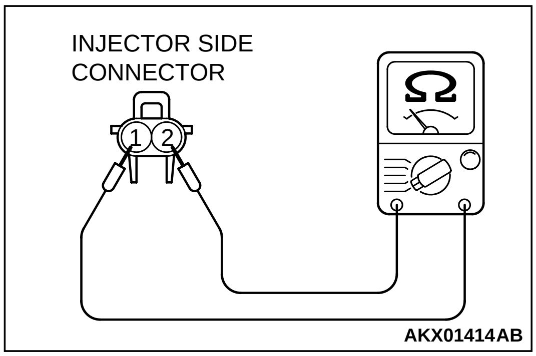
Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the spark plug cable. Then go to Step 9.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-01, B-33, B-02, B-35, B-03, B-11.



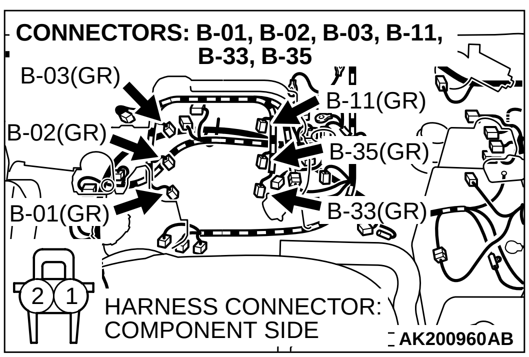
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?

YES : Go to Step 4.

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



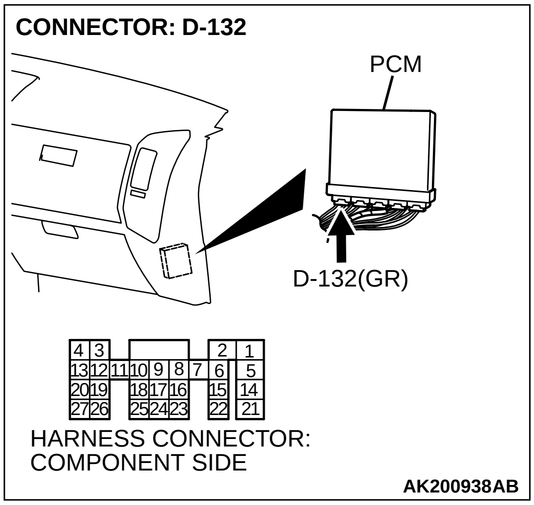
STEP 4. Check harness connector B-01, B-33, B-02, B-35, B-03, B-11 at injector for damage.

a. Check the harness connector B-01 when checking No. 1 cylinder injector.
b. Check the harness connector B-33 when checking No. 2 cylinder injector.
c. Check the harn.ess connector B-02 when checking No. 3 cylinder injector.
d. Check the harness connector B-35 when checking No. 4 cylinder injector.
e. Check the harness connector B-03 when checking No. 5 cylinder injector.
f. Check the harness connector B-11 when checking No. 6 cylinder injector.

Q: Is the harness 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.

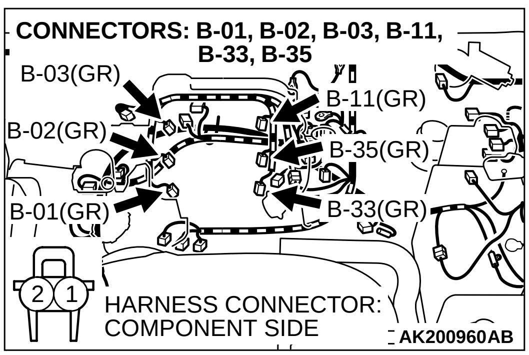


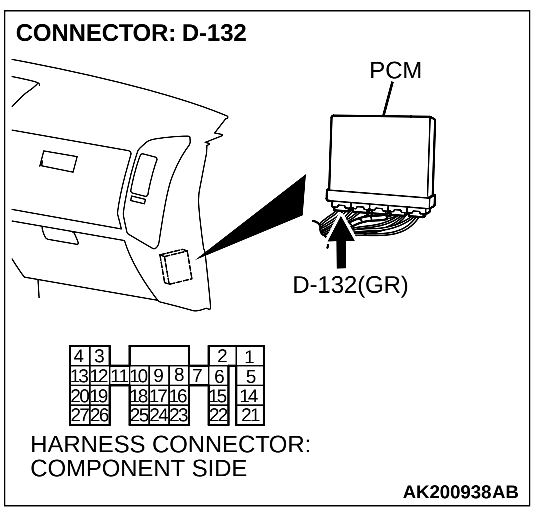
STEP 5. Check harness connector D-132 at PCM for damage.

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 9.





STEP 6. Check for harness damage between injector connector and PCM connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) when checking No. 1 cylinder injector.
b. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 5) when checking No. 2 cylinder injector.
c. Check the harness wire between injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 14) when checking No. 3 cylinder injector.
d. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 21) when checking No. 4 cylinder injector.
e. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 2) when checking No. 5 cylinder injector.
f. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 6) when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 9.

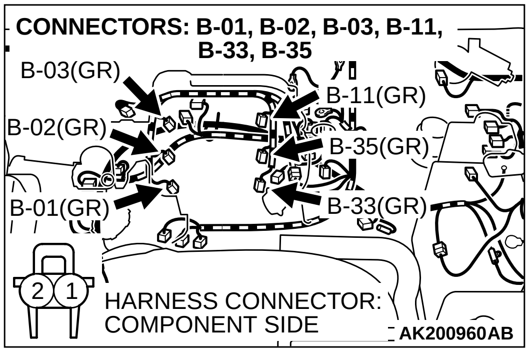
STEP 7. Check the compression.

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

Q: Are there any abnormalities?

YES : Go to Step 8.

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



STEP 8. Replace the injector.

(1) Replace the injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

(3) Read in the diagnostic trouble code (DTC).

Q: Are DTC P0301, P0302, P0303, P0304, P0305 and P0306 sets?

YES : Replace the PCM. Then go to Step 9.

NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

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

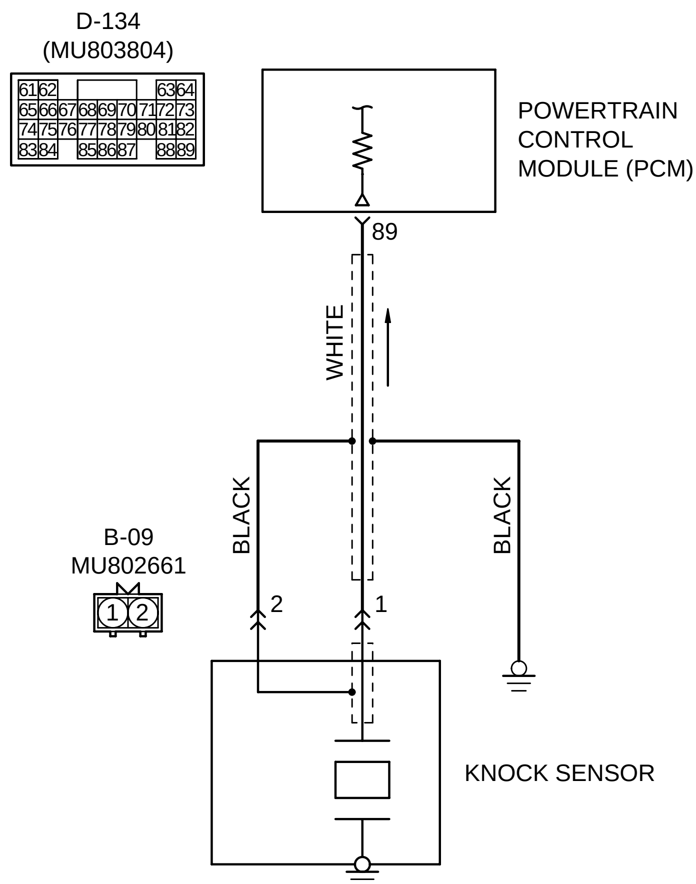
Q: Are DTC P0301, P0302, P0303, P0304, P0305 and P0306 sets?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0325: Knock Sensor 1 Circuit Malfunction

Knock Sensor Circuit



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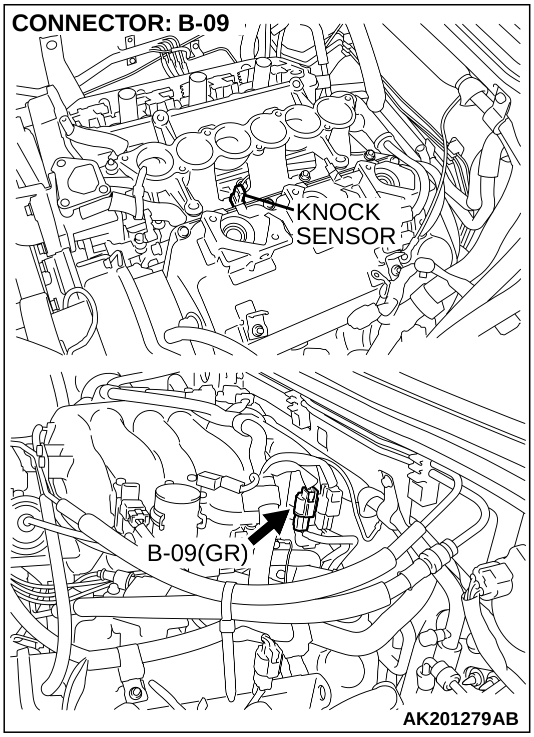
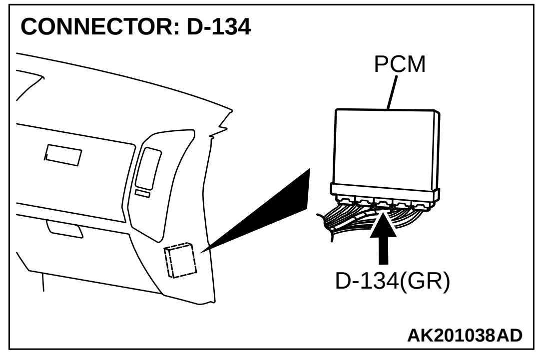




CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the PCM (terminal No. 89).

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 PCM checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 3,000 r/min.

Judgment Criteria

- Knock sensor output voltage (knock sensor peak voltage in each 1/3 turn of the crankshaft) has not changed more than 0.06 V in the last consecutive 200 periods.

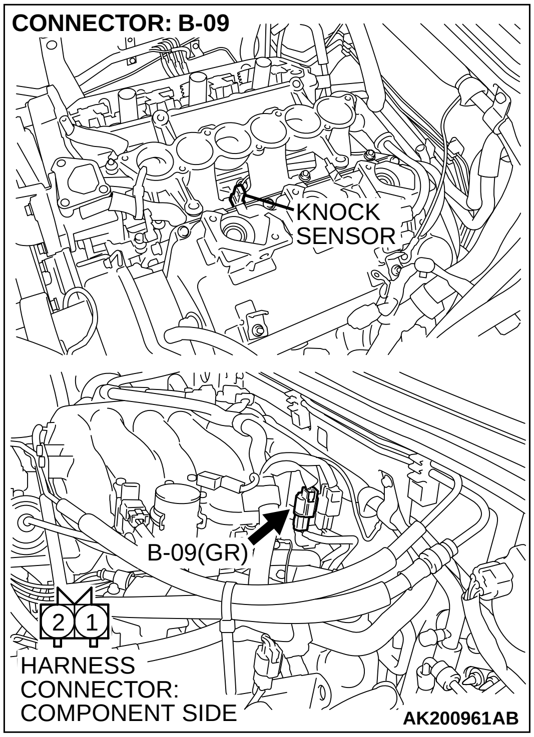
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



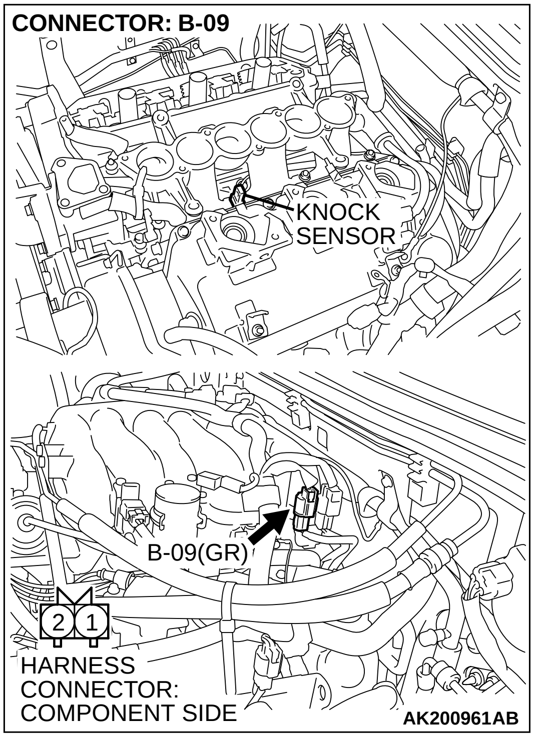
STEP 1. Check harness connector B-09 at the knock sensor for damage.

Q: Is the harness connector in good condition?

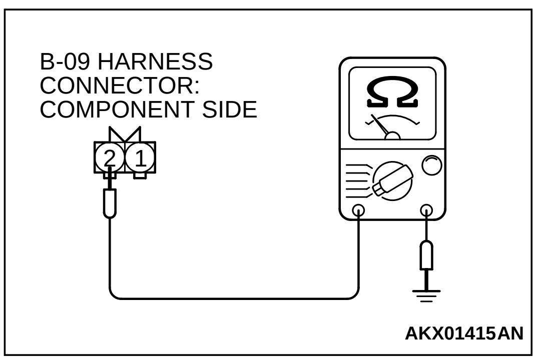
YES : Go to Step 2.

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

STEP 2. Check the continuity at knock sensor harness side connector B-09.



(1) Disconnect the connector B-09 and measure at the harness side.



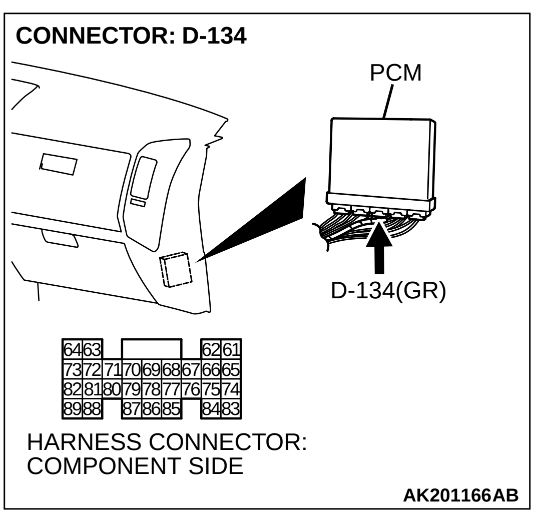
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 3.

NO : Repair an open circuit or harness damage between knock sensor connector B-09 (terminal No. 2) and ground. Then go to Step 6.

STEP 3. Check harness connector D-134 at PCM for damage.



Q: Is the harness connector in good condition?

YES : Go to Step 4.

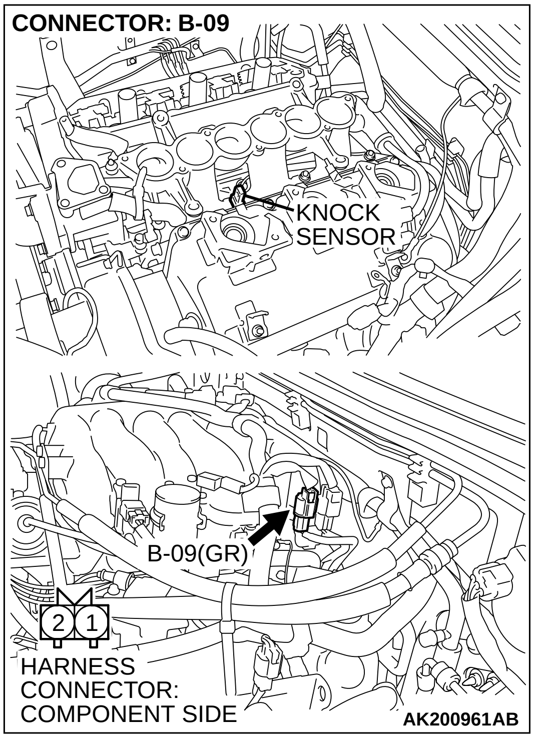
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

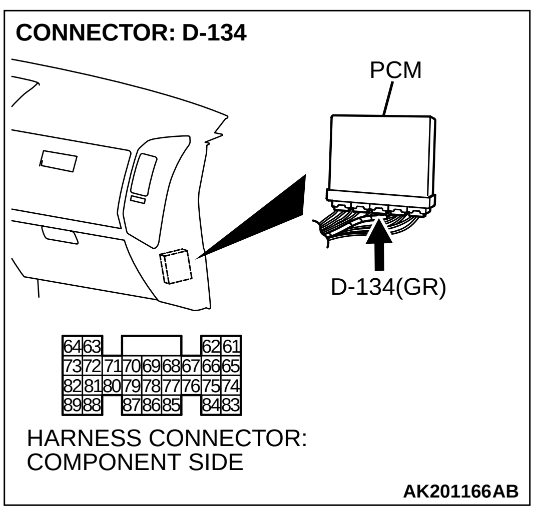
STEP 4. Check for open circuit, short circuit to ground and harness damage between knock sensor connector B-09 (terminal No. 1) and PCM connector D-134 (terminal No. 89).

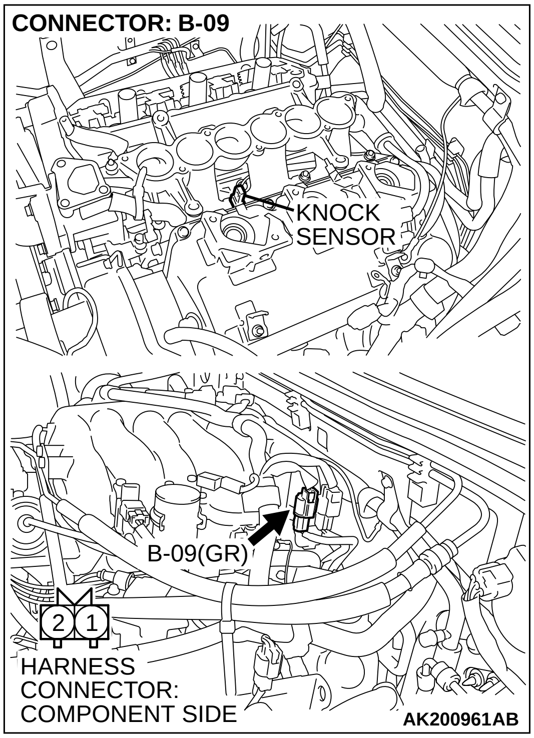
Q: Is the harness wire in good condition?

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-09.
(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.

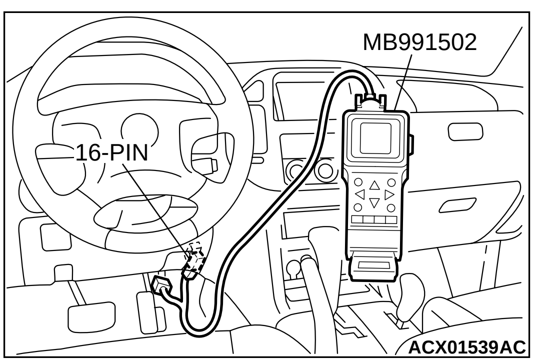
Q: Is the sensor operating properly?

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

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

⚠ CAUTION

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



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3000 – 5000r/min
- Engine load : 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

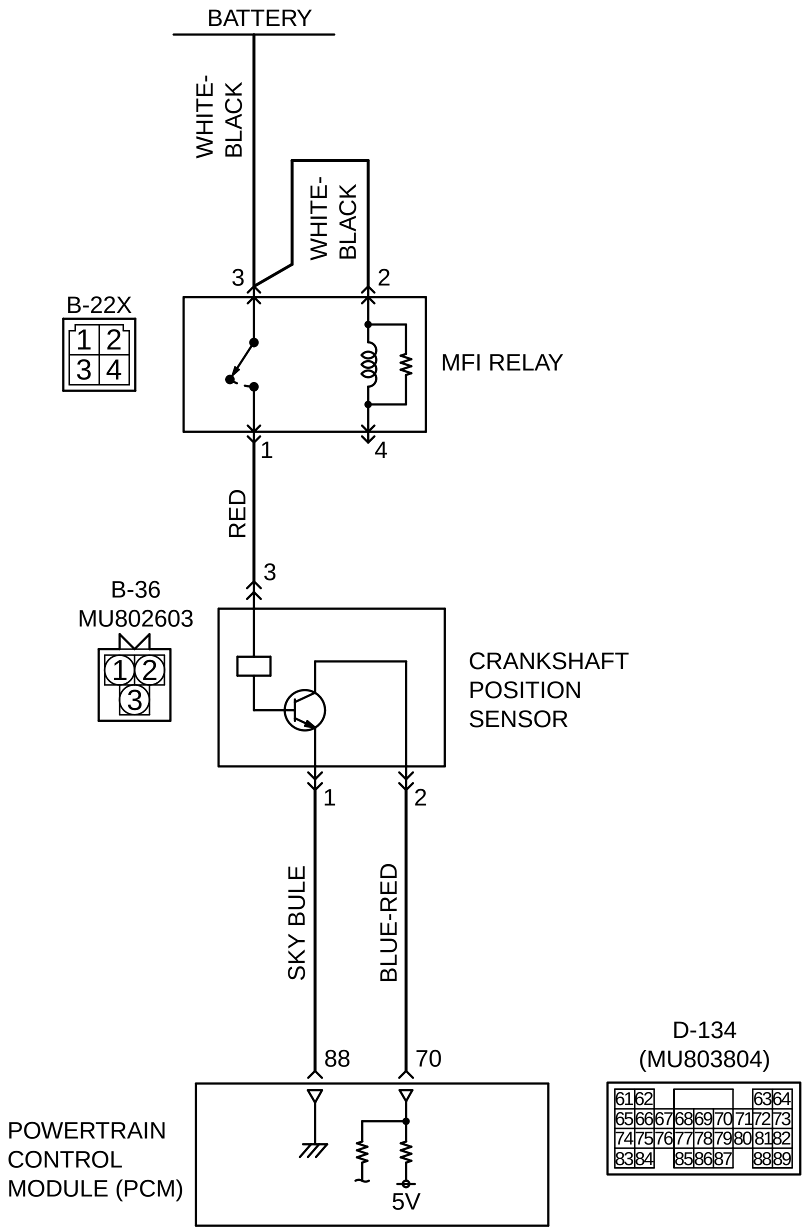
(5) After completing the test drive, read the DTC.Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0325 set?

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

DTC P0335: Crankshaft Position Sensor Circuit

Crankshaft Position Sensor Circuit



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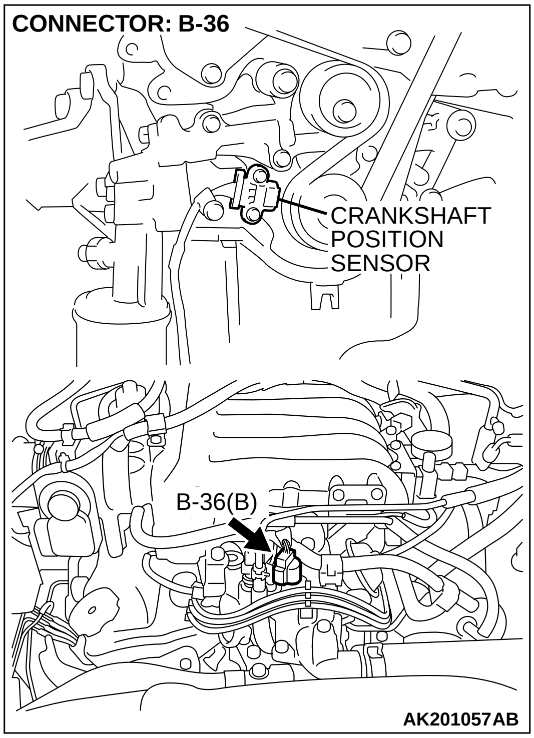
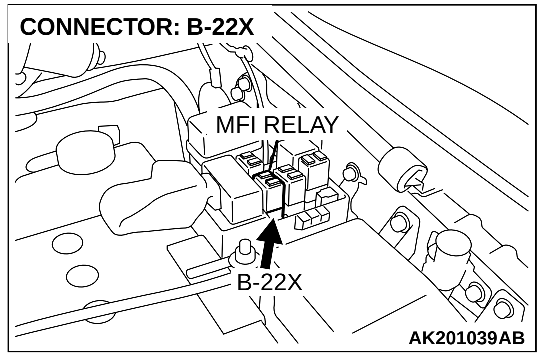
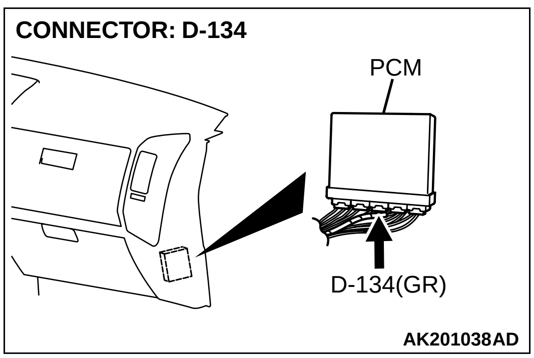






CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 1).
- Terminal No. 1 of the crankshaft position sensor is grounded with PCM (terminal No. 88).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 70). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the PCM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.

Judgment Criteria

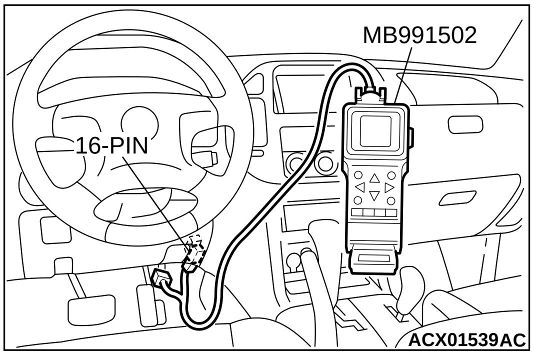
- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions, Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

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

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- PCM failed.



DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998478: Test Harness (3pin, triangle)

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

⚠ CAUTION

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

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

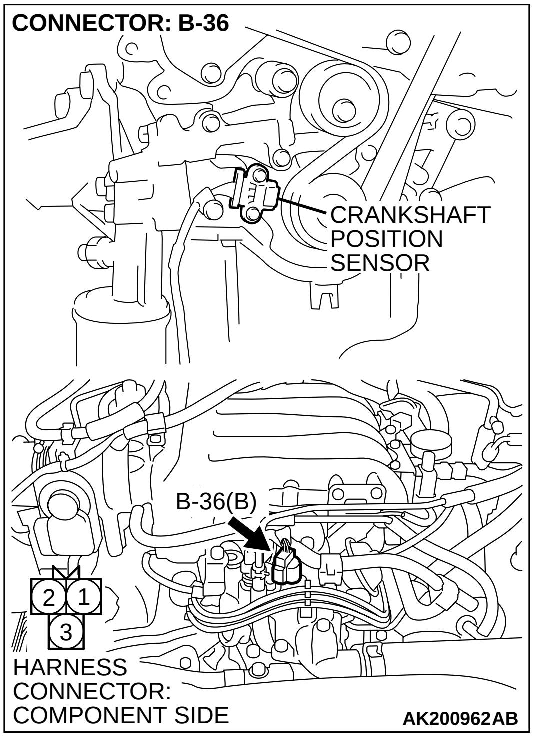
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

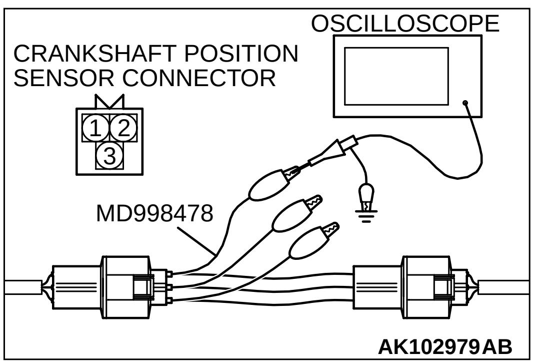
YES : It can be assumed that this malfunction is intermittent. Refer to IN GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

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



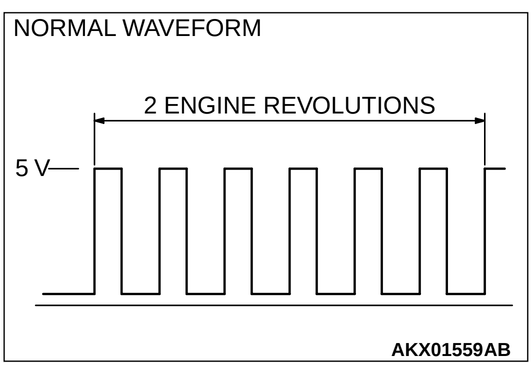
(1) Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.



(2) Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2 (bank clip of special tool).

NOTE: Connect the oscilloscope plobe to terminal No. 45 by backprobing when measuring with the PCM connector.

(3) Start the engine and run at idle.

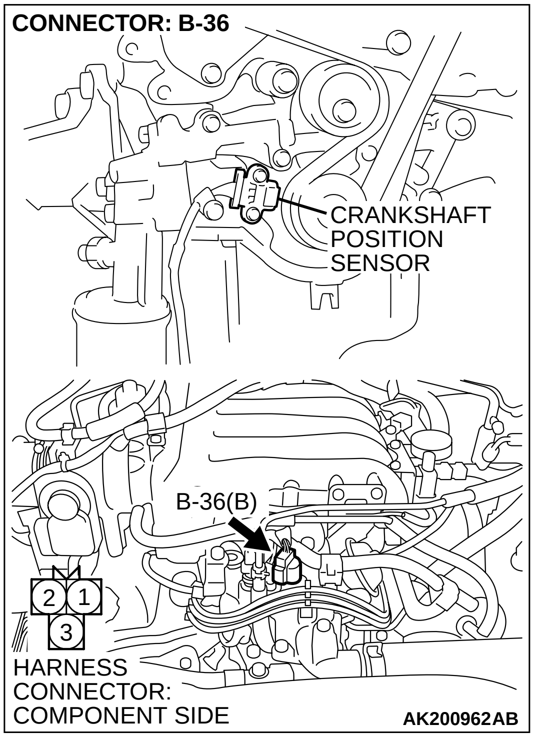


(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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

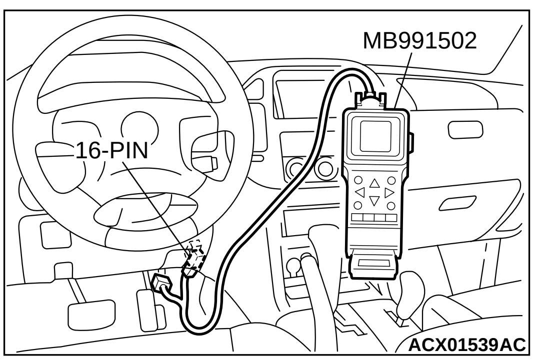


STEP 3. Check connector B-36 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

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



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

⚠ CAUTION

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

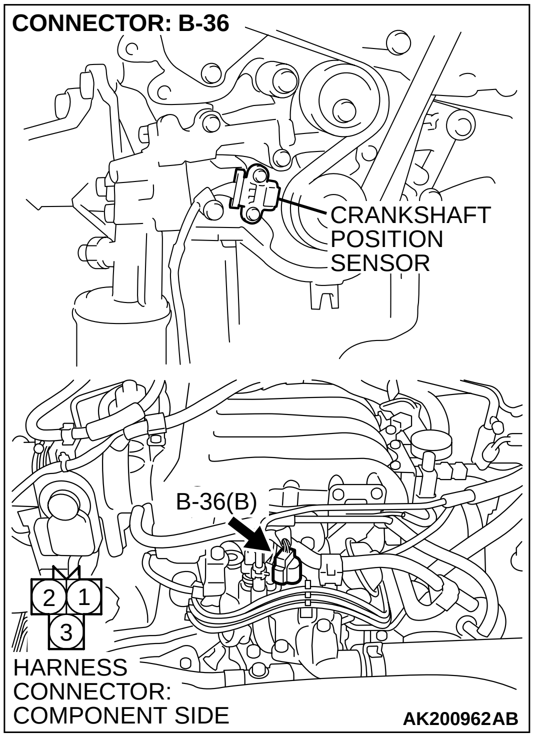
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

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

Q: Is the sensor operating properly?

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

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



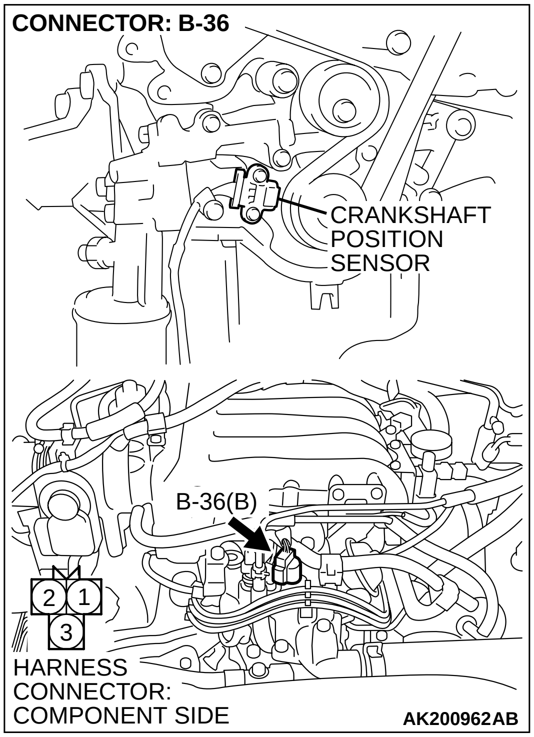
STEP 5. Check connector B-36 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

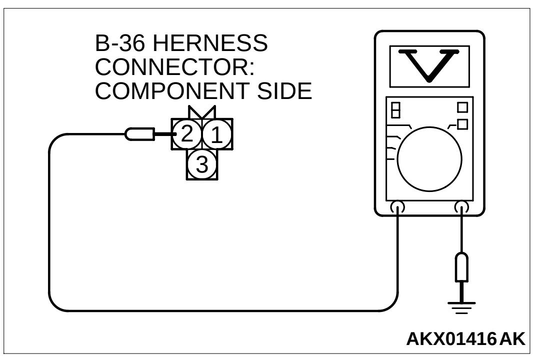
YES : Go to Step 6.

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

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-36.



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

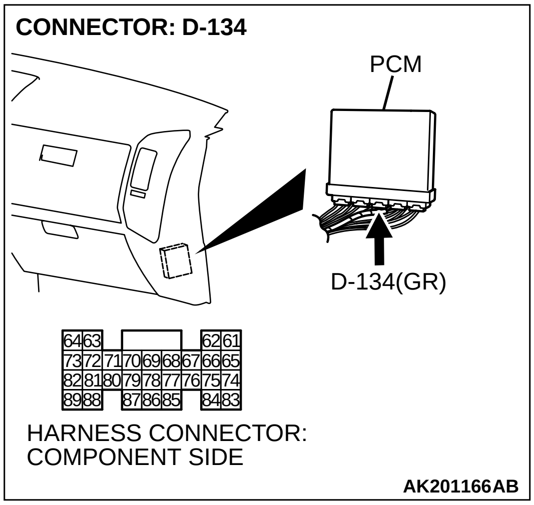


(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.8 and 5.2 volts.

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

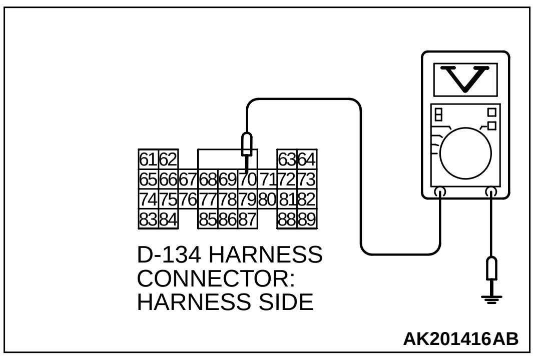
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 11.
NO : Go to Step 7.



STEP 7. Measure the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the crankshaft position sensor connector B-36.
(3) Turn the ignition switch to the "ON" position.

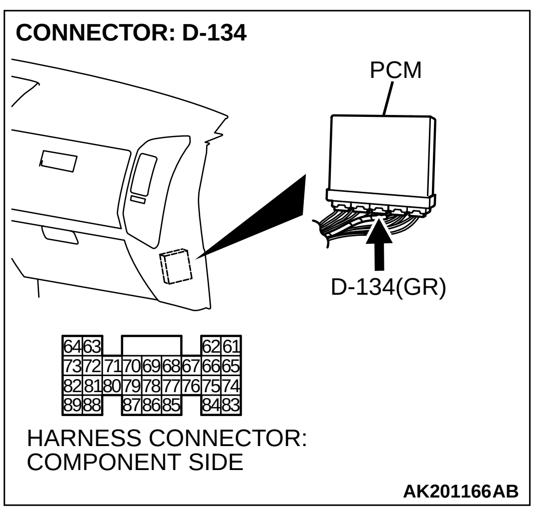


(4) Measure the voltage between terminal No. 70 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

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

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

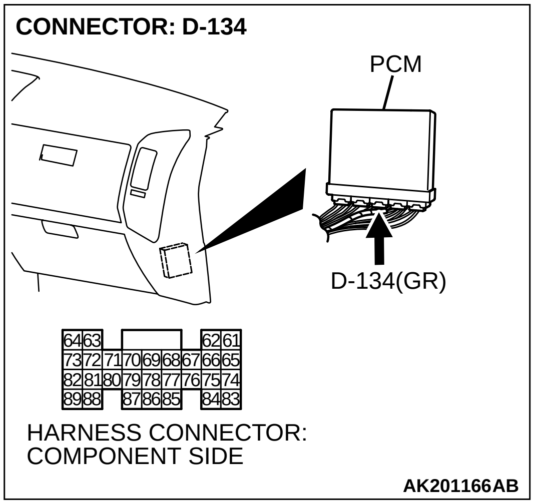
YES : Go to Step 8.
NO : Go to Step 9.



STEP 8. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair it because of open circuit between crankshaft position sensor connector B-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70). 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 connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

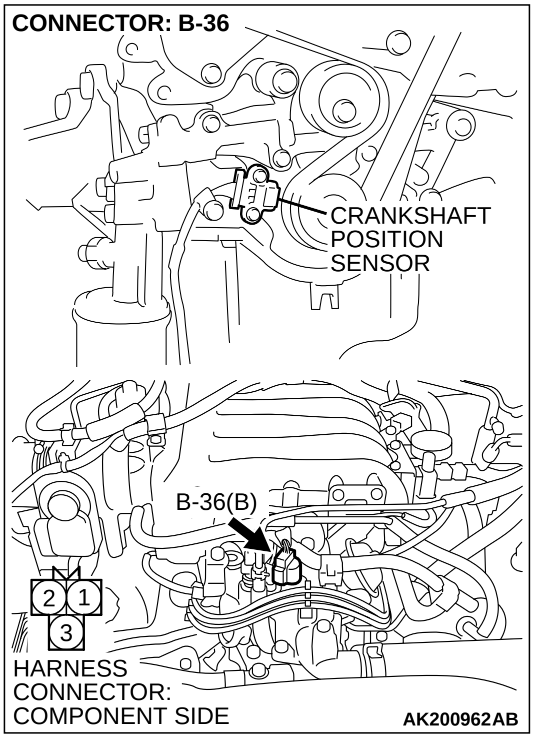
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

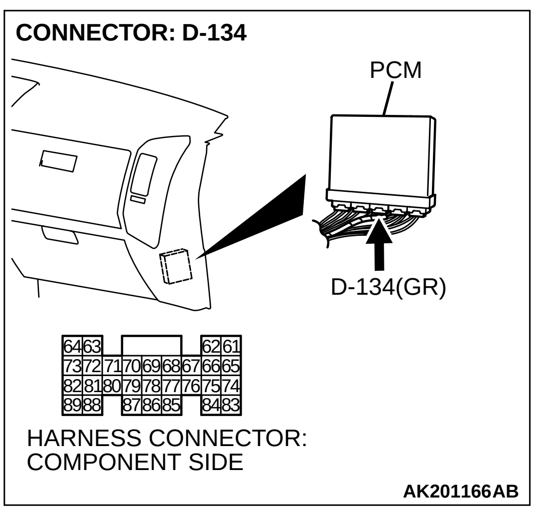
STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70).

Q: Is the harness wire in good condition?

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

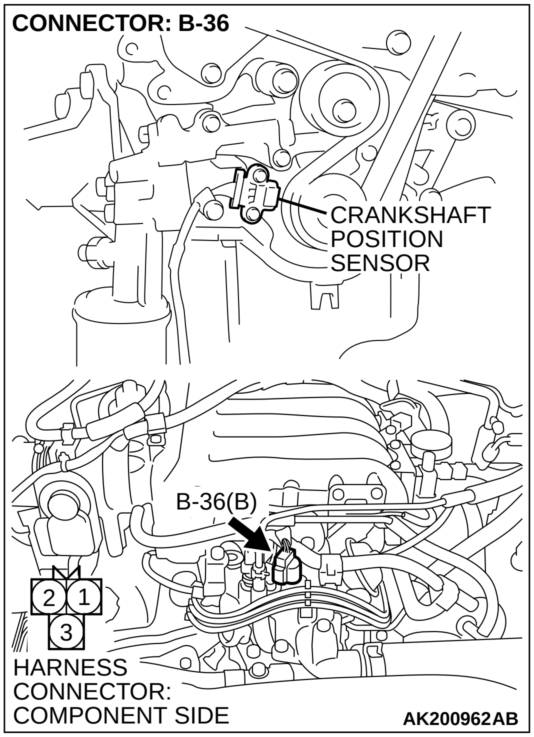
NO : Repair it. Then go to Step 21.

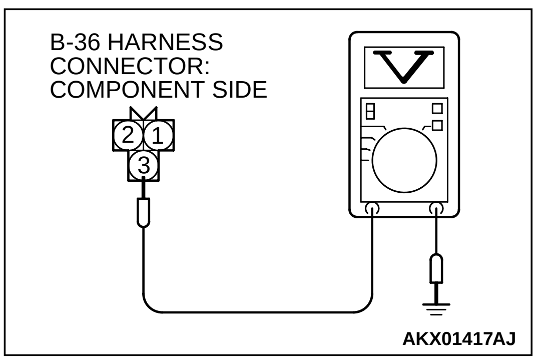




STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-36.

(1) Disconnect the connector B-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 be battery positive voltage.

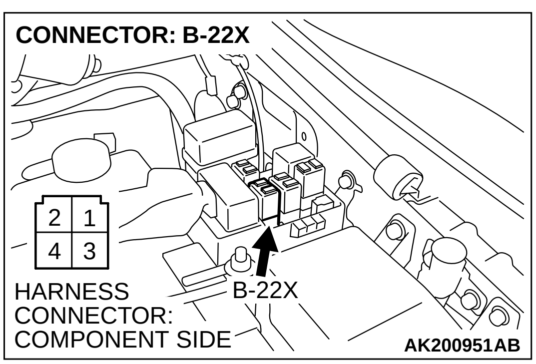
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

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

STEP 12. Check connector B-22X at MFI relay for damage.

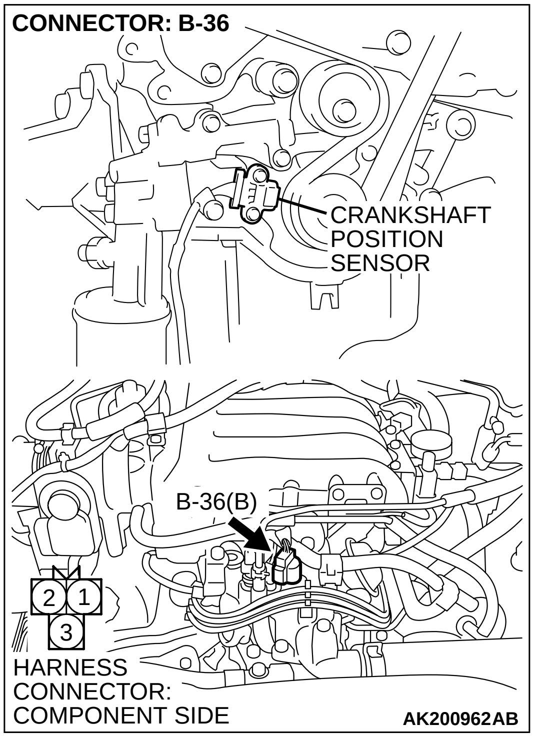
Q: Is the connector in good condition?

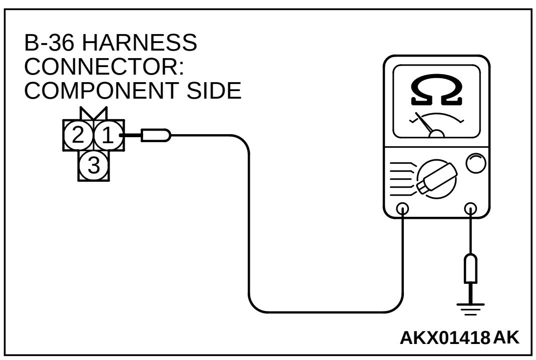


YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and crankshaft position sensor connector B-36 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

STEP 13. Check for continuity at crankshaft position sensor harness side connector B-36.

(1) Disconnect the connector B-36 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.

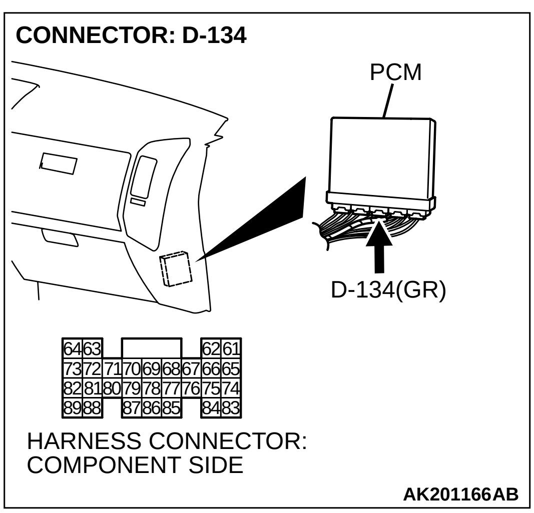
NO : Go to Step 14.

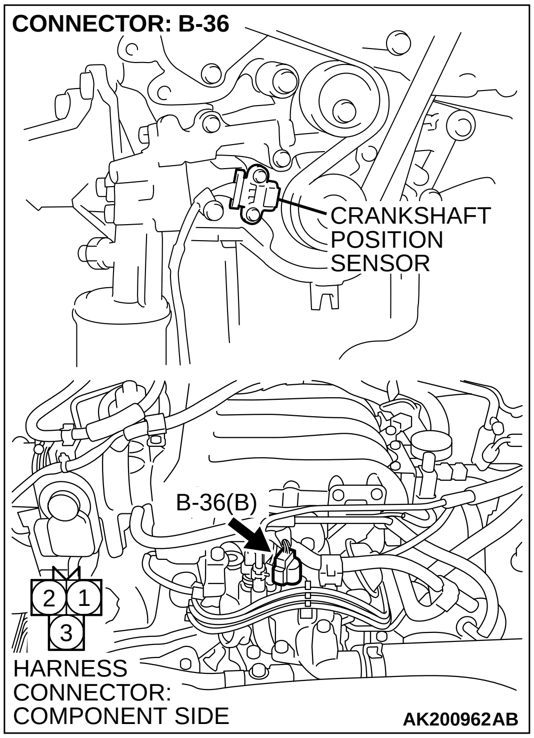
STEP 14. Check connector D-134 at PCM for damage.

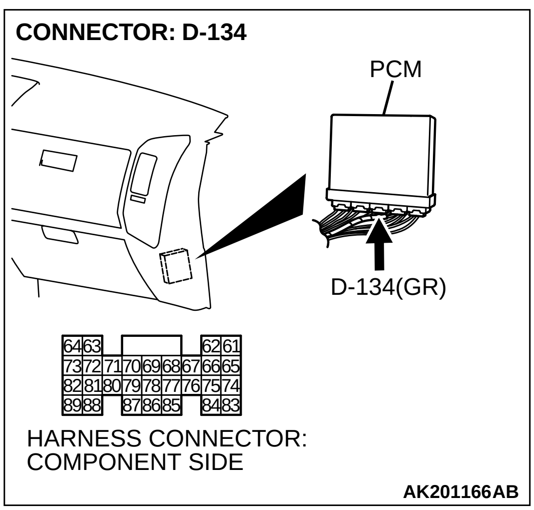
Q: Is the connector in good condition?

YES : Go to Step 15.

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







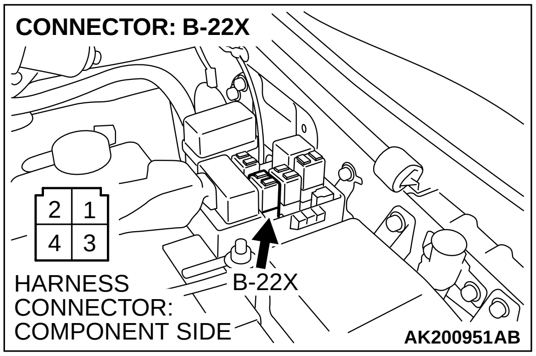
STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-36 (terminal No. 1) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 21.

STEP 16. Check connector B-22X at the MFI relay for damage.

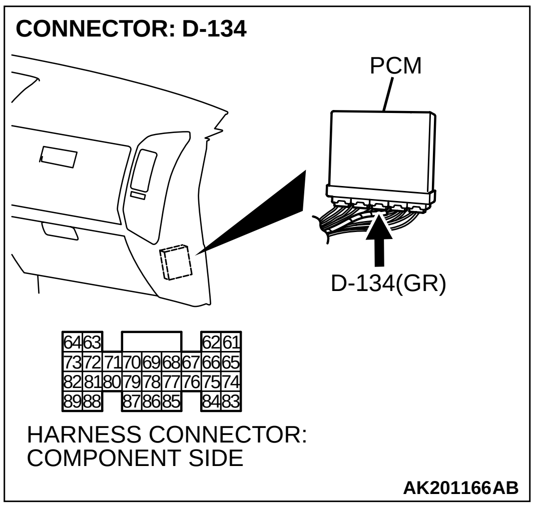


Q: Is the harness connector in good condition?

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.

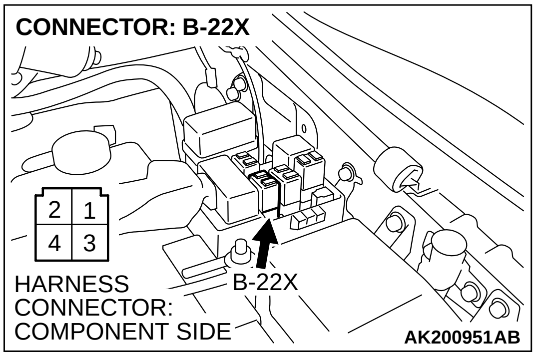
STEP 17. Check connector D-134 at PCM for damage.

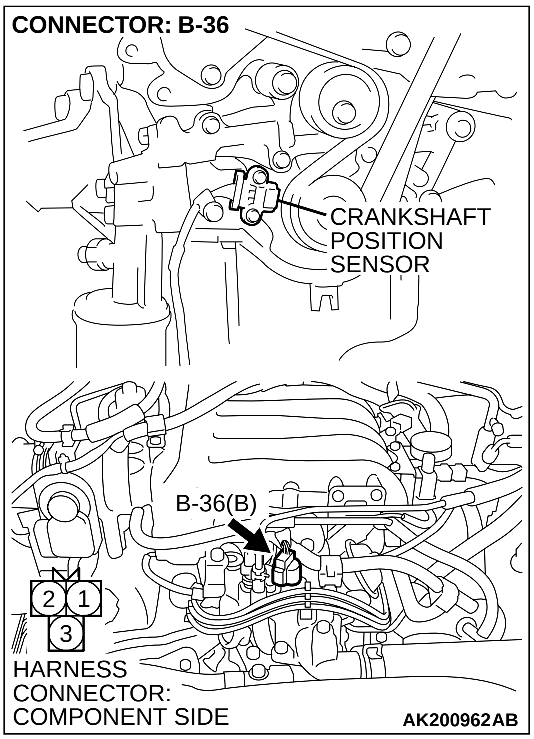


Q: Is the connector in good condition?

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.



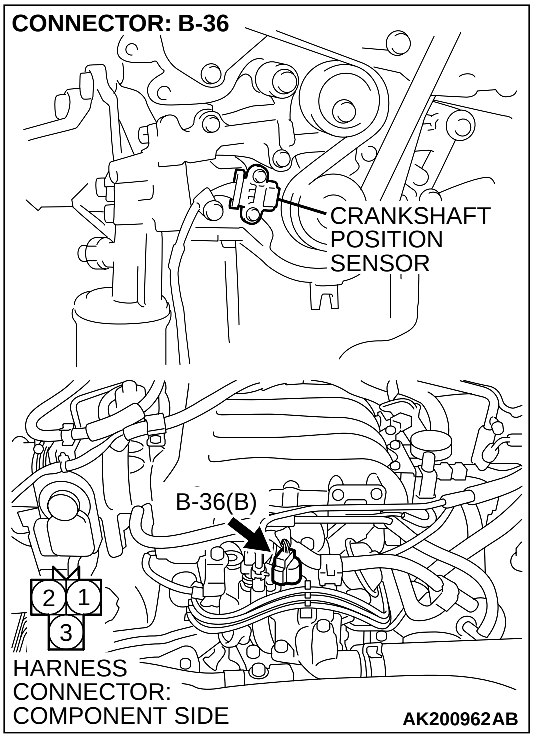


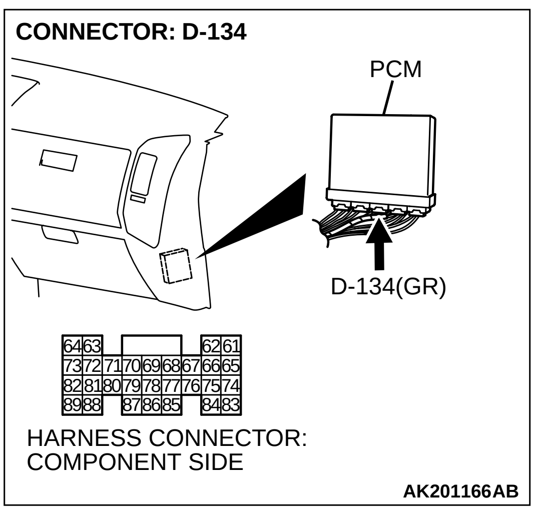
STEP 18. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and crankshaft position sensor connector B-36 (terminal No. 3).

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-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70).

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, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.

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

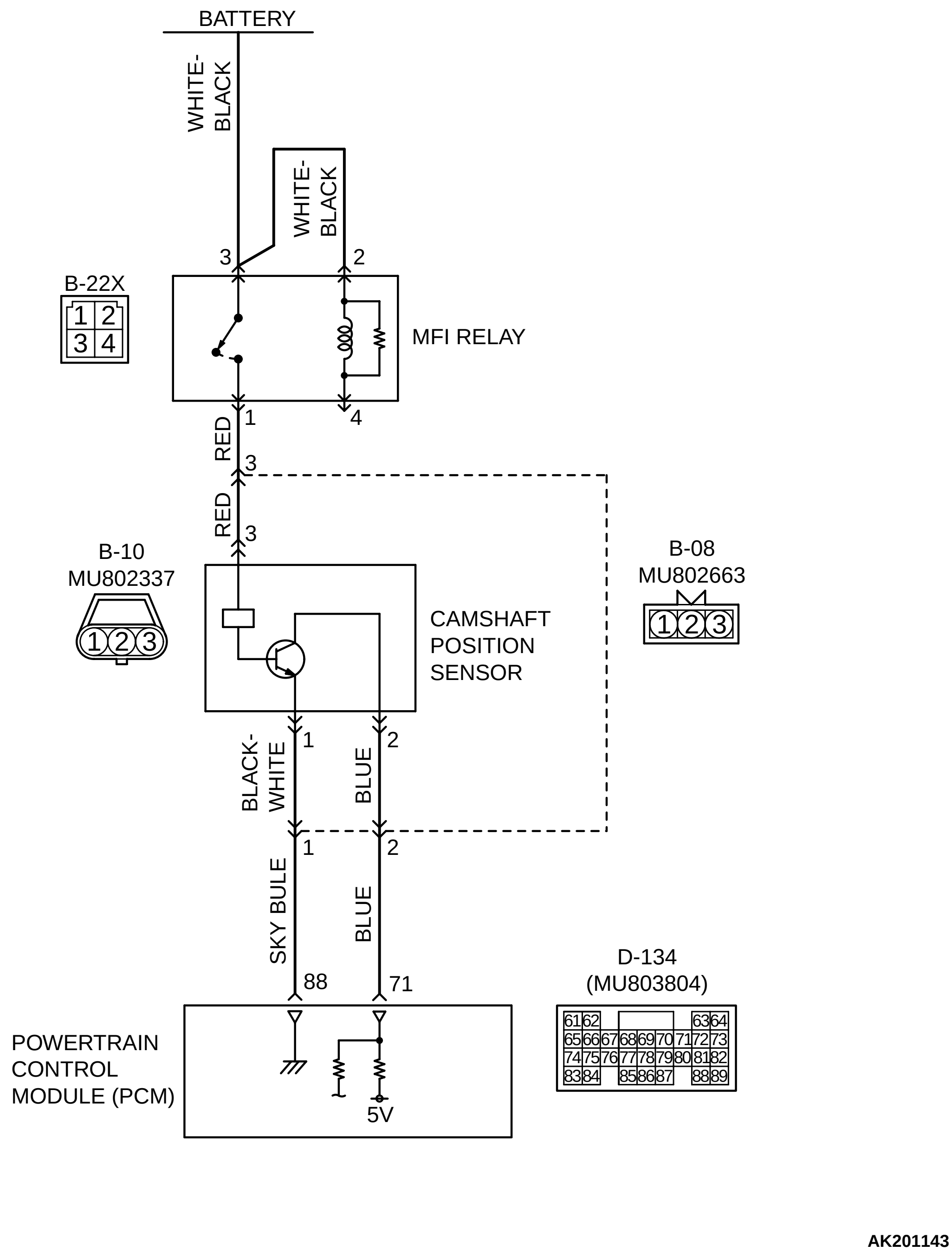
Q: Is DTC P0335 set?

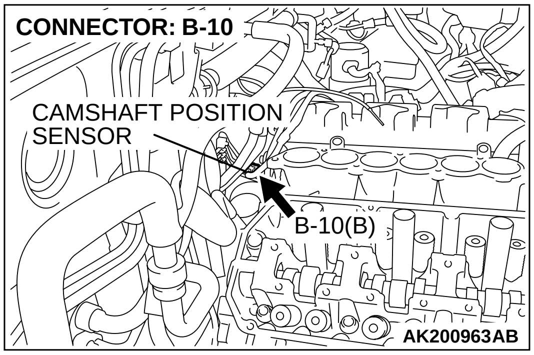
YES : Repeat the troubleshooting.

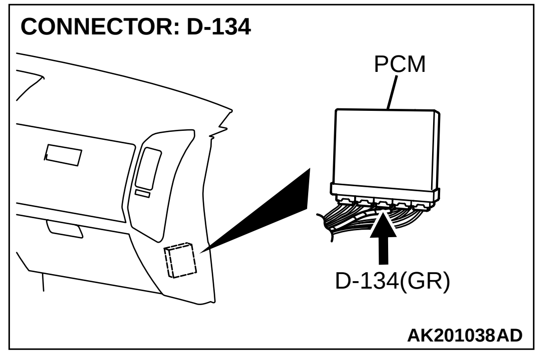
NO : The procedure is complete.

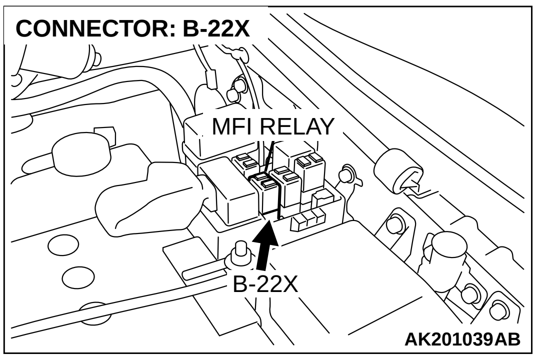
DTC P0340: Camshaft Position Sensor Circuit

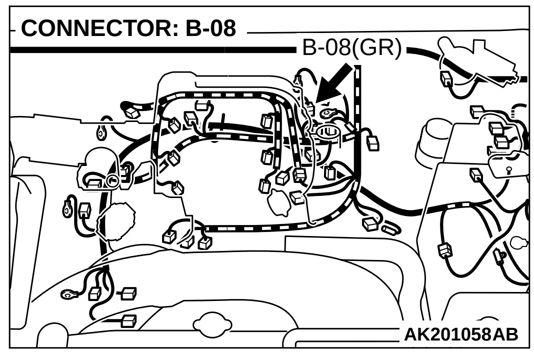
Camshaft Position Sensor Circuit











CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 1).
- Terminal No. 1 of the camshaft position sensor is grounded with PCM (terminal No. 88).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 70). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the PCM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

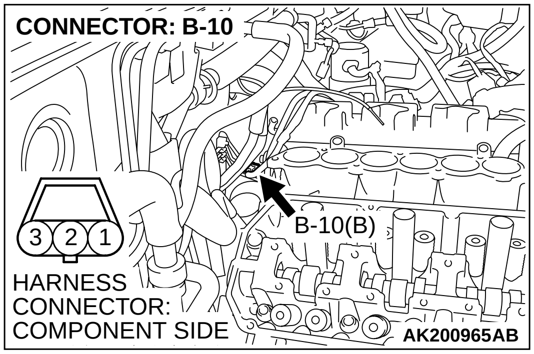
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or loose connector.
- PCM failed.

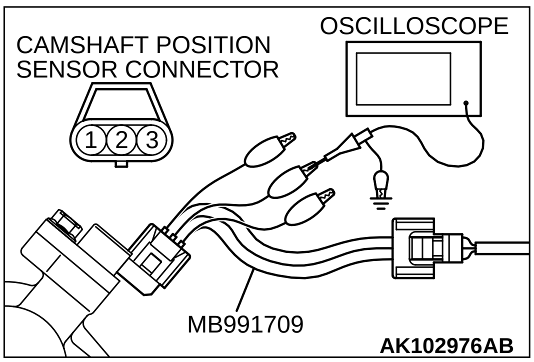
DIAGNOSIS

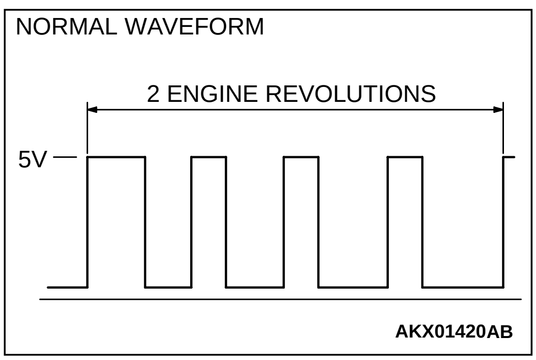
Required Special Tool:
- MB991709: Test Harness Set

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



(1) Disconnect the camshaft position sensor connector B-10, 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 PCM side connector, connect an oscilloscope probe to terminal No. 70.

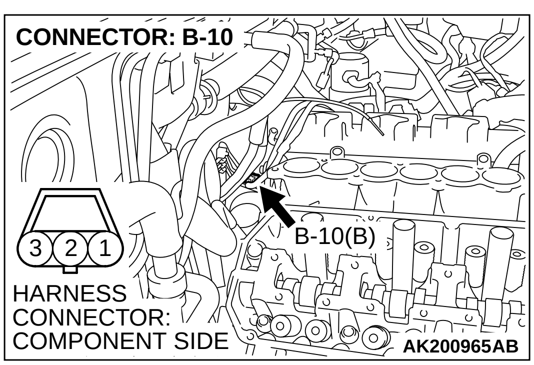
(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : Go to Step 2..
NO : Go to Step 4.

STEP 2. Check connector B-10 at camshaft position sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 3. Check the trouble symptoms.

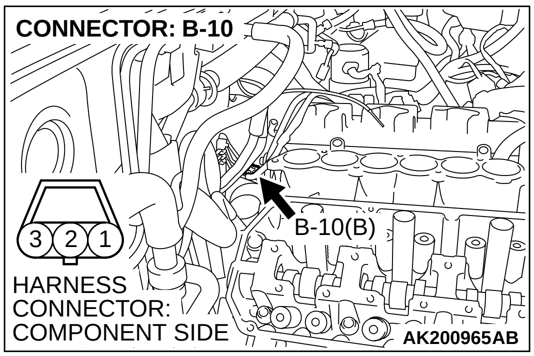
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.

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

Q: Is DTC P0340 set?

YES : Replace the PCM. 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.

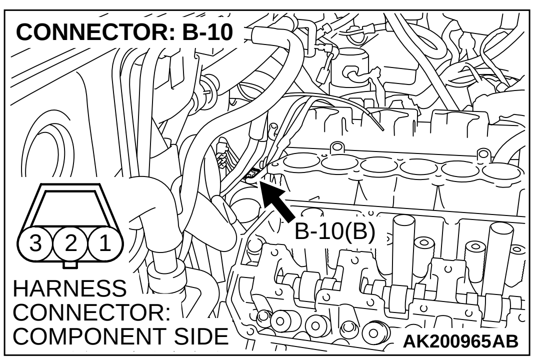


STEP 4. Check connector B-10 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

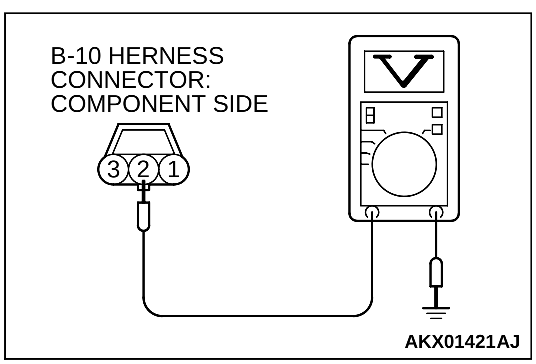
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 5. Measure the sensor supply voltage at camshaft position sensor connector B-10.

(1) Disconnect the connector B-10 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 be between 4.8 and 5.2 volts.

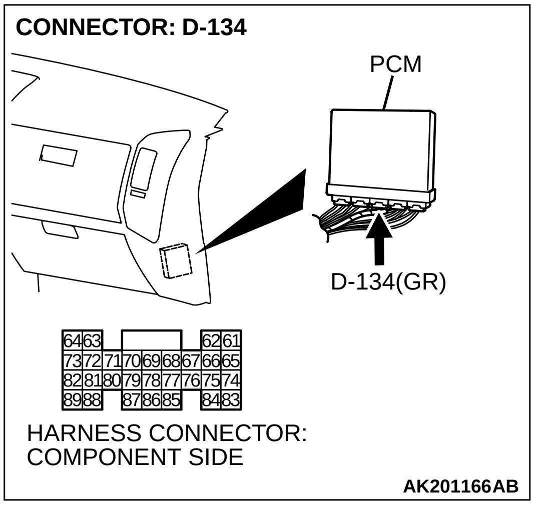
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

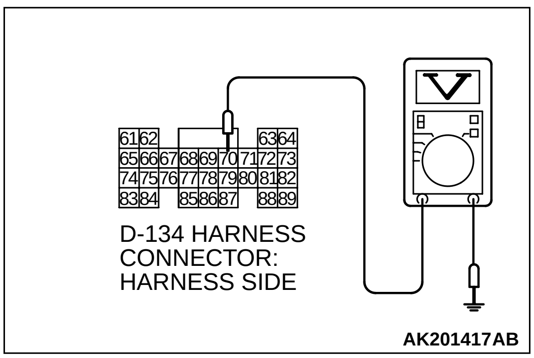
YES : Go to Step 10.

NO : Go to Step 6.

STEP 6. Measure the sensor supply voltage at PCM connector D-134 by backprobing.



(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the camshaft position sensor connector B-10.
(3) Turn the ignition switch to the "ON" position.



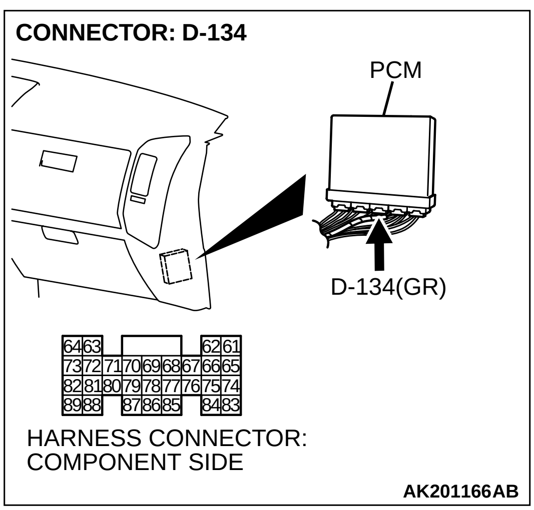
(4) Measure the voltage between terminal No. 70 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

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

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

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

STEP 7. Check connector D-134 at PCM for damage.



Q: Is the connector in good condition?

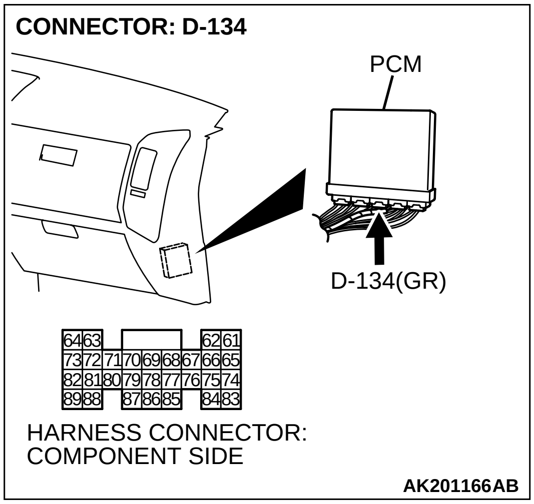
YES : Repair harness wire between camshaft position sensor connector B-10 (terminal No. 2) and PCM connector D-134 (terminal No. 70) because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 8. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

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

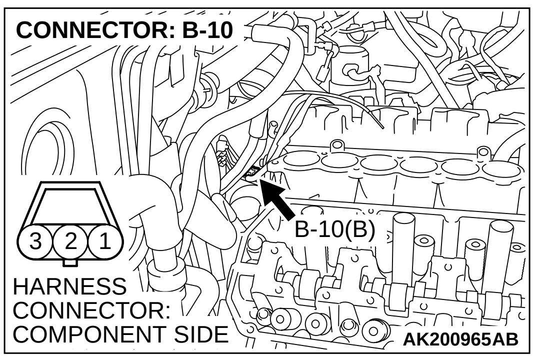


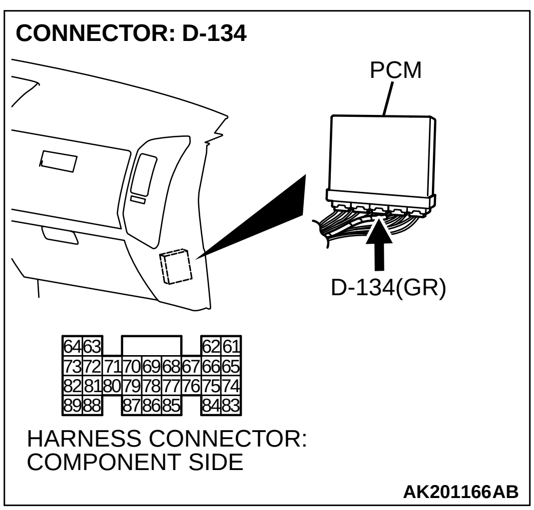
STEP 9. Check for short circuit to ground between camshaft position sensor connector B-10 (terminal No. 2) and PCM connector D-134 (terminal No. 70).

Q: Is the harness wire in good condition?

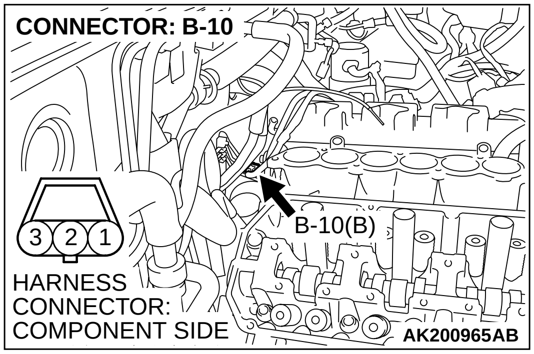
YES : Replace the PCM. Then go to Step 20.

NO : Repair it. Then go to Step 20.

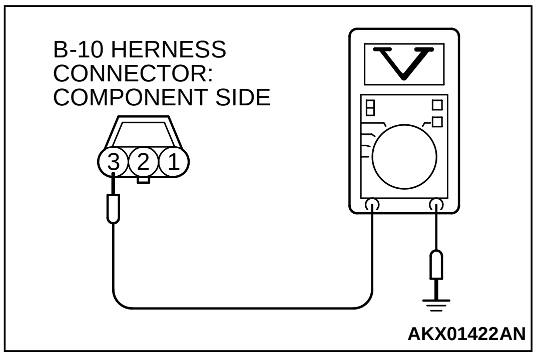




STEP 10. Measure the power supply voltage at camshaft position sensor connector B-10.



(1) Disconnect the connector B-10 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



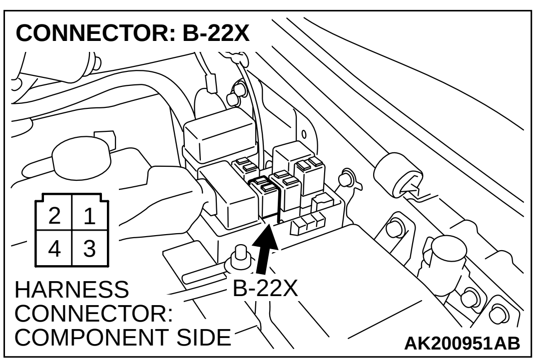
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

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

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

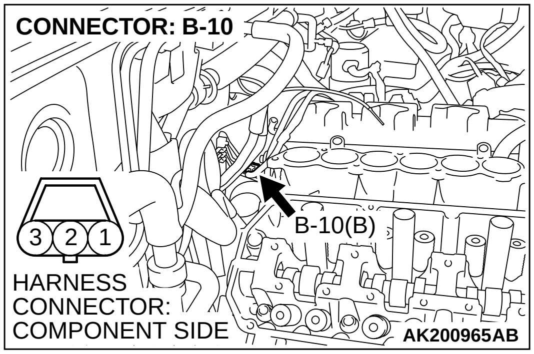
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check connector B-22X at MFI relay for damage.



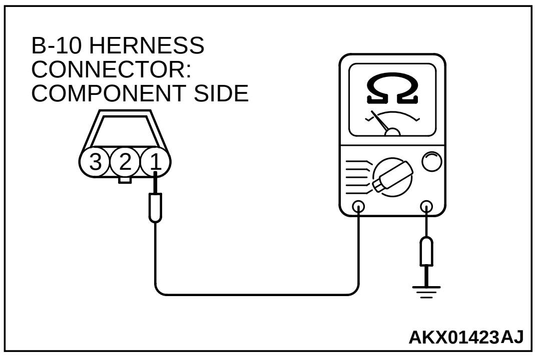
Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and camshaft position sensor connector B-10 (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 the continuity at camshaft position sensor connector B-10.

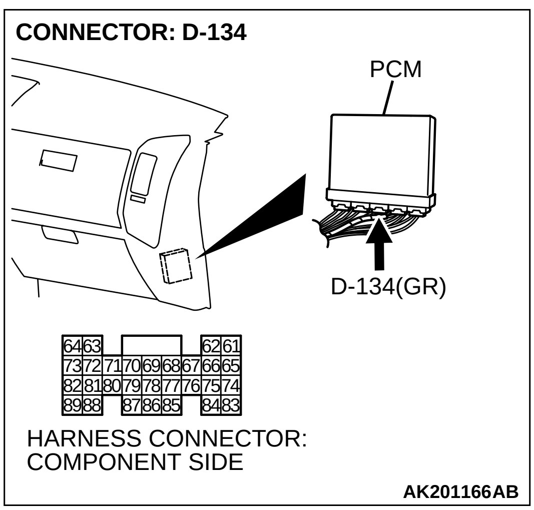
(1) Disconnect the connector B-10 and measure at the harness side.



(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 15.
NO : Go to Step 13.

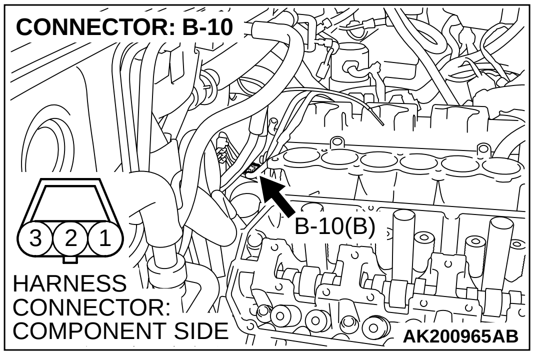


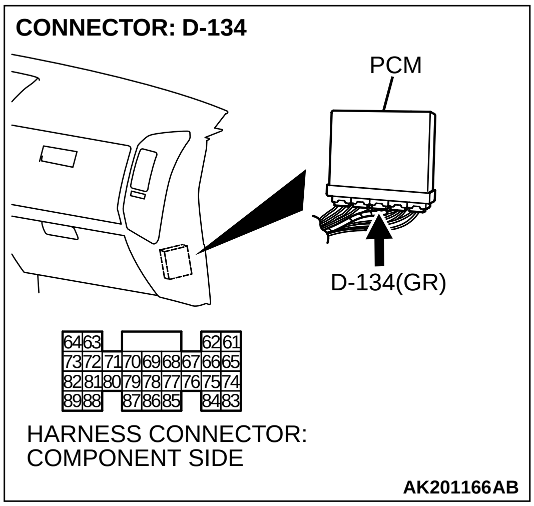
STEP 13. Check connectorD-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-10 (terminal No. 1) and PCM connector D-134 (terminal No. 88).

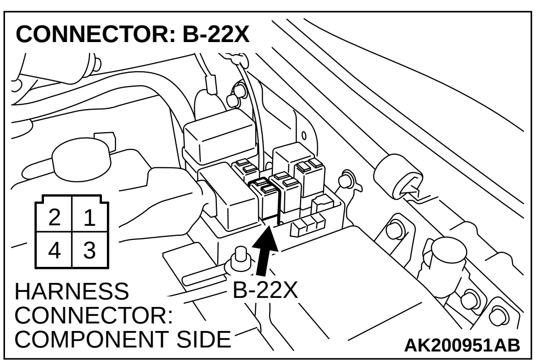




Q: Is the harness wire in good condition?

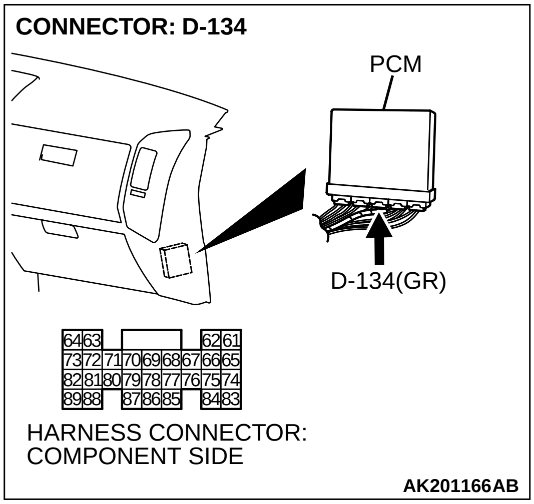
YES : Replace the PCM. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 15. Check connector B-22X at the MFI relay for damage.



Q: Is the connector in good condition?

YES : Go to Step 16.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

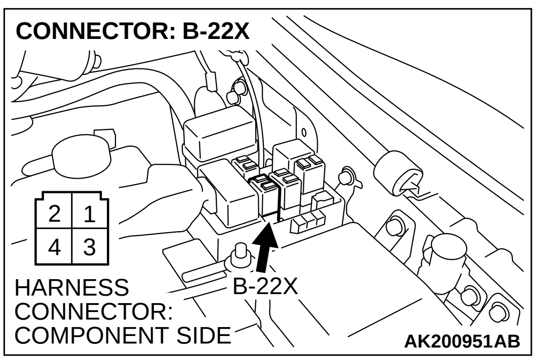


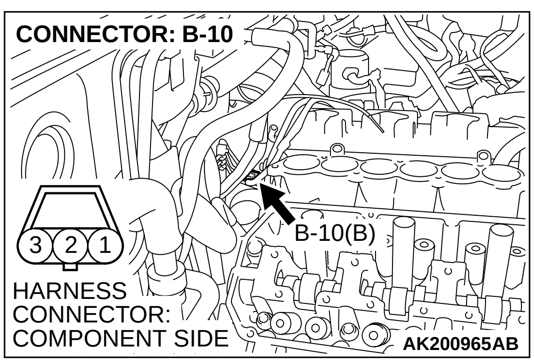
STEP 16. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



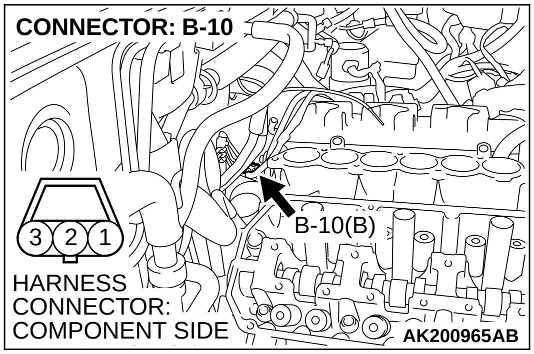


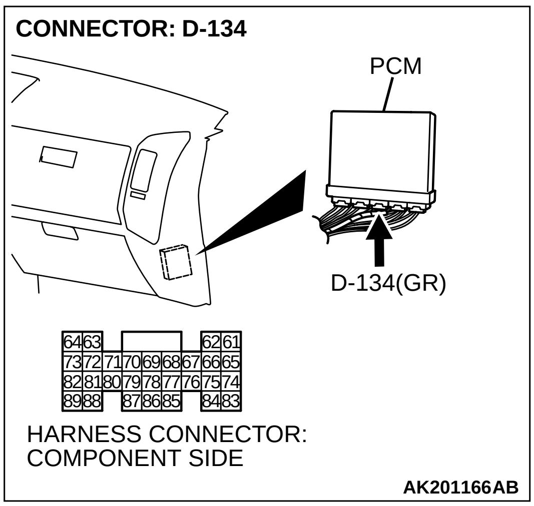
STEP 17. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and camshaft position sensor connector B-10 (terminal No. 3).

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-10 (terminal No. 2) and PCM connector D-134 (terminal No. 70).

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. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0340 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR valve (stepper motor) is actuated from the fully closed position toward the open position while the engine is running, EGR gas flows.
- The PCM checks how the EGR gas flow signal changes.

DTC SET CONDITIONS

Check Conditions

- At least 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 910 and 1,650 r/min.
- Intake air temperature is higher than 0°C (32°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 30 km/h (18.7 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 28 percent.
- The PCM monitors for this condition for 3 cycles of 2 seconds each during the drive cycle.

Judgement Criteria

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.6 kPa (0.37 psi).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Dirtiness of the EGR valve and EGR passage.
- EGR valve (stopper motor) failed.
- Open or shorted EGR valve (stopper motor) circuit, or loose connector.
- Manifold differential pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

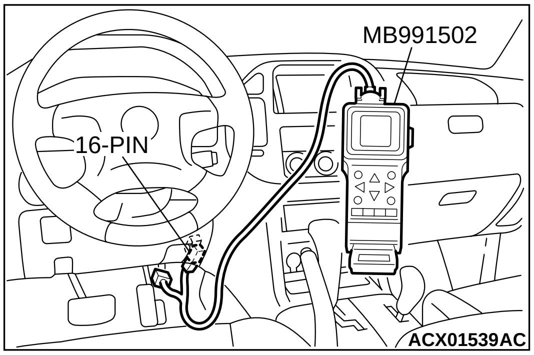
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information P.17-63.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 3.



STEP 2. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- Should be between 20.6 – 34.0 kPa (6.1 – 10.0 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.13Ac-557.

STEP 3. Test the OBD-II drive cycle.

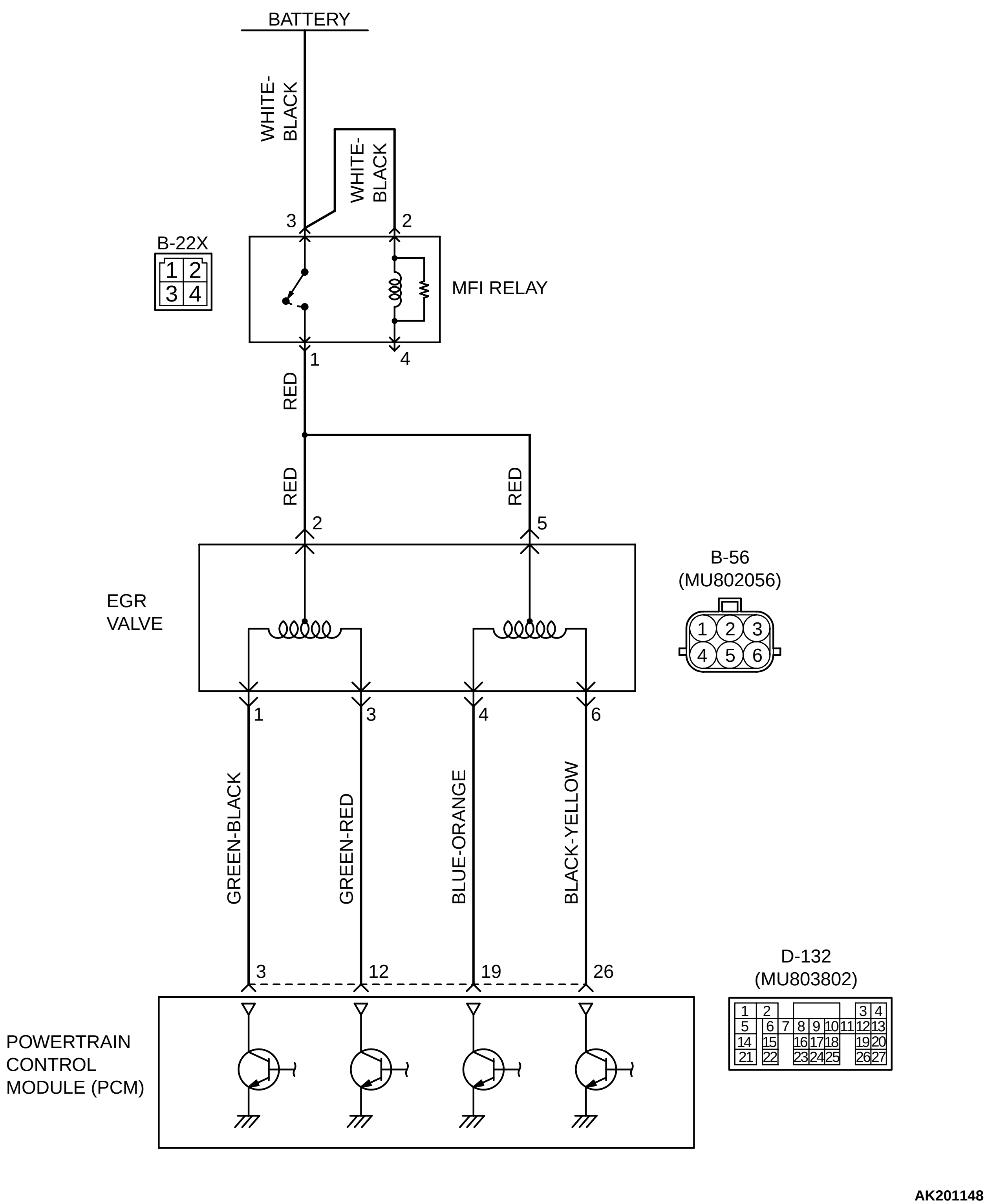
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

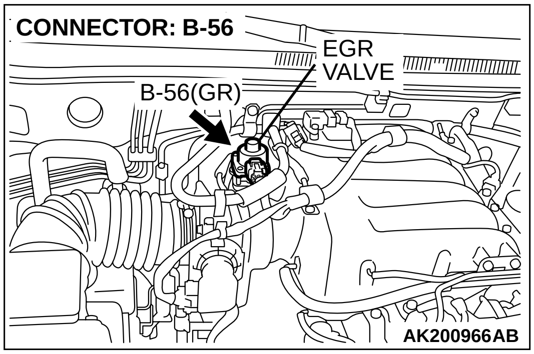
Q: Is DTC P0401 set?

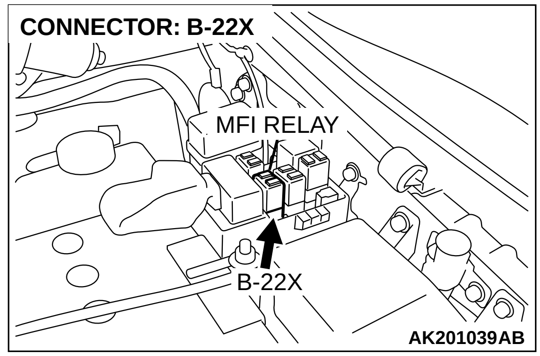
YES : Retry the troubleshooting.
NO : The inspection is complete.

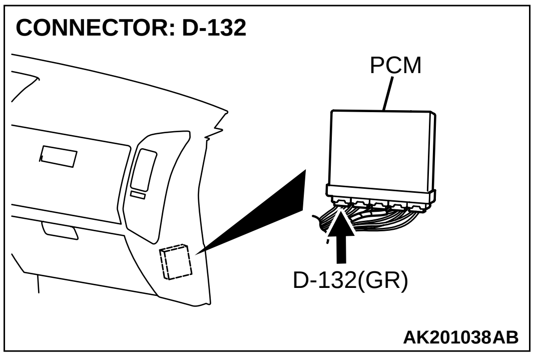
DTC P0403: Exhaust Gas Reculation Control Circuit

EGR Valve Circuit









CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 1).
- The PCM (terminals No. 3, No. 12, No. 19, No. 26) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the idle air control motor (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR valve (stepper motor) drive circuit, PCM measure the surge voltage of the EGR valve motor coil.

DTC SET CONDITIONS

Check Conditions

- Ignition switch: "OFF" to "ON".
- EGR valve is in operration after the ensgine starting process is complete. (While EGR valve is initialized.)

Judgment Criteria

- The EGR valve motor coil surge voltage (battery positive voltage + 2 volts) is not detected for 3 sconds.
- The PCM monitor for this condition once during the drive cycle.

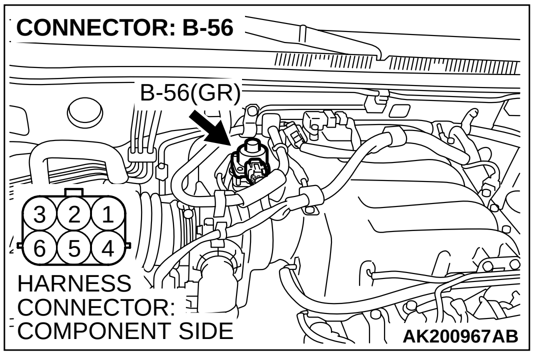
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test harness Set

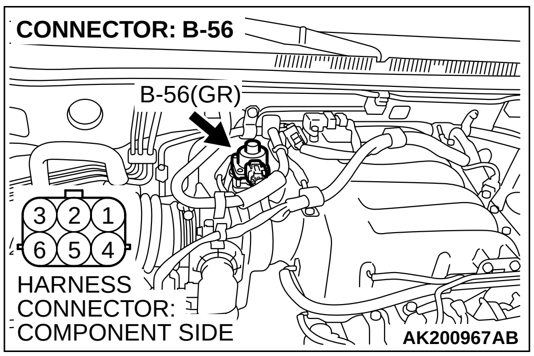


STEP 1. Check connector B-56 at EGR valve for damage.

Q: Is the connector in good condition?

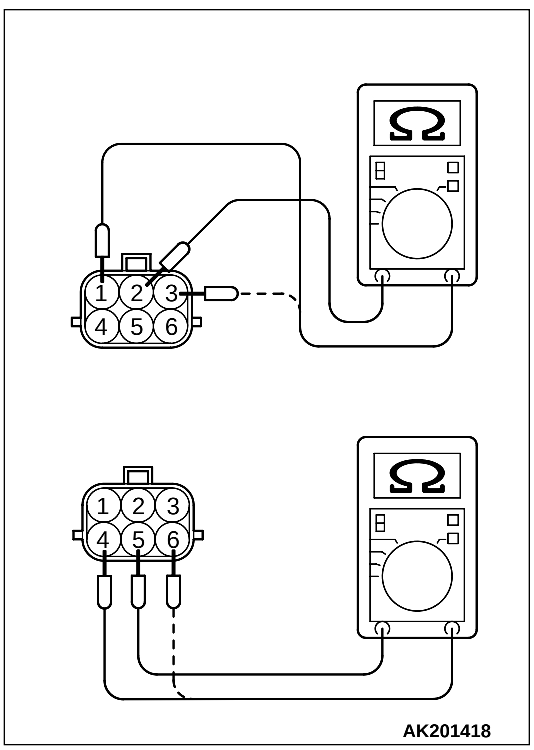
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-56.



(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

Standard value: 20 – 24 ohms [at 20°C (68°F)]

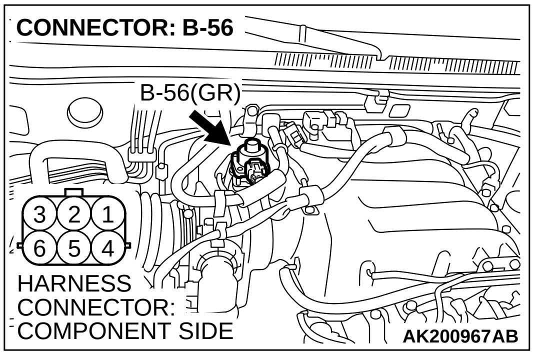
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 4 or terminal No. 6.

Standard value: 20 – 24 ohms [at 20°C (68°F)]

Q: Is the resistance normal?

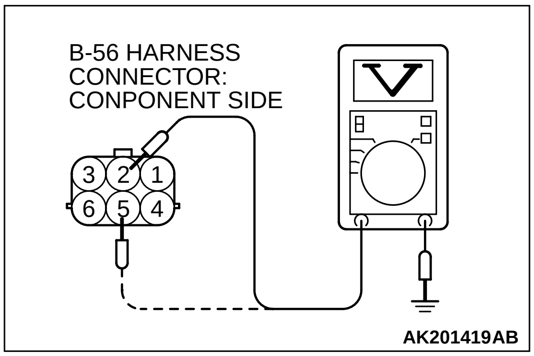
YES : Go to Step 3.

NO : Replace the EGR valve. Then go to Step 12.



STEP 3. Measure the power supply voltage at EGR valve motor harness side connector B-56.

(1) Disconnect the connector B-56 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

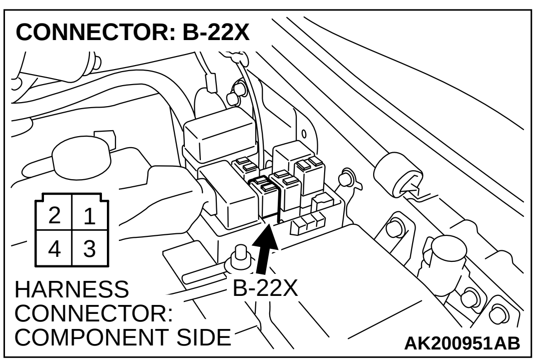


(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

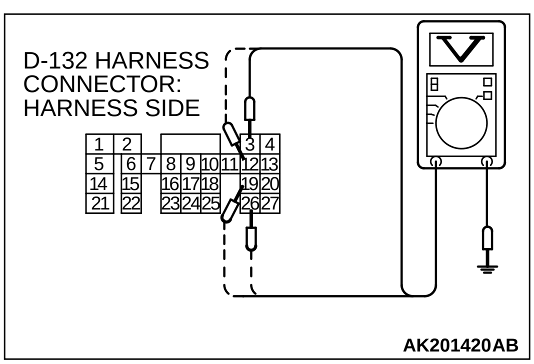
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check connector B-22X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and idle air control motor connector B-56 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



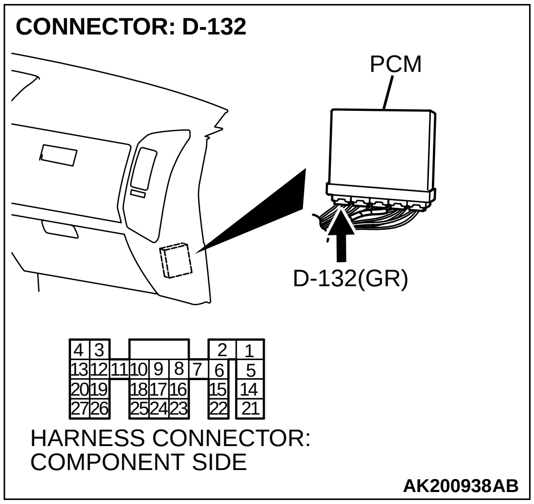
STEP 5. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Measure the voltage between terminal (No. 3, No. 12, No. 19, No. 26) and ground by backprobing.
- The voltage is 1volt or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.

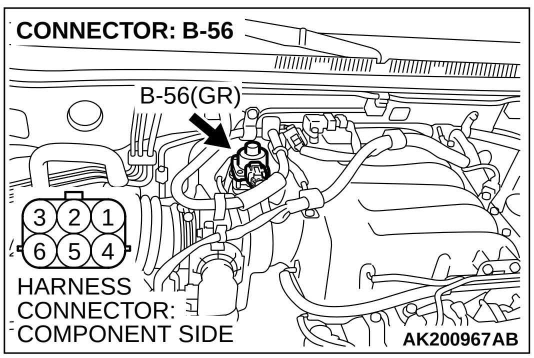


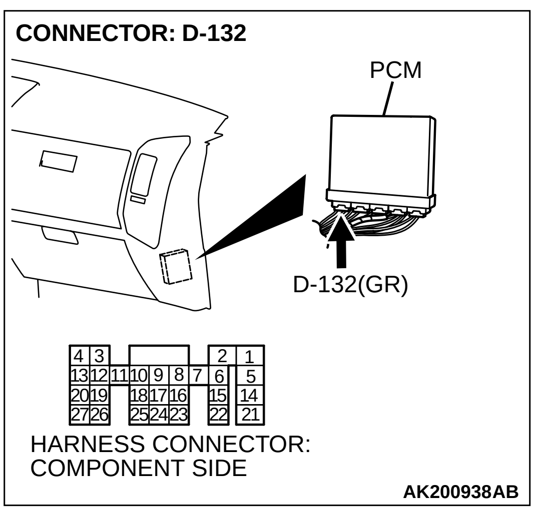
STEP 6. Check connector D-132 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





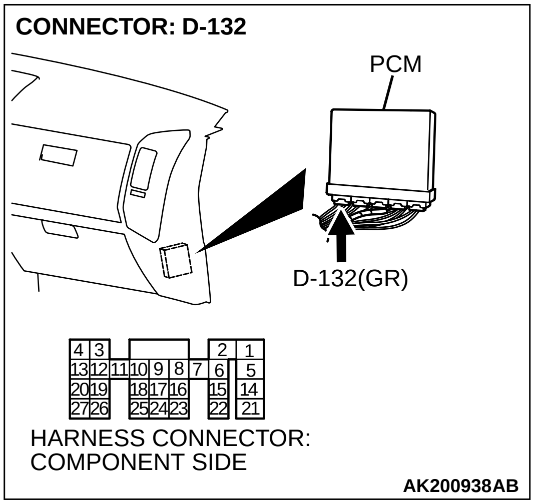
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-56 and PCM connector D-132.

a. EGR valve connector B-56 (terminal No. 1) and PCM connector D-132 (terminal No. 3).
b. EGR valve connector B-56 (terminal No. 3) and PCM connector D-132 (terminal No. 12).
c. EGR valve connector B-56 (terminal No. 4) and PCM connector D-132 (terminal No. 19).
d. EGR valve connector B-56 (terminal No. 6) and PCM connector D-132 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 8. Check connector D-132 at PCM for damage.

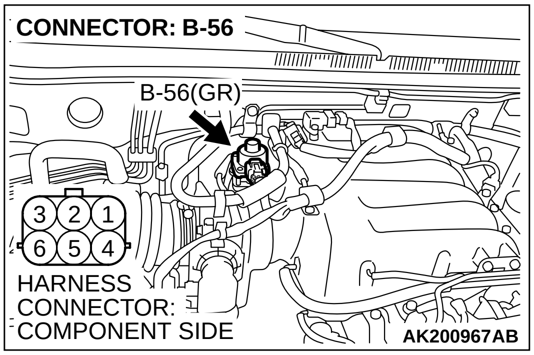
Q: Is the connector in good condition?

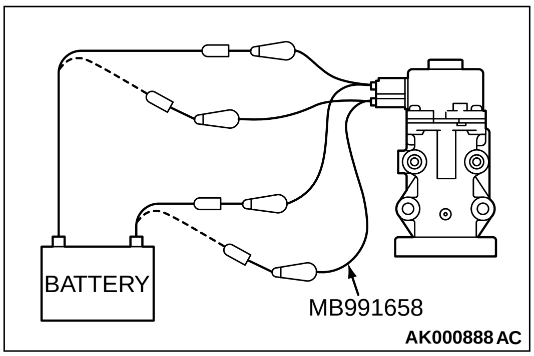
YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check the EGR valve operation using special tool MB991658.

(1) Remove the EGR valve.



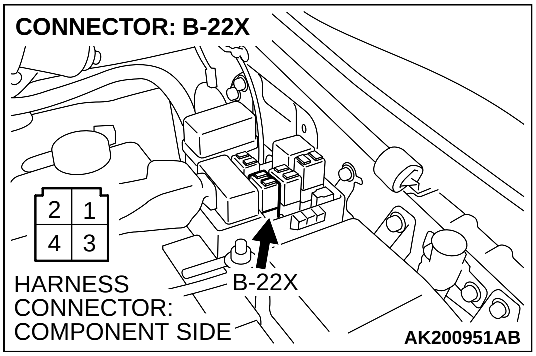


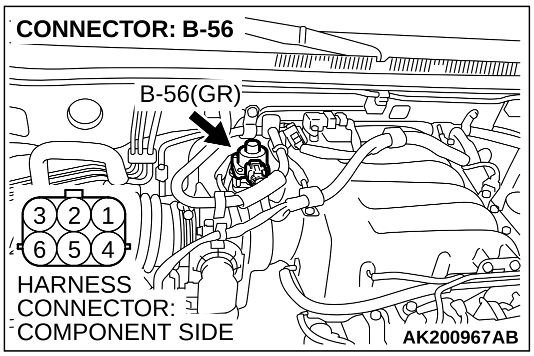
(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 2 of the EGR valve onnector to the positive battery terminal.
(4) Check the ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
   - Vibration should be present at each application of voltage to test clip combination.
(5) Then. Use jumper wires to connect the terminal No. 5 of the EGR valve connector to the positive battery terminal.
(6) Check the ensure that the motor operates when the terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
   - Vibration should be present at each application of voltage to test clip combination.
(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque : 24 ± 3 N·m [17 ± 3 ft·lb]

Q: Is the EGR valve operating properly?

YES : Go to Step 10.
NO : Replace the EGR valve. Then go to Step 12.



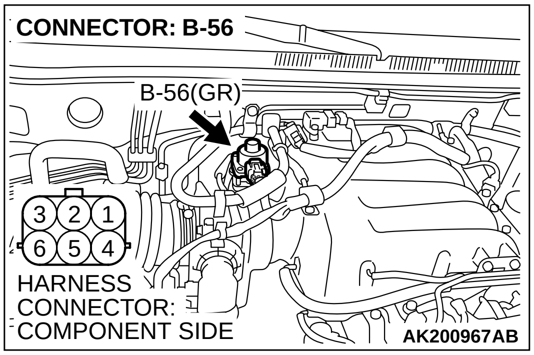


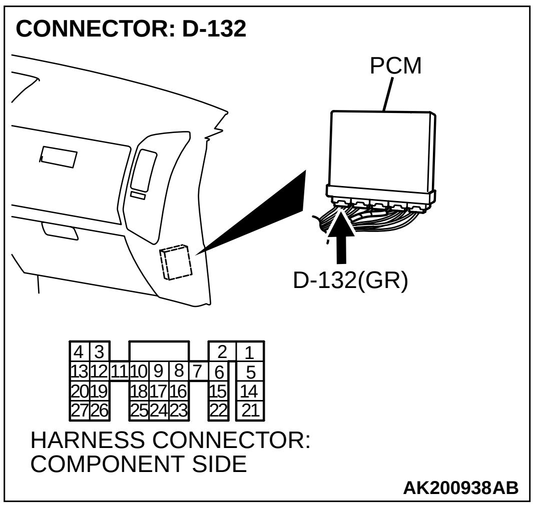
STEP 10. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and EGR valve connector B-56 (terminal No. 2, No. 5).

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 valve connector B-56 and PCM connector D-132.

a. EGR valve connector B-56 (terminal No. 1) and PCM connector D-132 (terminal No. 3).
b. EGR valve connector B-56 (terminal No. 3) and PCM connector D-132 (terminal No. 12).
c. EGR valve connector B-56 (terminal No. 4) and PCM connector D-132 (terminal No. 19).
d. EGR valver connector B-56 (terminal No. 6) and PCM connector D-132 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0421: Warm up catalyst Efficiency Below Threshold (bank 1)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- The throttle valve is open.
- Volume airflow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds has elapsed 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 PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than –30 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.

Judgment Criteria

- The right bank heated oxygen sensor (rear) signal frequency devided by right bank heated oxygen sensor (front) signal frequency = 0.75 or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank side catalytic converter deteriorated.
- Right bank heated oxygen sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

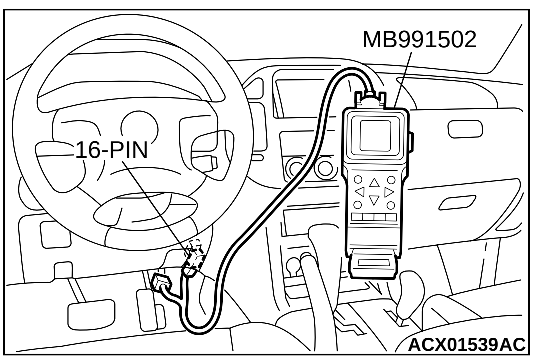
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.

STEP 2. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

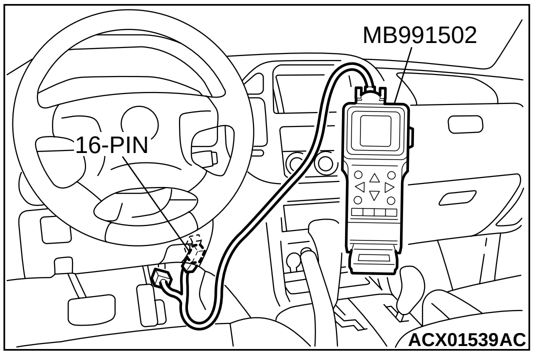
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0136 – Heated Oxygen Sensor Circuit (Bank 1, Sensor 2) P.13Ac-151, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 2) P.13Ac-166, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 2) P.13Ac-172, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (Bank 1, Sensor 2) P.13Ac-176.

STEP 3. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 2 (right front).



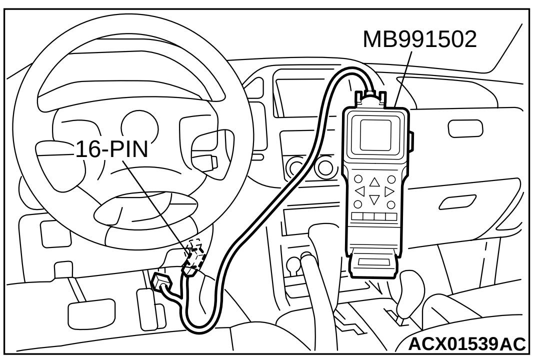
(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 2 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0130 – Heated Oxygen Sensor Circuit (Bank 1, Sensor 1) P.13Ac-105, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 1) P.13Ac-120, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 1) P.13Ac-126, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (Bank 1, Sensor 1) P.13Ac-130, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (Bank 1, Sensor 1) P.13Ac-133.

STEP 4. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right 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 right bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Read the diagnostic trouble code.

Q: Is DTC P0421 set?

YES : Replace the right bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Read the diagnostic trouble code.

Q: Is DTC P0421 set?

YES : Replace the PCM. Then go to Step 7.
NO : The inspection is complete.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0431: Warm up catalyst Efficiency Below Threshold (bank 2)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- The throttle valve is open.
- Volume airflow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds has elapsed 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 PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than –30 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.

Judgment Criteria

- The left bank heated oxygen sensor (rear) signal frequency divided by left bank heated oxygen sensor (front) signal frequency = 0.75 or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank side catalytic converter deteriorated.
- Left bank heated oxygen sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tool:

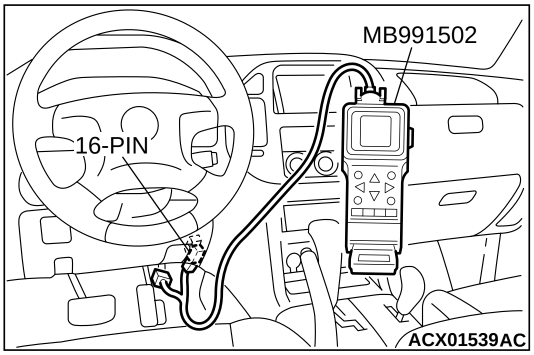
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.

STEP 2. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

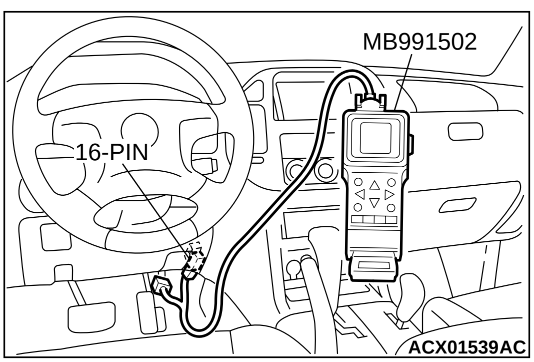
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0156 – Heated Oxygen Sensor Circuit (Bank 2, Sensor 2) P.13Ac-235, DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (Bank 2, Sensor 2) P.13Ac-250, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (Bank 2, Sensor 2) P.13Ac-256, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (Bank 2, Sensor 2) P.13Ac-260.

STEP 3. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

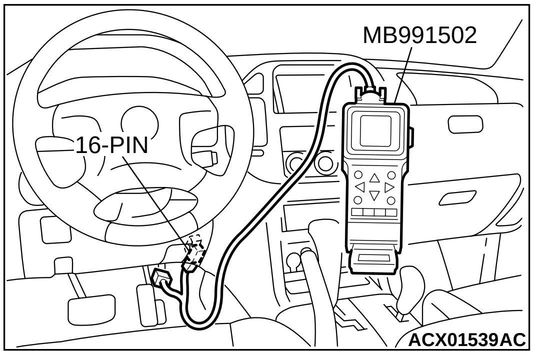


(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0150 – Heated Oxygen Sensor Circuit (Bank 2, Sensor 1) P.13Ac-189, DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (Bank 2, Sensor 1) P.13Ac-204, DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (Bank 2, Sensor 1) P.13Ac-210, DTC P0153 – Heated Oxygen Sensor Circuit Slow Response (Bank 2, Sensor 1) P.13Ac-214, DTC P0154 – Heated Oxygen Sensor Circuit No Activity Detected (Bank 2, Sensor 1) P.13Ac-217.



STEP 4. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left 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 left bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Read the diagnostic trouble code.

Q: Is DTC P0431 set?

YES : Replace the left bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Read the diagnostic trouble code.

Q: Is DTC P0431 set?

YES : Replace the PCM. Then go to Step 7.
NO : The inspection is complete.

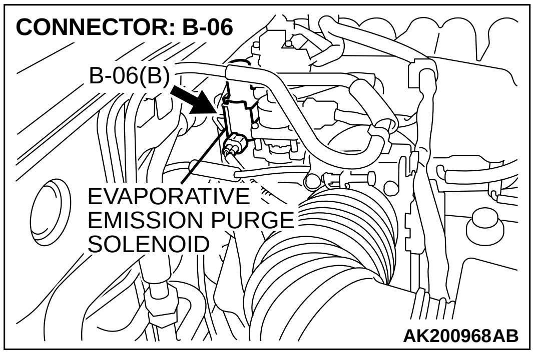
STEP 7. Test the OBD-II drive cycle.

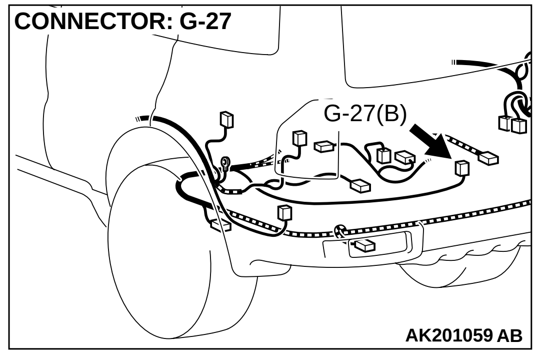
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 3 – Catalytic Converter Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0431 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0441: Evaporative Emission System Incorrect Purge Flow





TECHNICAL DESCRIPTION

- PCM detects stuck open of evaporative emission purge solenoid valve and stuck close of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open of evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission system.
- Stuck close of evaporative emission ventilation solenoid valve is judged after 20 seconds of 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.
- 20 seconds have elapsed from the time 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 (0.29 psi) or less for 0.1 second.

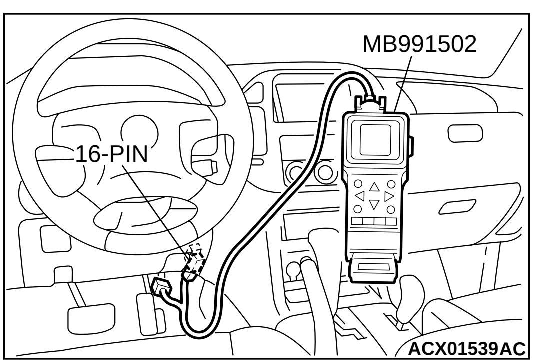
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Choking up of hose between evaporative emission canister and evaporative emission ventilation solenoid.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

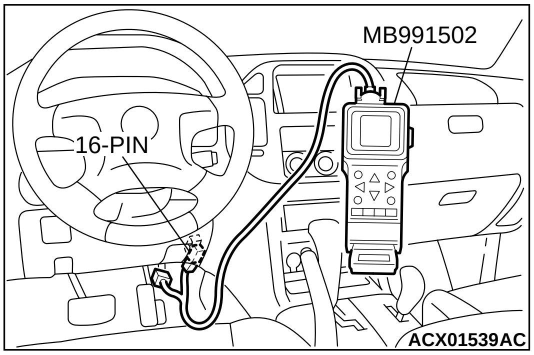
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0451 set?

YES : Refer to, DTC P0451 - Evaporative Emission System Pressure Sensor Range/Performance P.13Ac-436.

NO : Go to Step 2.



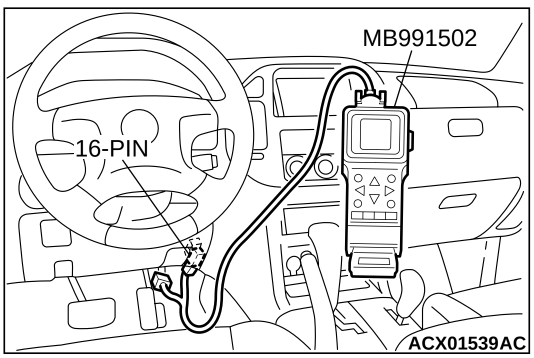
STEP 2. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be –3.3 – 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.13Ac-436.



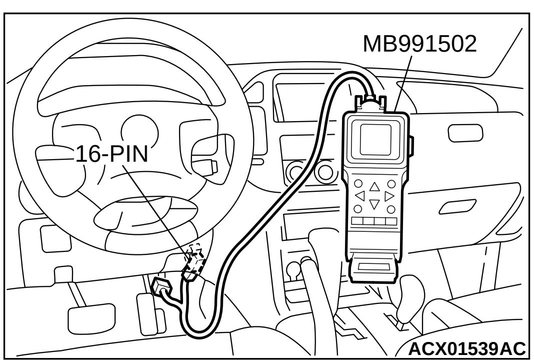
STEP 3. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(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, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

(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, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission System Leak Monitor P.13Ab-2.)

(2) Read the diagnostic trouble code.

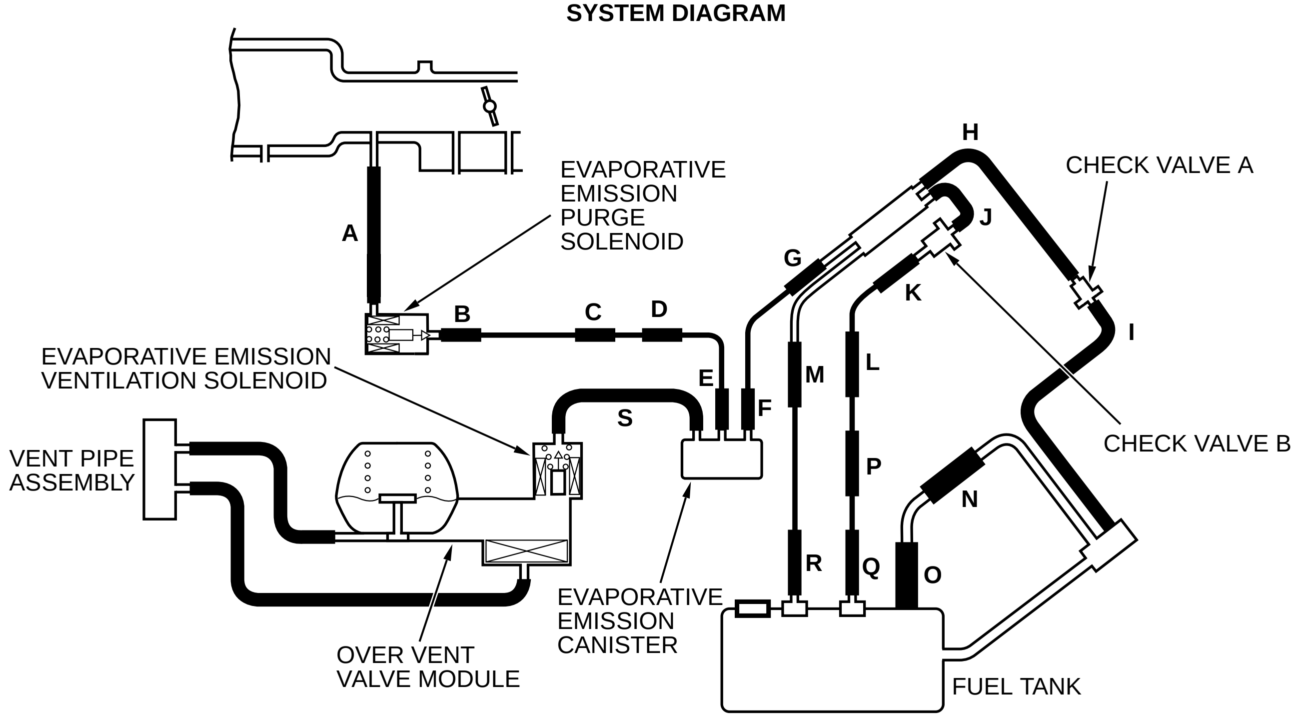
Q: Is DTC P0441 set?

YES : Go to Step 1.

NO : The procedure is complete.

DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

SYSTEM DIAGRAM



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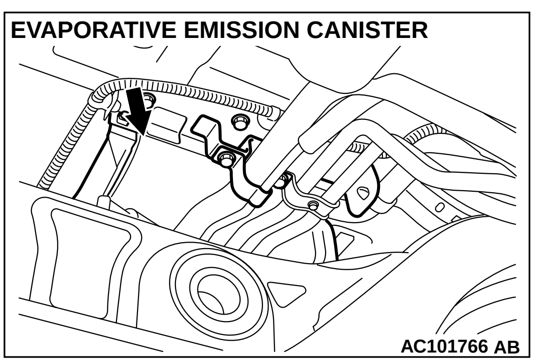
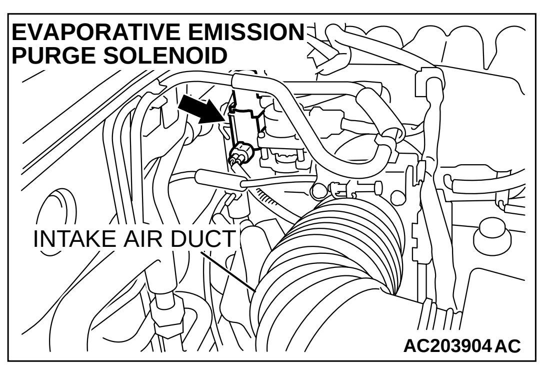
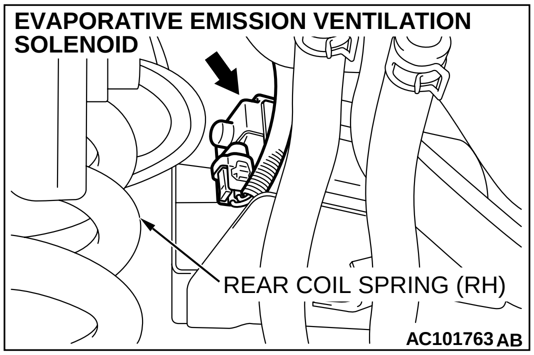


AC101766 AB



AC203904 AC



TECHNICAL DESCRIPTION

- The PCM monitors the Evaporative Emission (EVAP) System pressure.
- The PCM 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 PCM 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 voltage is 1.4 – 2.4 volts).

Test Conditions:

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Fuel tank 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).
- Intake air temperature is greater than –10°C (14°F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Power steering pressure switch: "OFF".
- Fuel tank differential pressure sensor output voltage is 1 – 4 volts.
- Pressure fluctuation is less than 647 Pa (0.094 psi).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises in the fuel tank is less than 451 Pa (0.065 psi).
- Vehicle speed is greater than or equal to 20 km/h (12.4 mph).
- 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 greater than 647 Pa (0.094 psi) in 20 seconds after the tank and vapor line were closed.
- Only one monitor during one drive cycle.

DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent of capacity. (fuel level sensor output voltage is 2.4 – 3.7 volts).

Test Conditions:

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is greater than 20°C (68°F).
- Intake air temperature is greater than –10°C (14°F).
- Fuel tank 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 – 4 volts.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises 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 greater than 1.9 kPa (0.28 psi) in 128 seconds after the tank and vapor line were closed.
- Only one monitor during one 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.

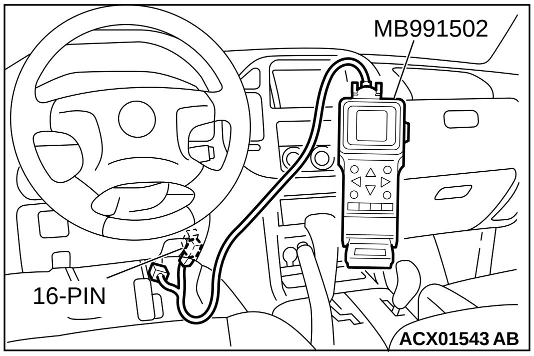
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set to the data reading mode for the fuel tank differential pressure sensor (TANK PRES SNER 73). The mechanical gauge reading is used to verify the scan tool reading. A comparison of the mechanical gauge and scan tool MB991502 determines whether there is problem in the system.
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all EVAP system hoses and tubes for damage.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

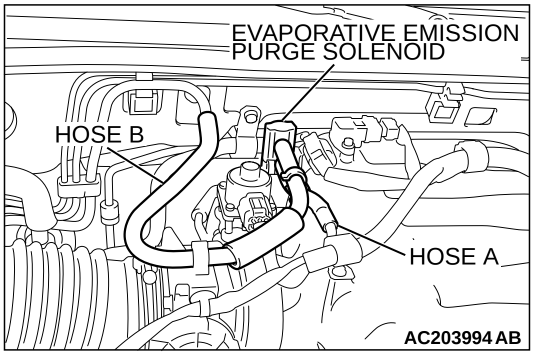
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

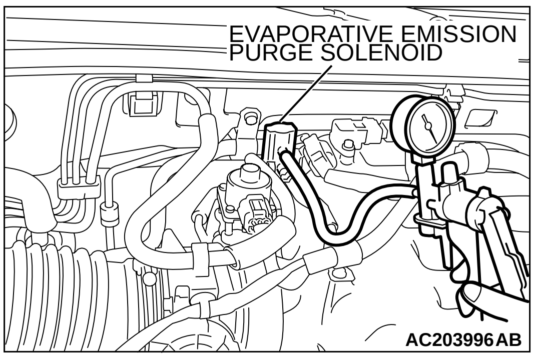
Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed Test Passed" : The EVAP system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause MIL to turn on. Return the vehicle to the customer.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Refer to GROUP 13A, Diagnostic Trouble Code Chart P.13Ab-22, and diagnose any other DTCs that are set. If no other DTCs have been set, go to Step 2.

"Evap Lead Mon. Discontinued. Retest again from the first" : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



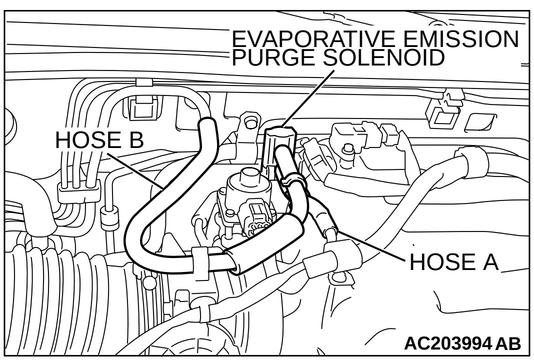


STEP 2. Check for leaks in the evaporative emission purge solenoid.

(1) Disconnect hose B 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 B 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 18.



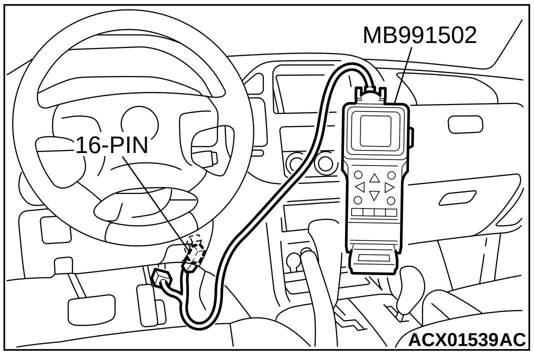
STEP 3. Check for leaks in the evaporative emission system hose A and hose B.

Perform a leakage test with a hand vacuum pump on each hose A and B.

Q: Does the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Go to Step 18.

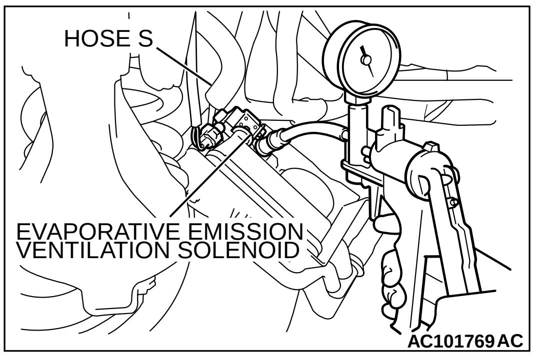
STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502 (Actuator test item 29).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

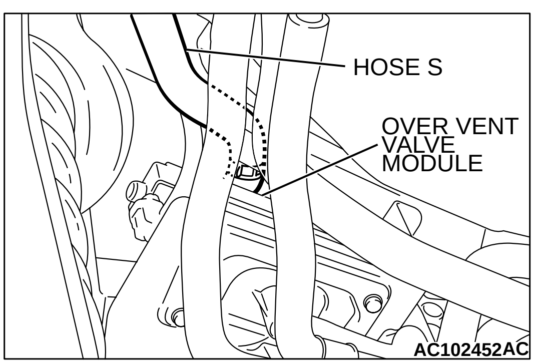


(2) Disconnect hose S from the evaporative emission ventilation solenoid and connect a hand vacuum pump.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid Valve. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that solenoid holds vacuum.
(5) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.
(6) Disconnect the hand vacuum pump and connect hose S to the evaporative emission ventilation solenoid.

Q: Does the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 18.

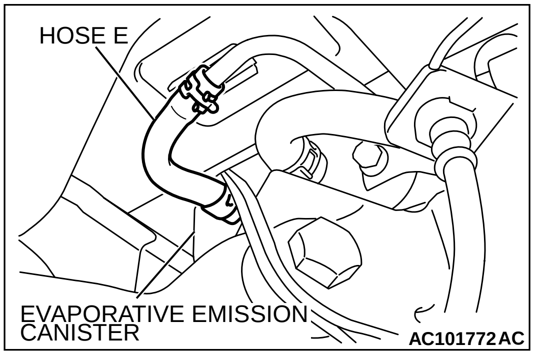
STEP 5. Check for leaks in the evaporative emission system hose S.



Perform a leakage test with a hand vacuum pump on hose S.

Q: Does hose S hold vacuum?

YES : Go to Step 6.
NO : Replace hose S. Go to Step 18.

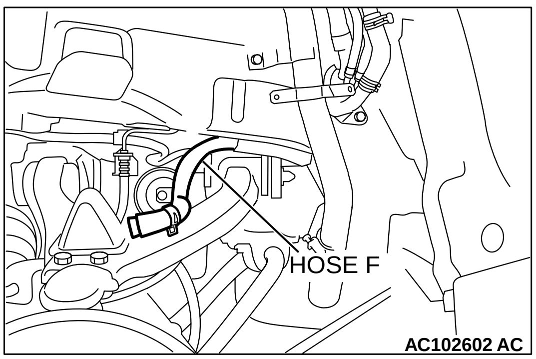


STEP 6. Check for leaks in the evaporative emission system hose E.

Perform a leakage test with a hand vacuum pump on hose E.

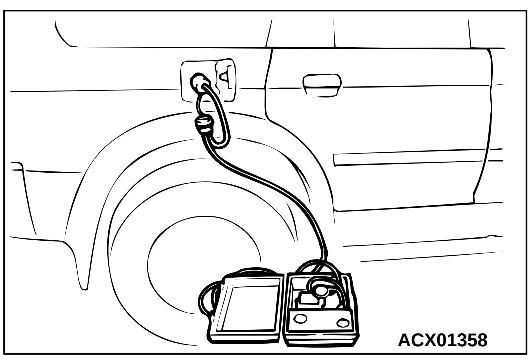
Q: Does hose E hold vacuum?

YES : Go to Step 7.
NO : Replace hose E. Go to Step 18.



STEP 7. Pressure test the evaporative emission system lines between hose F and R.

(1) Disconnect hose F from the evaporative emission canister and plug hose F 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) Remove the fuel cap.



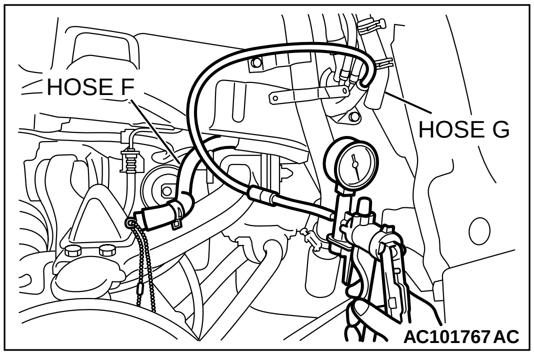
(4) Connect the evaporative emission system pressure pump to the fuel tank filler tube.
(5) Pressure test the system to determine whether any leaks are present.

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.

(6) Disconnect the evaporative emission system pressure pump and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 15.
NO : Go to Step 8.

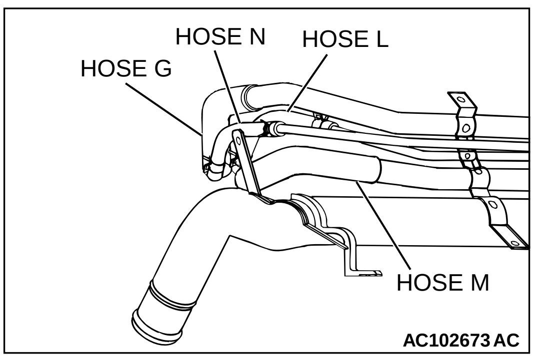


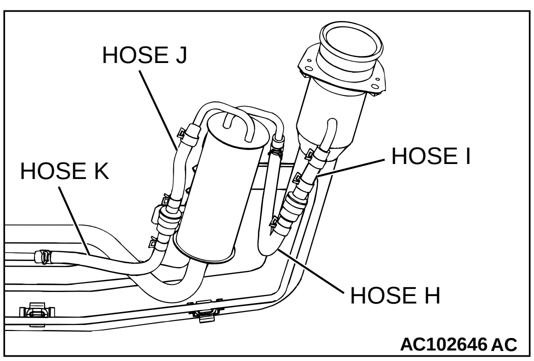
STEP 8. Check for leaks in the evaporator line hose F.

(1) Remove the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Disconnect hose F from the evaporative emission canister and plug hose F securely.
(3) Disconnect hose G from the evaporative emission canister side, and connect a hand vacuum pump.
(4) Apply vacuum with the hand vacuum pump and confirm that the vacuum holds.
(5) Disconnect the hand vacuum pump and connect hose F and G.

Q: Does hose F hold vacuum?

YES : Go to Step 9.
NO : Replace hose F and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.





STEP 9. Check for leaks in the evaporative emission system hoses G through N.

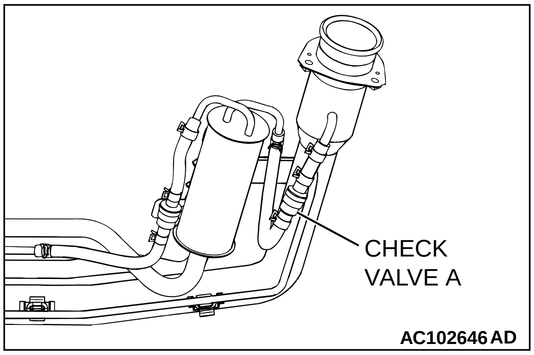
(1) Remove the fuel tank filler tube. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Perform a leakage test with a hand vacuum pump on each hose from hose G to N.

Q: Does the hoses hold vacuum?

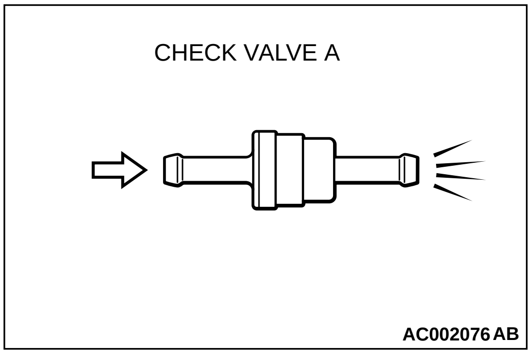
YES : Go to Step 10.
NO : Replace any damaged hose, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

STEP 10. Check the 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.



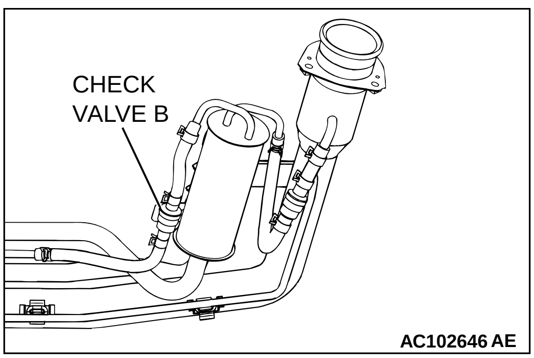
Q: Does check valve A allow air to press in one direction only?

YES : Go to Step 11.

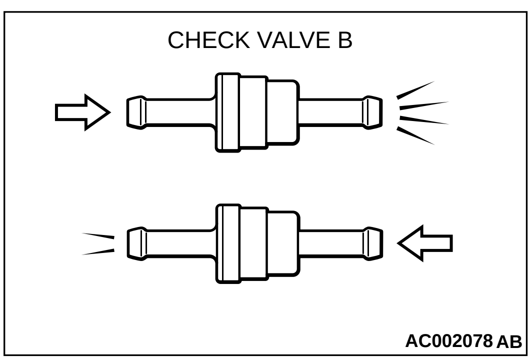
NO : Replace check valve A, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

STEP 11. Check the 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 press in one direction only?

YES : Go to Step 12.

NO : Replace check valve B, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

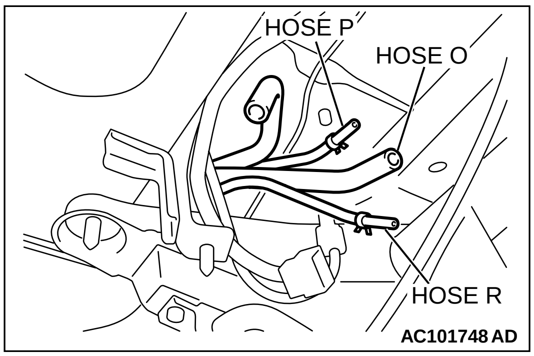
STEP 12. Check for cracks in the fuel tank filler tube assembly.

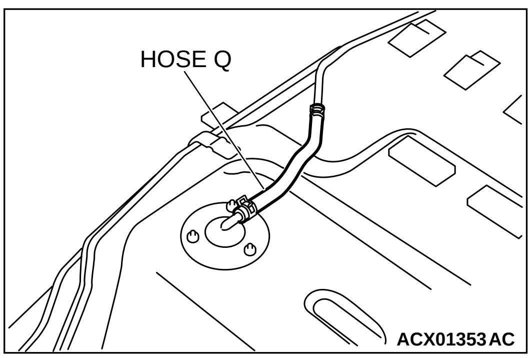
Visually check for cracks in the fuel tank filler tube assembly.

Q: Is the fuel tank filler tube assembly in good condition?

YES : Go to Step 13.

NO : Replace the fuel tank filler tube assembly and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.





STEP 13. Check for leaks in the evaporative emission system hoses O through R.

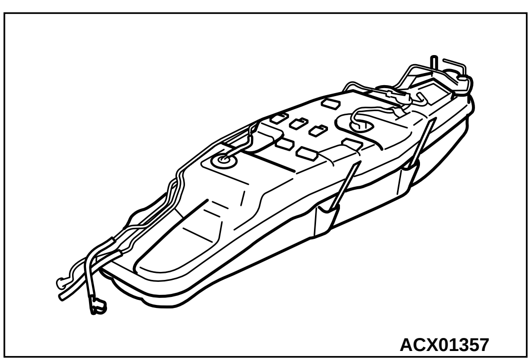
(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Perform a leakage test with a hand vacuum pump on each hose from hose O to R.

Q: Does the hoses hold vacuum?

YES : Go to Step 14.

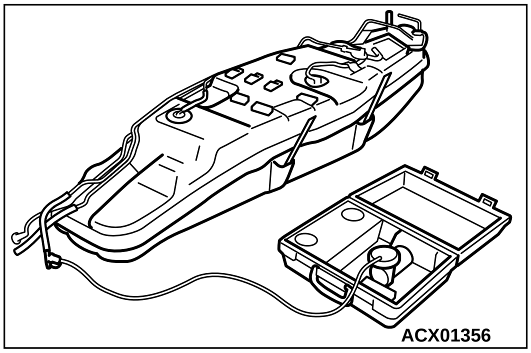
NO : Replace any damaged hose, and reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.



STEP 14. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve and fuel tank leveling valve installation section in the fuel tank.



(2) Connect the evaporative emission system pressure pump to the filler hose.

(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple that are connected to the fuel tank.

NOTE: If these items are not securely plugged at this time, the fuel could leak from the tank.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leaks by applying soapy water solution to each section and look for bubbles.

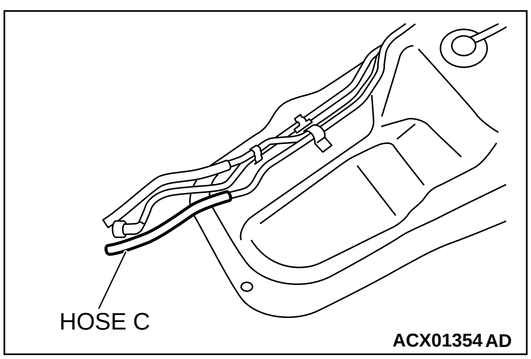
Q: Is the fuel tank free of leaks?

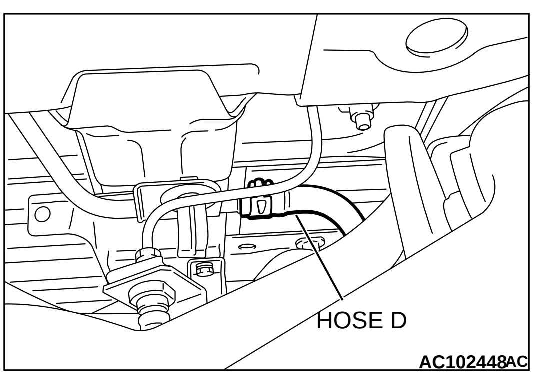
There are leaks at the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve or the fuel tank leveling valve installation section. : After reassemble the leaked parts, check again that there are no leaks. Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

There are leaks at the fuel tank. : Replace the fuel tank, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

There are no leaks. : Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 15 .

STEP 15. Check for leaks in evaporative emission system hose C and hose D.





(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Perform a leakage test with a hand vacuum pump on each hose C and D.

Q: Does the hoses hold vacuum?

YES : Reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 16.

NO : Replace any damaged hose and reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

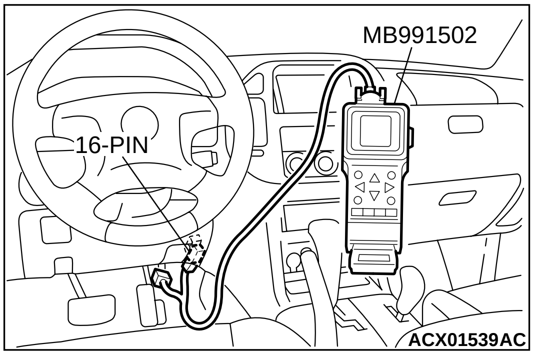
STEP 16. Check for leaks in the evaporative emission canister.

(1) Remove the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66).
(2) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(3) Plug the other two nipples or loop a hose between them.
(4) Apply vacuum with the hand vacuum pump and confirm that the canister holds vacuum.

Q: Does the evaporative emission canister hold vacuum?

YES : Reinstall the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 17 .

NO : Replace the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 18 .



STEP 17. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Go to Step 18 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the PCM. Go to Step 18.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once and repeat evaporative emission system monitor test.

STEP 18. Perform the OBD-II drive cycle.

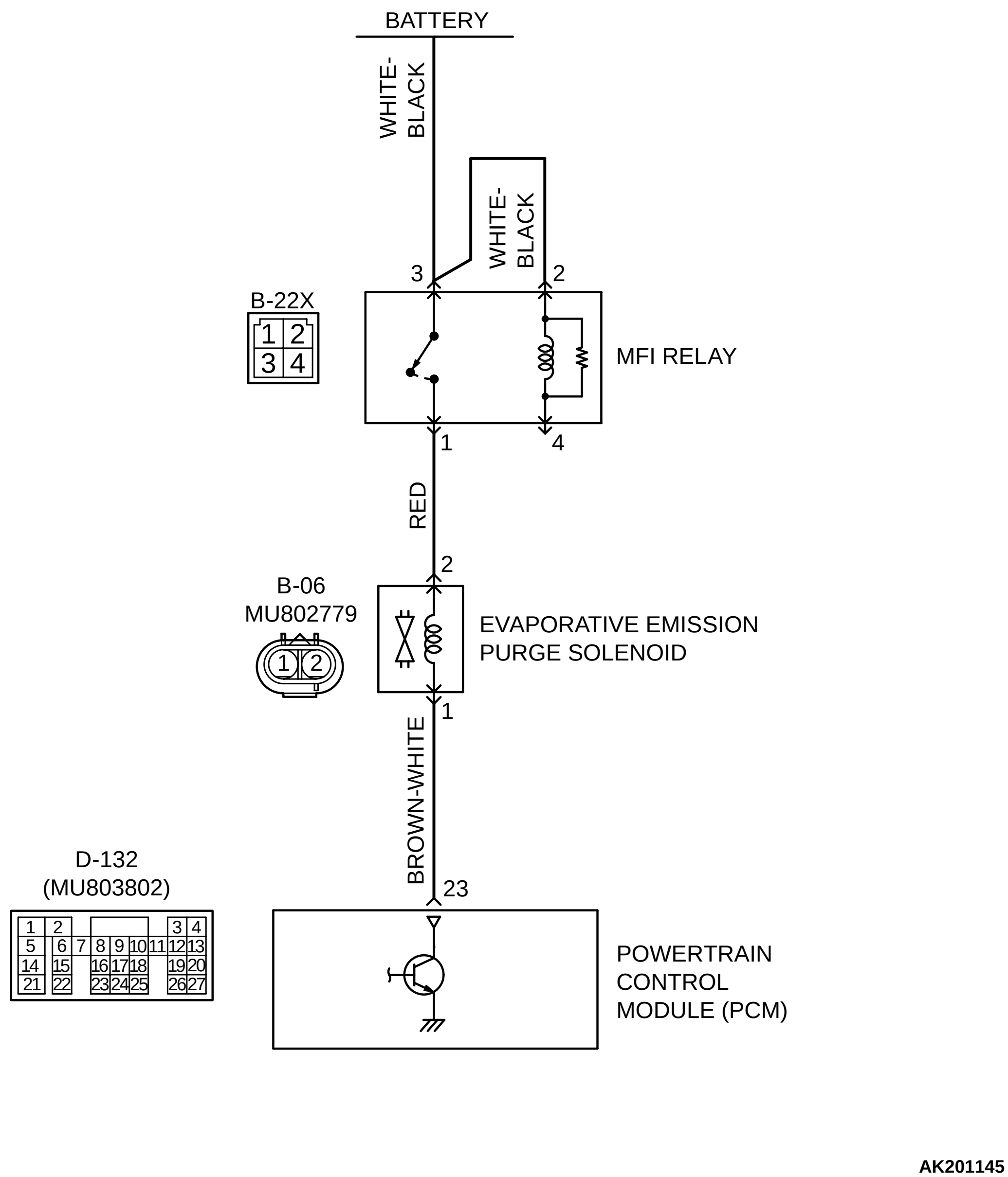
(1) Confirm the repair by performing the appropriate drive cycle. [Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the DTC.

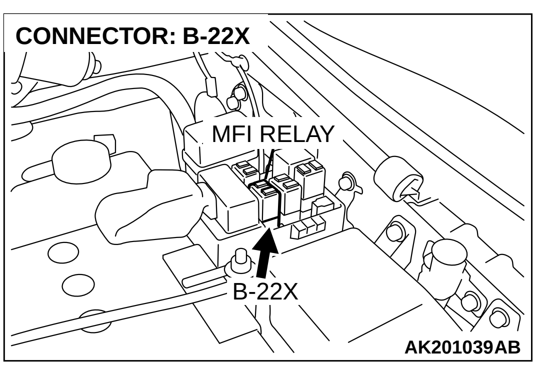
Q: Is DTC P0442 set?

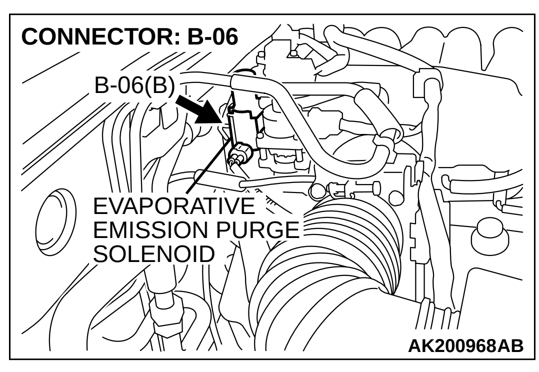
YES : Repeat the troubleshooting procedure. Go to Step 1.
NO : The procedure is complete.

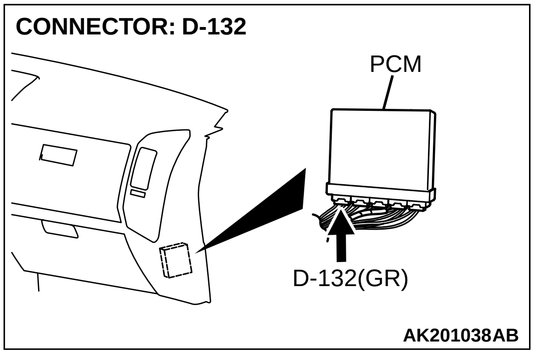
DTC P0443: Evaporative Emission System Purge Control Valve Circuit

Evaporative Emission Purge Solenoid Circuit









CIRCUIT OPERATION

- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 1).
- The PCM controls ground evaporative emission purge solenoid by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the PCM measures the surge voltage of the evaporative emission ventilation solenoid coil.

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 PCM 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.
- 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. When the evaporative emission purge solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

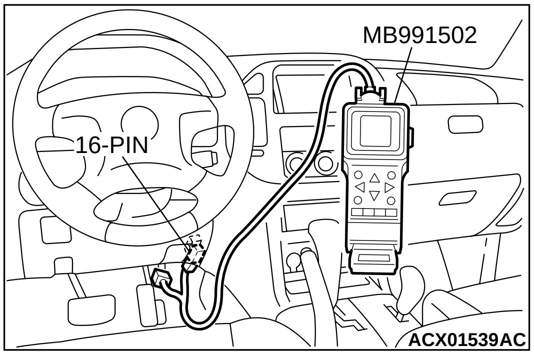
- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

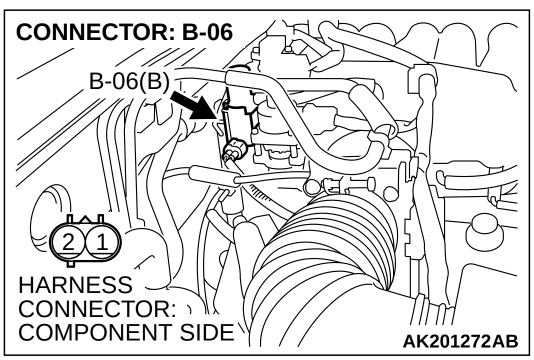
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2 Check harness connector B-06 at the evaporative emission purge solenoid for damage.

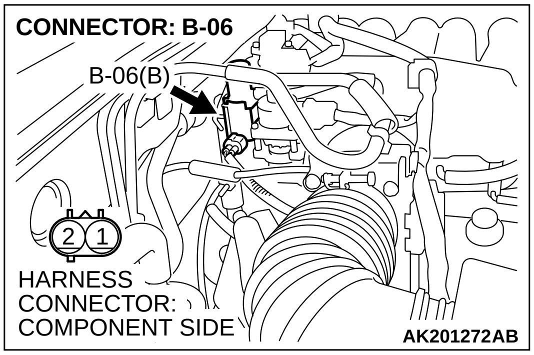


Q: Is the harness connector in good condition?

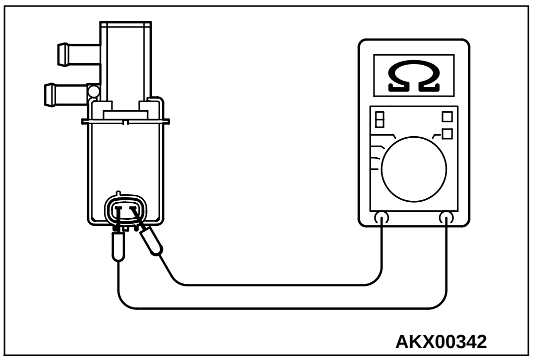
YES : Go to Step 3.

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-06.



(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

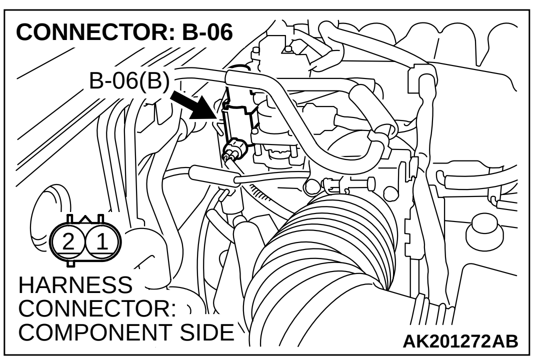
Standard value: 30 – 34 ohms [at 20°C (68°F)]

Q: Is the resistance between 30 and 34 ohms [at 20°C (68°F)]?

YES : Go to Step 4

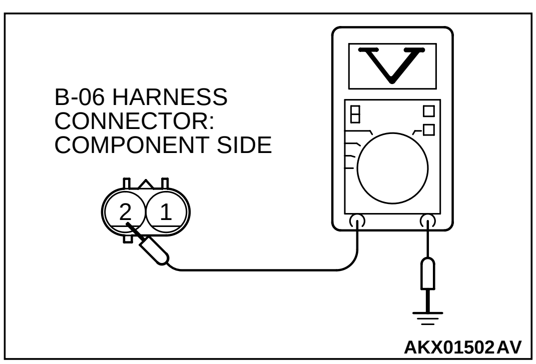
NO : Replace the evaporative emission purge solenoid. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-06.



(1) Disconnect the connector B-06 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



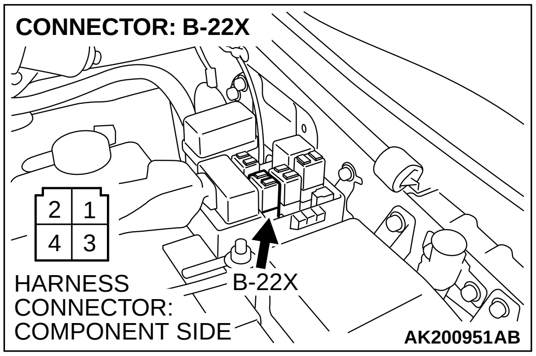
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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.

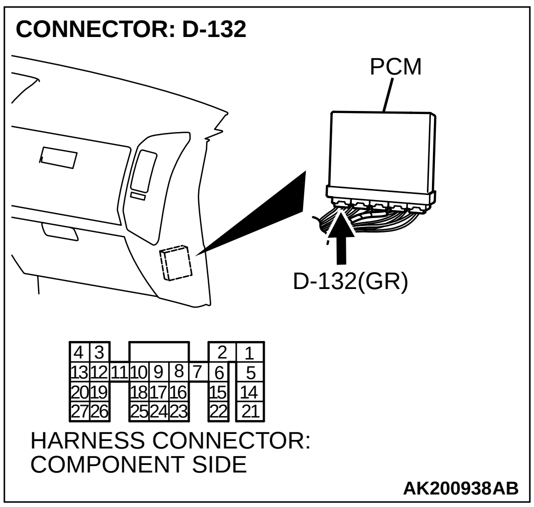


STEP 5. Check harness connector B-22X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and evaporative emission purge solenoid connector B-06 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

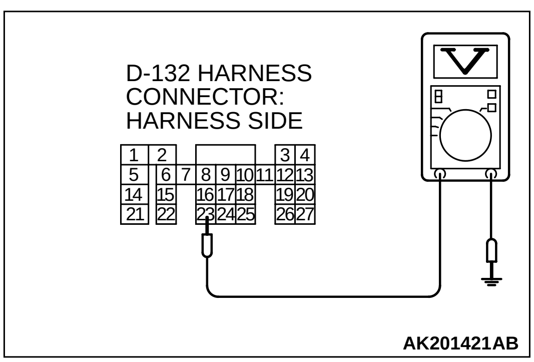
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 6. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 23 and ground by backprobing.

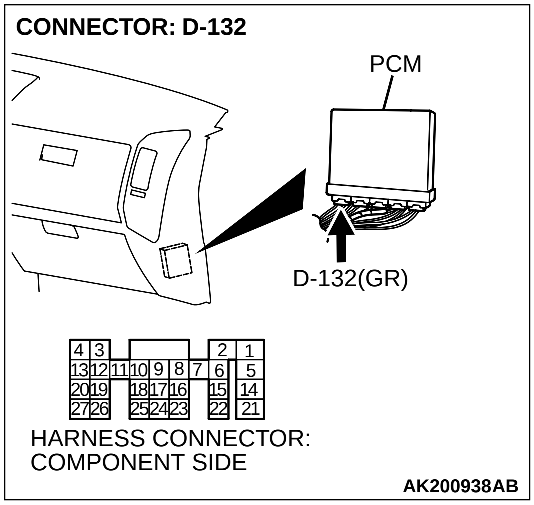
- Voltage should be battery positive voltage.

(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 D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

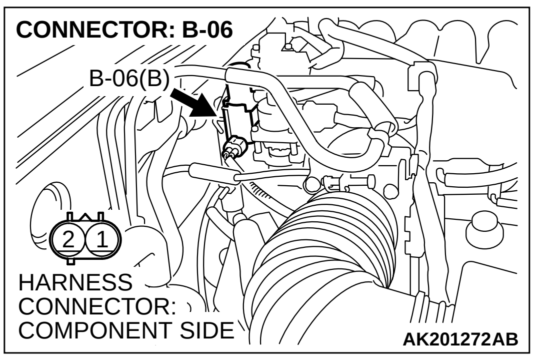
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

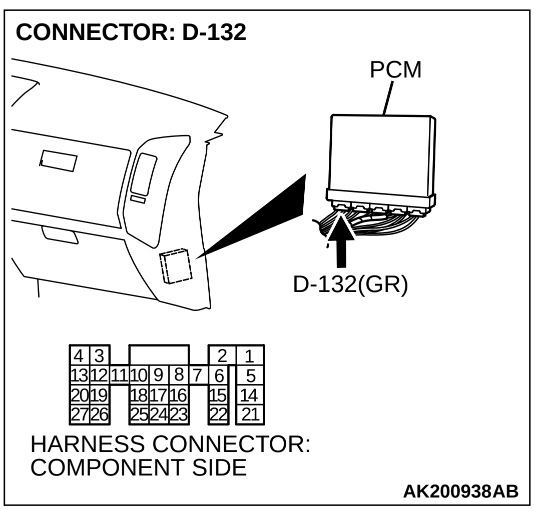
STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-06 (terminal No. 1) and PCM connector D-132 (terminal No. 23).

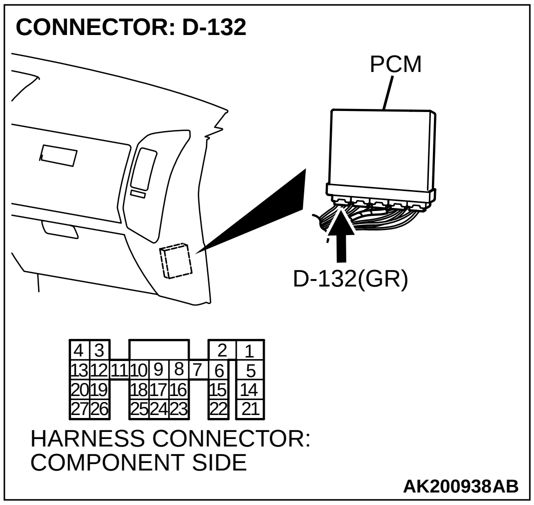
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.





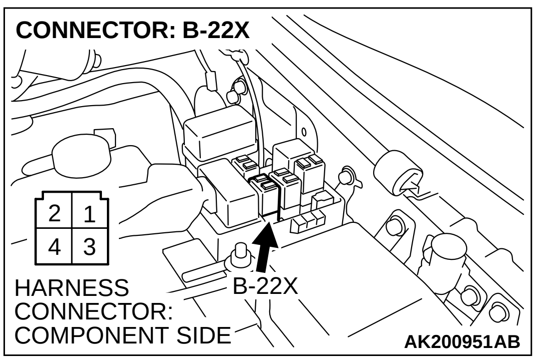


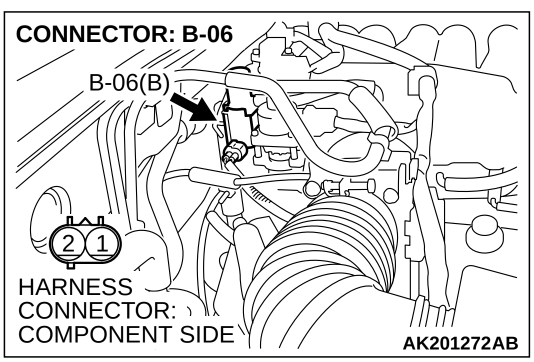
STEP 9. Check harness connector D-132 at PCM for damage.

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.



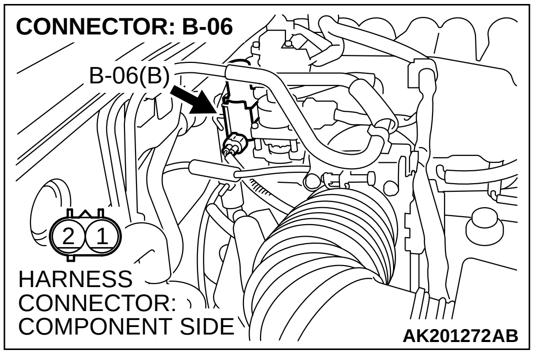


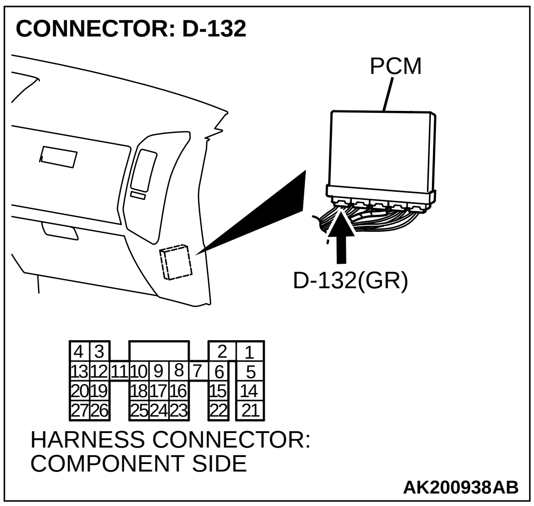
STEP 10. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and evaporative emission purge solenoid connector B-06 (terminal No. 2).

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-06 (terminal No. 1) and PCM connector D-132 (terminal No. 23).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

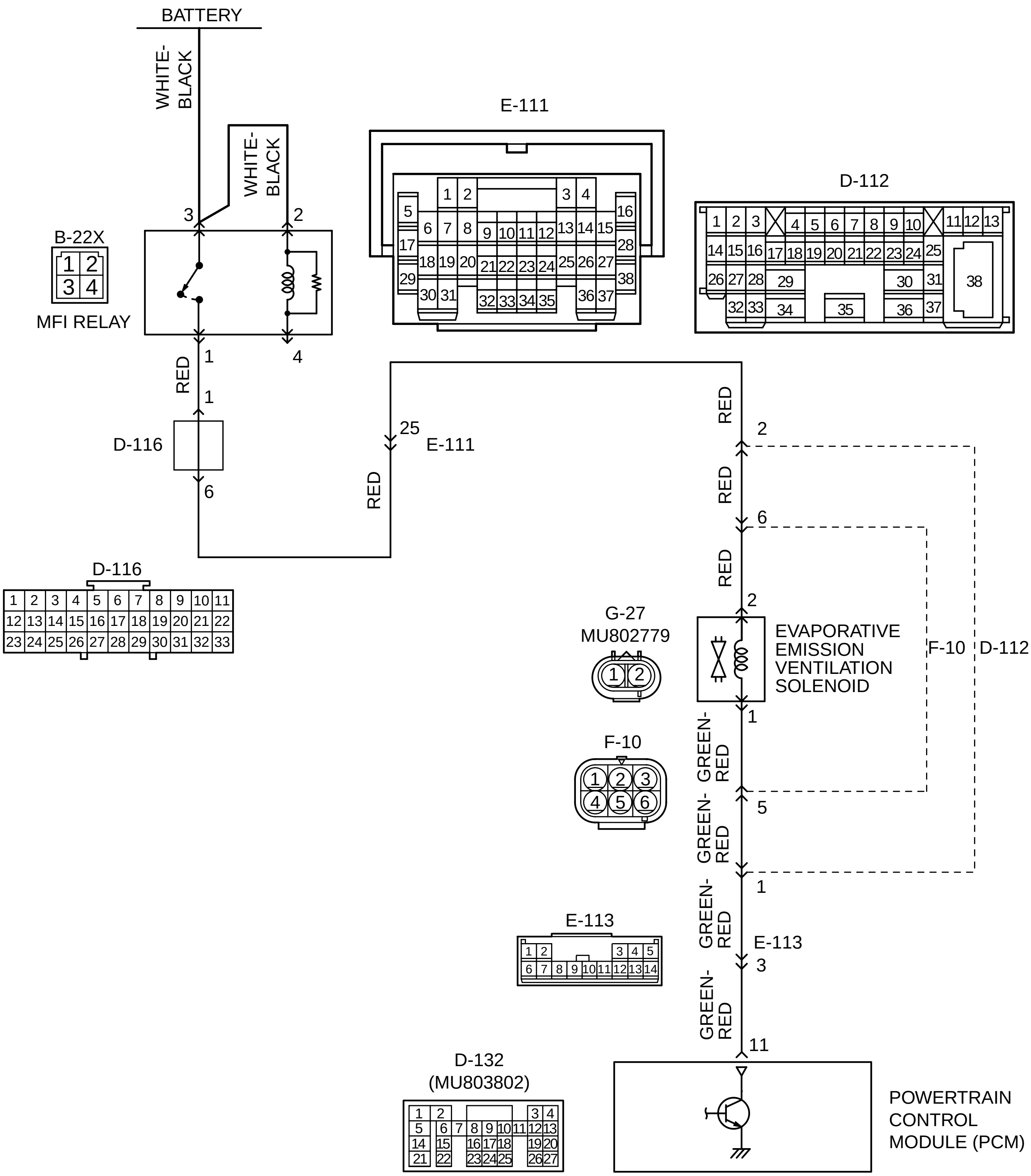
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0443 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0446: Evaporative Emission System Vent Control Circuit

Evaporative Emission Ventilation Solenoid Circuit



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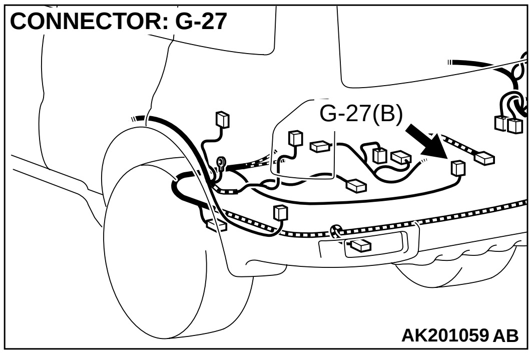
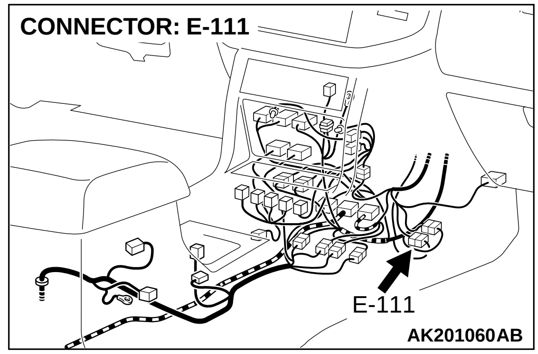
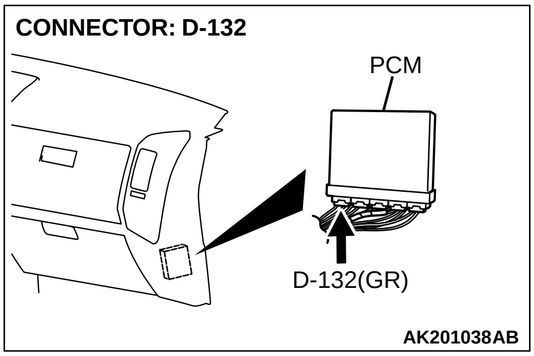
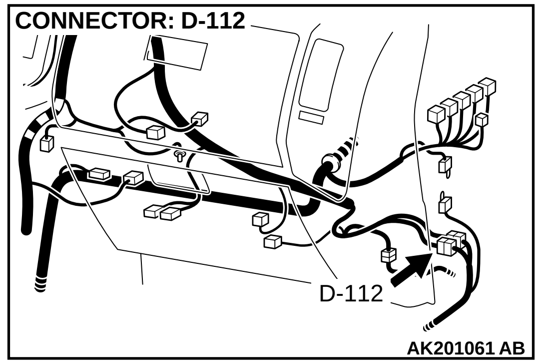
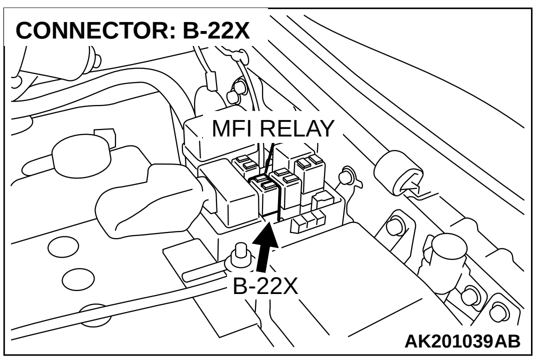
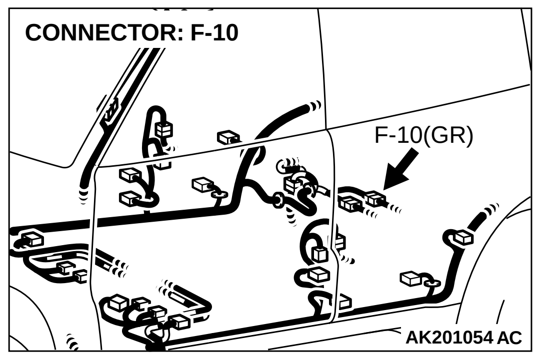


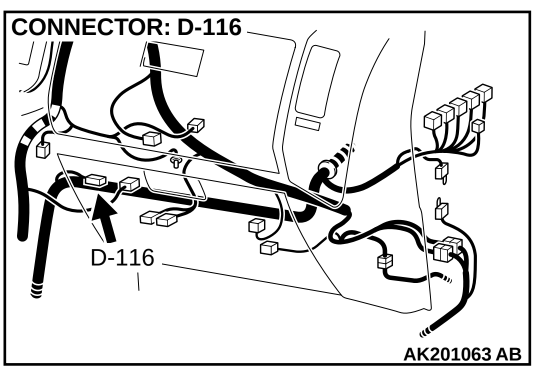


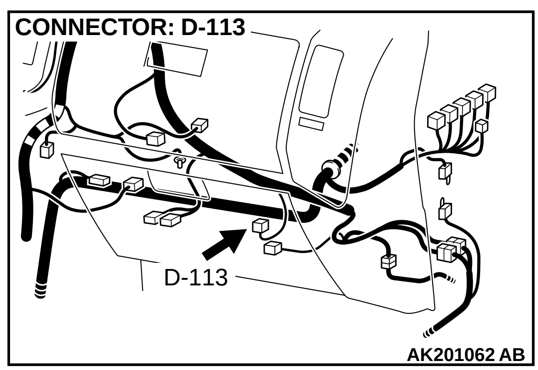












CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 1).
- The PCM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the PCM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, PCM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The PCM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the PCM will check if the solenoid coil produces a surge voltage of 2 V 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 ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The PCM monitors for this condition once during the drive cycle.

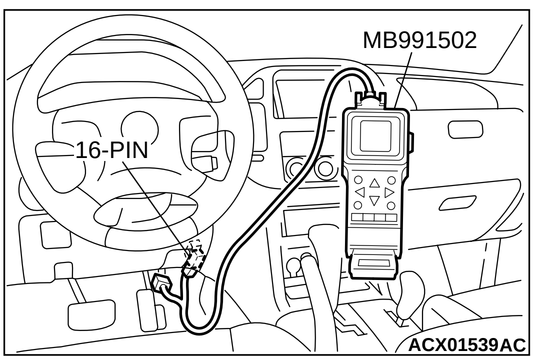
Check Conditions
- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When 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, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

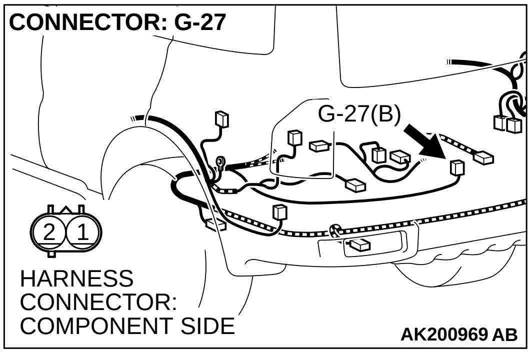
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Check connector G-27 at the evaporative emission ventilation solenoid for damage.

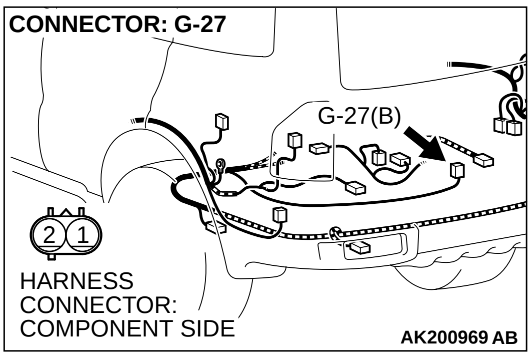


Q: Is the connector in good condition?

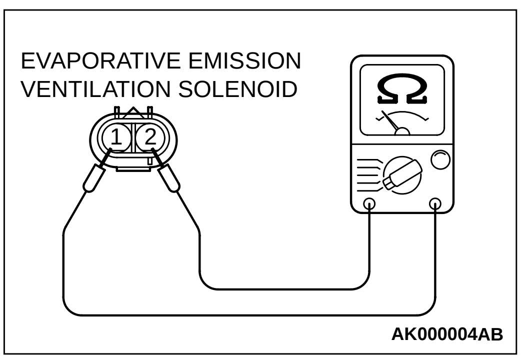
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the evaporative emission ventilation solenoid.



(1) Disconnect the evaporative emission ventilation solenoid connector G-27.



(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

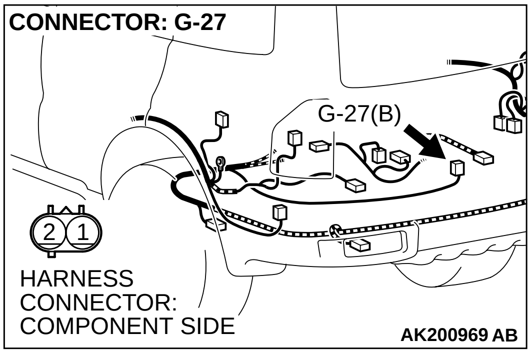
Standard value: 17 – 21 ohms [at 20°C (68°F)]

Q: Is the resistance between 17 and 21 ohms [at 20°C (68°F)]?

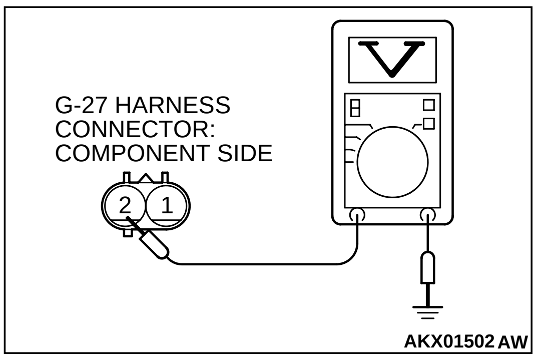
YES : Go to Step 4.

NO : Replace the over vent valve module. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector G-27.



(1) Disconnect the connector G-27 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



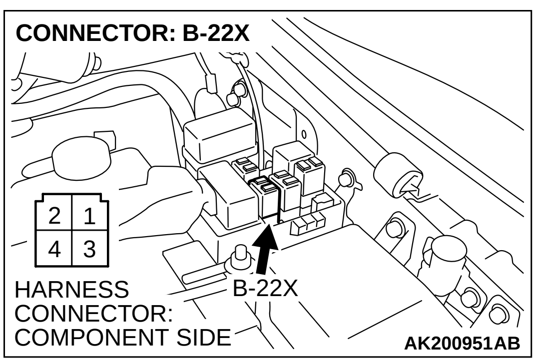
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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.

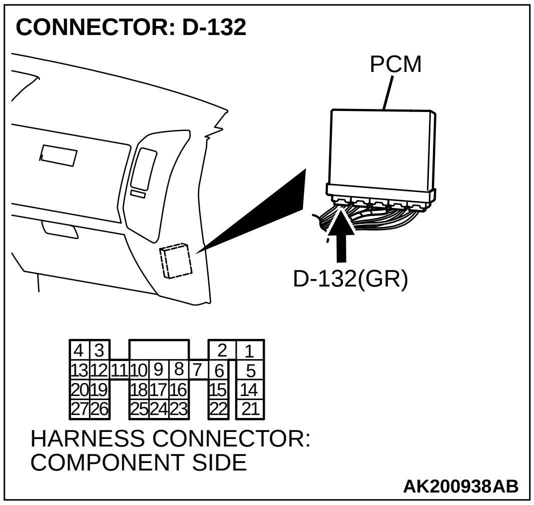
STEP 5. Check connector B-22X at MFI relay for damage.



Q: Is the connector in good condition?

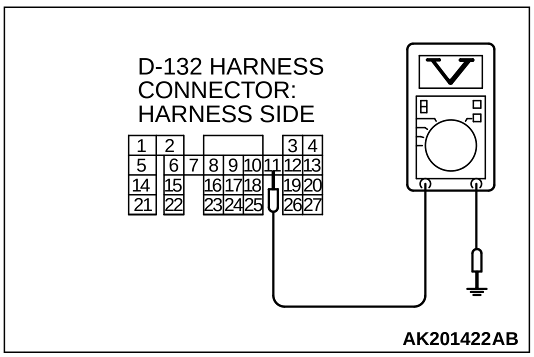
YES : Check connectors D-116, E-111, D-112 and F-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector B-22X (terminal No. 1) and evaporative emission ventilation solenoid connector G-27 (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 PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.
(2) Turn the ignition switch to the "ON" position.

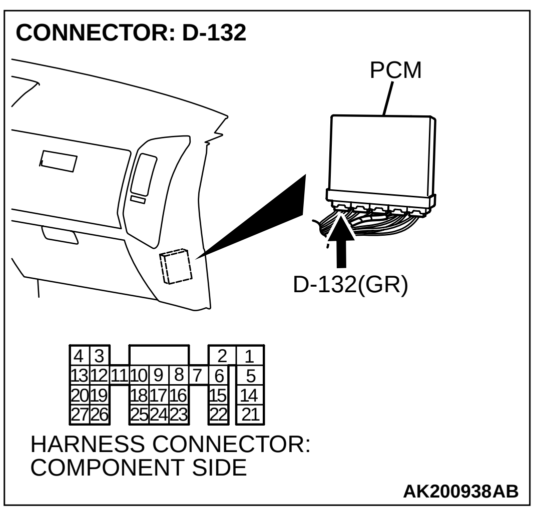


(3) Measure the voltage between terminal No. 11 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

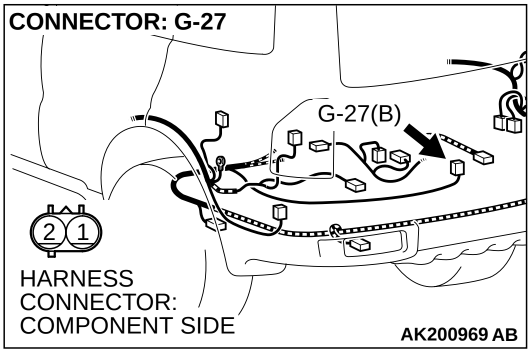
YES : Go to Step 9.
NO : Go to Step 7.

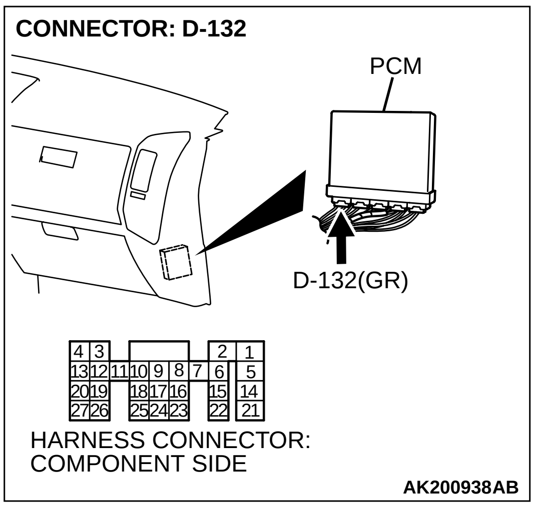


STEP 7. Check connector D-132 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





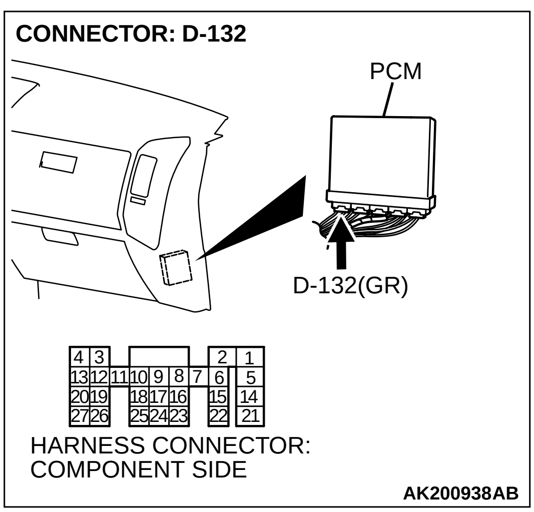
STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector G-27 (terminal No. 1) and PCM connector D-132 (terminal No. 11).

NOTE: Check harness after checking intermediate connectors F-10, D-112 and E-113. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

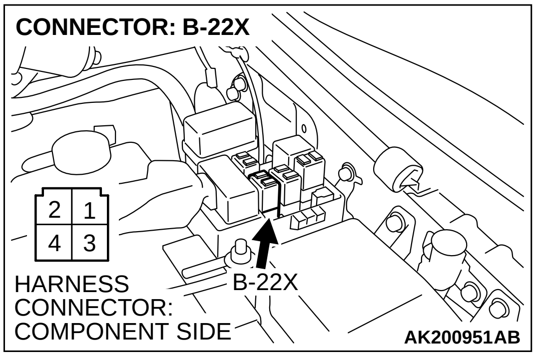


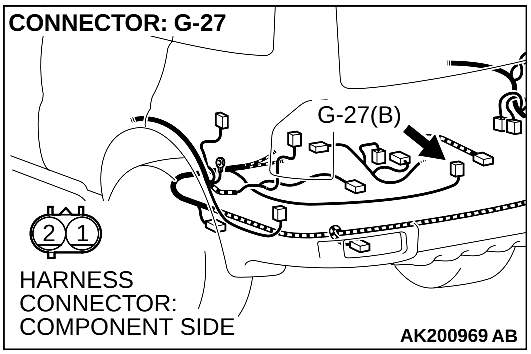
STEP 9. Check connector D-132 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





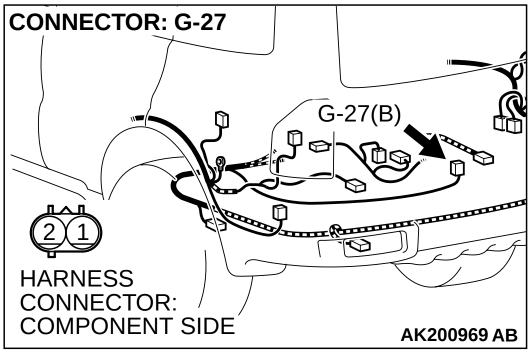
STEP 10. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and evaporative emission ventilation solenoid connector G-27 (terminal No. 2).

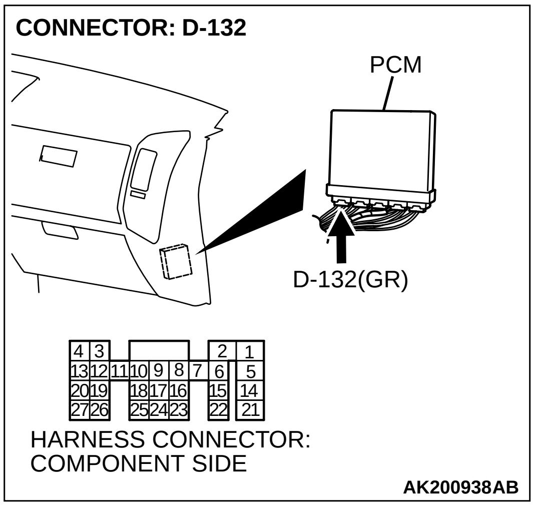
NOTE: Check harness after checking intermediate connectors D-116, E-111, D-112 and F-10. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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 G-27 (terminal No. 1) and PCM connector D-132 (terminal No. 11).

NOTE: Check harness after checking intermediate connectors F-10, D-112 and E-113. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

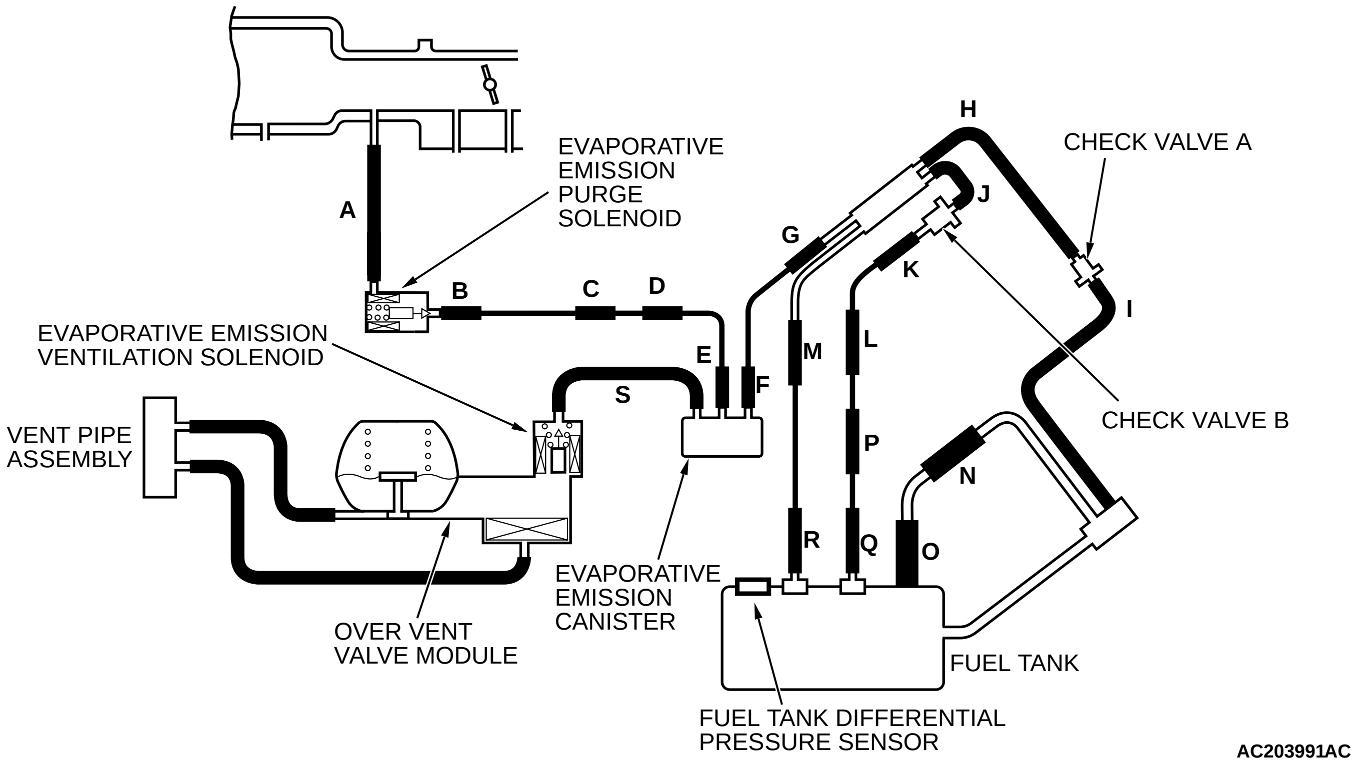
(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0446 set?

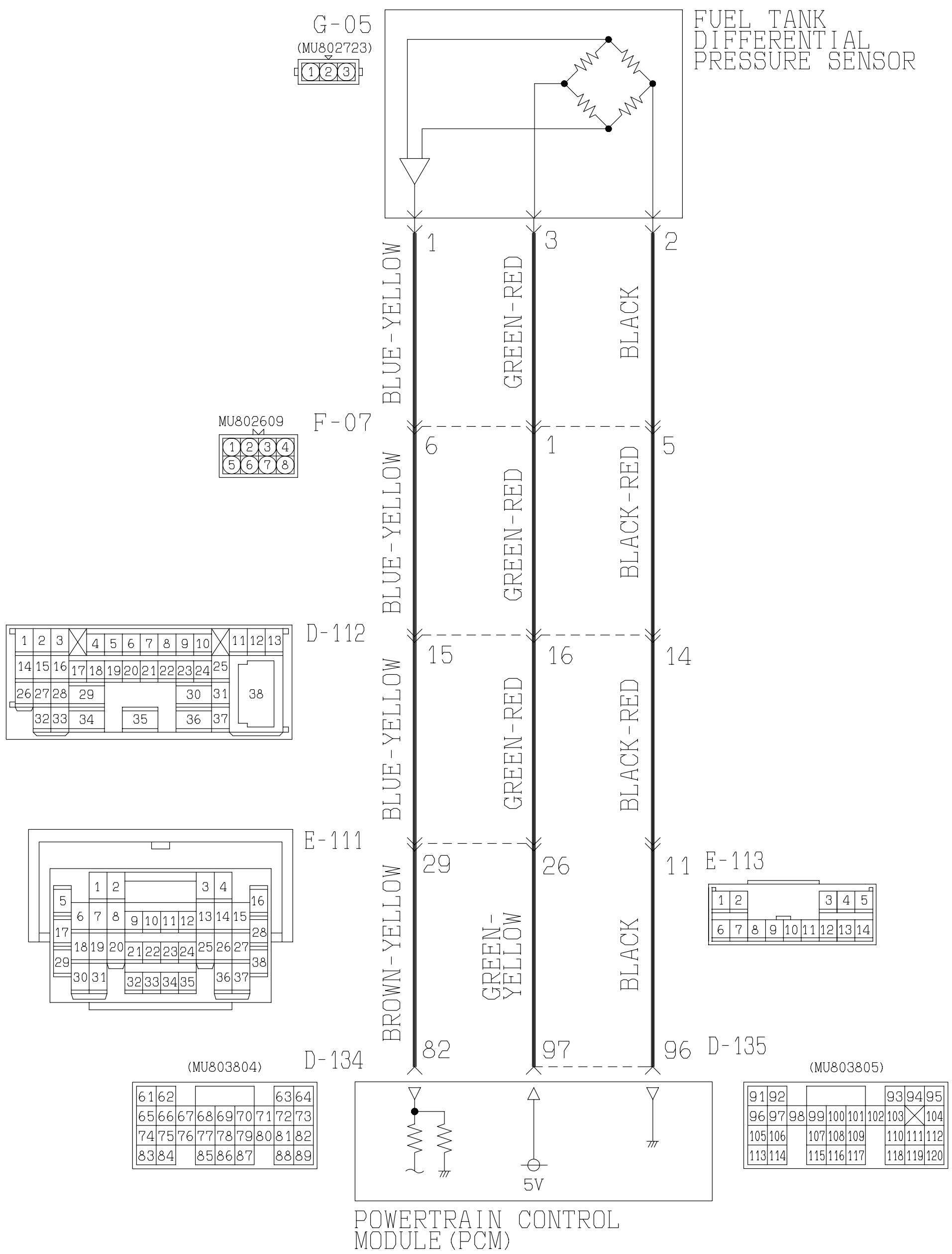
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0451: Evaporative Emission System Pressure Sensor Range/Performance

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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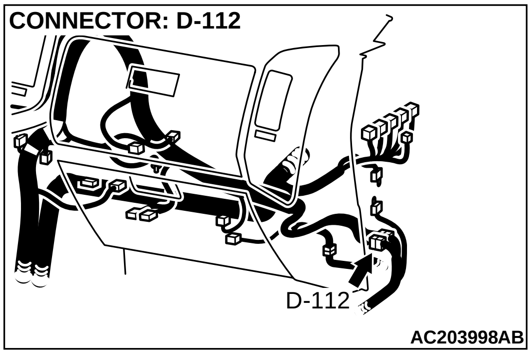
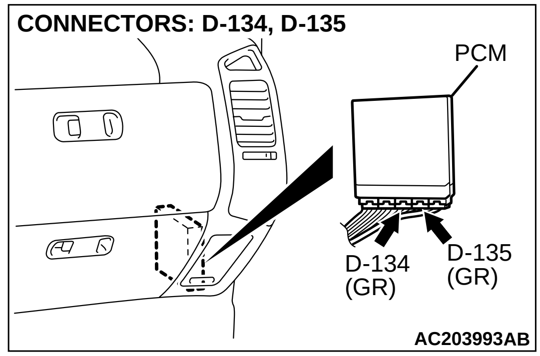
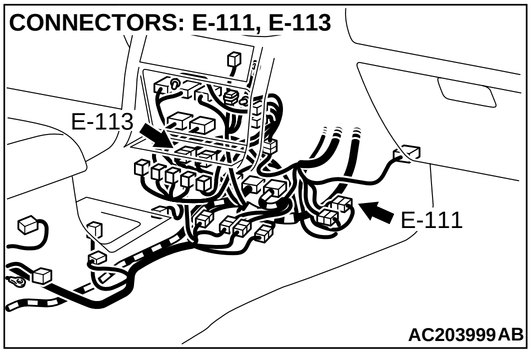
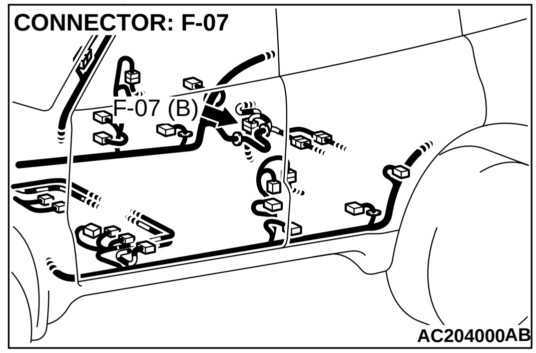
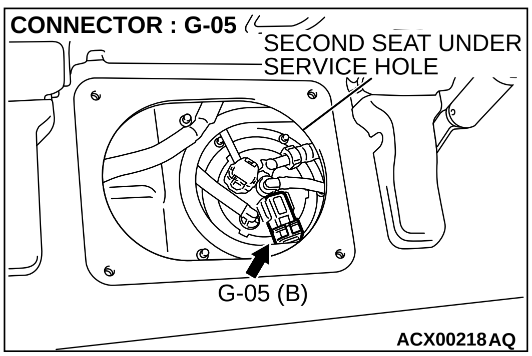










CIRCUIT OPERATION

- The PCM (terminal 97) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 96).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 82) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DTC SET CONDITIONS

Test Conditions:

- Throttle valve is closed.
- Vehicle speed is less than 1.5 km/h (0.93 mph).

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 the ignition switch is turned "LOCK" (OFF) position, 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 greater than 15 km/h (9.3 mph).*
- *Volumetric efficiency is greater than 55 percent.*

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 PCM.

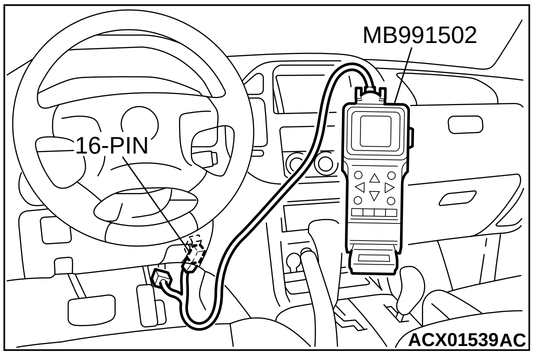
OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73).
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge with the reading on scan tool MB991502 will locate a problem in the system.

DIAGNOSIS

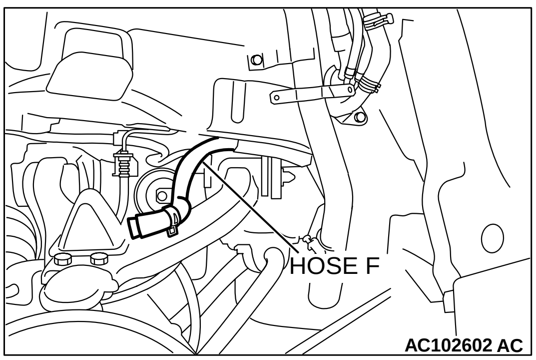
Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

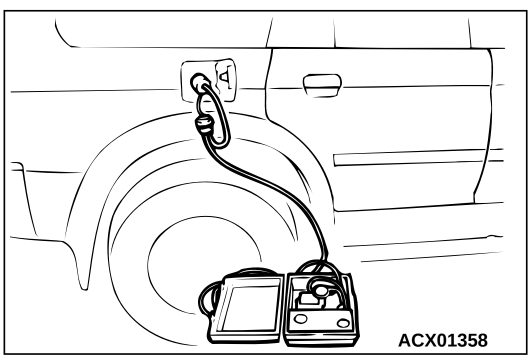


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

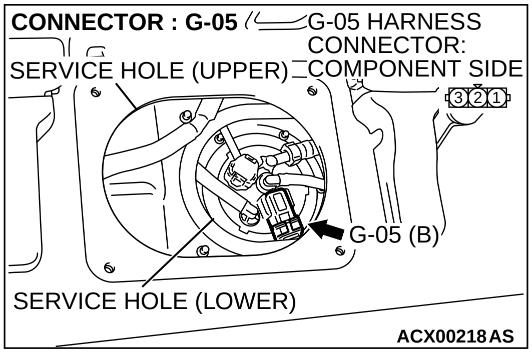
(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

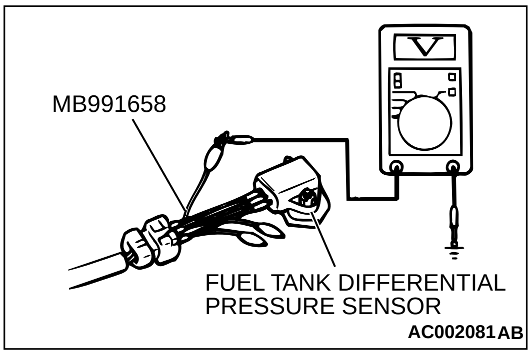
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

NO : Go to Step 2.

STEP 2. Measure the signal voltage at fuel tank differential pressure sensor connector G-05.



(1) Tumble the second seat.
(2) Remove the service hole cover (upper) and packing.
(3) Remove the service hole cover (lower) and packing.
(4) Disconnect fuel tank differential pressure sensor connector G-05.

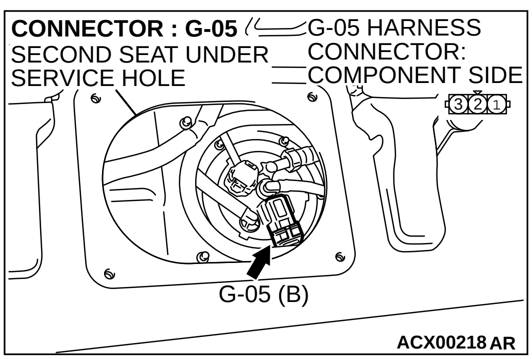


(5) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(6) Turn the ignition switch to the "ON" position.
(7) Remove the fuel cap.
(8) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 1 and ground.
  - The voltage should measure between 2.0 and 3.0 volts.
(9) Turn the ignition switch to the "LOCK" (OFF) position.

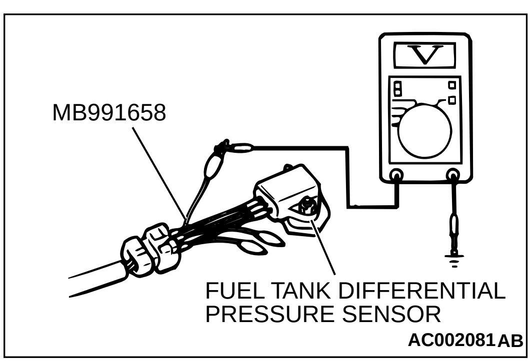
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 10.
NO : Go to Step 3.

STEP 3. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector G-05.



(1) Disconnect fuel tank differential pressure sensor connector G-05.



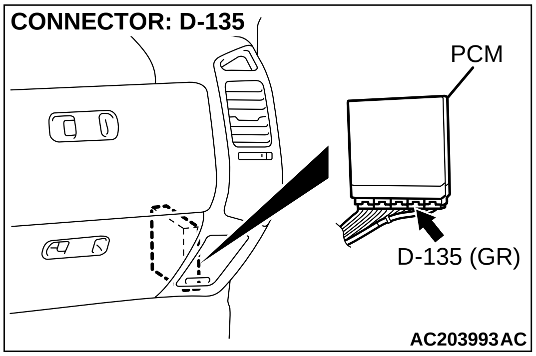
(2) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 3 and ground.
  - The voltage should 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 4.

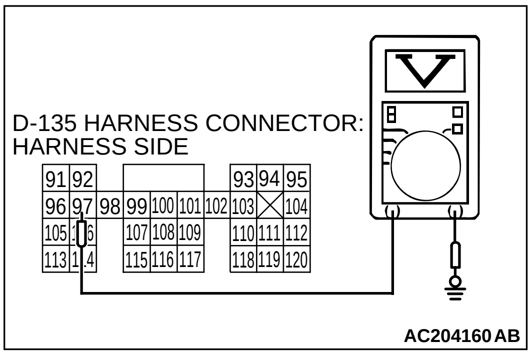
STEP 4. Measure the 5-volt reference signal at PCM connector D-135 by backprobing.

(1) Do not disconnect PCM connector D-135.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between PCM connector D-135 terminal 97 and ground by backprobing.
- The voltage should measure between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



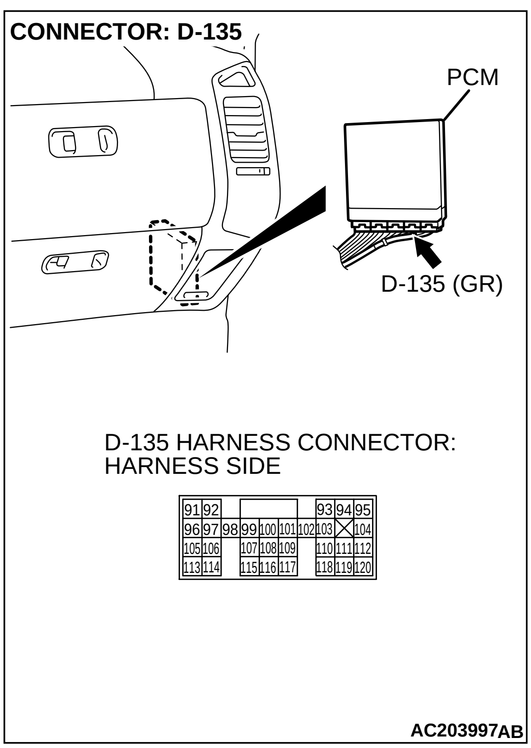
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check PCM connector D-135 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 14.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.

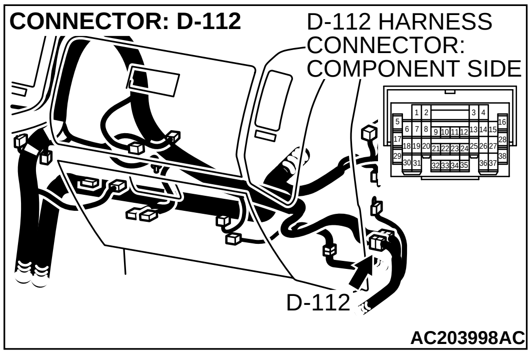


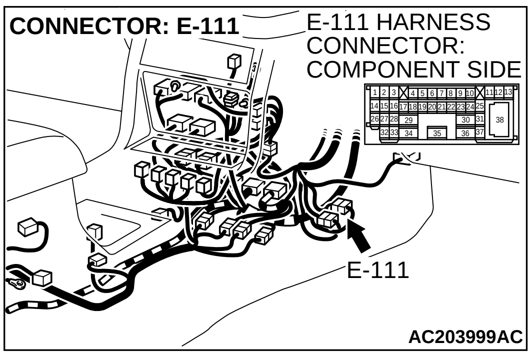
STEP 6. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

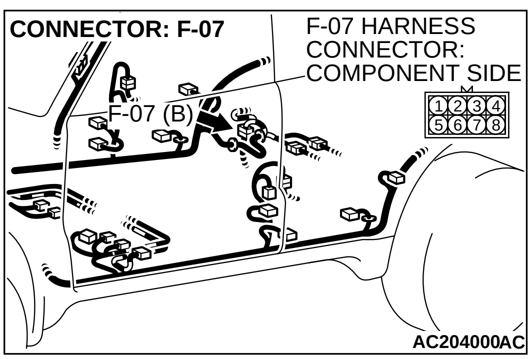
Q: Are the connectors and terminals in good condition?

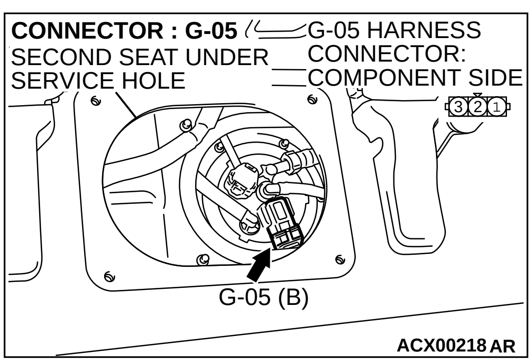
YES : Go to Step 7.

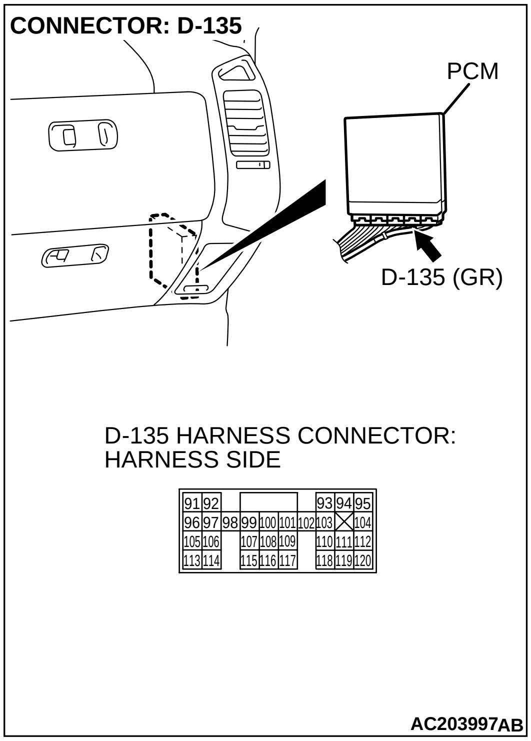
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.

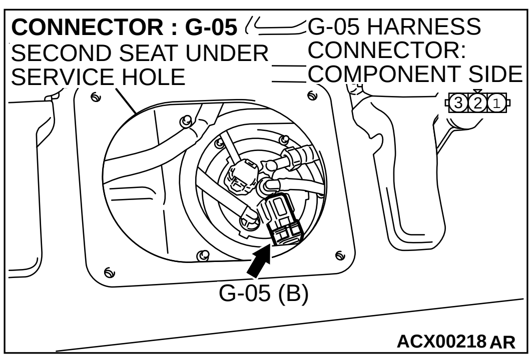












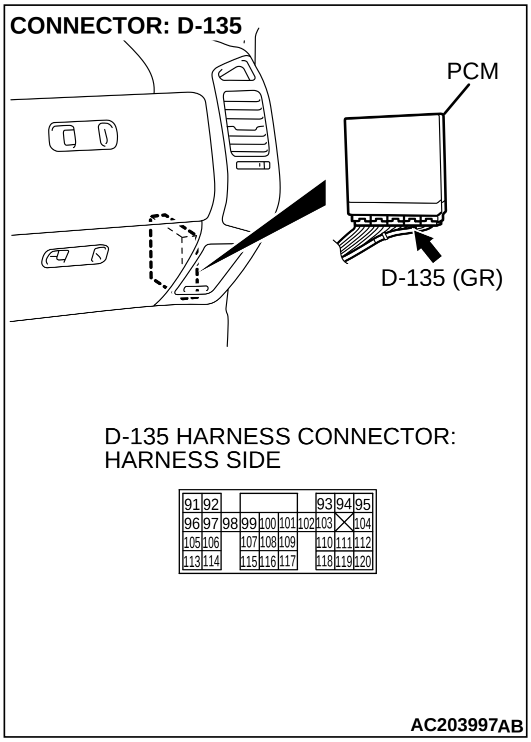
STEP 7. Check the harness wires between PCM connector D-135 terminal 97 and fuel tank differential pressure sensor connector G-05 terminal 3 for damage.

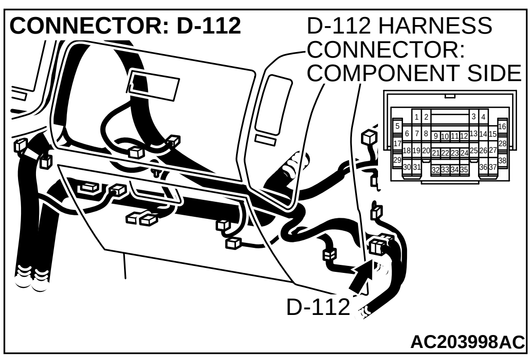
Q: Are the harness wires in good condition?

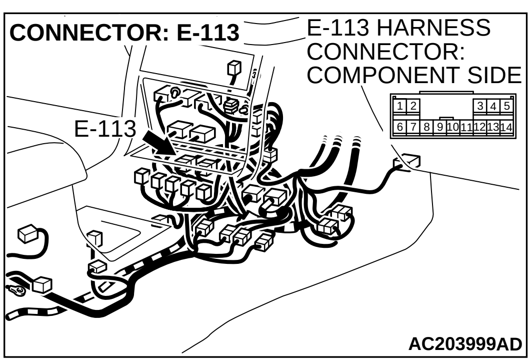
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

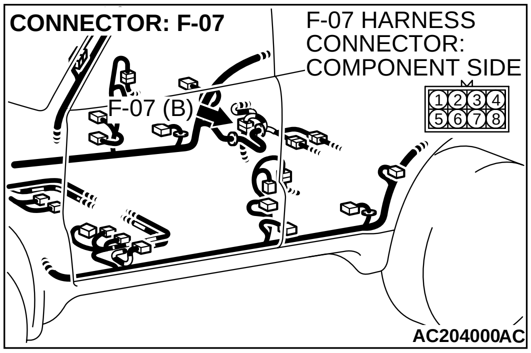
NO : Repair the damaged harness wires. Go to Step 15.

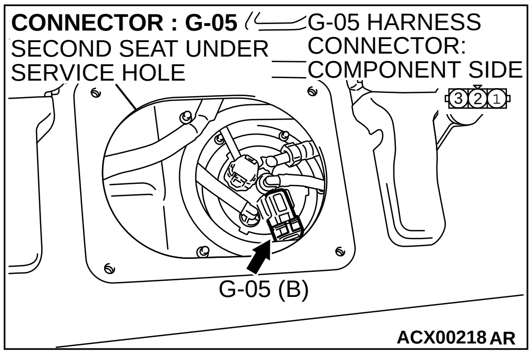
STEP 8. Check PCM connector D-135, intermediate connectors D-112, E-113 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.







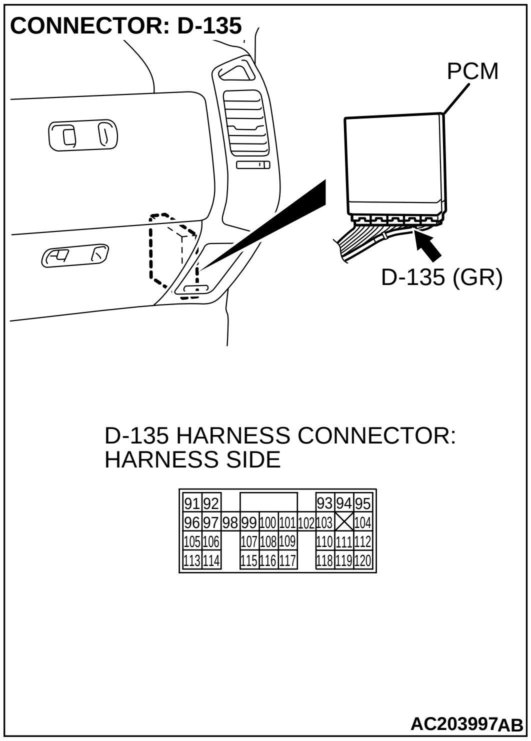


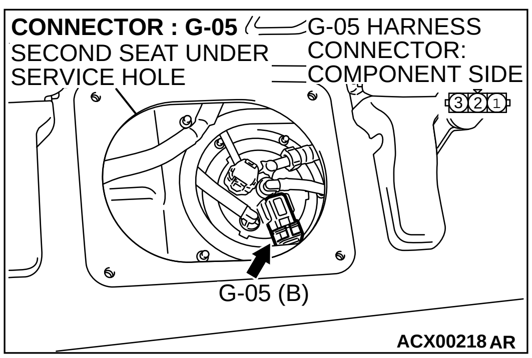


Q: Are the connectors and terminals in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.





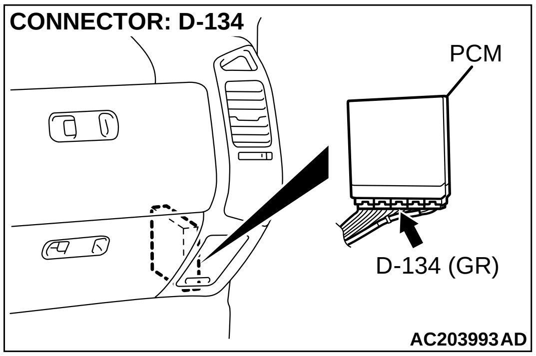
STEP 9. Check the harness wires between PCM connector D-135 terminal 96 and fuel tank differential pressure sensor connector G-05 terminal 2 for damage.

Q: Are the harness wires in good condition?

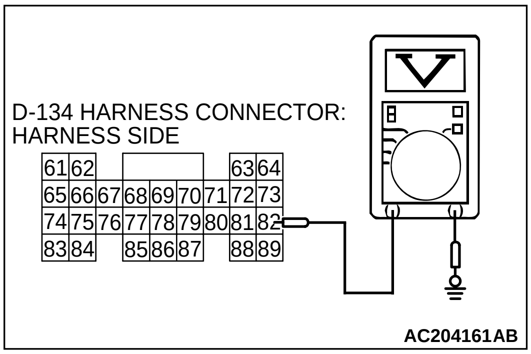
YES : Replace the fuel tank differential pressure sensor. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 14.

NO : Repair the damaged harness wires. Go to Step 15.

STEP 10. Measure the signal voltage at PCM connector D-134 by backprobing.



(1) Do not disconnect PCM connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.



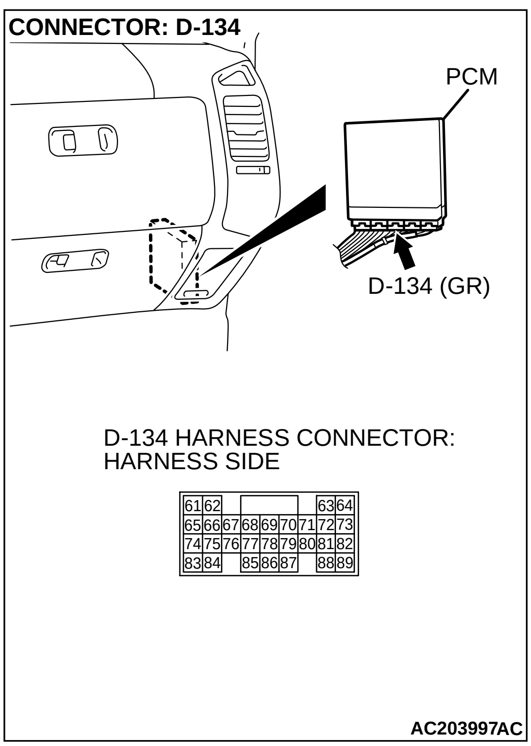
(4) Measure the voltage between PCM connector D-134 terminal 82 and ground by backprobing.
- The voltage should measure between 2.0 and 3.0 volts.

(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 14.
NO : Go to Step 11.

STEP 11. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Are the connector and terminals in good condition?

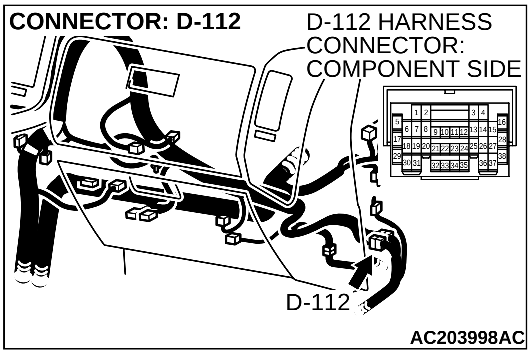
YES : Go to Step 12.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.

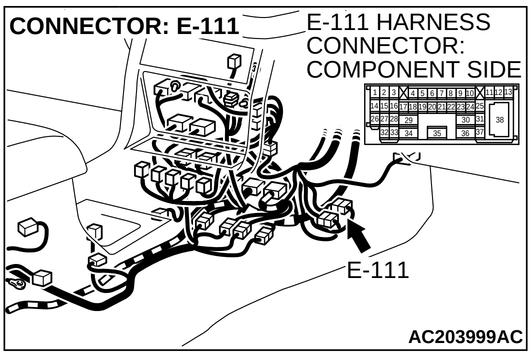
STEP 12. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

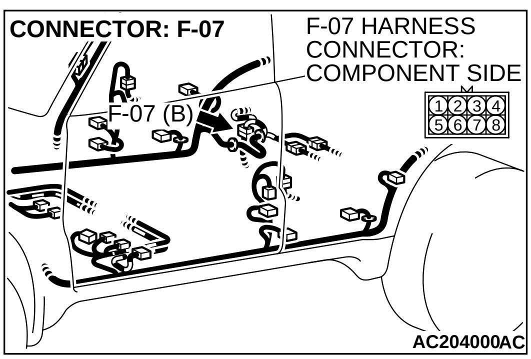
Q: Are the connectors and terminals in good condition?

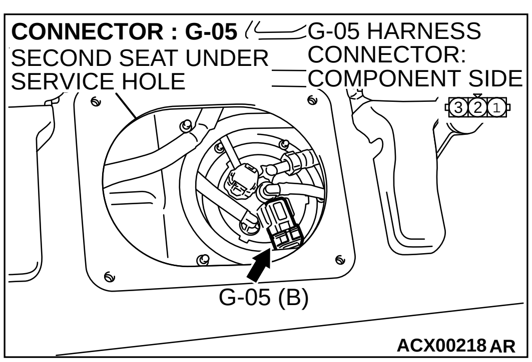
YES : Go to Step 13.

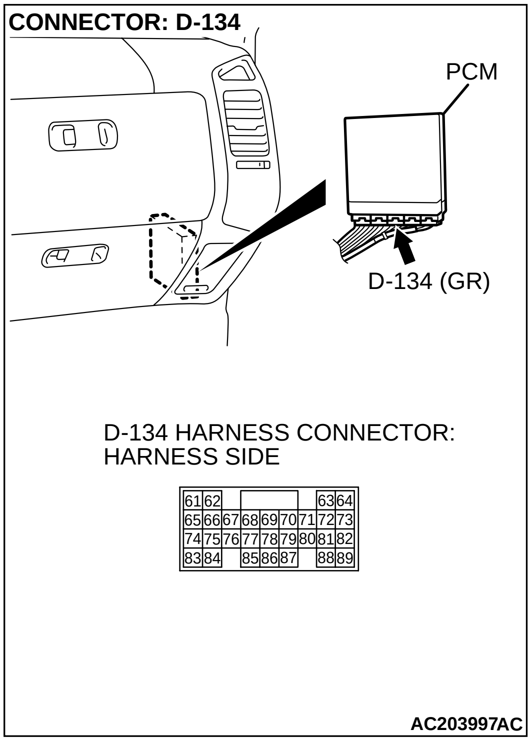
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.

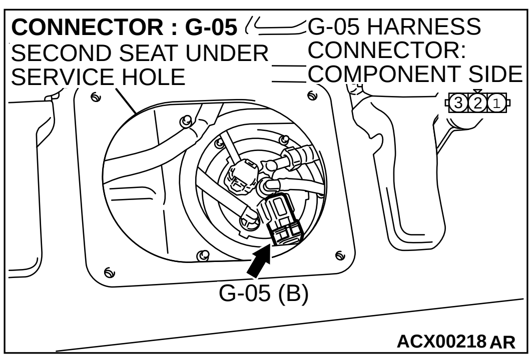












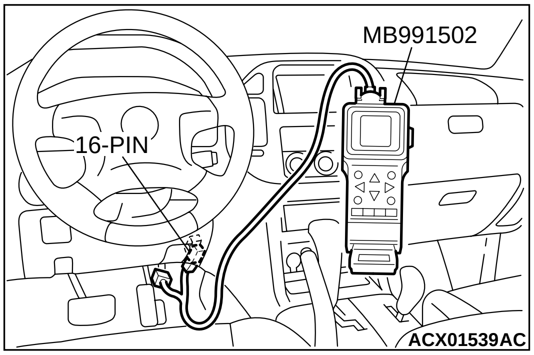
STEP 13. Check the harness wires between PCM connector D-134 terminal 82 and fuel tank differential pressure sensor connector G-05 terminal 1 for damage.

Q: Are the harness wires 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 the damaged harness wires. Go to Step 15.

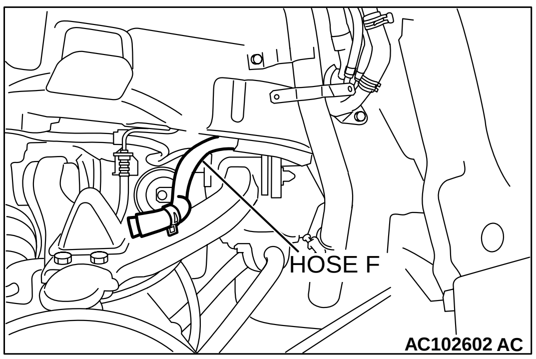
STEP 14. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



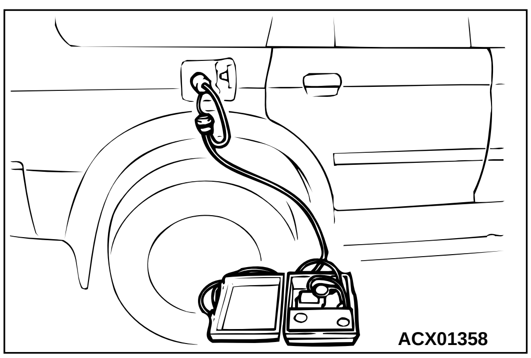
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

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 : Replace the PCM. 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 GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the diagnostic trouble code (DTC).

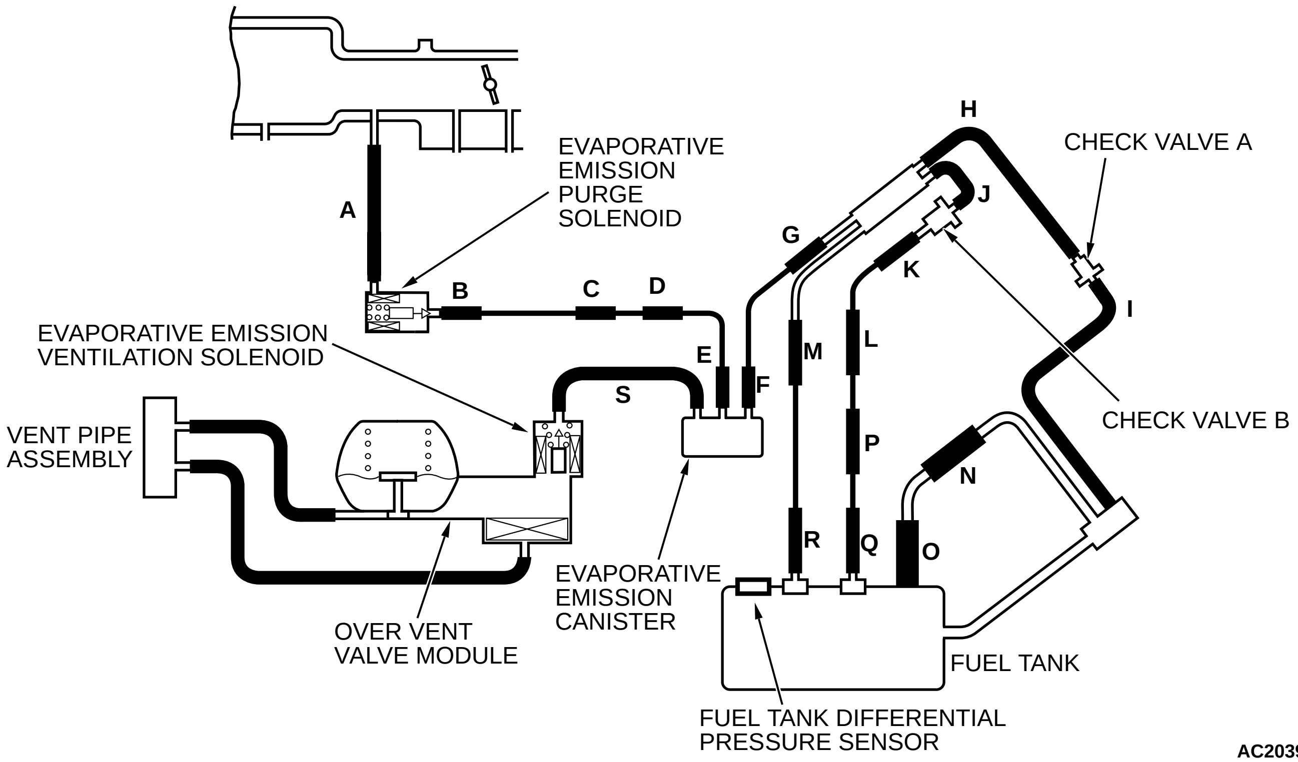
Q: Is DTC P0451 set?

YES : Go to Step 2.

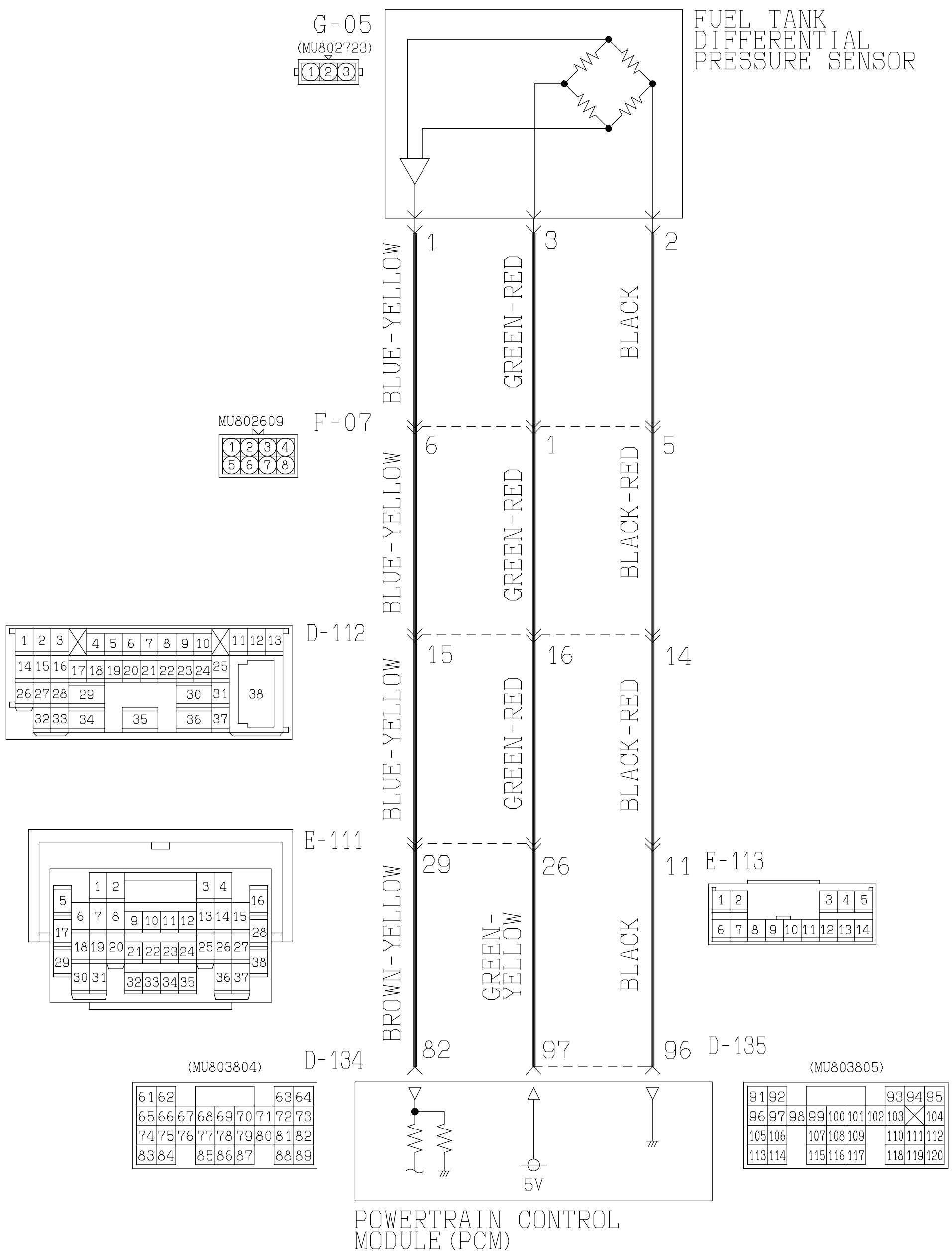
NO : The procedure is complete.

DTC P0452: Evaporative Emission System Pressure Sensor Low Input

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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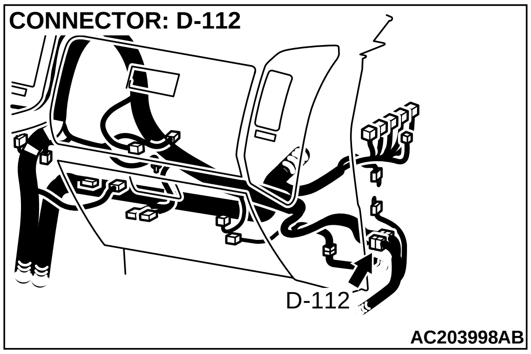
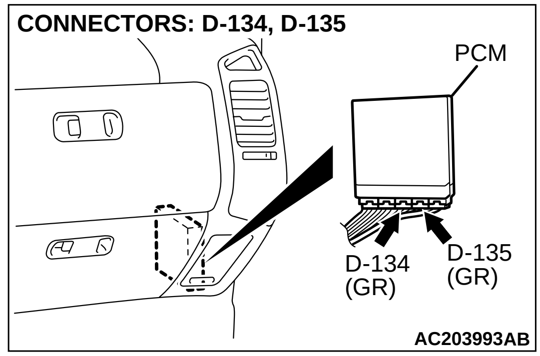
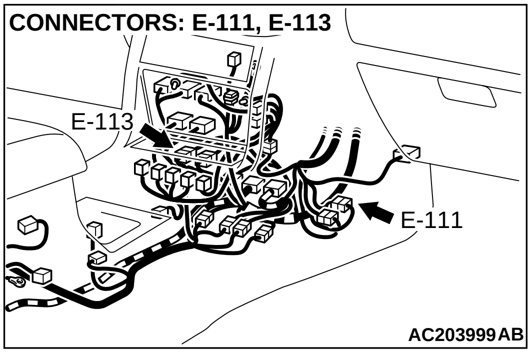
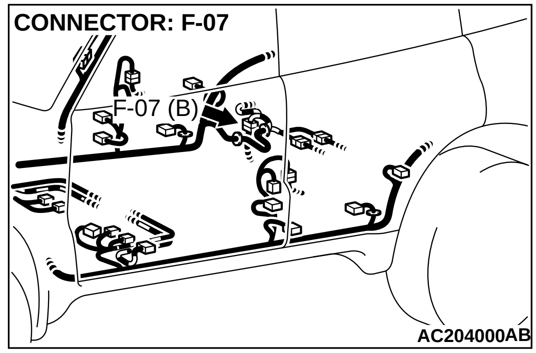
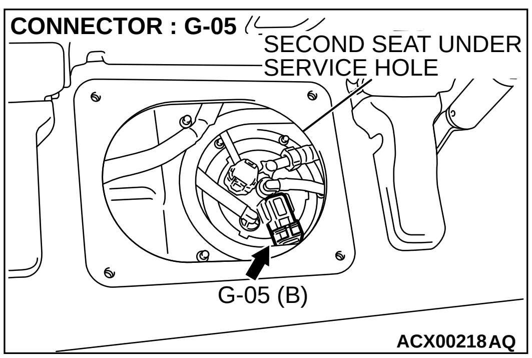










CIRCUIT OPERATION

- The PCM (terminal 97) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 96).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 82) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DTC SET CONDITIONS

Test Conditions:

- Intake air temperature is greater than 5°C (41°F).
- Engine speed is greater than 1,600 r/min.
- Volumetric efficiency is between 25 and 80 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 PCM.

OVERVIEW OF TROUBLESHOOTING

- DTC P0452 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73).

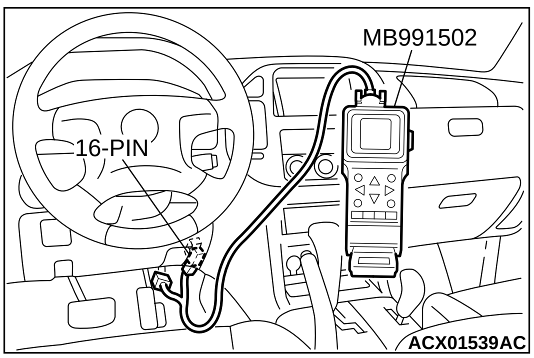
The mechanical gauge reading is used to verify scan tool MB991502 reading.
A comparison of the mechanical gauge with the reading on scan tool MB991502 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

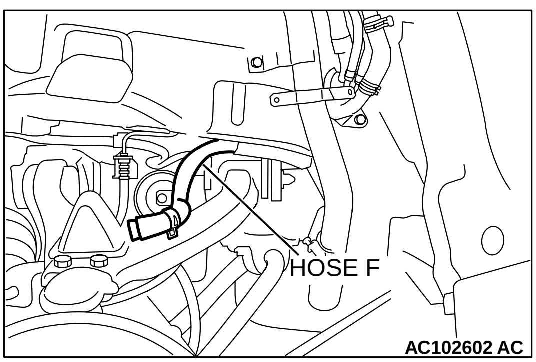
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



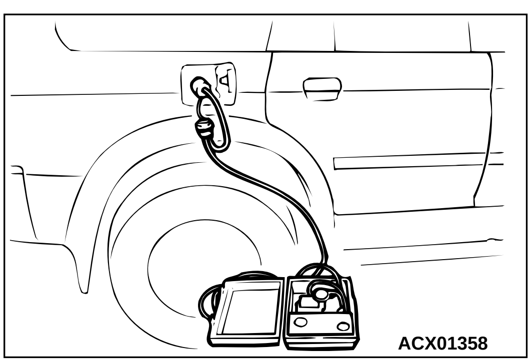
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

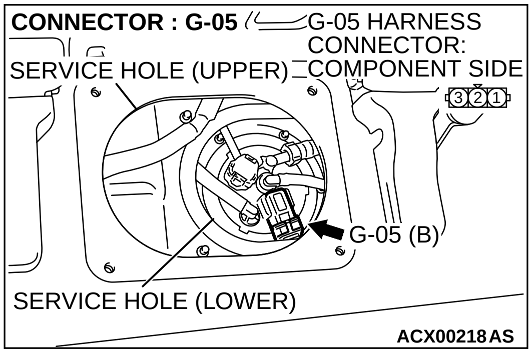
(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

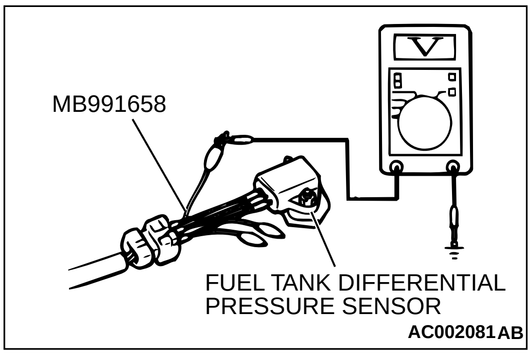
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

NO : Go to Step 2.

STEP 2. Measure the signal voltage at fuel tank differential pressure sensor connector G-05.



(1) Tumble the second seat.
(2) Remove the service hole cover (upper) and packing.
(3) Remove the service hole cover (lower) and packing.
(4) Disconnect fuel tank differential pressure sensor connector G-05.



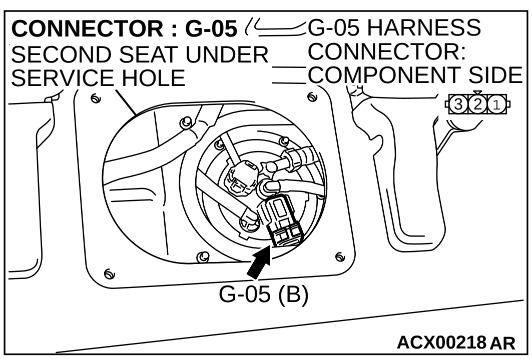
(5) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(6) Turn the ignition switch to the "ON" position.
(7) Remove the fuel cap.
(8) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

(9) Turn the ignition switch to the "LOCK" (OFF) position.

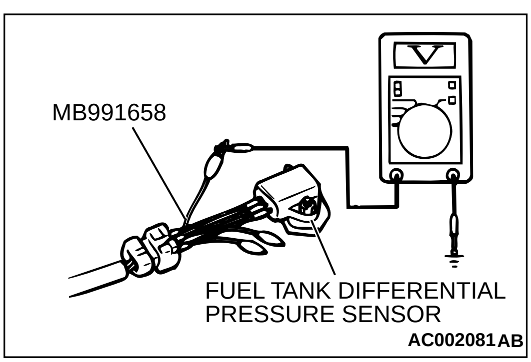
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 10.
NO : Go to Step 3.

STEP 3. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector G-05.



(1) Disconnect fuel tank differential pressure sensor connector G-05.



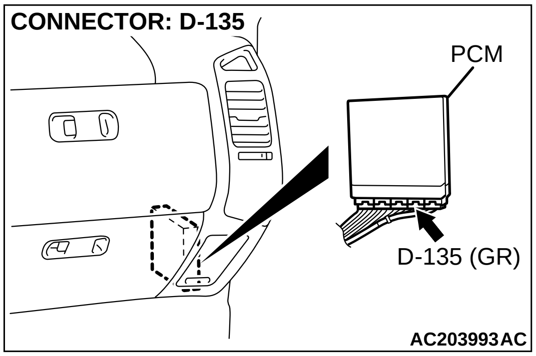
(2) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 3 and ground.
- The voltage should measure between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

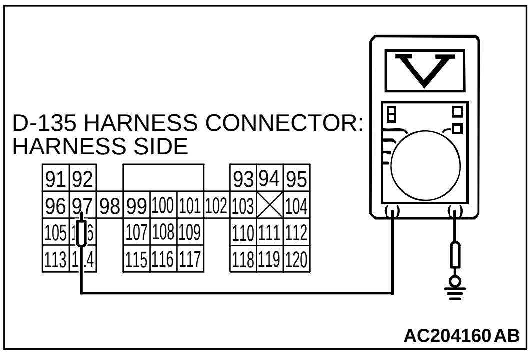
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the 5-volt reference signal at PCM connector D-135 by backprobing.



(1) Do not disconnect PCM connector D-135.
(2) Turn the ignition switch to the "ON" position.



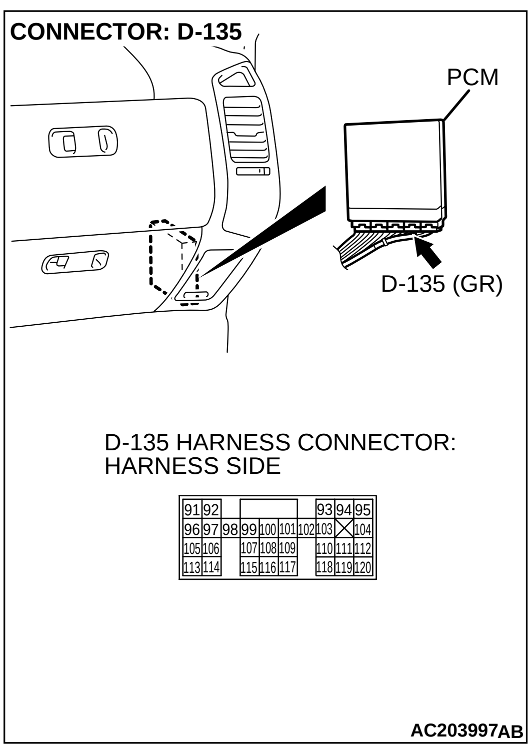
(3) Measure the voltage between PCM connector D-135 terminal 97 and ground by backprobing.
- The voltage should measure between 4.8 and 5.2 volts.

(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 6.
NO : Go to Step 5.

STEP 5. Check PCM connector D-135 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Are the connector and terminals in good condition?

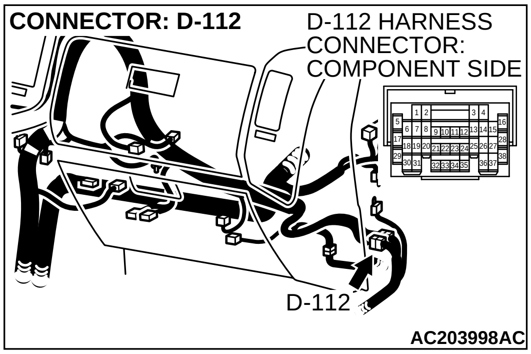
YES : Go to Step 14.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.

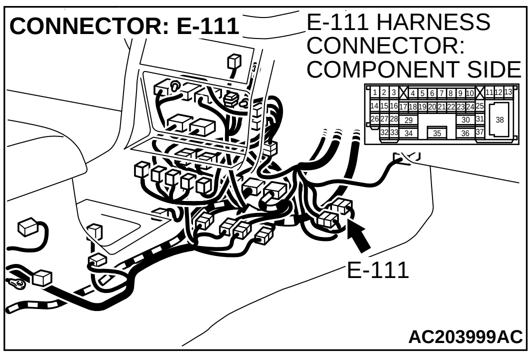
STEP 6. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

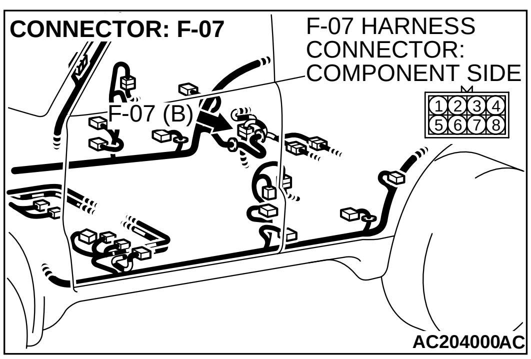
Q: Are the connectors and terminals in good condition?

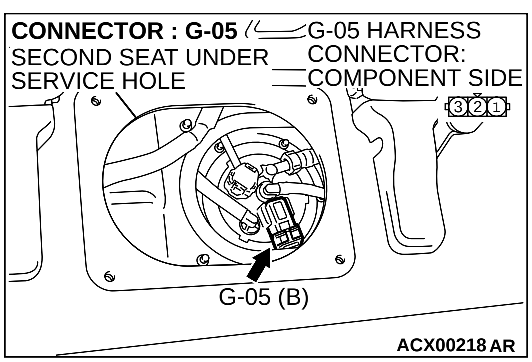
YES : Go to Step 7.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.







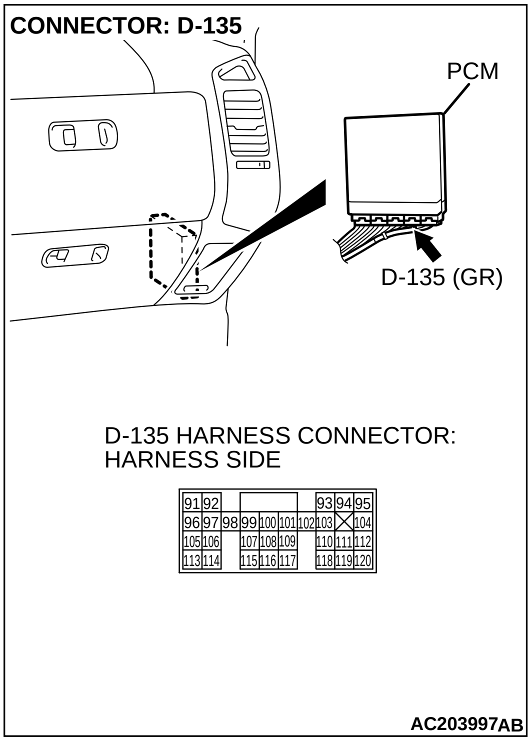


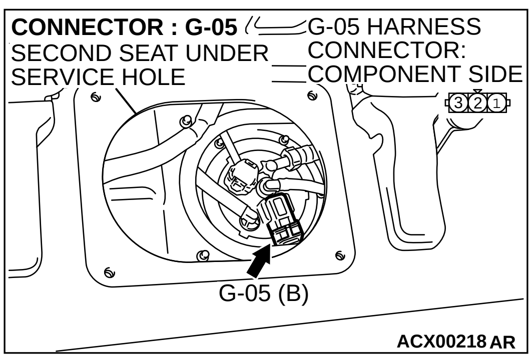
STEP 7. Check the harness wires between PCM connector D-135 terminal 97 and fuel tank differential pressure sensor connector G-05 terminal 3 for damage.

Q: Are the harness wires in good condition?

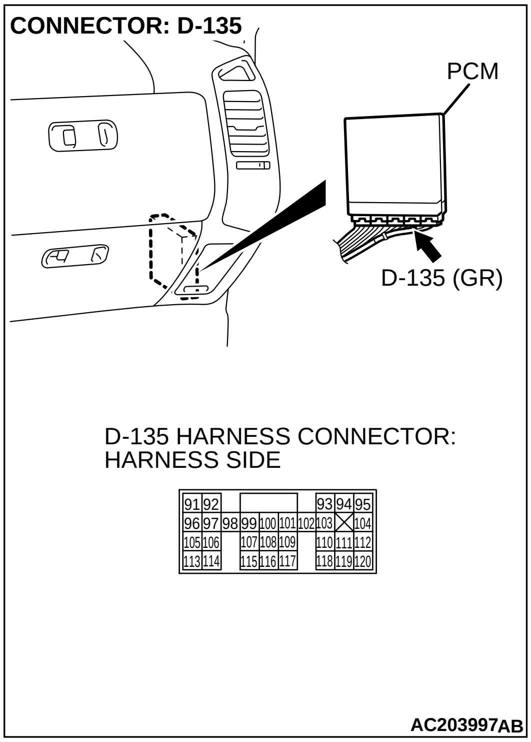
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

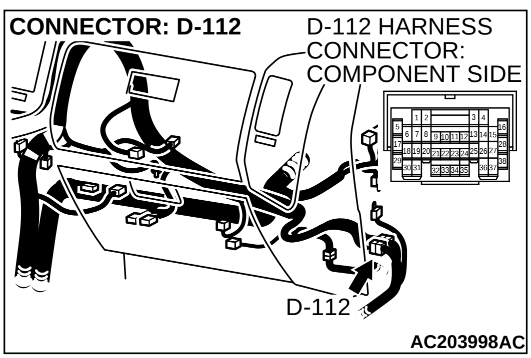
NO : Repair the damaged harness wires. Go to Step 15.

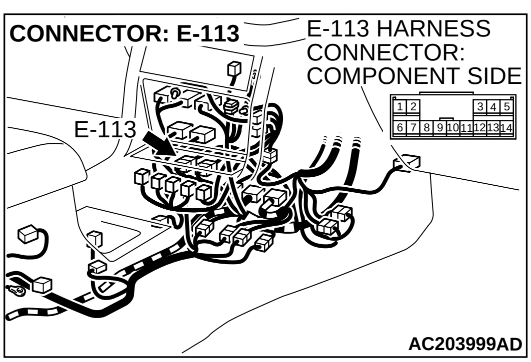


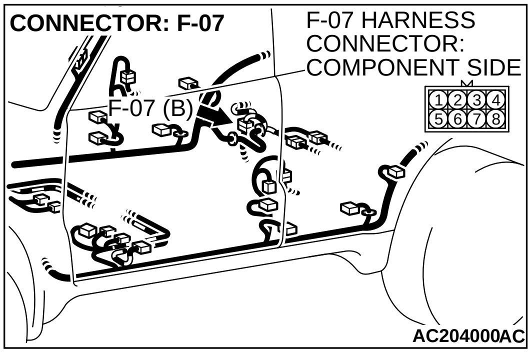


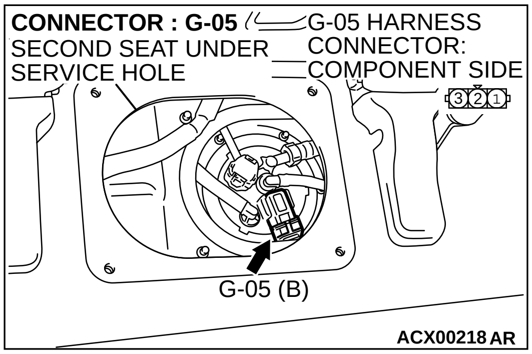
STEP 8. Check PCM connector D-135, intermediate connectors D-112, E-113 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.







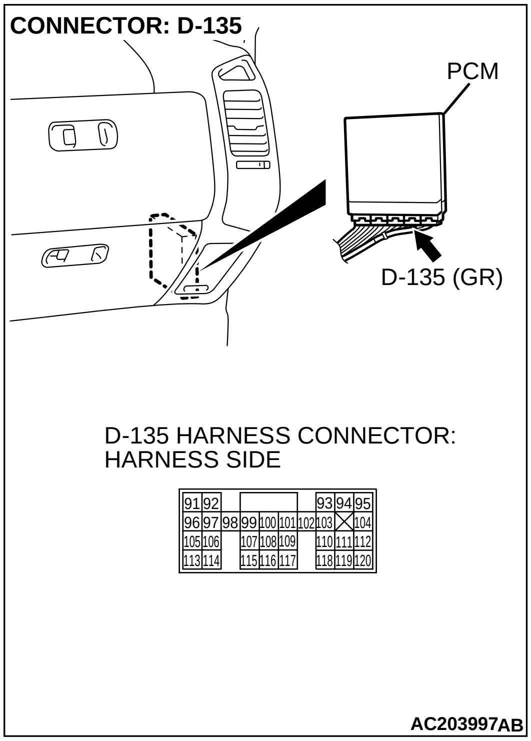


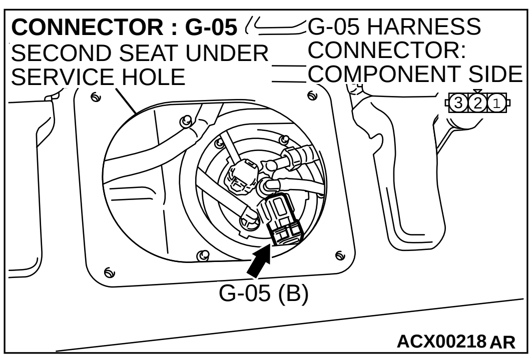


Q: Are the connectors and terminals in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.



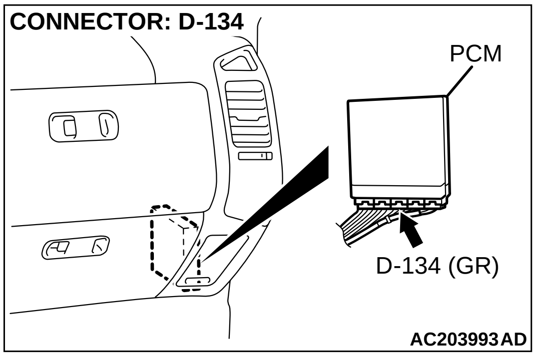


STEP 9. Check the harness wires between PCM connector D-135 terminal 96 and fuel tank differential pressure sensor connector G-05 terminal 2 for damage.

Q: Are the harness wires in good condition?

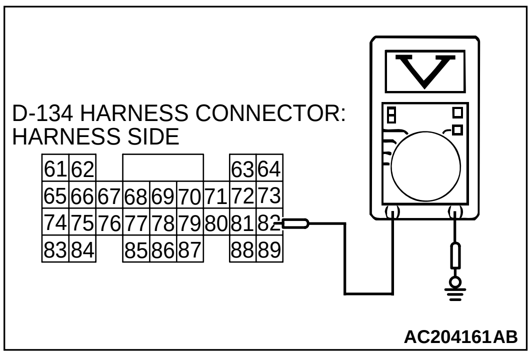
YES : Replace the fuel tank differential pressure sensor. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 14.

NO : Repair the damaged harness wires. Go to Step 15.



STEP 10. Measure the signal voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect PCM connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.

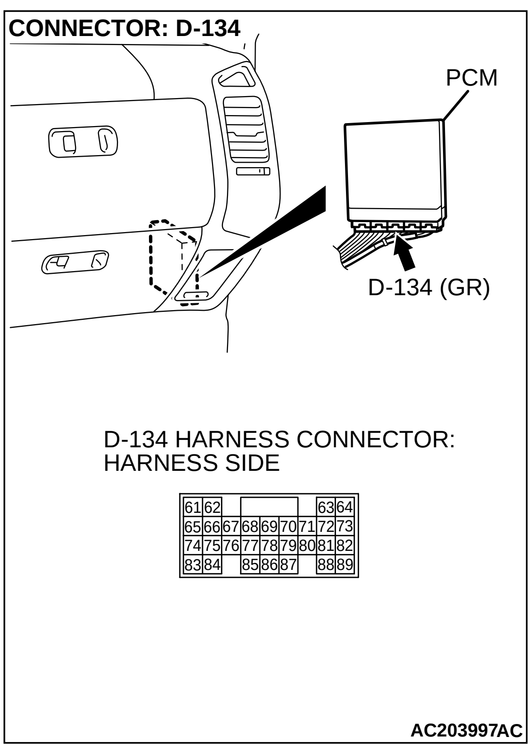


(4) Measure the voltage between PCM connector D-134 terminal 82 and ground by backprobing.
- The voltage should measure between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

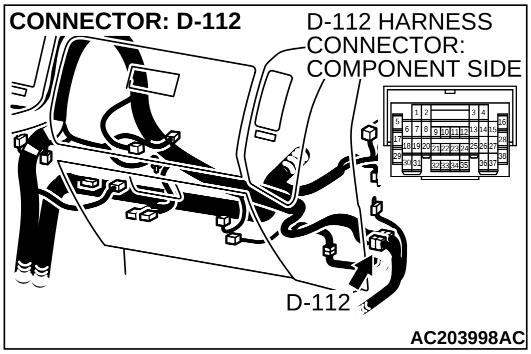
YES : Go to Step 14.
NO : Go to Step 11.

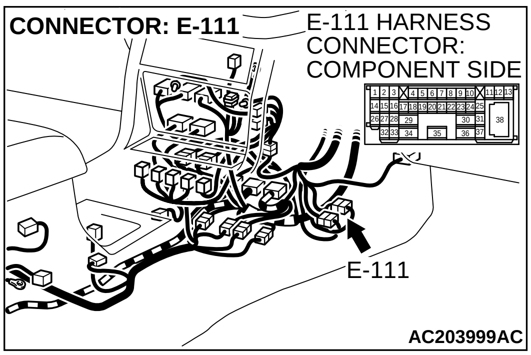


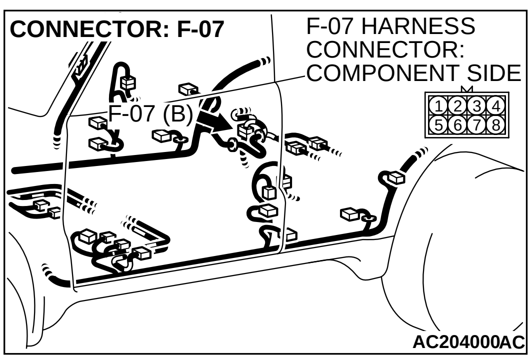
STEP 11. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

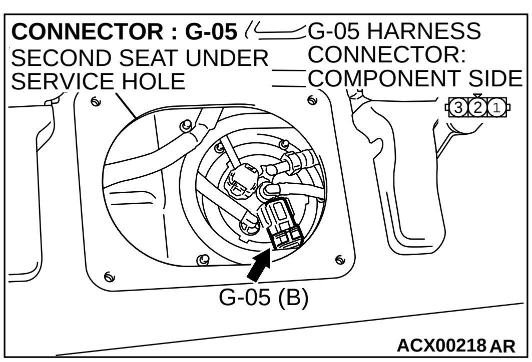
Q: Are the connector and terminals in good condition?

YES : Go to Step 12.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.







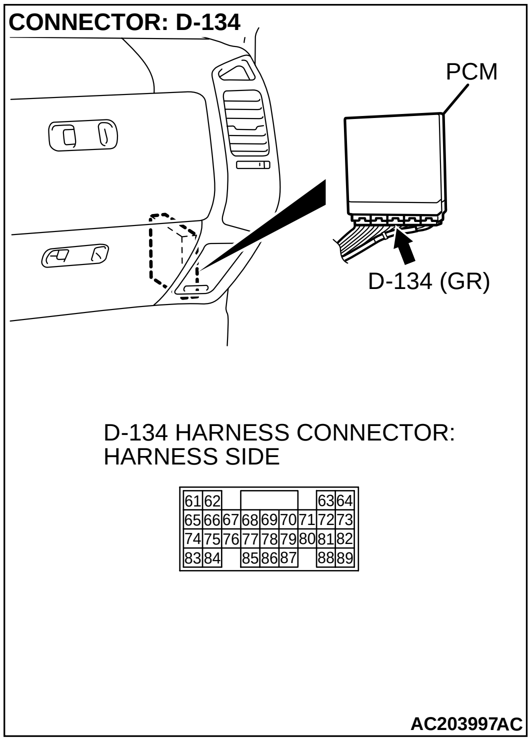


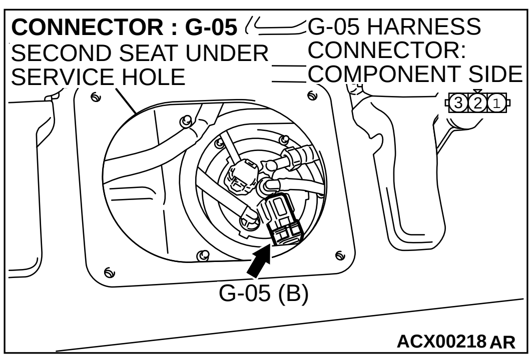
STEP 12. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.





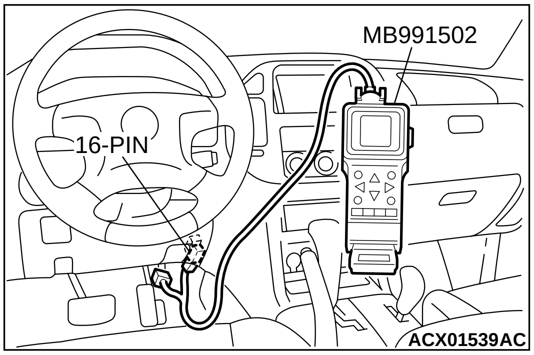
STEP 13. Check the harness wires between PCM connector D-134 terminal 82 and fuel tank differential pressure sensor connector G-05 terminal 1 for damage.

Q: Are the harness wires 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 the damaged harness wires. Go to Step 15.

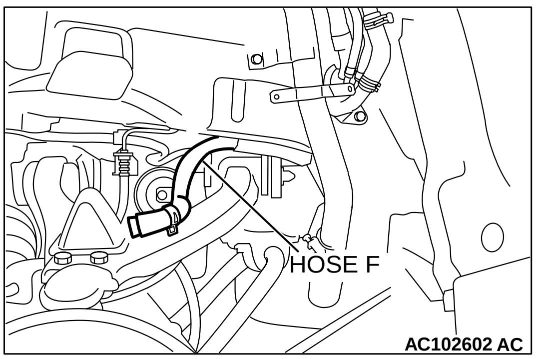
STEP 14. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



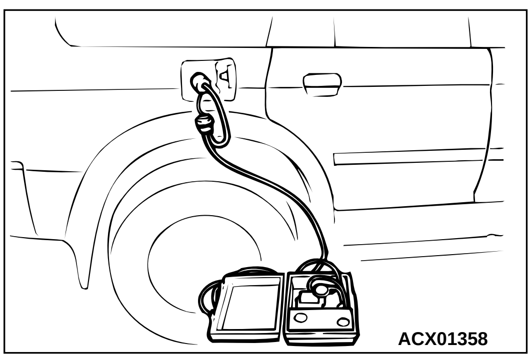
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
  - The fuel tank pressure reading should increase.
(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

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 : Replace the PCM. 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 GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the diagnostic trouble code (DTC).

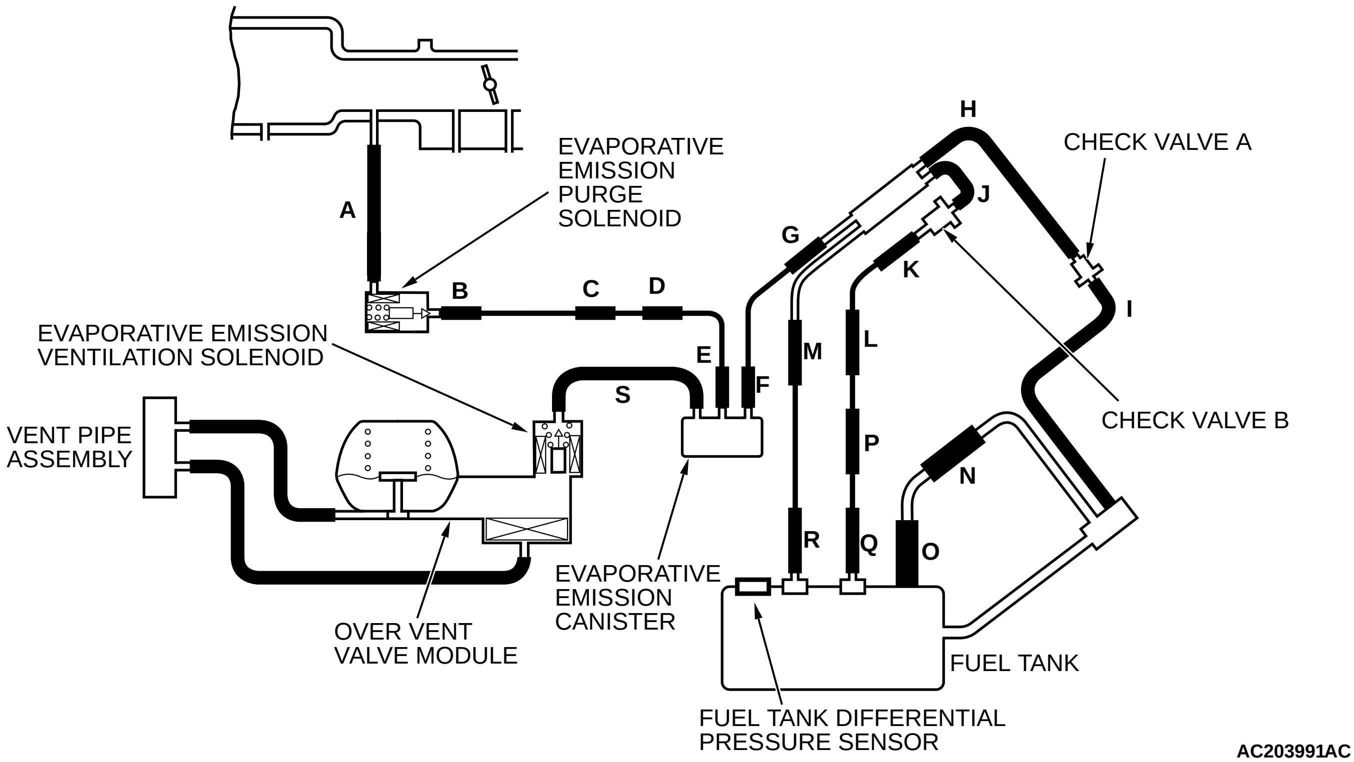
Q: Is DTC P0452 set?

YES : Go to Step 2.

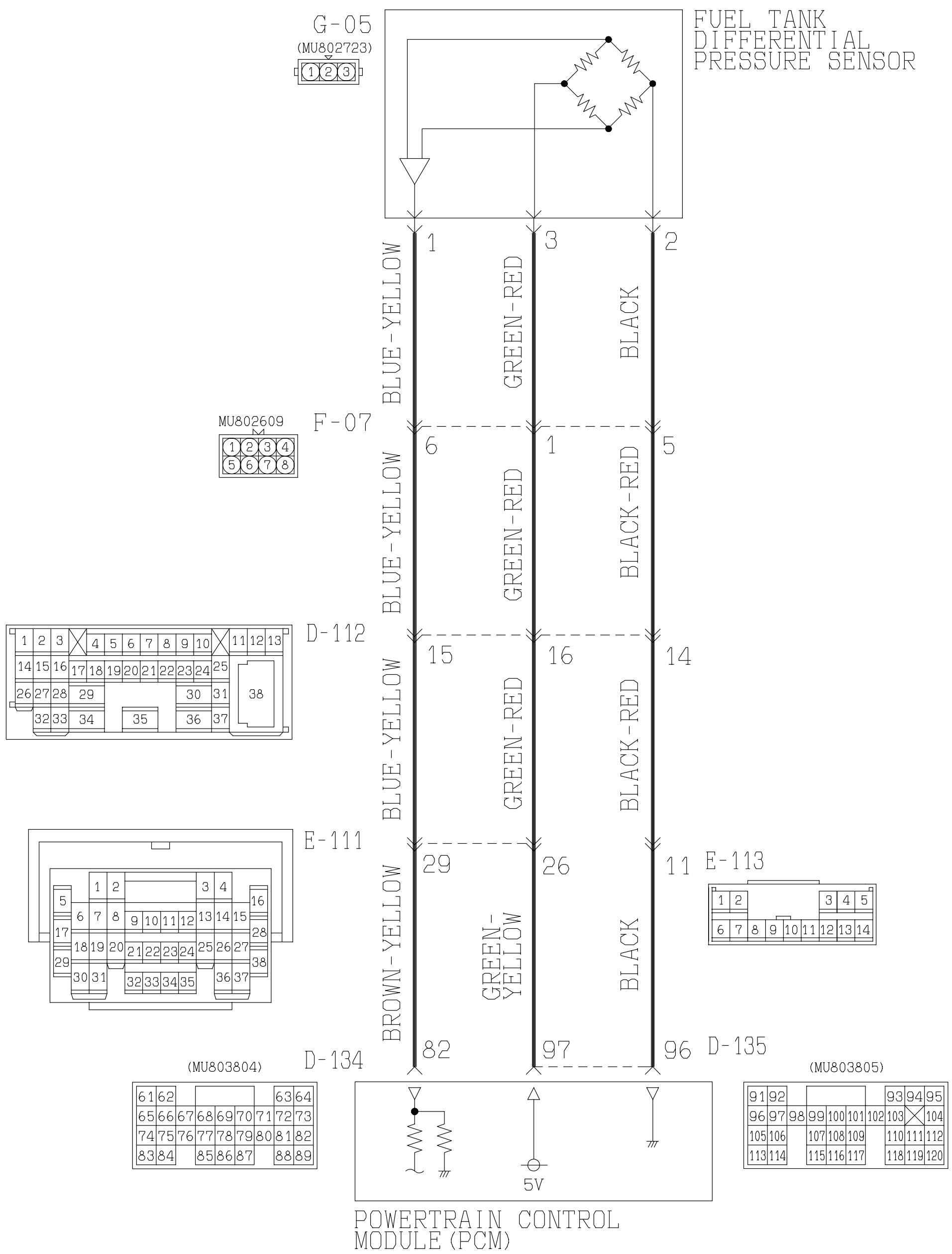
NO : The procedure is complete.

DTC P0453: Evaporative Emission System Pressure Sensor High Input

SYSTEM DIAGRAM



Fuel Tank Differential Pressure Sensor Circuit



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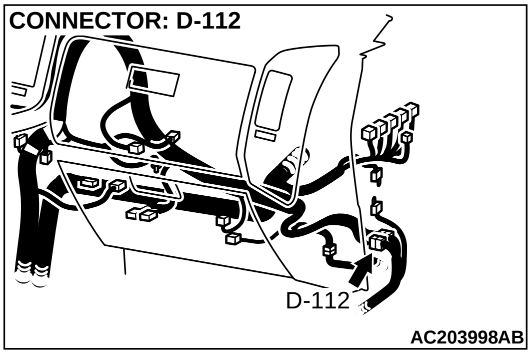
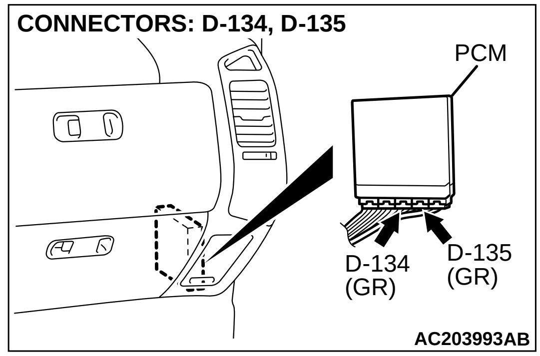
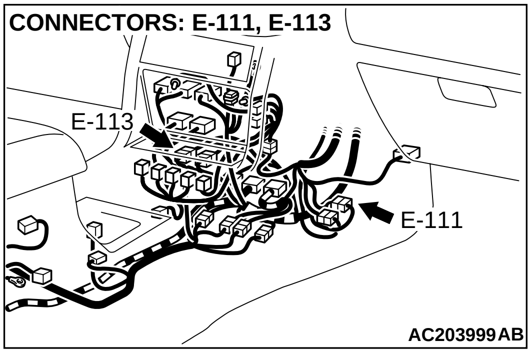
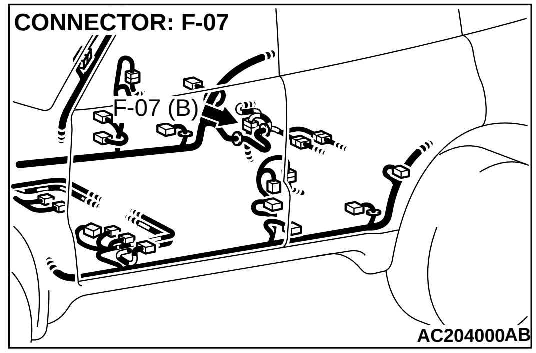
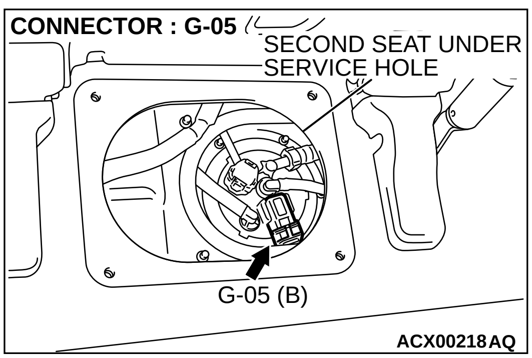










CIRCUIT OPERATION

- The PCM (terminal 97) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the PCM (terminal 96).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the PCM (terminal 82) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The PCM monitors the fuel tank differential pressure sensor output voltage.
- The PCM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DTC SET CONDITIONS

Test Conditions:

- Intake air temperature is between 5°C (41°F) and 45°C (113°F) or greater.
- Engine speed is greater than 1,600 r/min.
- Volumetric efficiency is between 25 and 80 percent.

Judgment Criteria:

- When the evaporative emission purge solenoid is fully operational (100 percent ratio), the fuel differential pressure sensor output voltage remains 4.0 volts or greater 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 PCM.

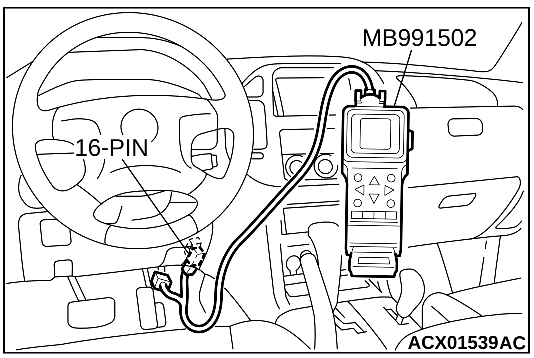
OVERVIEW OF TROUBLESHOOTING

- DTC P0453 can be set by a faulty fuel tank differential pressure sensor or related circuit, or PCM failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73).
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge with the reading on scan tool MB991502 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

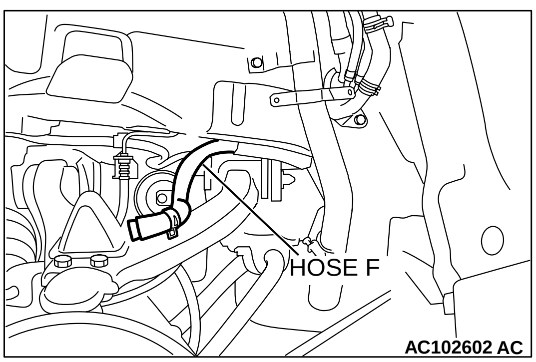
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



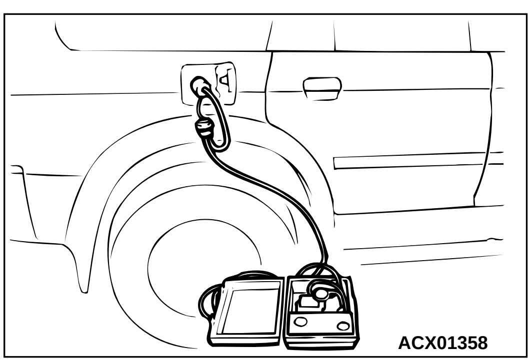
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



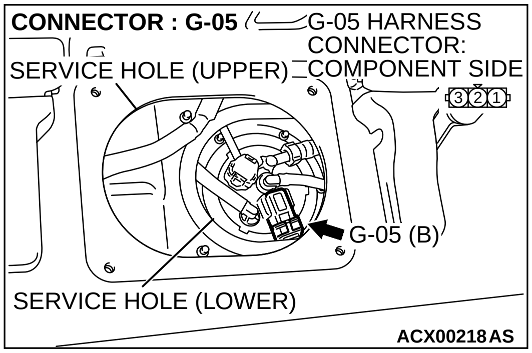
(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

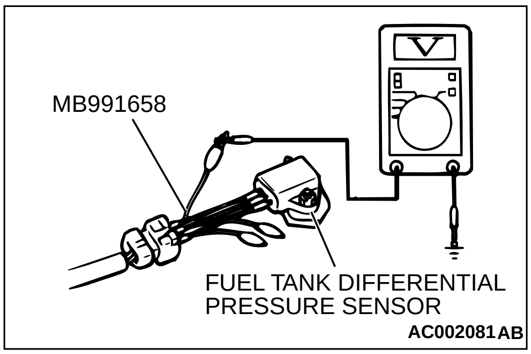
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

NO : Go to Step 2.



STEP 2. Measure the signal voltage at fuel tank differential pressure sensor connector G-05.

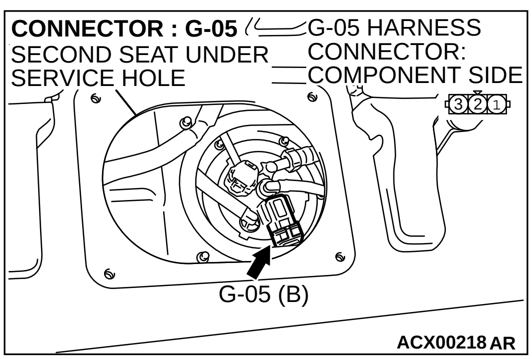
(1) Tumble the second seat.
(2) Remove the service hole cover (upper) and packing.
(3) Remove the service hole cover (lower) and packing.
(4) Disconnect fuel tank differential pressure sensor connector G-05.



(5) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(6) Turn the ignition switch to the "ON" position.
(7) Remove the fuel cap.
(8) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 1 and ground.
   - The voltage should measure between 2.0 and 3.0 volts.
(9) Turn the ignition switch to the "LOCK" (OFF) position.

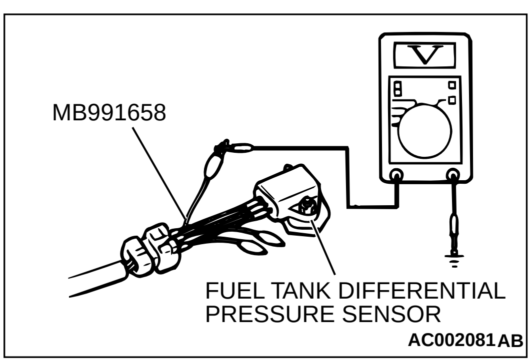
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 10.
NO : Go to Step 3.



STEP 3. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector G-05.

(1) Disconnect fuel tank differential pressure sensor connector G-05.



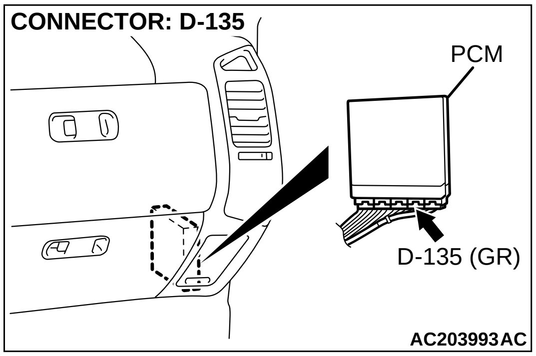
(2) Connect special tool MB991658 between fuel tank differential pressure sensor connector G-05 terminals 1, 2 and 3.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between fuel tank differential pressure sensor connector G-05 terminal 3 and ground.
   - The voltage should measure between 4.8 and 5.2 volts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

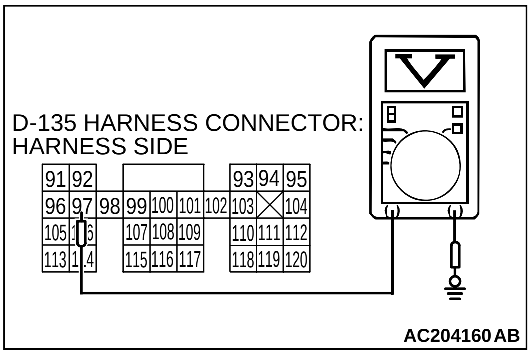
Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the 5-volt reference signal at PCM connector D-135 by backprobing.

(1) Do not disconnect PCM connector D-135.
(2) Turn the ignition switch to the "ON" position.





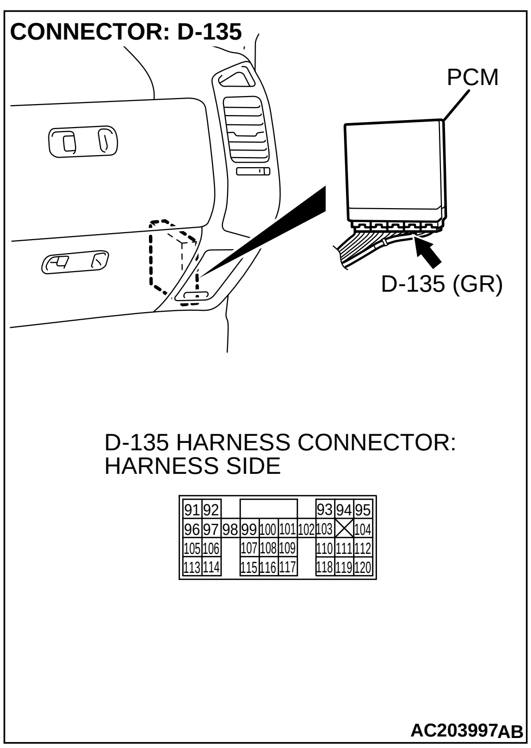
(3) Measure the voltage between PCM connector D-135 terminal 97 and ground by backprobing.
- The voltage should measure between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.8 and 5.2 volts?

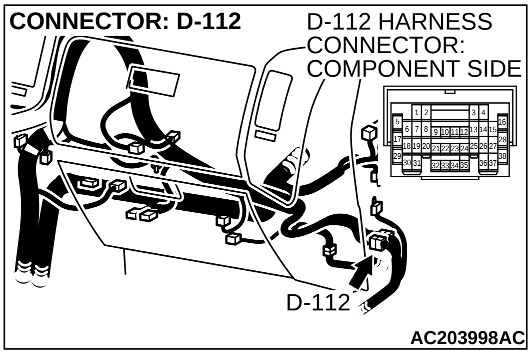
YES : Go to Step 6.
NO : Go to Step 5.

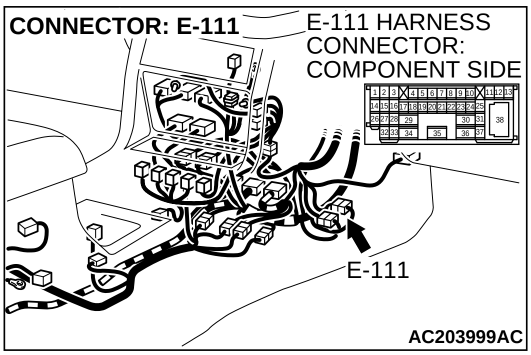
STEP 5. Check PCM connector D-135 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

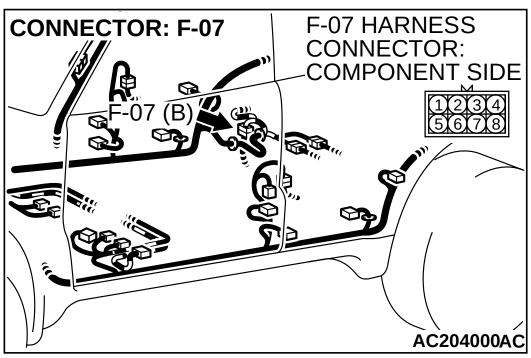


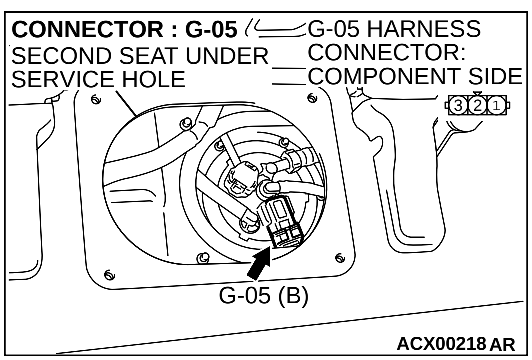
Q: Are the connector and terminals in good condition?

YES : Go to Step 14.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.







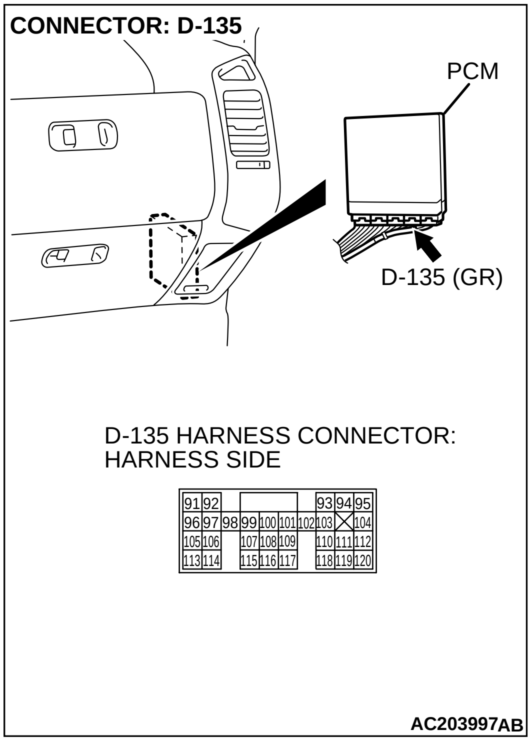


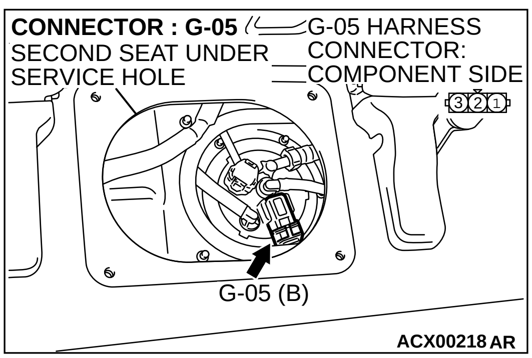
STEP 6. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.





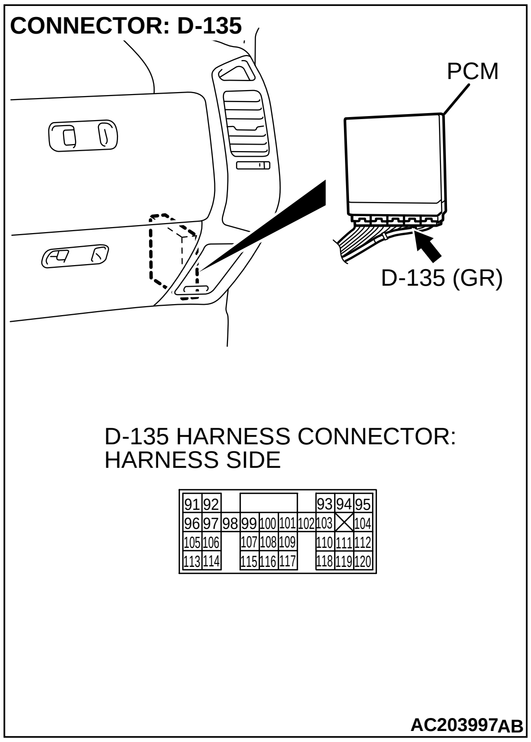
STEP 7. Check the harness wires between PCM connector D-135 terminal 97 and fuel tank differential pressure sensor connector G-05 terminal 3 for damage.

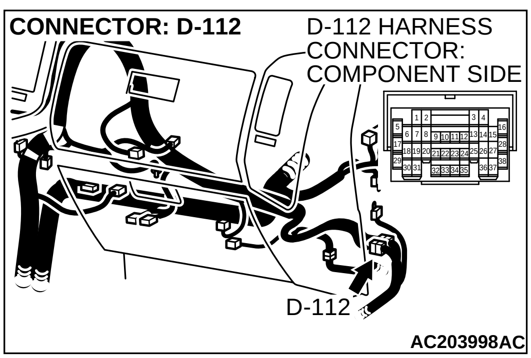
Q: Are the harness wires in good condition?

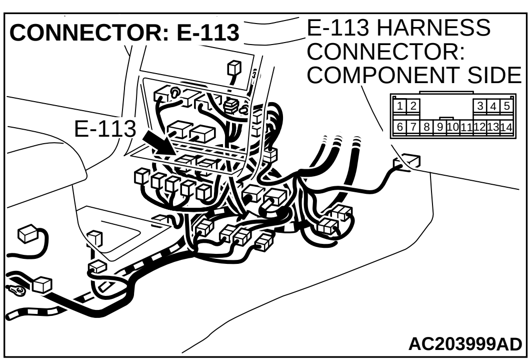
YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6). Go to Step 15.

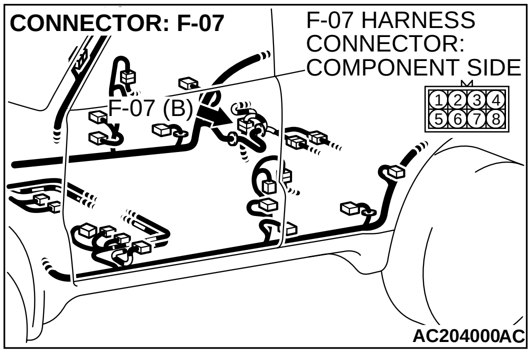
NO : Repair the damaged harness wires. Go to Step 15.

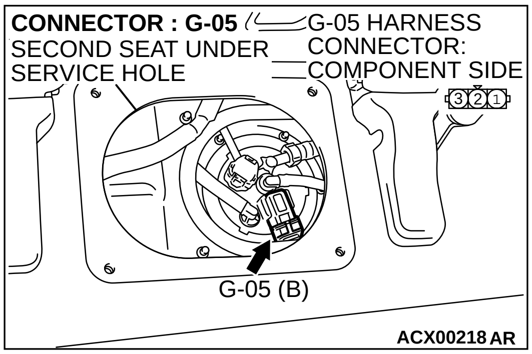
STEP 8. Check PCM connector D-135, intermediate connectors D-112, E-113 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.







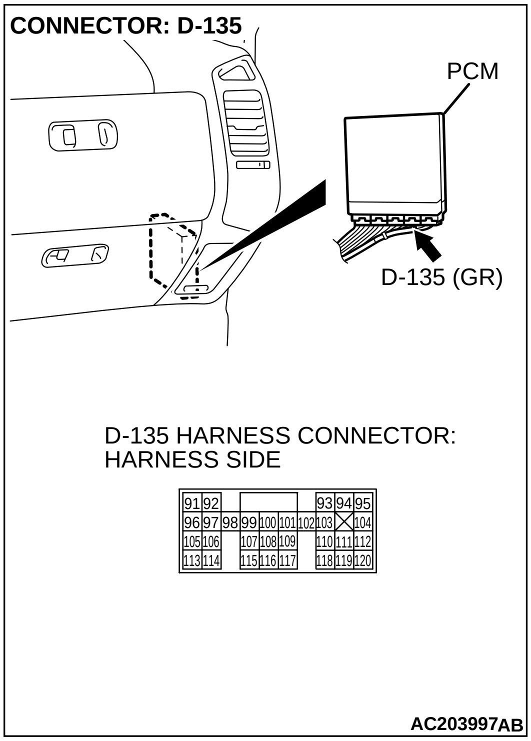


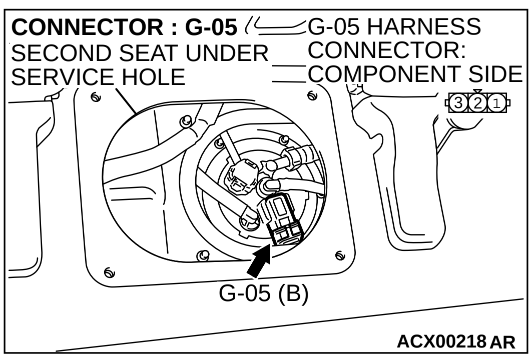


Q: Are the connectors and terminals in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.





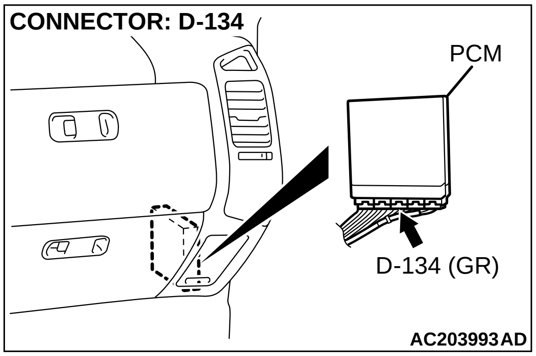
STEP 9. Check the harness wires between PCM connector D-135 terminal 96 and fuel tank differential pressure sensor connector G-05 terminal 2 for damage.

Q: Are the harness wires in good condition?

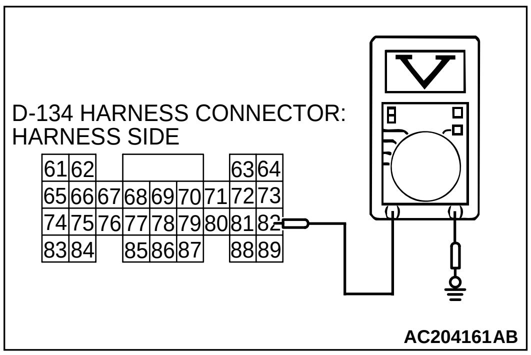
YES : Replace the fuel tank differential pressure sensor. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 14.

NO : Repair the damaged harness wires. Go to Step 15.

STEP 10. Measure the signal voltage at PCM connector D-134 by backprobing.



(1) Do not disconnect PCM connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.



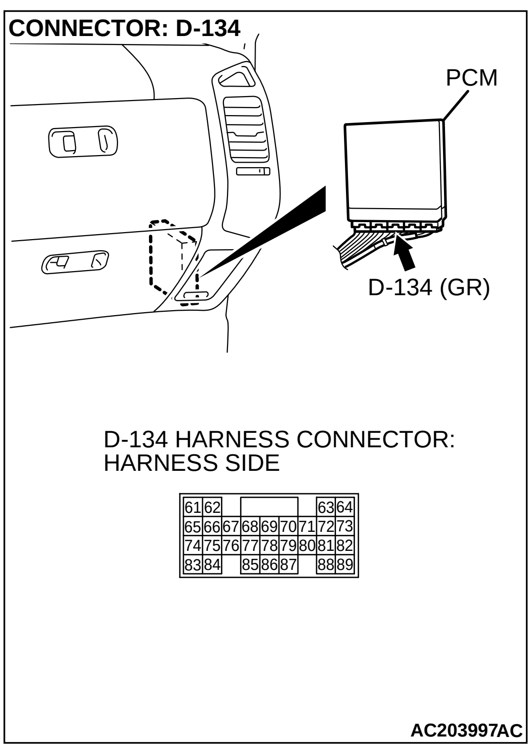
(4) Measure the voltage between PCM connector D-134 terminal 82 and ground by backprobing.
- The voltage should measure between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

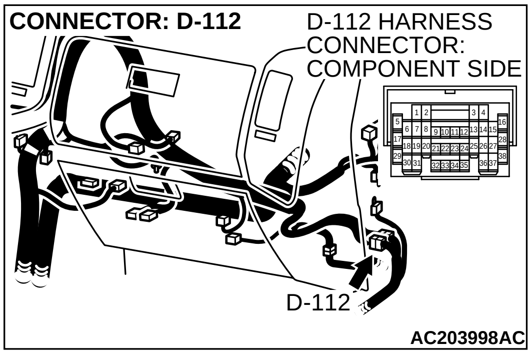
YES : Go to Step 14.
NO : Go to Step 11.

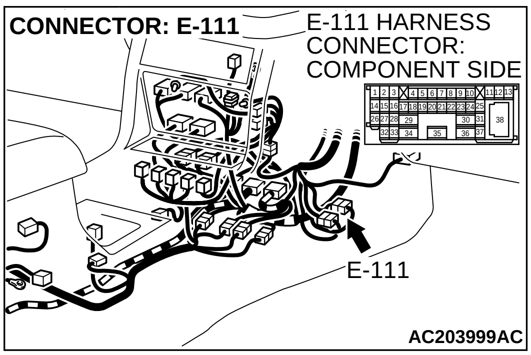
STEP 11. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

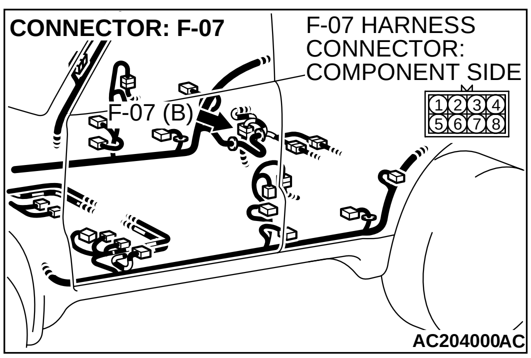


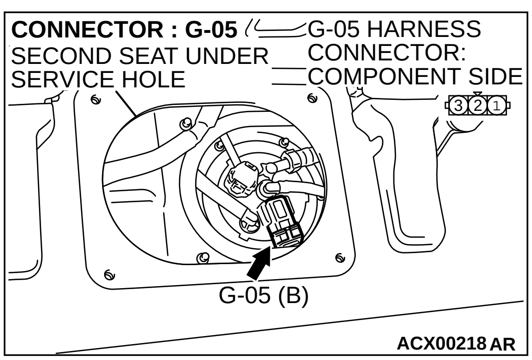
Q: Are the connector and terminals in good condition?

YES : Go to Step 12.
NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.







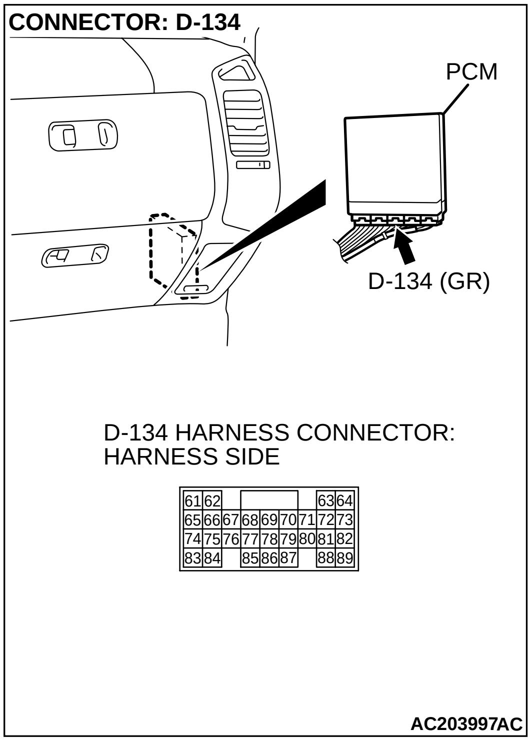


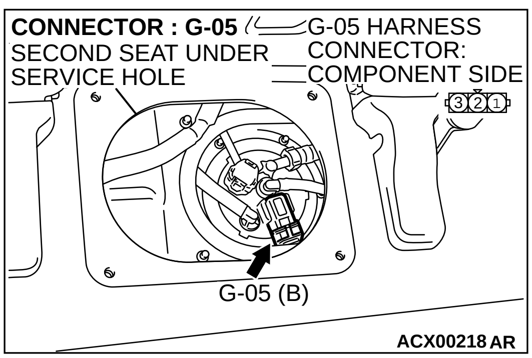
STEP 12. Check intermediate connectors D-112, E-111 and F-07, and fuel tank differential pressure sensor connector G-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

NO : Repair or replace the faulty component. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Go to Step 15.





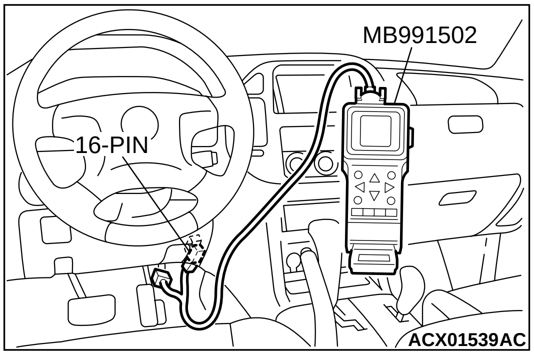
STEP 13. Check the harness wires between PCM connector D-134 terminal 82 and fuel tank differential pressure sensor connector G-05 terminal 1 for damage.

Q: Are the harness wires 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 the damaged harness wires. Go to Step 15.

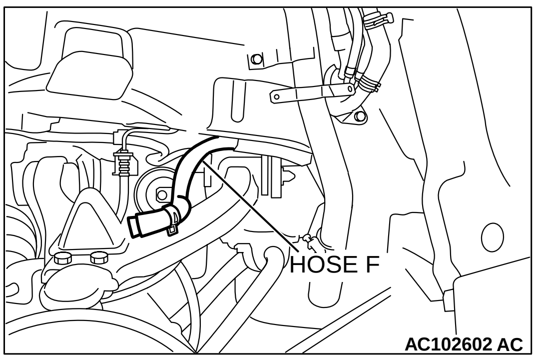
STEP 14. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.



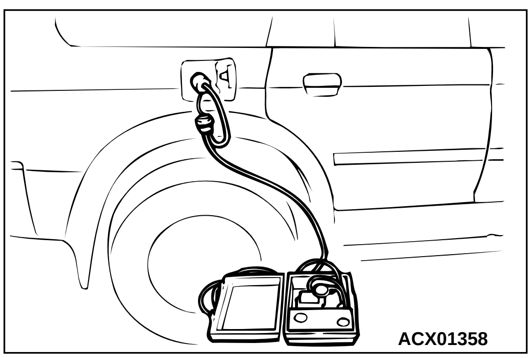
⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures reading on the scan tool should be –3.3 to 3.3 kPa (–0.97 to 0.97 inHg).



(6) Connect an evaporative emission system pressure pump to the fuel tank filler tube and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Disconnect an evaporative emission system pressure pump and connect hose F.
(8) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: Is the fuel tank pressure between –3.3 and 3.3 kPa (–0.97 and 0.97 inHg)?

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 : Replace the PCM. 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 GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the diagnostic trouble code (DTC).

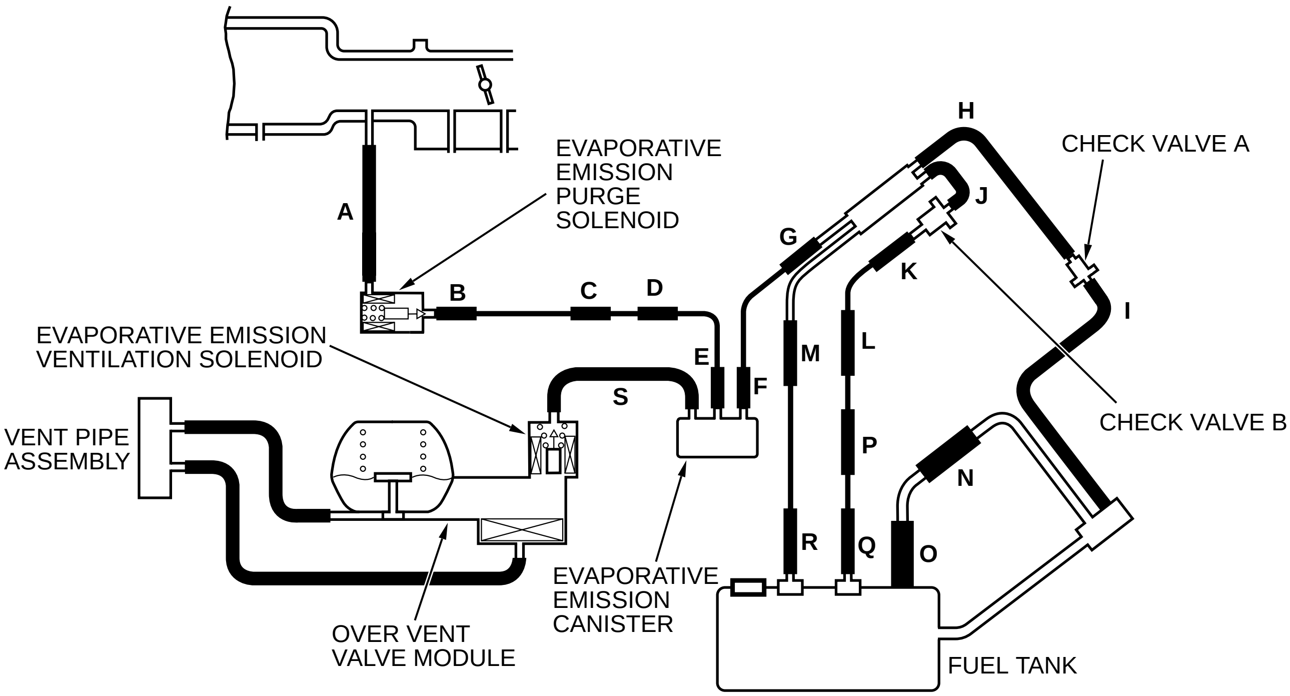
Q: Is DTC P0453 set?

YES : Go to Step 2.

NO : The procedure is complete.

DTC P0455: Evaporative Emission System Leak Detected (Gross Leak)

SYSTEM DIAGRAM



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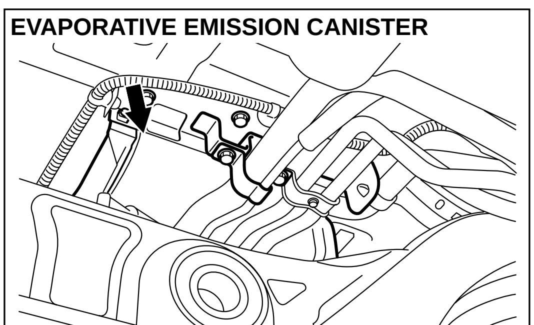
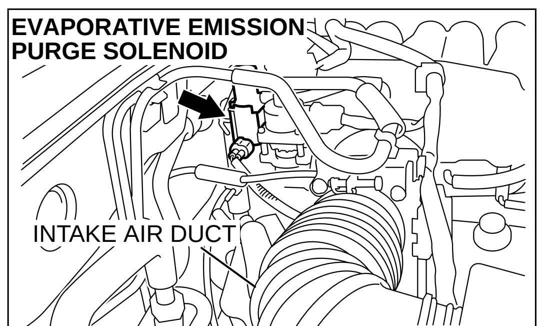
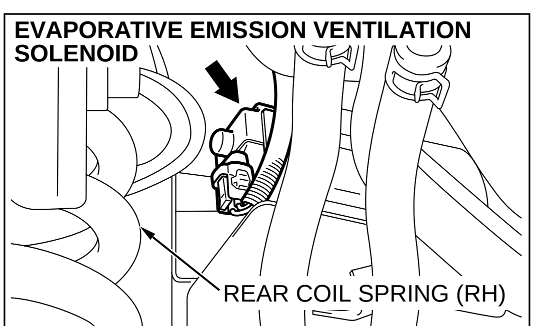


AC101766 AB



AC203904 AC



AC101763 AB

TECHNICAL DESCRIPTION

- The fuel tank may be under a slight positive and negative pressure depending on the state of the evaporative emission system. The PCM monitors and responds to these pressure changes. If the pressure varies from the specified range, the PCM will set DTC P0455.
- The PCM energizes the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- The evaporative emission purge solenoid is to apply engine manifold vacuum to the evaporative emission system.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "OFF" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The PCM determines if there is a leak or clog in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is determined to be too high.

DTC SET CONDITIONS

Test Conditions:

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is greater than 60°C (140°F) When the amount of remaining fuel is 15 – 40 percent of capacity upon engine start up.
- Engine coolant temperature is greater than 20°C (68°F) when the amount of remaining fuel is 40 – 85 percent of capacity upon engine start up.
- Intake air temperature is greater than 5°C (41°F).
- Fuel tank temperature is less than 36°C (97°F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 70 percent.
- Fuel tank differential pressure sensor output voltage is 1 – 4 volts.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 451 Pa (0.065 psi) or less and the amount of remaining fuel is 15 – 40 percent of capacity upon engine start up.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 324 Pa (0.047 psi) or less and the amount of remaining fuel is 40 – 85 percent of capacity upon engine start up.
- Engine speed is greater than 1,600 r/min.
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 150 seconds.

Judgment Criteria:

- The fuel tank internal pressure is greater than 2 kPa (0.29 psi) after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Malfunction of the fuel overflow limiter valve.
- Purge line or vapor line is clogged.
- Malfunction of the fuel tank, purge line or vapor line seal.
- Malfunction of the evaporative emission purge solenoid.
- Malfunction of the evaporative emission ventilation solenoid.
- Malfunction of the fuel tank differential pressure sensor.
- Malfunction of the evaporative emission canister seal.
- Evaporative emission canister is clogged.

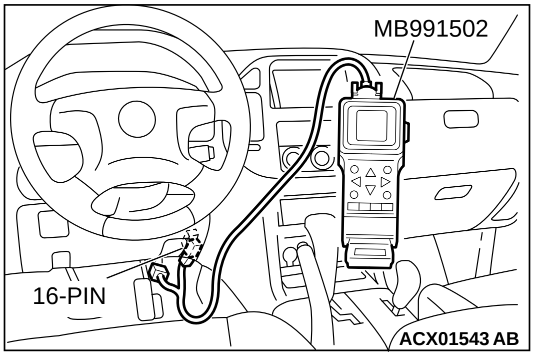
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0455, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set to data reading mode for the fuel tank differential pressure sensor (TANK PRES SNER 73). The mechanical gauge reading is used to verify the scan tool reading. A comparison of the mechanical gauge and scan tool MB991502 determines whether there is a problem in the system
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all EVAP system hoses and tubes for damage.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.



⚠ CAUTION
- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

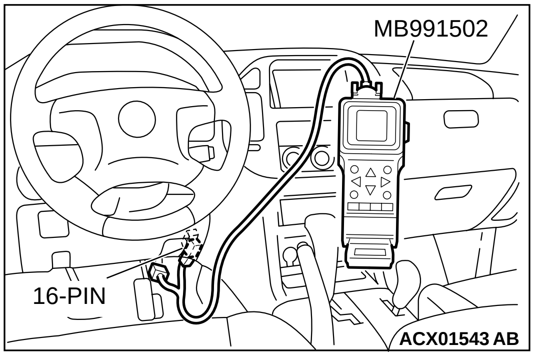
Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed Test Passed" : The EVAP system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause MIL to turn on. Return the vehicle to the customer.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Refer to GROUP 13A, Diagnostic Trouble Code Chart P.13Ab-22, and diagnose any other DTCs that are set. If no other DTCs have been set, go to Step 2.

"Evap Lead Mon. Discontinued. Retest again from the first" : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

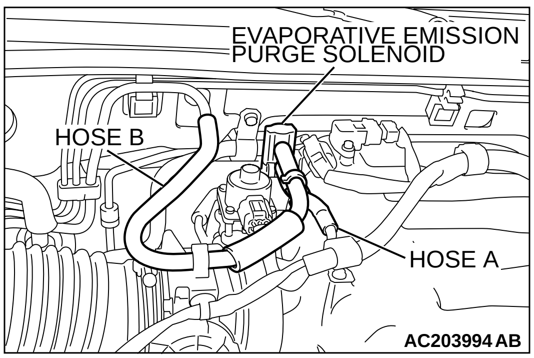
STEP 2. Check for leaks in the evaporative emission purge solenoid.



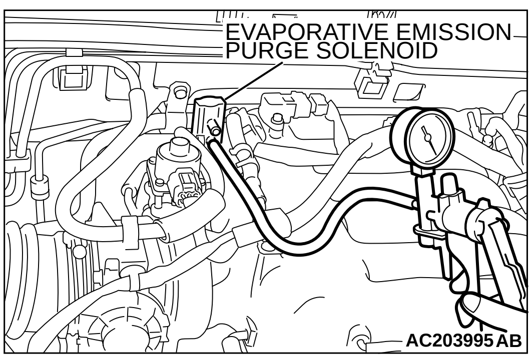
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hoses A and B from the evaporative emission purge solenoid.

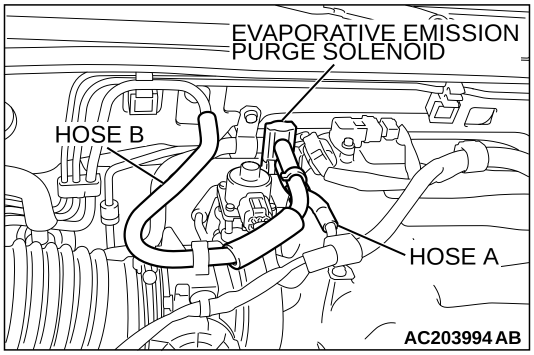


(3) Connect the hand vacuum pump to the evaporative emission purge solenoid instead of hose A.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 08: Evaporative Emission Purge Solenoid. When the evaporative emission purge solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump and connect hoses A and B to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid nipple blow the air?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Go to Step 26.

STEP 3. Check for leaks and clogging in the evaporative emission system hoses A and hose B.

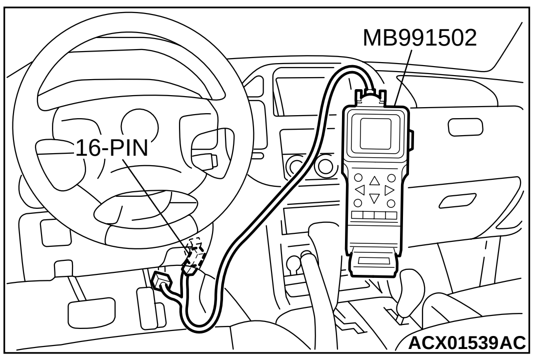


Using a hand vacuum pump, do leakage test and clogging test on each hose A and B.

Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace any damaged hose. Go to Step 26.

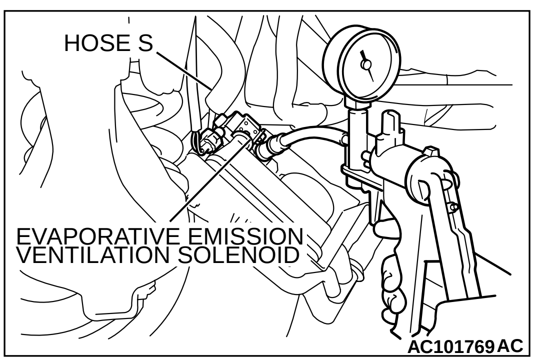
STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502. (Actuator test item 29).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

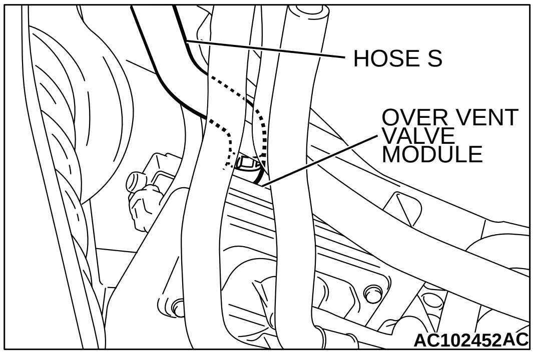
(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose S from the evaporative emission ventilation solenoid and connect a hand vacuum pump.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid Valve. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that solenoid holds vacuum.
(5) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.
(6) Disconnect the hand vacuum pump and connect hose S to the evaporative emission ventilation solenoid.

Q: Does the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 26.



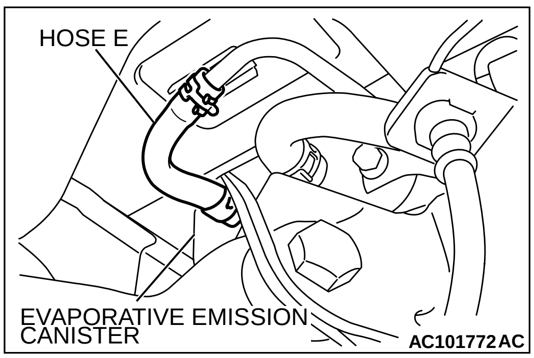
STEP 5. Check for leaks and clogging in the evaporative emission system hose S.

Using a hand vacuum pump, do leakage test and clogging test on hose S.

Q: Does hose S in good condition?

YES : Go to Step 6.

NO : Replace hose S. Go to Step 26.



STEP 6. Check for leaks and clogging in evaporative emission system hose E

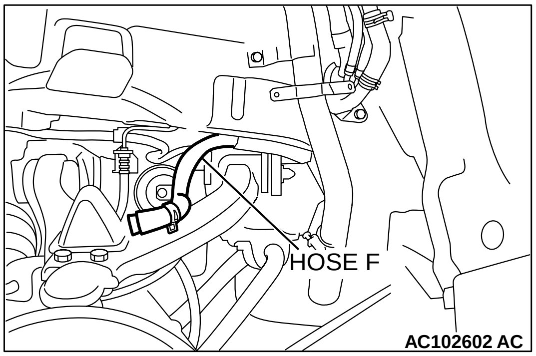
Using a hand vacuum pump, do leakage test and clogging test on hose E.

Q: Does hose E in good condition?

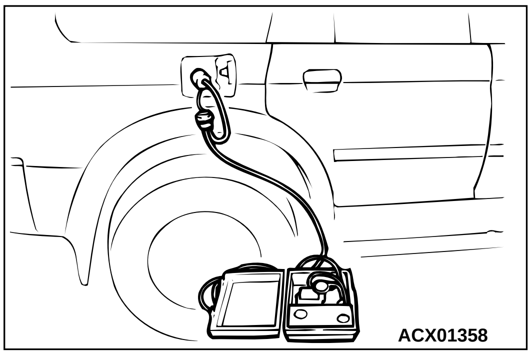
YES : Go to Step 7.

NO : Replace hose E. Go to Step 26.

STEP 7. Pressure test the evaporative emission system lines between hose F and R.



(1) Disconnect hose F from the evaporative emission canister and plug hose F 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) Remove the fuel cap.



(4) Connect the evaporative emission system pressure pump to the fuel tank filler tube.
(5) Pressure test the system to determine whether any leaks are present.

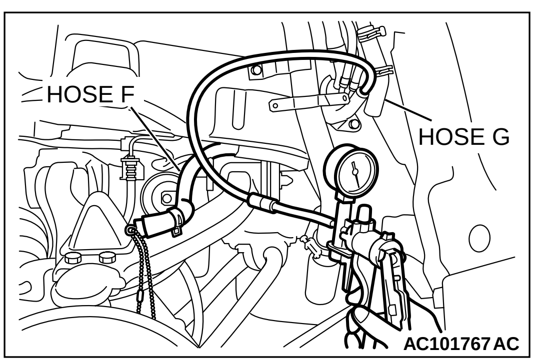
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(6) Disconnect the evaporative emission system pressure pump and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 15.
NO : Go to Step 8.

STEP 8. Check for leaks in the evaporator line hose F.



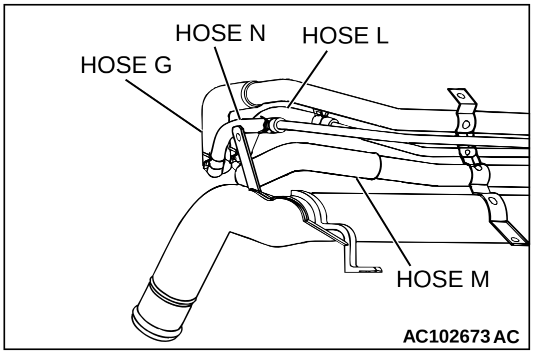
(1) Remove the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Disconnect hose F from the evaporative emission canister and plug hose F securely.
(3) Disconnect hose G from the evaporative emission canister side, and connect a hand vacuum pump.
(4) Apply vacuum with the hand vacuum pump and confirm that the vacuum holds.
(5) Disconnect the hand vacuum pump and connect hose F and G.

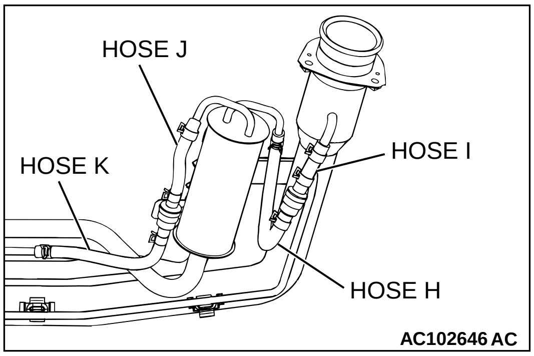
Q: Does hose F hold vacuum?

YES : Go to Step 9.
NO : Replace hose F and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 9. Check for leaks in the evaporative emission system hoses G through N.

(1) Remove the fuel tank filler tube. (Refer to GROUP 13B, Fuel Tank P.13B-11).





(2) Perform a leakage test with a hand vacuum pump on each hose from hose G to N.

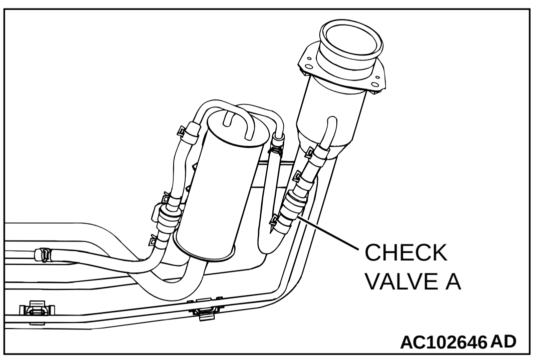
Q: Does the hoses hold vacuum?

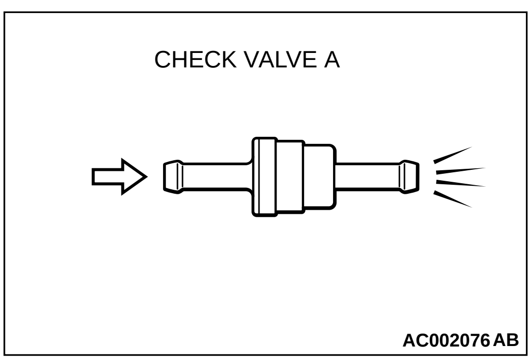
YES : Go to Step 10.

NO : Replace any damaged hose, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 10. Check the 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.

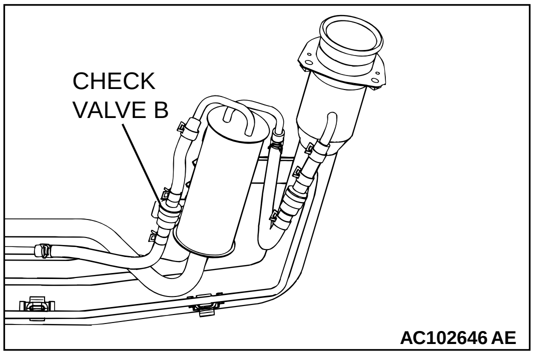
Q: Does check valve A allow air to press in one direction only?

YES : Go to Step 11.

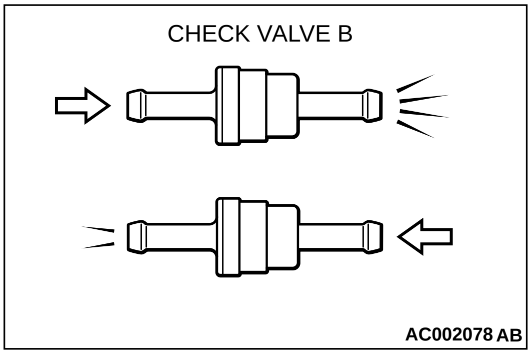
NO : Replace check valve A, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 11. Check the 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 press in one direction only?

YES : Go to Step 12.

NO : Replace check valve B, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

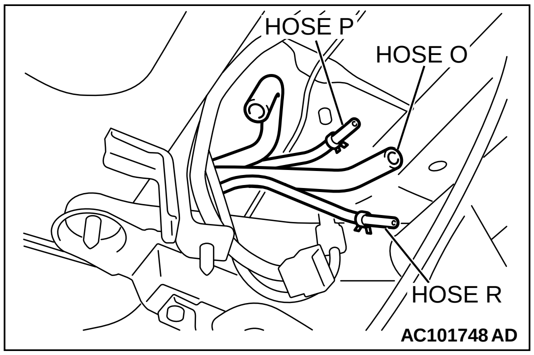
STEP 12.Check for cracks in the fuel tank filler tube assembly.

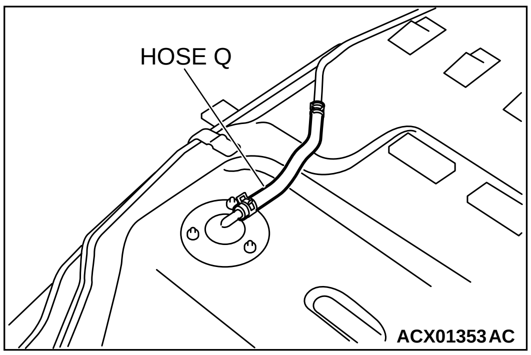
Visually check for cracks in the fuel tank filler tube assembly.

Q: Is the fuel tank filler tube assembly in good condition?

YES : Go to Step 13.

NO : Replace the fuel tank filler tube assembly and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26 .





STEP 13. Check for leaks in the evaporative emission system hoses O through R.

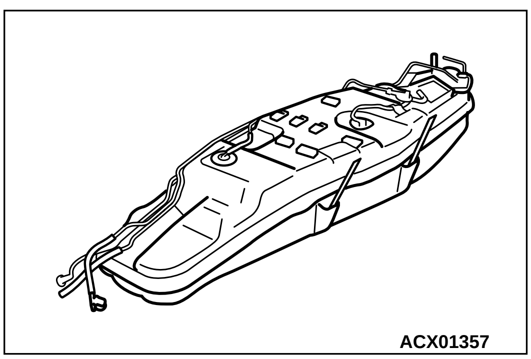
(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Perform a leakage test with a hand vacuum pump on each hose from hose O to R.

Q: Does the hoses hold vacuum?

YES : Go to Step 14.

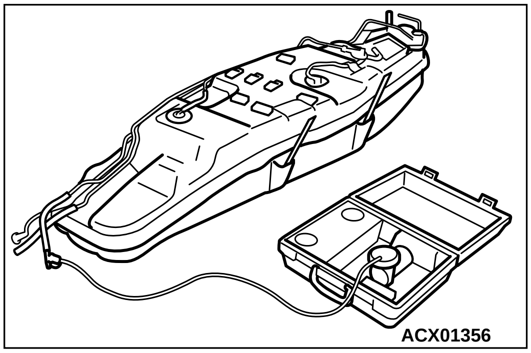
NO : Replace any damaged hose, and reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.



STEP 14. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve and fuel tank leveling valve installation section in the fuel tank.



(2) Connect the evaporative emission system pressure pump to the filler hose.
(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple that are connected to the fuel tank.

NOTE: If these items are not securely plugged at this time, the fuel could leak from the tank.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.
(5) In the pressurized state, check for the leaks by applying soapy water solution to each section and look for bubbles.

Q: Is the fuel tank free of leaks?

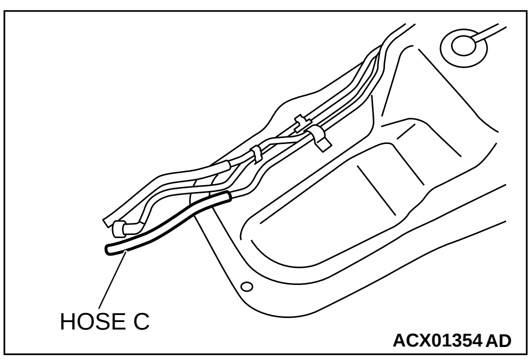
There are leaks at the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve or the fuel tank leveling valve installation section. : After reassemble the leaked parts, check again that there are no leaks. Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

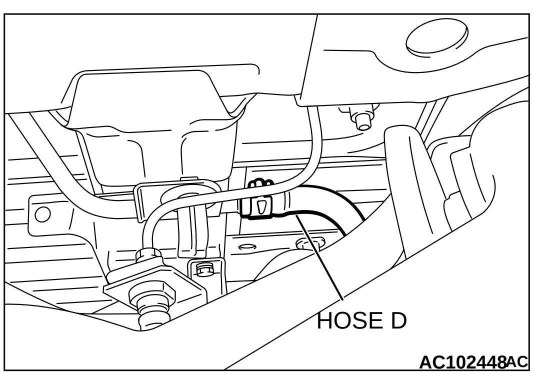
There are leaks at the fuel tank. : Replace the fuel tank, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

There are no leaks. : Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 25 .

STEP 15. Check for leaks in the evaporative emission system hose C and hose D.

(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Perform a leakage test with a hand vacuum pump on each hose C and D.





Q: Does the hoses hold vacuum?

YES : Reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 16.

NO : Replace any damaged hose and reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

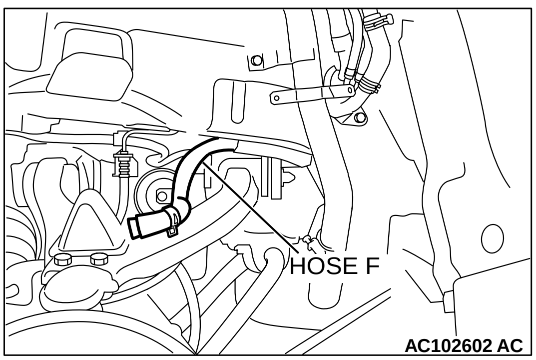
STEP 16. Check for leaks in the evaporative emission canister.

(1) Remove the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66).
(2) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(3) Plug the other two nipples or loop a hose between them.
(4) Apply vacuum with the hand vacuum pump and confirm that the canister holds vacuum.

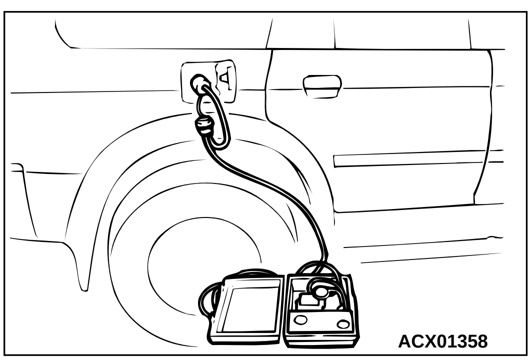
Q: Does the evaporative emission canister hold vacuum?

YES : Reinstall the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 17 .
NO : Replace the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 26 .

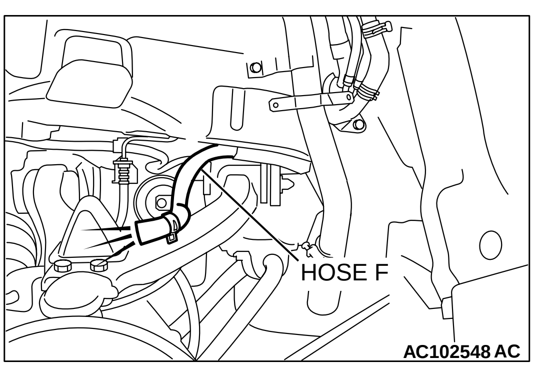
STEP 17. Pressure test for clogging in evaporative emission system lines between hose F and R.



(1) Disconnect hose F from the evaporative emission canister and plug hose F 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) Remove the fuel cap.



(4) Connect the evaporative emission system pressure pump to the fuel tank filler tube.

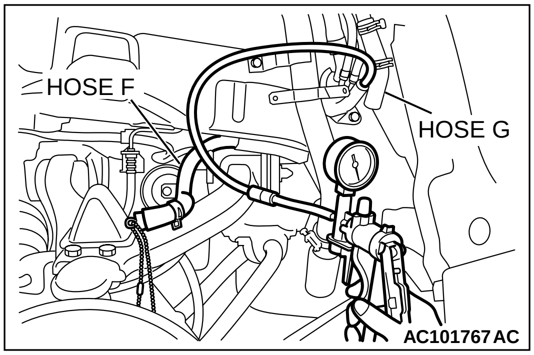


(5) After it is confirmed that pressure maintained, unplug hose F.
(6) Disconnect the evaporative emission system pressure pump and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

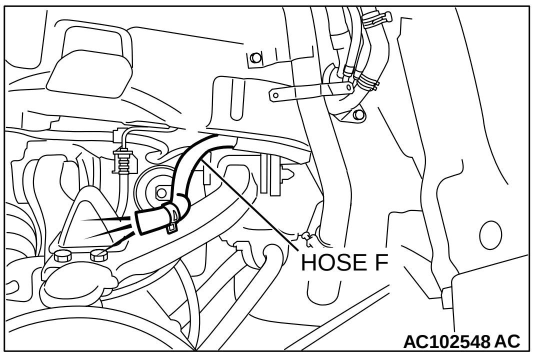
Q: Does hose F blow the air?

YES : Go to Step 23.
NO : Go to Step 18.

STEP 18. Check for clogging in the evaporator line hose F.



(1) Remove the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Disconnect hose F from the evaporative emission canister and plug hose F securely.
(3) Disconnect hose G from the evaporative emission canister side, and connect a hand vacuum pump.

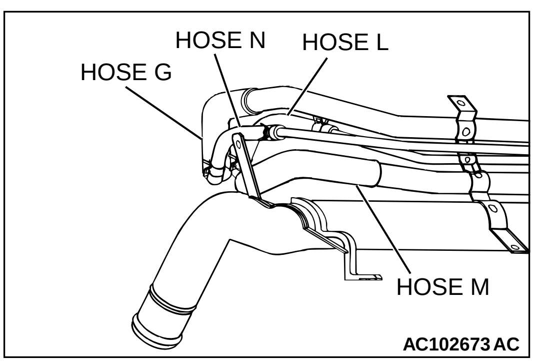


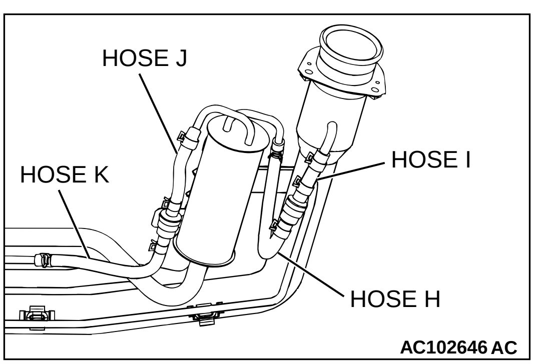
(4) Apply vacuum with the hand vacuum pump, unplug hose F.
(5) Disconnect the hand vacuum pump and connect hose F and G.

Q: Does hose F blow the air?

YES : Go to Step 19.
NO : Replace hose F and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 19. Check for clogging in the evaporative emission system hoses G through N.

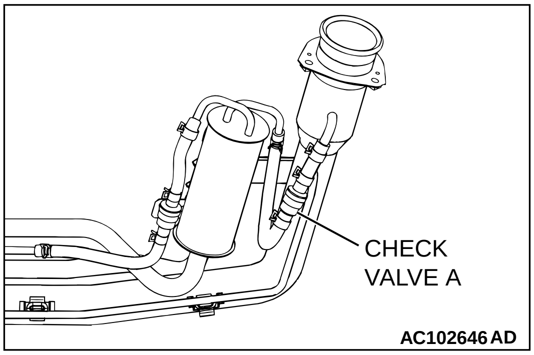




(1) Remove the fuel tank filler tube. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Use a hand vacuum pump to clogging test on each hose from hose G to hose N.

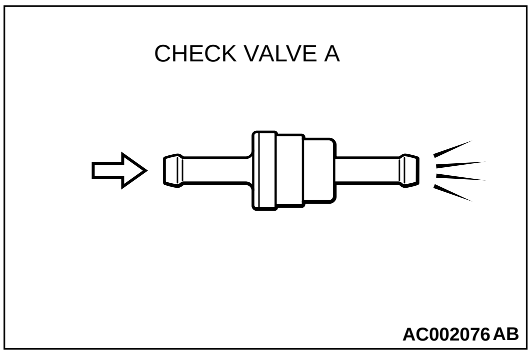
Q: Are the hoses in good condition?

YES : Go to Step 20.
NO : Replace any damaged hose, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.



STEP 20. Check the check valve A.

(1) Check valve A is a one-way check valve.

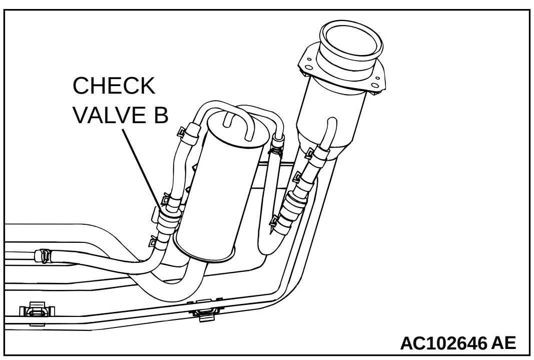


(2) Check valve A should allow air to flow in only one direction.

Q: Does check valve A allow air to press in one direction only?

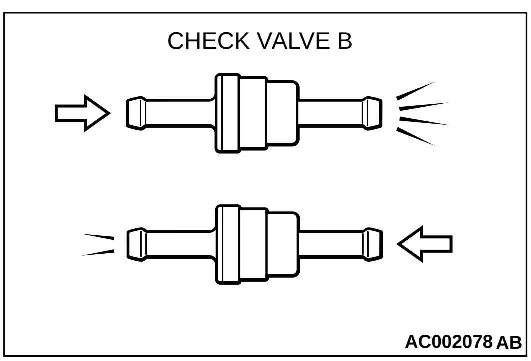
YES : Go to Step 21.

NO : Replace check valve A, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.



STEP 21. Check the 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 press in one direction only?

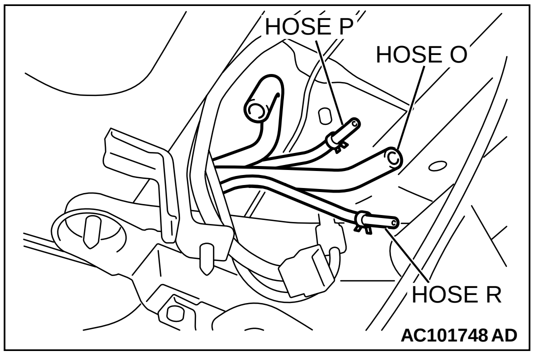
YES : Go to Step 22.

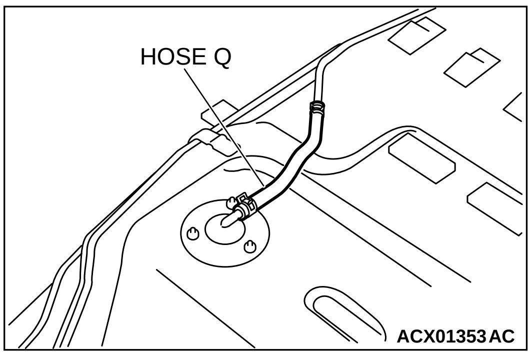
NO : Replace check valve B, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 22. Check for clogging in the evaporative emission system hoses O through R.

(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Use a hand vacuum pump to clogging test on each hose from hose O to hose R.





Q: Are the hoses in good condition?

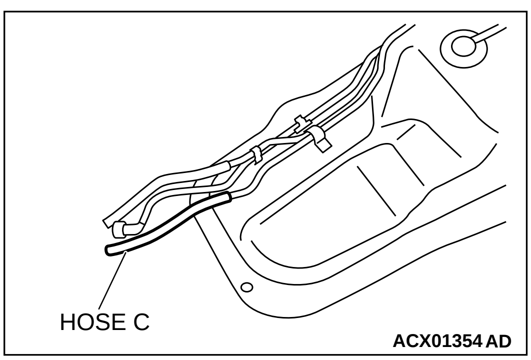
YES : Go to Step 25.

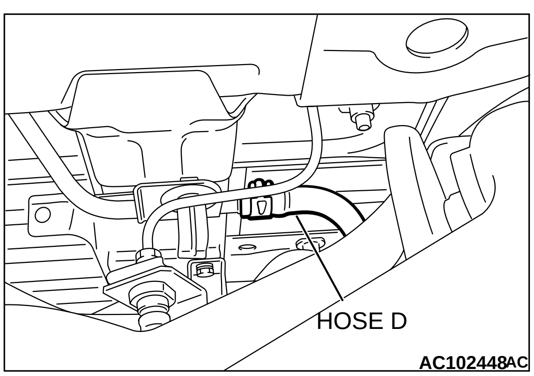
NO : Replace any damaged hose, and reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

STEP 23. Check for clogging in the evaporative emission system hose C and hose D.

(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Use a hand vacuum pump to clogging test on each hose C and hose D.





Q: Are the hoses in good condition?

YES : Reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 24.

NO : Replace any damaged hose and reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 26.

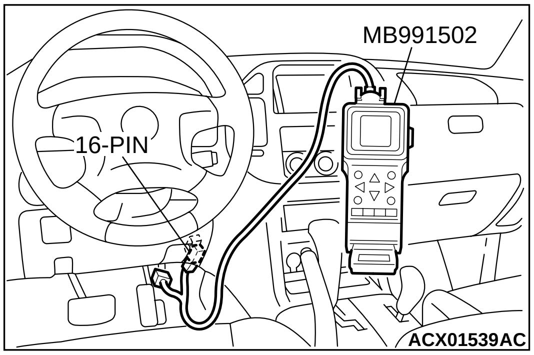
STEP 24. Check for clogging in the evaporative emission canister.

(1) Remove the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66).
(2) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(3) Plug the other two nipples or loop a hose between the other nipples.
(4) Apply a pressure on the vacuum pump.
(5) When each nipple is unplugged, air should pass through the unplugged nipple.

Q: Is the evaporative emission canister in good condition?

YES : Reinstall the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 25 .

NO : Replace the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 26 .



STEP 25. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ **CAUTION**

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Go to Step 26 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the PCM. Go to Step 26.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once and repeat evaporative emission system monitor test.

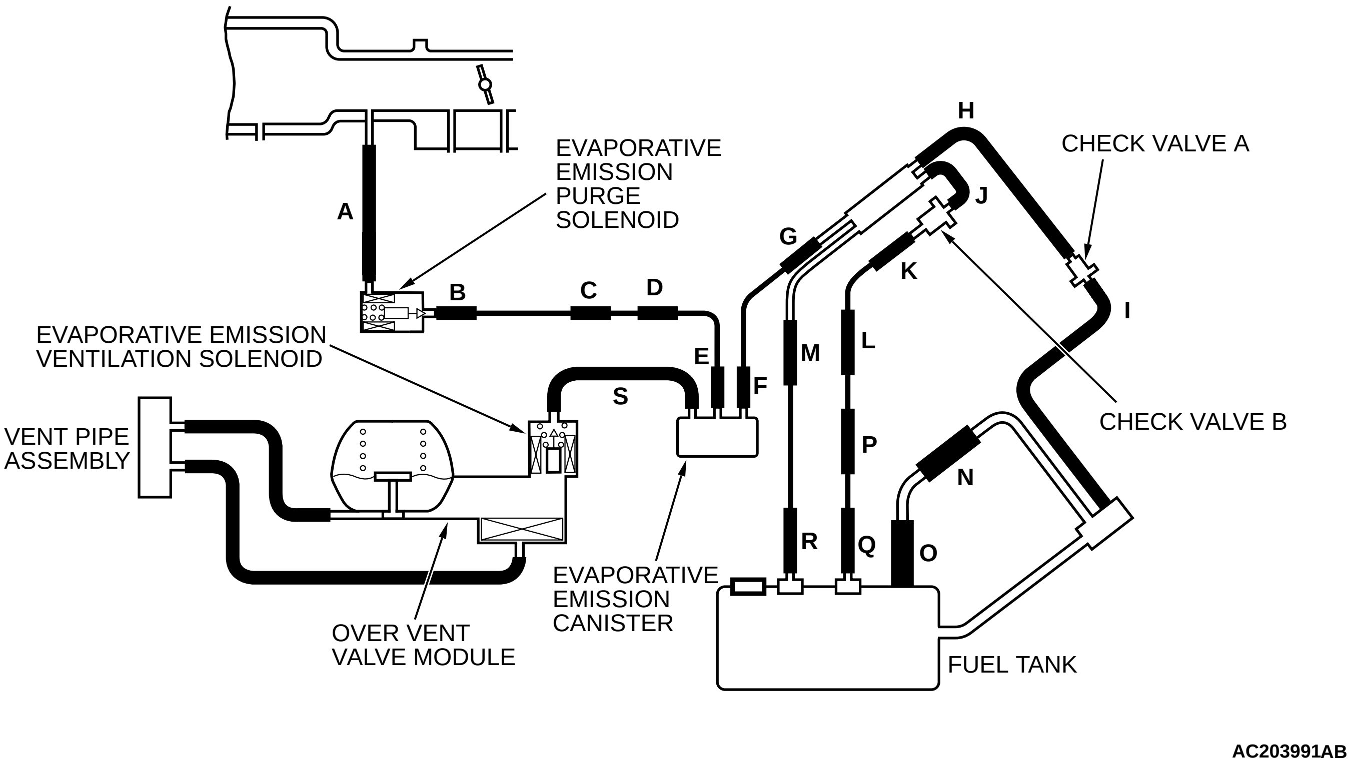
STEP 26. Perform the OBD-II drive cycle.

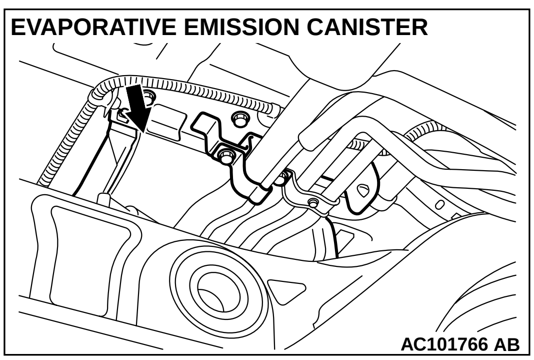
(1) Confirm the repair by performing the appropriate drive cycle. [Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the DTC.

Q: Is DTC P0455 set?

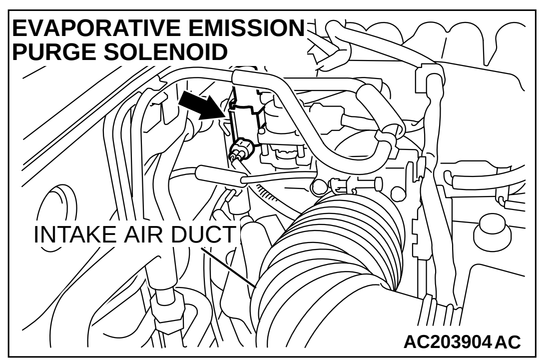
YES : Repeat the troubleshooting procedure. Go to Step 1.
NO : The procedure is complete.

DTC P0456: Evaporative Emission System Leak Detected (Very Small Leak)

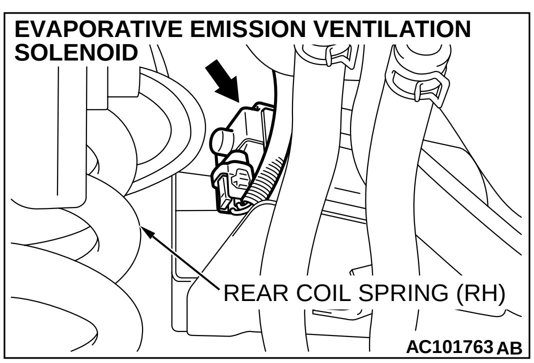




EVAPORATIVE EMISSION CANISTER



EVAPORATIVE EMISSION PURGE SOLENOID



EVAPORATIVE EMISSION VENTILATION SOLENOID

TECHNICAL DESCRIPTION

- The PCM monitors the Evaporative Emission (EVAP) System pressure.
- The PCM 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 PCM 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

Test Conditions:

- Fuel level sensor output voltage is 2.4 – 3.7 volts when the engine is started, and the amount of remaining fuel is 40 – 85 percent of capacity.
- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is greater than 20°C (68°F).
- Intake air temperature is greater than –10°C (14°F).
- Fuel tank temperature is less than 33°C (91°F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 – 4 volts.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises 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 seconds.

Judgment Criteria:

- Internal pressure of the fuel tank has changed greater than 1,177 – 1,373 Pa (0.171 – 0.199 psi) in 128 seconds after the tank and vapor line were closed.
- Only one monitor during one 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.

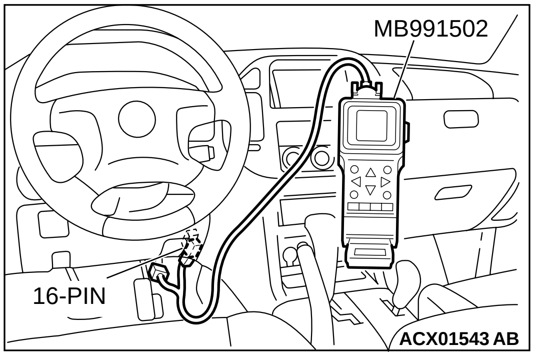
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0456, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set to the data reading mode for the fuel tank differential pressure sensor (TANK PRES SNER 73). The mechanical gauge reading is used to verify the scan tool reading. A comparison of the mechanical gauge and scan tool MB991502 determines whether there is problem in the system.
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all EVAP system hoses and tubes for damage.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

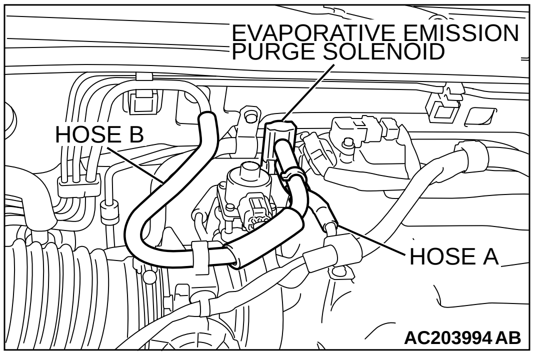
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

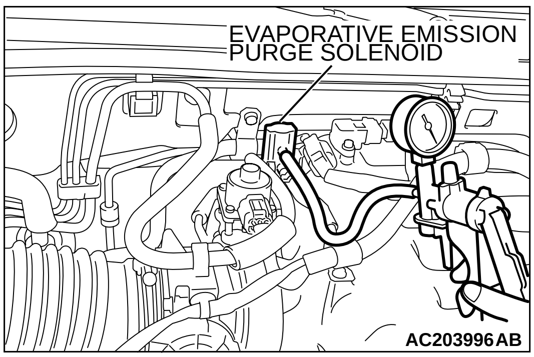
Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed Test Passed" : The EVAP system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause MIL to turn on. Return the vehicle to the customer.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Refer to GROUP 13A, Diagnostic Trouble Code Chart P.13Ab-22, and diagnose any other DTCs that are set. If no other DTCs have been set, go to Step 2.

"Evap Lead Mon. Discontinued. Retest again from the first" : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



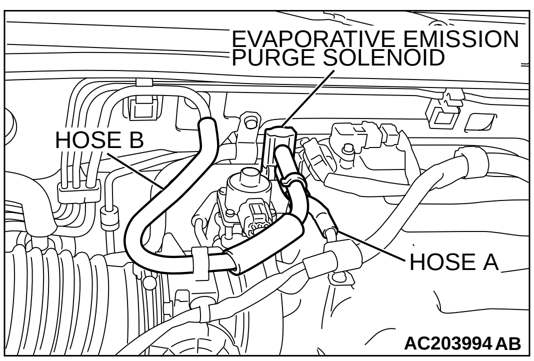


STEP 2. Check for leaks in the evaporative emission purge solenoid.

(1) Disconnect hose B 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 B 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 18.



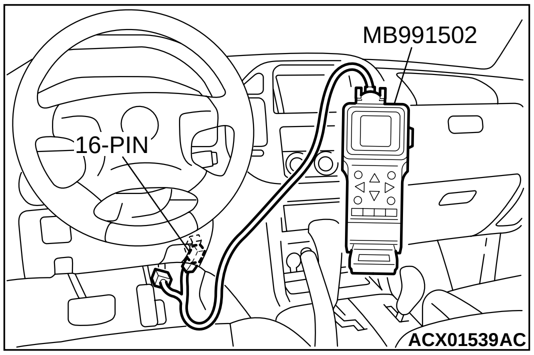
STEP 3. Check for leaks in the evaporative emission system hose A and hose B.

Perform a leakage test with a hand vacuum pump on each hose A and B.

Q: Does the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Go to Step 18.

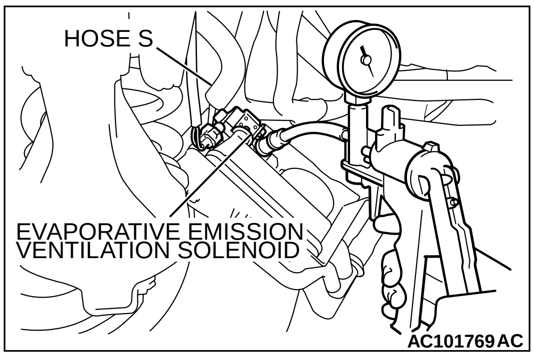
STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502 (Actuator test item 29).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

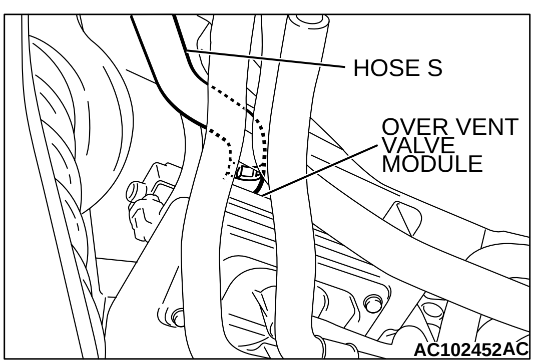


(2) Disconnect hose S from the evaporative emission ventilation solenoid and connect a hand vacuum pump.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid Valve. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that solenoid holds vacuum.
(5) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.
(6) Disconnect the hand vacuum pump and connect hose S to the evaporative emission ventilation solenoid.

Q: Does the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 18.

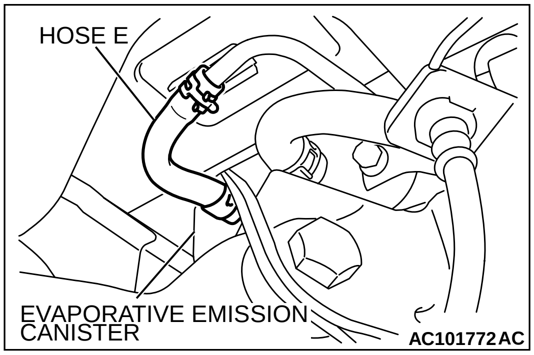
STEP 5. Check for leaks in the evaporative emission system hose S.



Perform a leakage test with a hand vacuum pump on hose S.

Q: Does hose S hold vacuum?

YES : Go to Step 6.
NO : Replace hose S. Go to Step 18.

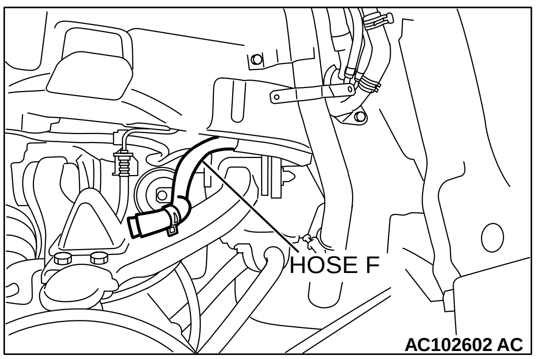


STEP 6. Check for leaks in the evaporative emission system hose E.

Perform a leakage test with a hand vacuum pump on hose E.

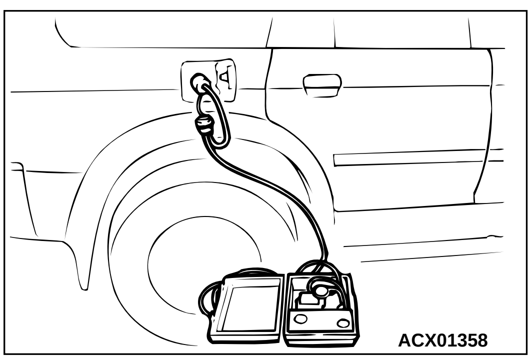
Q: Does hose E hold vacuum?

YES : Go to Step 7.
NO : Replace hose E. Go to Step 18.



STEP 7. Pressure test the evaporative emission system lines between hose F and R.

(1) Disconnect hose F from the evaporative emission canister and plug hose F 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) Remove the fuel cap.



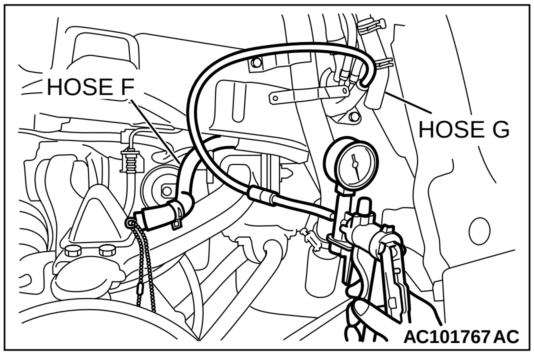
(4) Connect the evaporative emission system pressure pump to the fuel tank filler tube.
(5) Pressure test the system to determine whether any leaks are present.

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.

(6) Disconnect the evaporative emission system pressure pump and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 15.
NO : Go to Step 8.

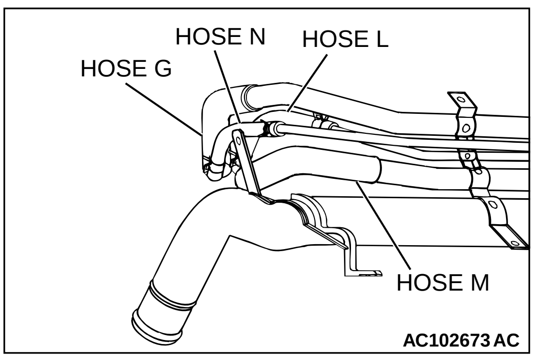


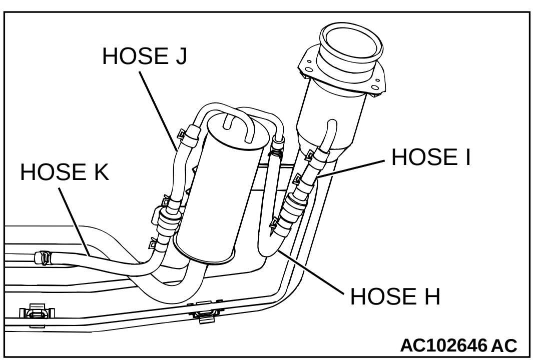
STEP 8. Check for leaks in the evaporator line hose F.

(1) Remove the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Disconnect hose F from the evaporative emission canister and plug hose F securely.
(3) Disconnect hose G from the evaporative emission canister side, and connect a hand vacuum pump.
(4) Apply vacuum with the hand vacuum pump and confirm that the vacuum holds.
(5) Disconnect the hand vacuum pump and connect hose F and G.

Q: Does hose F hold vacuum?

YES : Go to Step 9.
NO : Replace hose F and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.



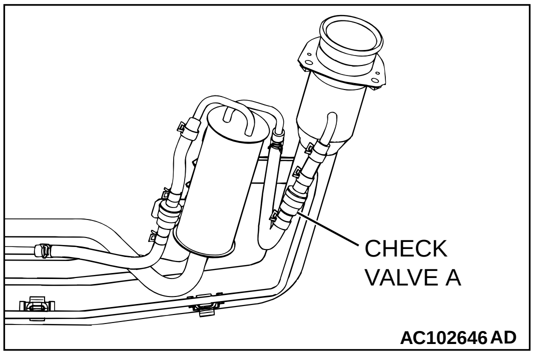


STEP 9. Check for leaks in the evaporative emission system hoses G through N.

(1) Remove the fuel tank filler tube. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Perform a leakage test with a hand vacuum pump on each hose from hose G to N.

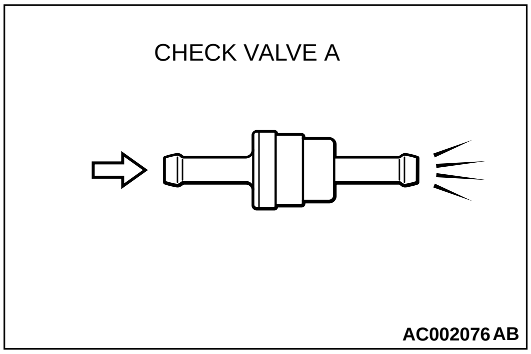
Q: Does the hoses hold vacuum?

YES : Go to Step 10.
NO : Replace any damaged hose, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.



STEP 10. Check the check valve A.

(1) Check valve A is a one-way check valve.

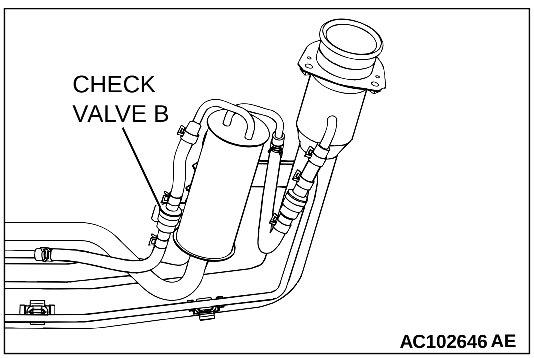


(2) Check valve A should allow air to flow in only one direction.

Q: Does check valve A allow air to press in one direction only?

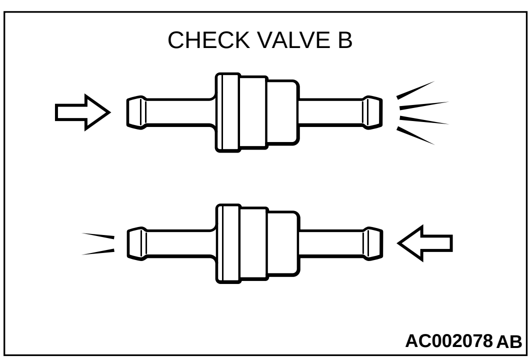
YES : Go to Step 11.

NO : Replace check valve A, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.



STEP 11. Check the 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 press in one direction only?

YES : Go to Step 12.

NO : Replace check valve B, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

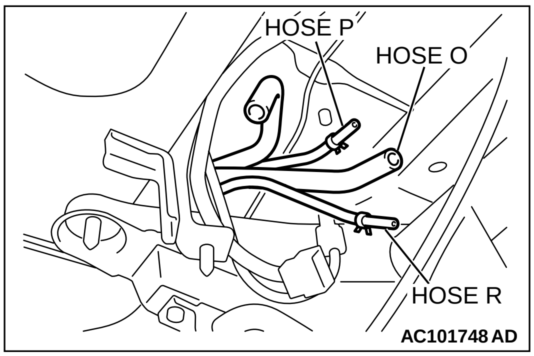
STEP 12. Check for cracks in the fuel tank filler tube assembly.

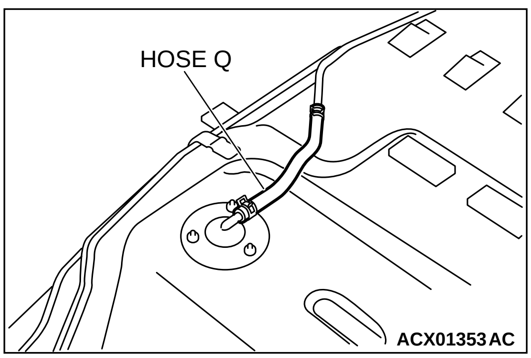
Visually check for cracks in the fuel tank filler tube assembly.

Q: Is the fuel tank filler tube assembly in good condition?

YES : Go to Step 13.

NO : Replace the fuel tank filler tube assembly and reinstall the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18 .





STEP 13. Check for leaks in the evaporative emission system hoses O through R.

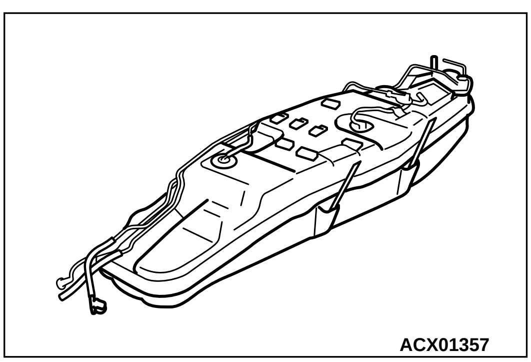
(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).

(2) Perform a leakage test with a hand vacuum pump on each hose from hose O to R.

Q: Does the hoses hold vacuum?

YES : Go to Step 14.

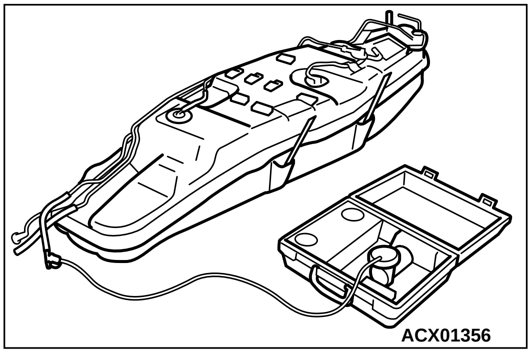
NO : Replace any damaged hose, and reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.



STEP 14. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve and fuel tank leveling valve installation section in the fuel tank.



(2) Connect the evaporative emission system pressure pump to the filler hose.
(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple that are connected to the fuel tank.

NOTE: If these items are not securely plugged at this time, the fuel could leak from the tank.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.
(5) In the pressurized state, check for the leaks by applying soapy water solution to each section and look for bubbles.

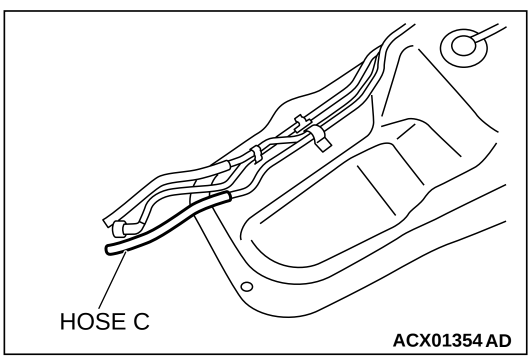
Q: Is the fuel tank free of leaks?

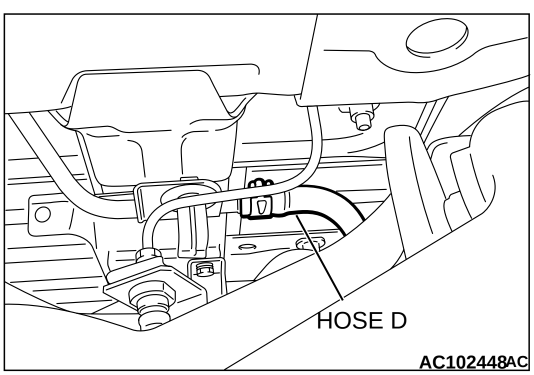
There are leaks at the fuel pump assembly, the fuel level sensor, the fuel tank rollover valve or the fuel tank leveling valve installation section. : After reassemble the leaked parts, check again that there are no leaks. Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

There are leaks at the fuel tank. : Replace the fuel tank, and reinstall the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

There are no leaks. : Reinstall the fuel tank, the fuel tank filler tube and the fuel tank filler tube protector. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 15 .

STEP 15. Check for leaks in the evaporative emission system hose C and hose D.





(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11).
(2) Perform a leakage test with a hand vacuum pump on each hose C and D.

Q: Does the hoses hold vacuum?

YES : Reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 16.

NO : Replace any damaged hose and reinstall the fuel tank. (Refer to GROUP 13B, Fuel Tank P.13B-11). Go to Step 18.

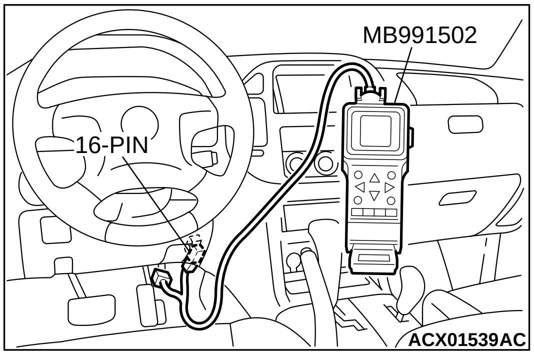
STEP 16. Check for leaks in the evaporative emission canister.

(1) Remove the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66).
(2) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(3) Plug the other two nipples or loop a hose between them.
(4) Apply vacuum with the hand vacuum pump and confirm that the canister holds vacuum.

Q: Does the evaporative emission canister hold vacuum?

YES : Reinstall the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 17 .

NO : Replace the evaporative emission canister. (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-66). Go to Step 18 .



STEP 17. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ **CAUTION**

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transmission is set to "P" position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502. (Refer to GROUP 13A, Trouble Code Diagnosis P.13Ab-2).
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test" and press the "YES" key.
(7) Select "Evap Leak Mon" and press the "YES" key.
(8) During this test, keep the accelerator pedal at the idling 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 will change from "NO" to "YES".
(10)Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Go to Step 18 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the PCM. Go to Step 18.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once and repeat evaporative emission system monitor test.

STEP 18. Perform the OBD-II drive cycle.

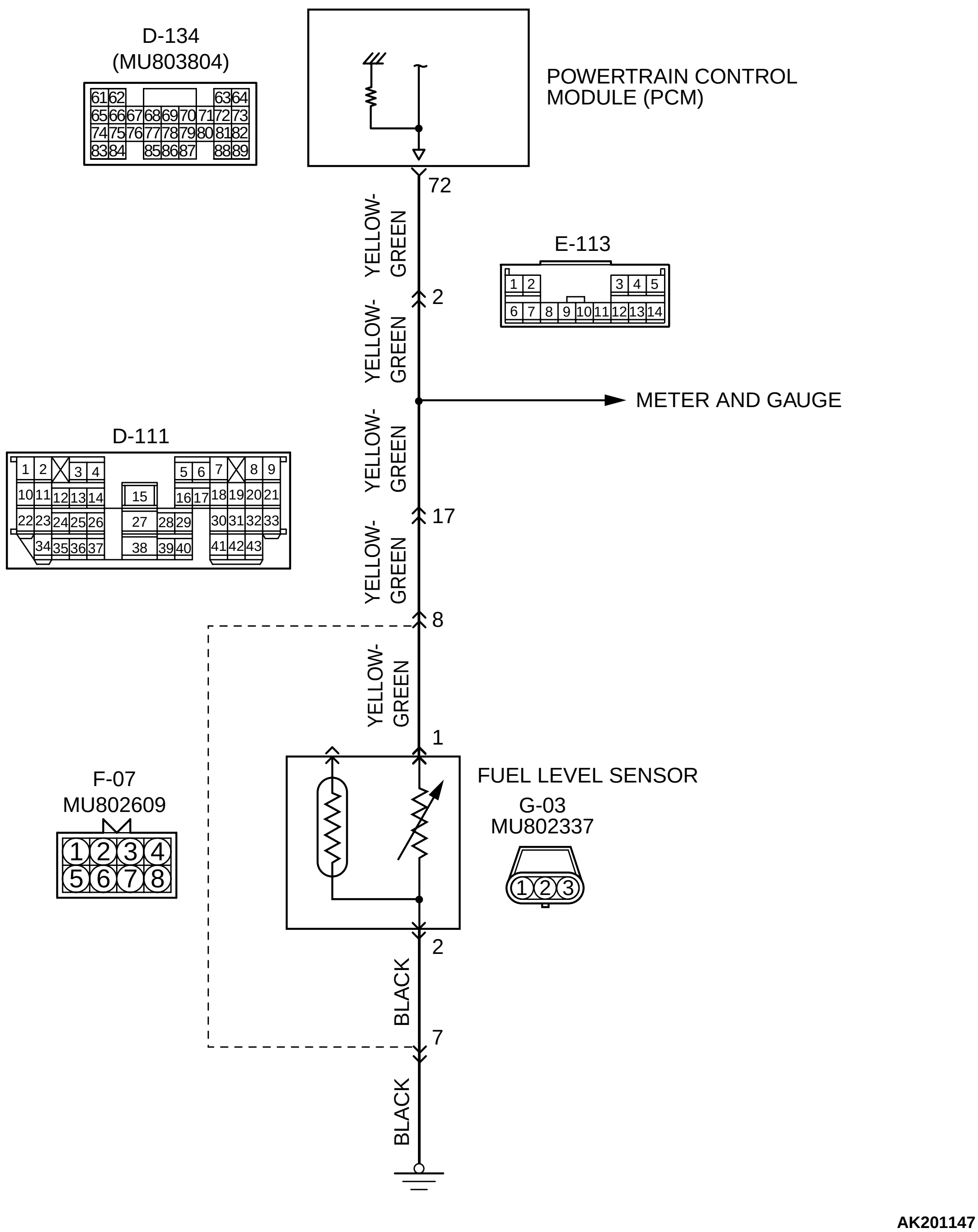
(1) Confirm the repair by performing the appropriate drive cycle. [Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle (Procedure 1: Evaporative Emission Control system Leak Monitor) P.13Ab-2].
(2) Read the DTC.

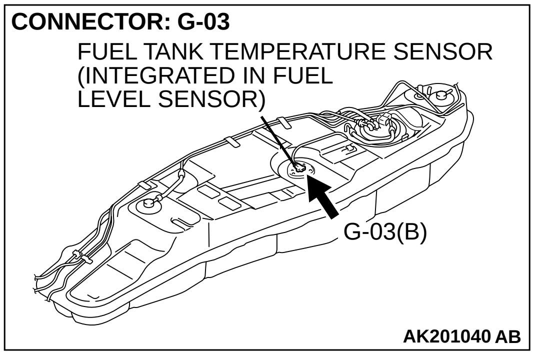
Q: Is DTC P0456 set?

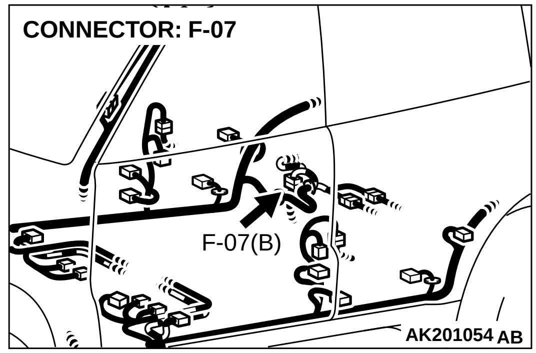
YES : Repeat the troubleshooting procedure. Go to Step 1.
NO : The procedure is complete.

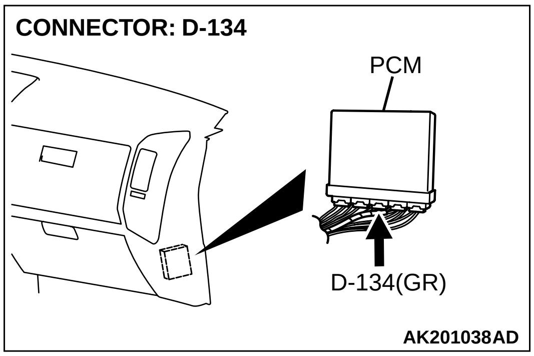
DTC P0461: Fuel Level Sensor Circuit Range/Performance

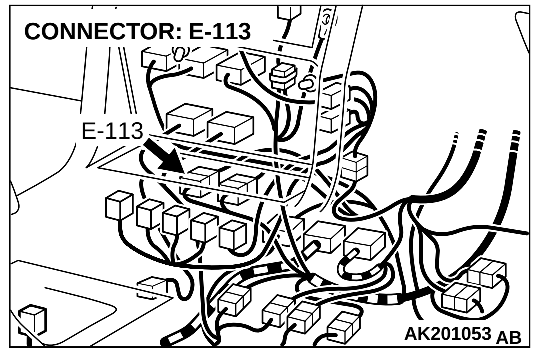
Fuel Level Sensor Circuit

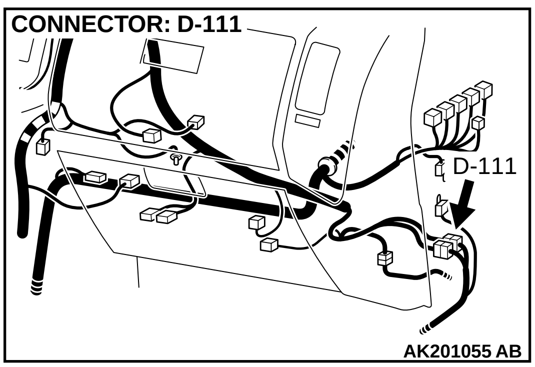












CIRCUIT OPERATION

- The fuel gauge drive signal is input in PCM (terminal No. 72).

TECHNICAL DESCRIPTION

- Branch the drive signal from the fuel gauge circuit, and input it into PCM.
- The PCM detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

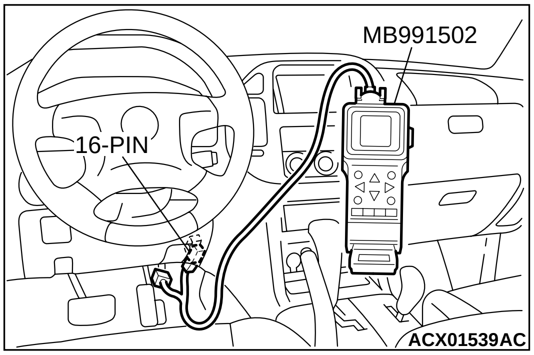
- When the fuel consumption calculated from the operation time of the injector amounts to 20 litter, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 litter or less.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel level sensor failed.
- Open or shorted fuel level sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4B: Fuel Level Sensor.

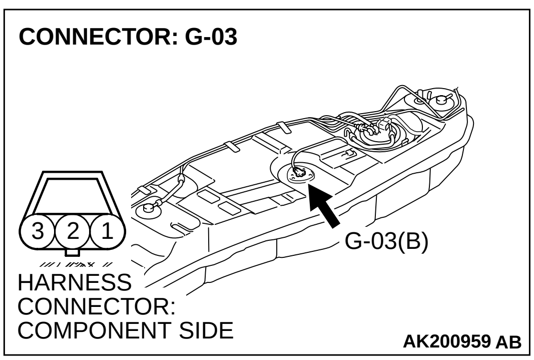
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4B, Fuel Level Sensor.
- When the fuel gauge is near "FULL", voltage should be 100 – 3,600 mV.
- When the fuel gauge is near "EMPTY", voltage should be 2,700 – 6,200 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

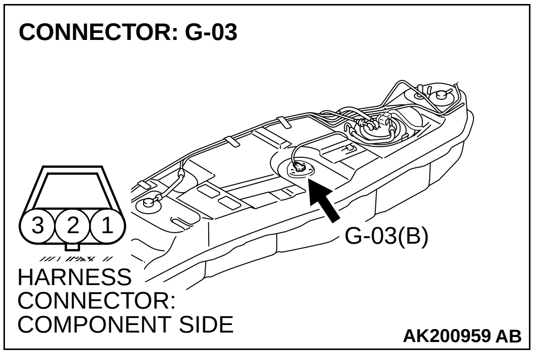
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector G-03 at the fuel level sensor for damage.

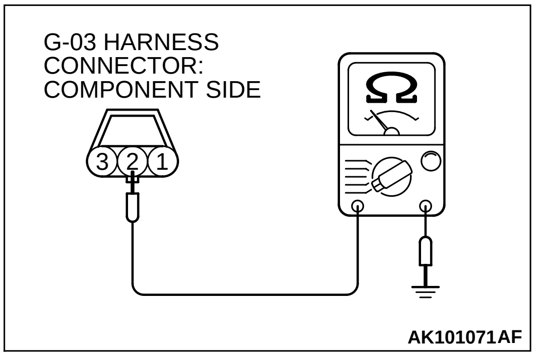
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the continuity at fuel level sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.

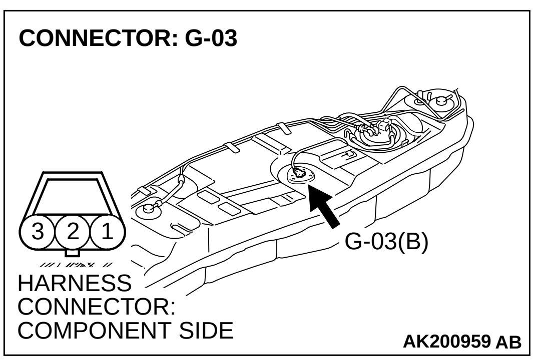


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

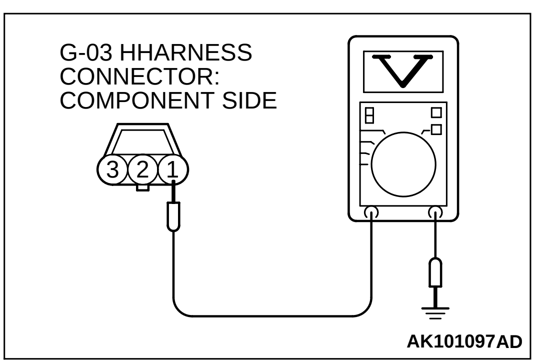
YES : Go to Step 4.

NO : Check connector F-07 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 level sensor connector G-03 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 12.



STEP 4. Measure the sensor supply voltage at fuel level sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.
(2) Disconnect the combination connector D-03.
(3) Turn the ignition switch to the "ON" position.



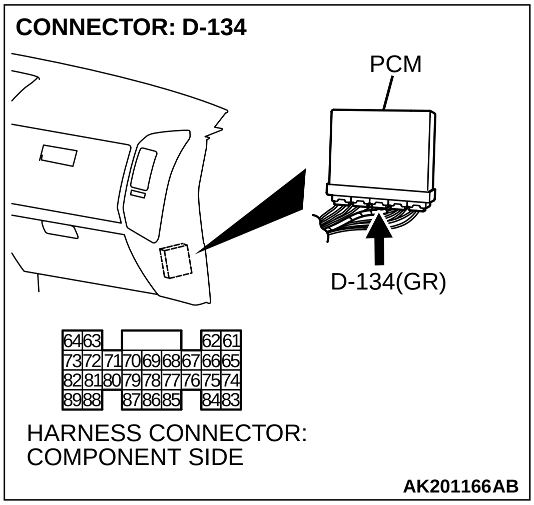
(4) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

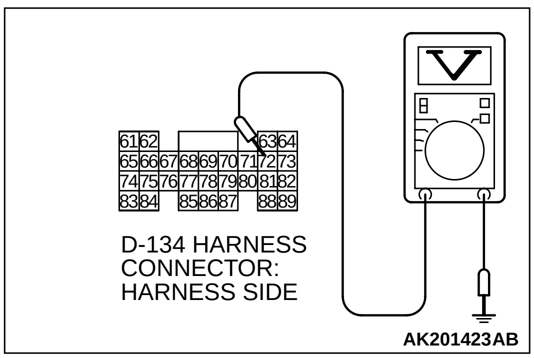
YES : Go to Step 9.

NO : Go to Step 5.



STEP 5. Measure the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the combination meter connector D-03.
(3) Turn the ignition switch to the "ON" position.

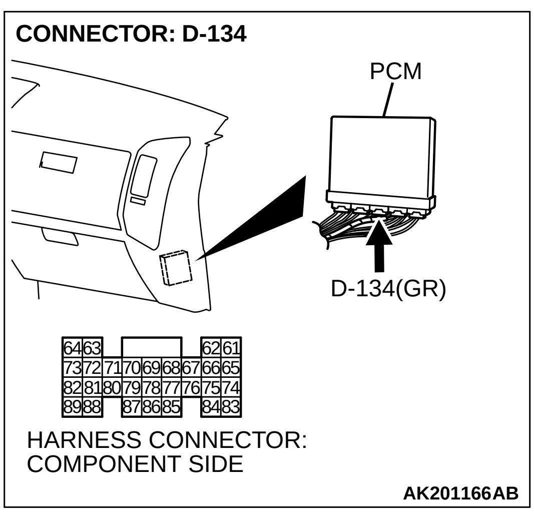


(4) Measure the voltage between terminal No. 72 and ground by backprobing.
- When the fuel gauge is near "FULL", voltage should be 0.1 and 3.6 volts.
- When the fuel gauge is near "EMPTY", voltage should be 2.7 and 6.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 7.

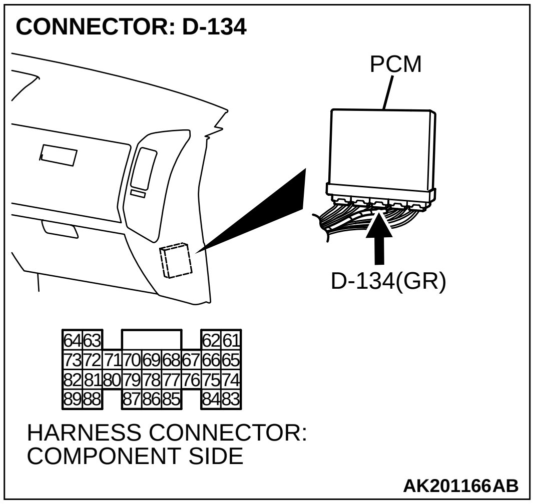


STEP 6. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Check connector D-111, E-113 and F-07 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 level sensor connector G-03 (terminal No. 1) and PCM connector D-134 (terminal No. 72) 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 7. Check connector D-134 at PCM for damage.

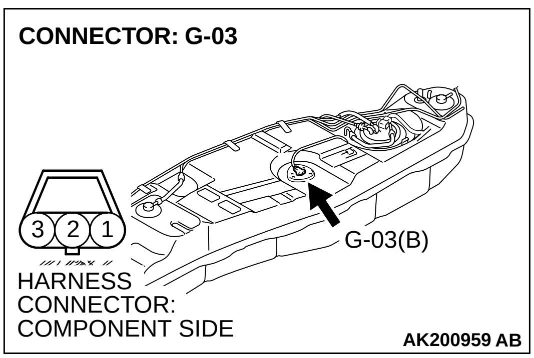
Q: Is the connector in good condition?

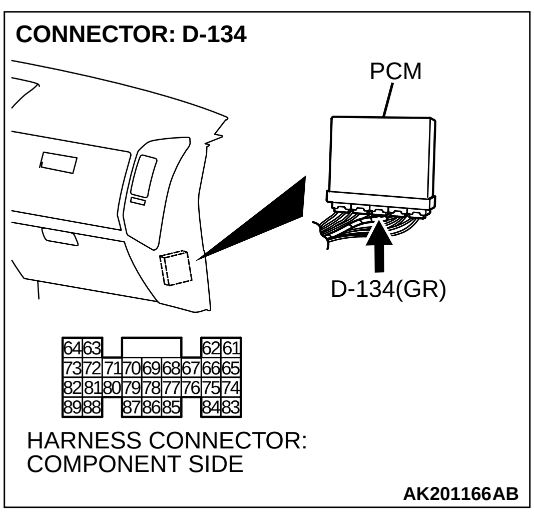
YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 8. Check for short circuit to ground between fuel level sensor connector G-03 (terminal No. 1) and PCM connector D-134 (terminal No. 72).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.



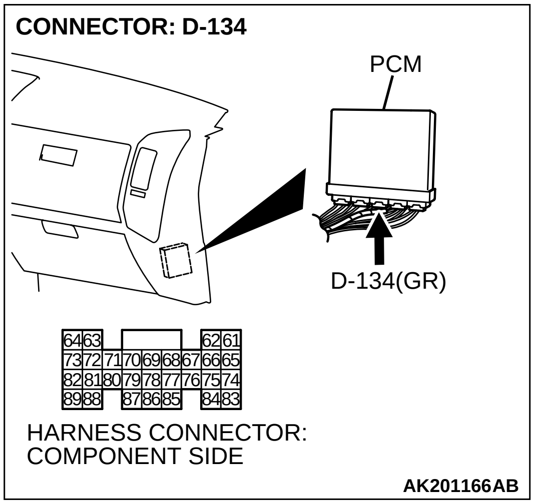


STEP 9. Check the fuel level sensor.

Refer to GROUP 54, Combination Meter. P.54A-63

Q: Is the fuel level sensor normal?

YES : Go to Step 10.
NO : Replace the fuel level sensor. Then go to Step 12.

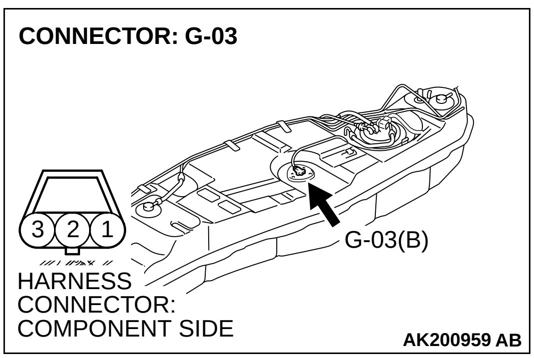


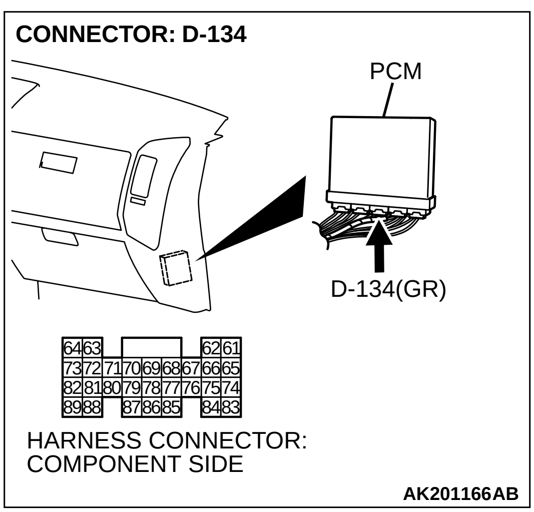
STEP 10. Check connector D-134 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 11. Check for harness damage between fuel level sensor connector G-03 (terminal No. 1) and PCM connector D-134 (terminal No. 72).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0461 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- PCM monitors the communication condition with the immobilizer-ECU and the message from the immobilizer-ECU, and when the abnormality is found, PCM makes the engine not to start.

DTC SET CONDITIONS

Check Conditions

- Ignition switch: ON

Judgment Criteria

- When the communication error between PCM and the immobilizer-ECU continues for 2 seconds or more.

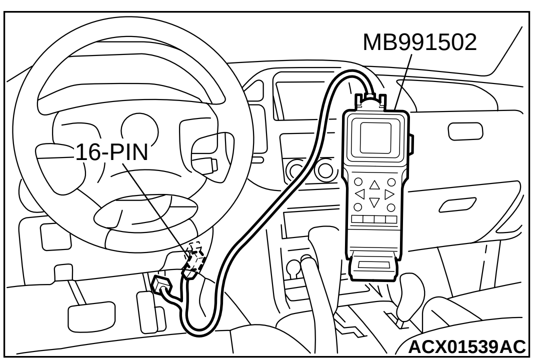
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of PCM.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the immobilizer diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Read the immobilizer system-DTC.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

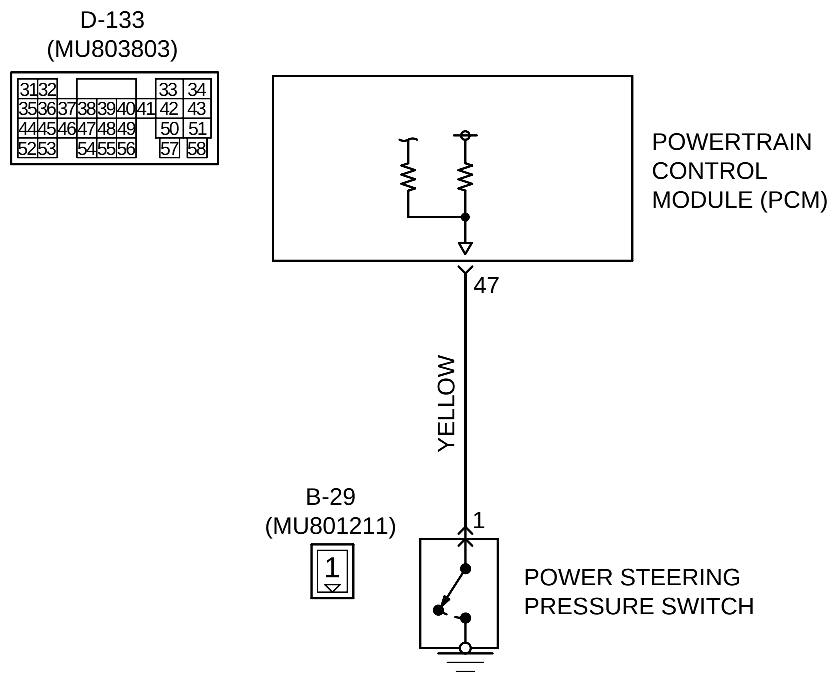
Q: Is the immobilizer system – DTC is output?

YES : Refer to GROUP 54A, Ignition Switch and Immobilizer System – Diagnostic Trouble Code Chart P.54A-8.

NO : If DTC P0513 is output again after the MFI – DTC has been erased, replace the PCM. Then check that the DTC P0513 does not reset.

DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance

Power Steering Pressure Switch Circuit



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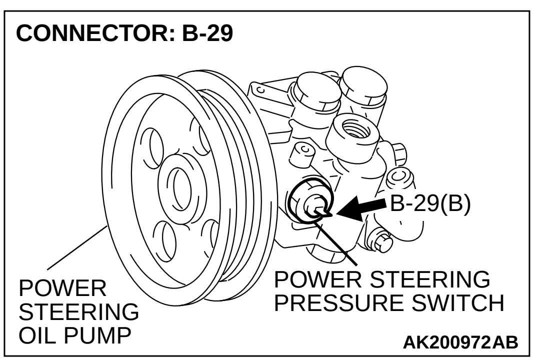
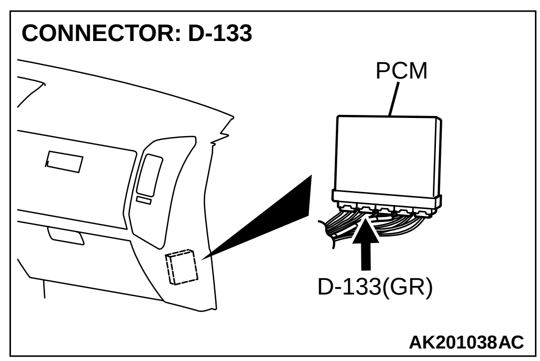




CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the PCM (terminal No. 47) via the resistor in the PCM.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The PCM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the PCM.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.

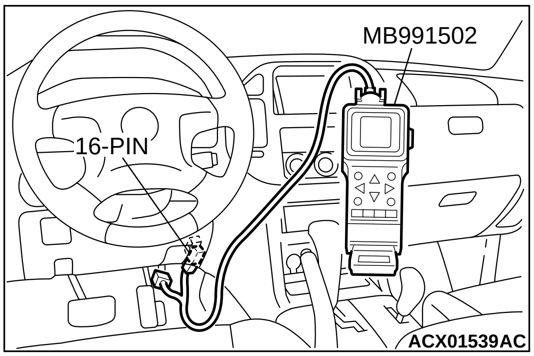
DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 30°C (86°F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (0.93 mph) or less]. Repeat 10 times or more.

Judgment Criteria

- Power steering pressure switch continues to be "ON".



TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

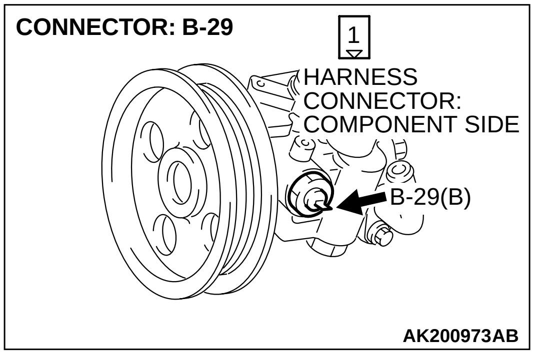
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

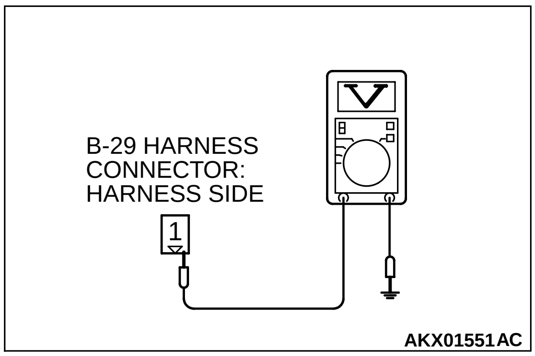
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Measure the power supply voltage at power steering pressure switch connector B-29 by backprobing.



(1) Do not disconnect the connector B-29.
(2) Start the engine and run at idle.



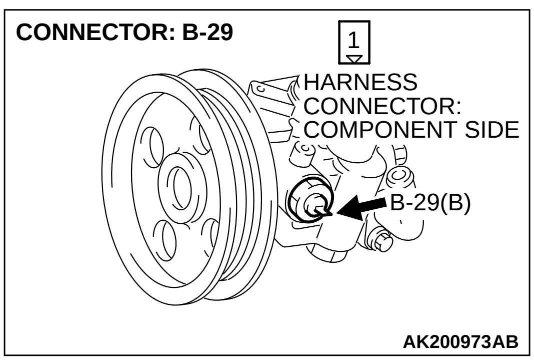
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When steering wheel is stationary, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

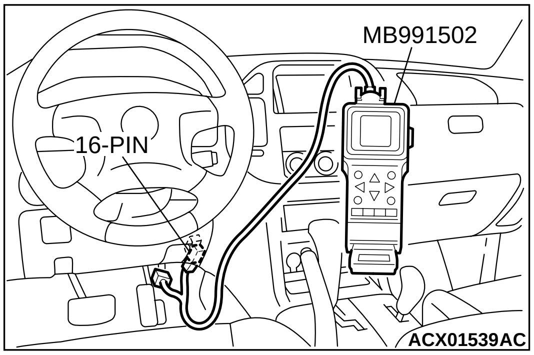
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-29 at power steering pressure switch 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. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

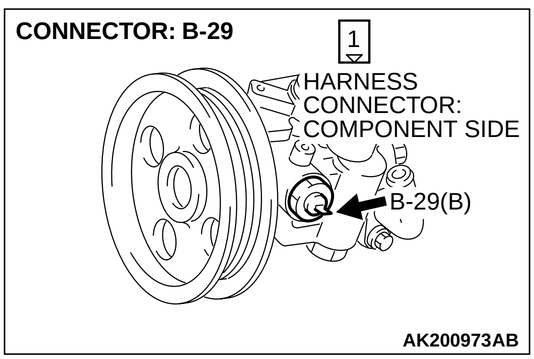
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : 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 PCM. Then go to Step 14.

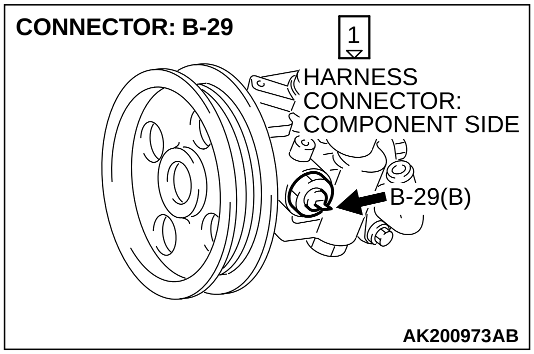


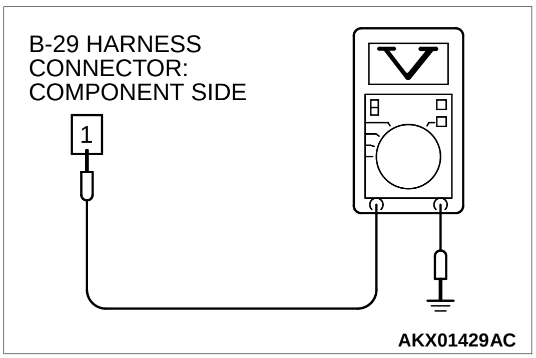
STEP 5. Check harness connector B-29 at power steering pressure switch for damage.

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 14.



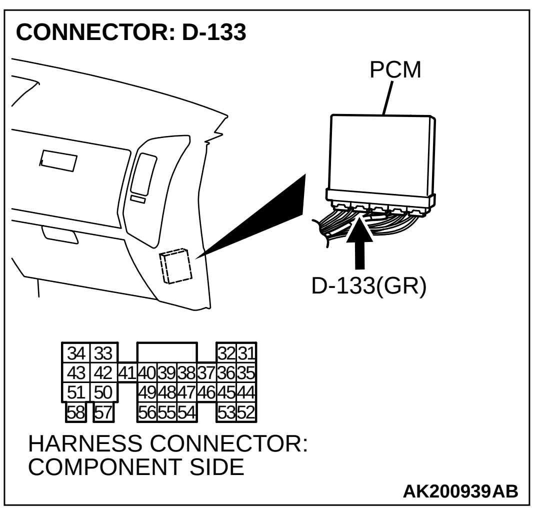


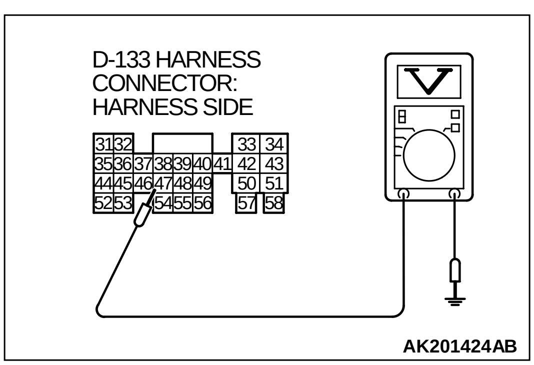
STEP 6. Measure the power supply voltage at power steering pressure switch harness side connector B-29.

(1) Disconnect the connector B-29 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 be 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 11.
NO : Go to Step 7.





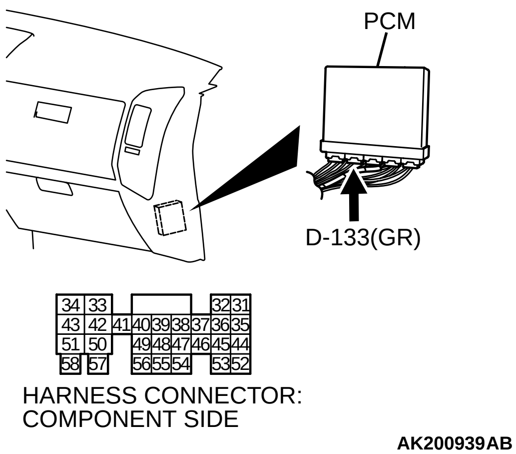
STEP 7. Measure the power supply voltage at PCM connector D-133 by backprobing.

(1) Do not disconnect the PCM connector D-133.
(2) Disconnect the power steering pressure switch connector B-29.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal No. 47 and ground by backprobing.
 - Voltage should be between battery positive voltage.
(5) 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 9.

CONNECTOR: D-133



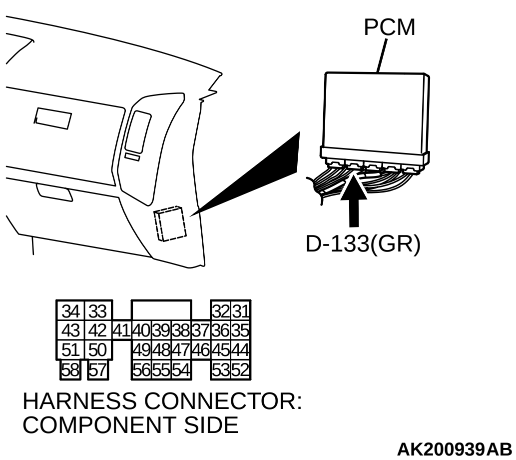
STEP 8. Check harness connector D-133 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between power steering pressure switch connector B-29 (terminal No. 1) and PCM connector D-133 (terminal No. 47) because of open circuit. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

CONNECTOR: D-133

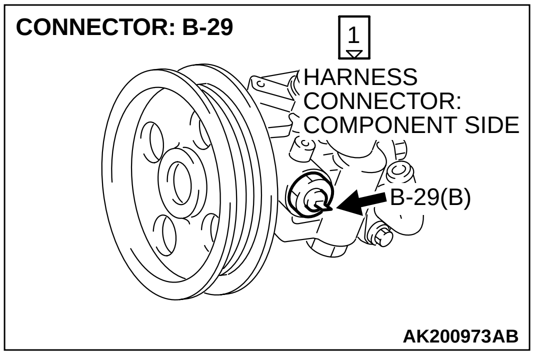


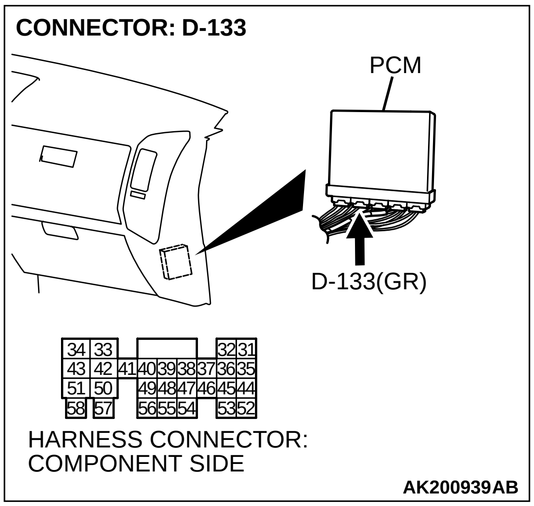
STEP 9. Check harness connector D-133 at PCM for damage.

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 14.

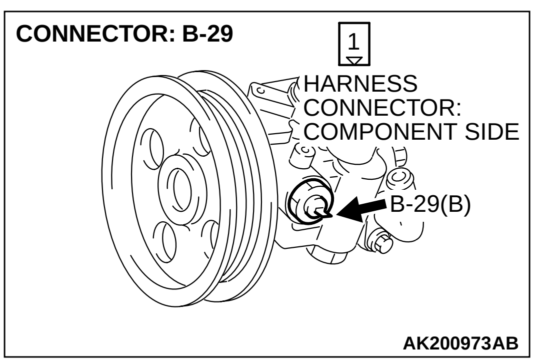




STEP 10. Check for short circuit to ground between power steering pressure switch connector B-29 (terminal No. 1) and PCM connector D-133 (terminal No. 47).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

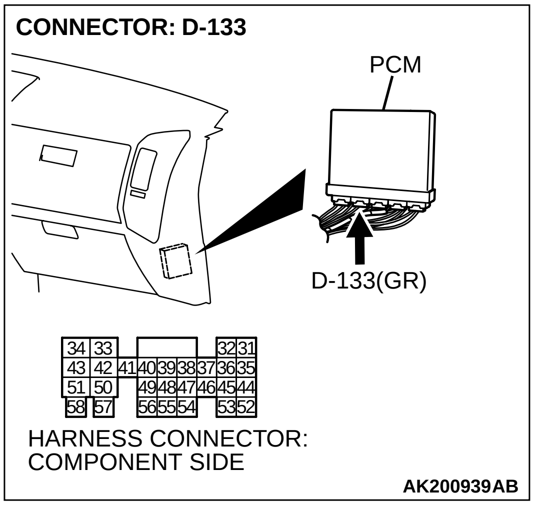


STEP 11. Replace the power steering pressure switch.

(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0551 set?

YES : Go to Step 12.
NO : Go to Step 14.

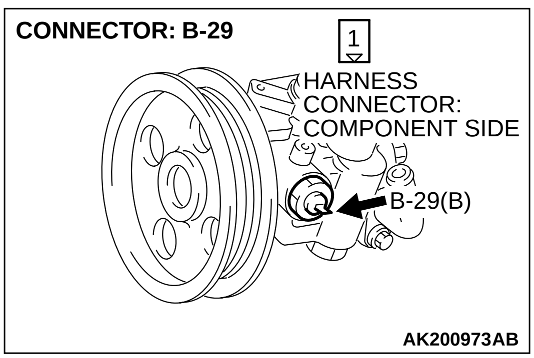


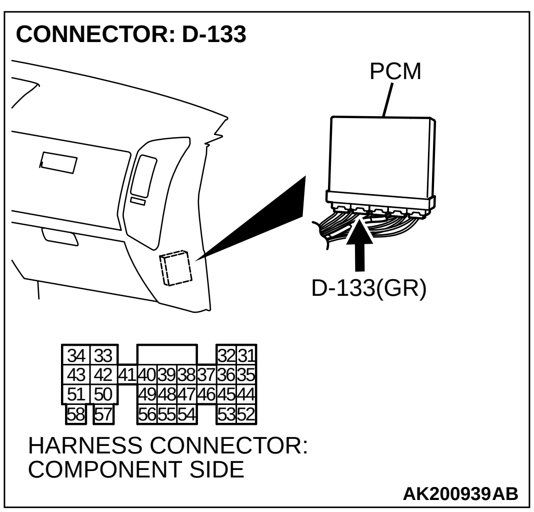
STEP 12. Check harness connector D-133 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



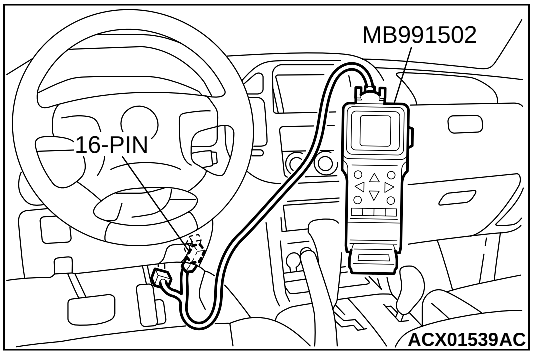


STEP 13. Check for harness damage between power steering pressure switch connector B-29 (terminal No. 1) and PCM connector D-133 (terminal No. 47).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



STEP 14. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

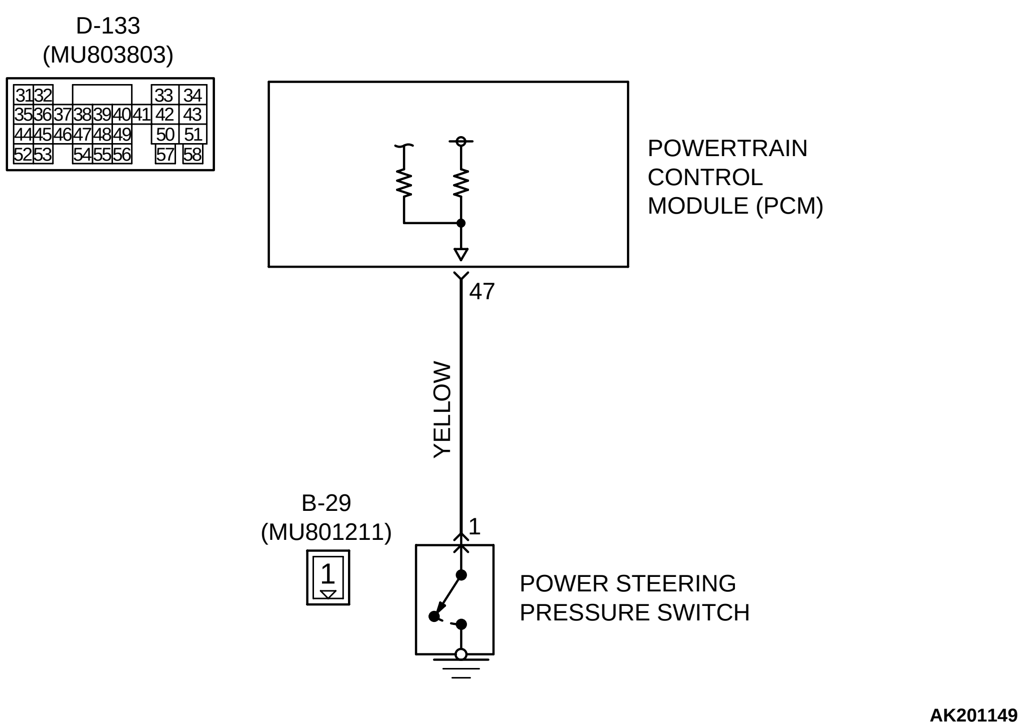
(4) Turn the ignition switch to the "LOCK" (OFF) position.

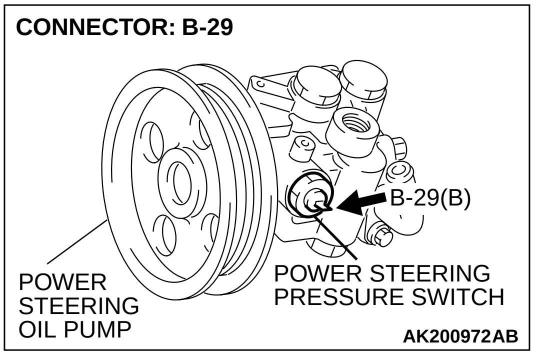
Q: Is the switch operating properly?

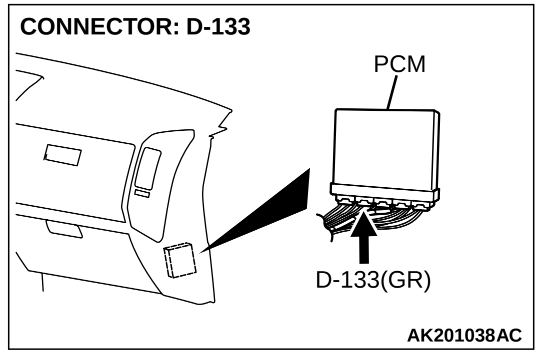
YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0554: Power Steering Pressure Sensor Circuit Intermittent

Power Steering Pressure Switch Circuit







CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the PCM (terminal No. 47) via the resistor in the PCM.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the PCM.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The PCM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 30°C (86°F).
- Vehicle speed is higher than 50 km/h (31 mph).

Judgment Criteria

- The ON/OFF frequency of a power steering pressure switch is 10 Hz or more for 20 seconds.

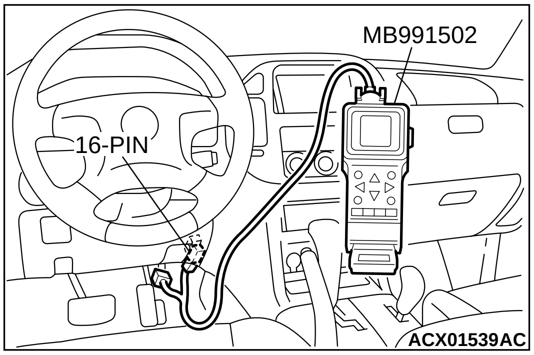
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Air entered to power steering system.
- Open or shorted power steering pressure switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

STEP 2. Check the power steering fluid level.

Refer to GROUP 37A, On-Vehicle Service - Fluid Level Check P.37A-18.

Q: Are there any abnormalities?

YES : Go to Step 3.

NO : Repair it. Then go to Step 7.

STEP 3. Check the power steering pressure switch.

Refer to GROUP 37A, On-Vehicle Service - Power Steering Pressure Switch CheckP.37A-21.

Q: Are there any abnormalities?

YES : Go to Step 4.

NO : Replace the power steering pressure switch. Then go to Step 7.

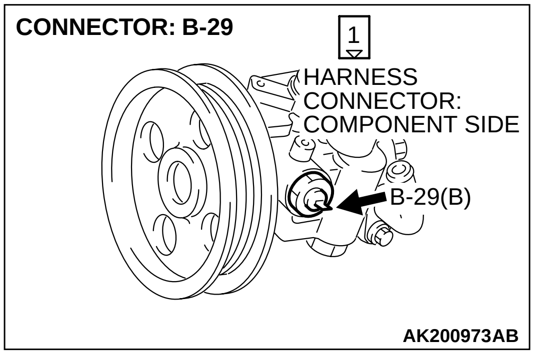
STEP 4. Check the oil pump pressure .

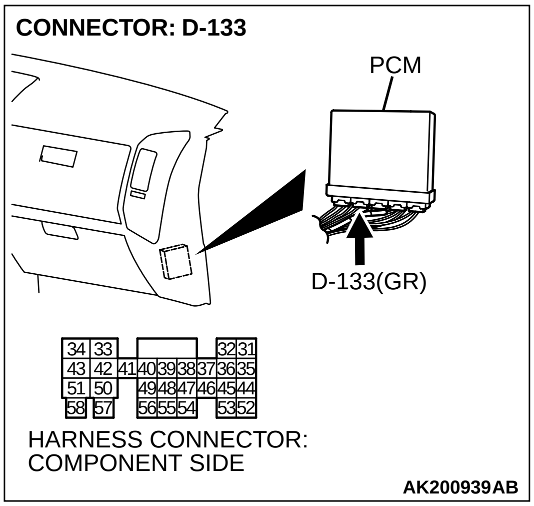
Refer to GROUP 37A, On-Vehicle Service - Oil Pump Pressure Test P.37A-3.

Q: Are there any abnormalities?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



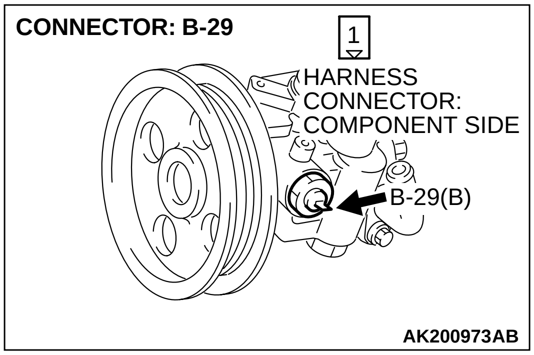


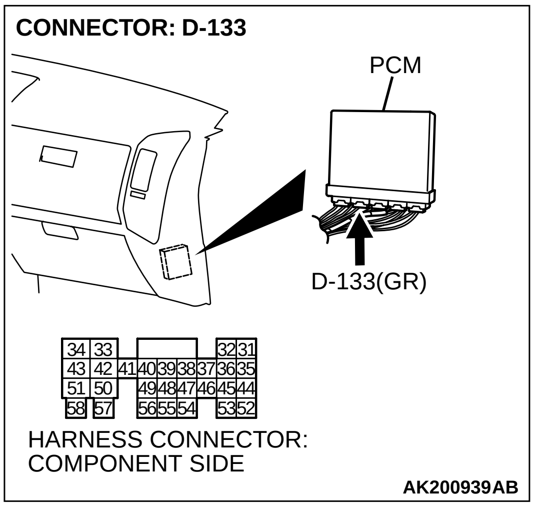
STEP 5. Check connector B-29 at the power steering pressure switch and connector D-133 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

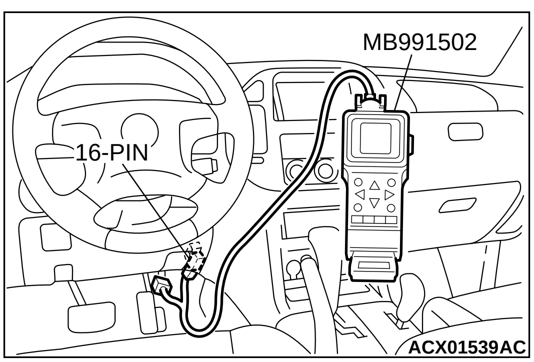




STEP 6. Check for harness damage between power steering pressure switch connector B-29 (terminal No. 1) and PCM connector D-133 (terminal No. 47).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 7.
NO : Repair it. Then go to Step 7.



STEP 7. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : The procedure is complete.
NO : Repeat the troubleshooting.

P0606 Powertrain Control Module Main Processor Malfunction

TECHNICAL DESCRIPTION

- Throttle actuator control module processor checks the PCM for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.

Judgement Criteria

- No surveillance pulse signals should be input for 0.5 seconds.

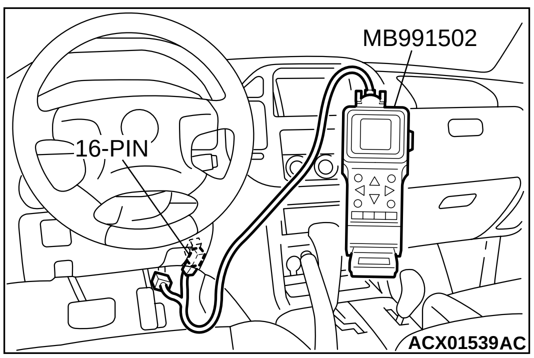
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0606 set?

YES : Replace the PCM.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

P0638 Throttle Actuator Control Motor Circuit Range/Performance Problem

Throttle Actuator Control Motor Circuit Range/Performance Problem Circuit

- Refer to, DTC P2101 – Throttle Actuator Control Motor Circuit P.13Ac-318.

CIRCUIT OPERATION

- Refer to, DTC P2101 – Throttle Actuator Control Motor Circuit P.13Ac-318.

TECHNICAL DESCRIPTION

- PCM checks the electronic controlled throttle system for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- TPS (main) output voltage is higher than 0.35 volts and lower than 4.8 volts.
- Difference between TPS (main) output voltages is 0.4volt/100ms or higher.

Judgement Criteria

- Difference between TPS (main) output voltage and target output voltage should be 0.5 volts or higher for 0.5 seconds.

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- TPS1 output voltage is higher than 0.35 volts and lower than 4.8 volts.

Judgement Criteria

- Difference between TPS (main) output voltage and target output voltage is 1 volt or higher for 4 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

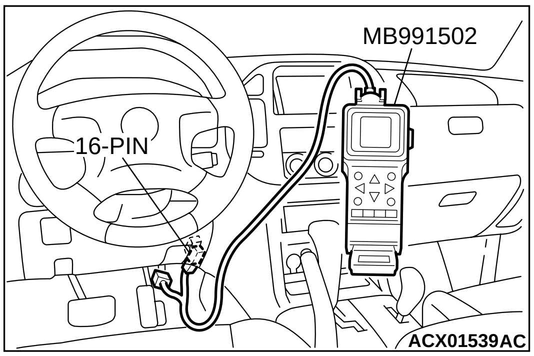
- Throttle valve return spring failed.
- Throttle valve operation failed.
- Throttle actuator control motor failed or maladjusted.
- Open or shorted throttle actuator control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 9A: Throttle Position Sensor (main) Mid Opening Learning Value.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

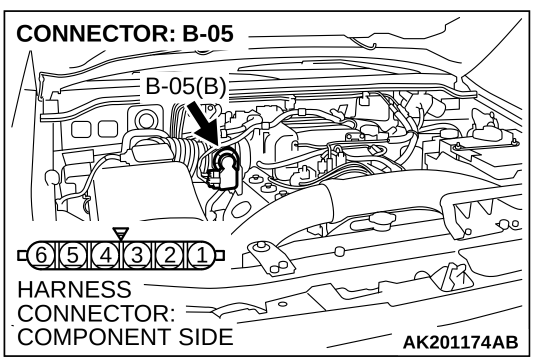
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 9A, Throttle position sensor (main) mid opening learning value.
- Check that it is 4 volts or less.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

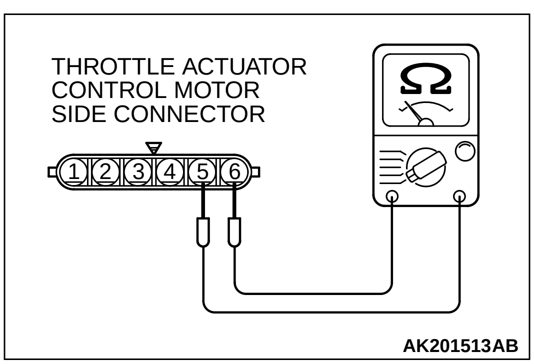
Q: Is voltage 4 volts or less?

YES : Go to Step 2..
NO : Replace the throttle body ASSY. Then go to Step 8.

STEP 2. Check the throttle actuator control motor.



(1) Disconnect the connector B-05.

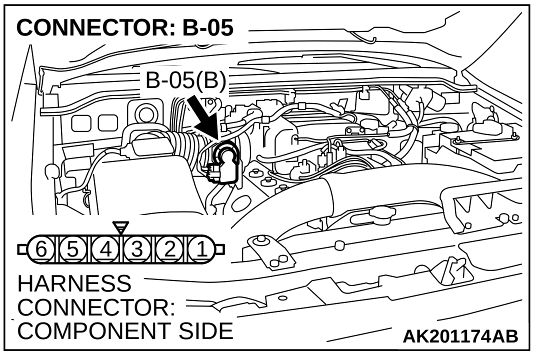


(2) Measure the resistance between throttle actuator control motor side connector terminal No. 5 and No. 6.

Standard value: 0.3 – 100 ohms

Q: Is the measured resistance between 0.3 and 100 ohms?

YES : Go to Step 3.
NO : Replace the throttle body ASSY. Then go to Step 8.

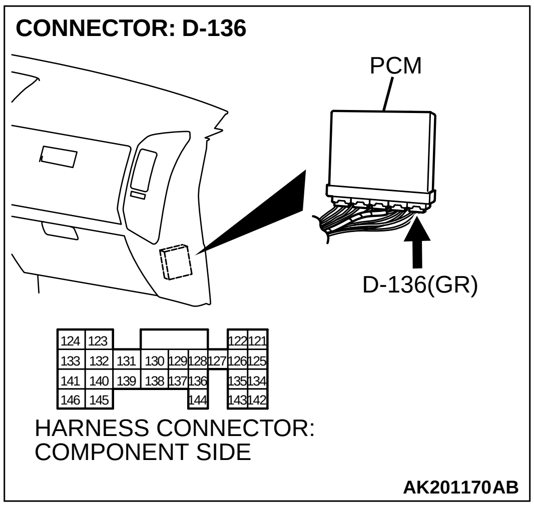


STEP 3. Check connector B-05 at throttle actuator control motor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8..

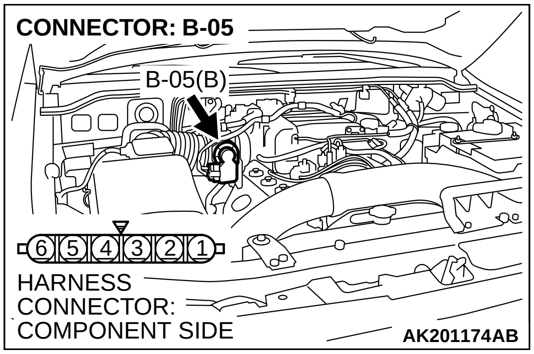


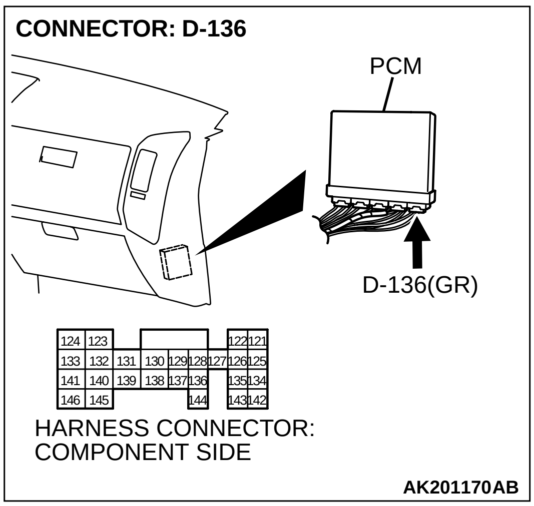
STEP 4. Check connector D-136 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection . Then go to Step 8.





STEP 5. Check for harness damage between throttle actuator control motor connector B-05 (terminal No. 6) and PCM connector D-136 (terminal No. 133).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

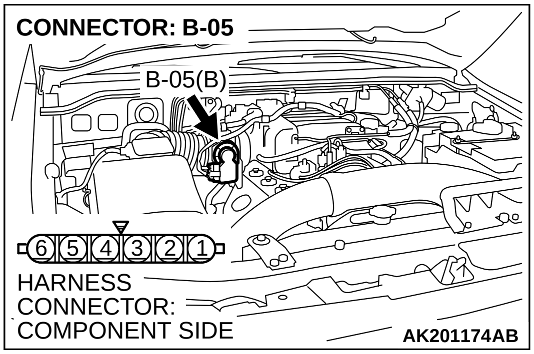
NO : Repair it. Then go to Step 8.

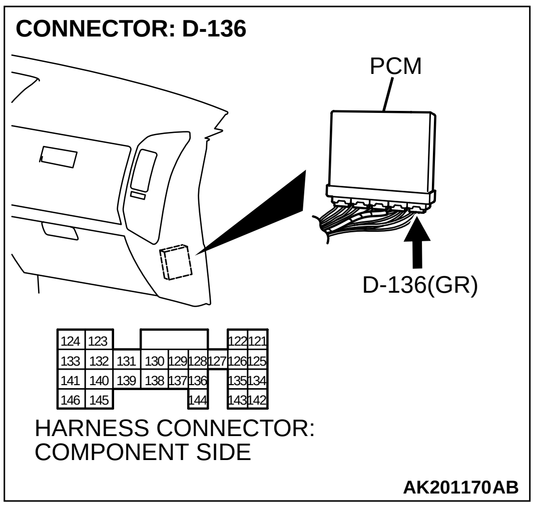
STEP 6. Check for harness damage between throttle actuator control motor connector B-05 (terminal No. 5) and PCM connector D-136 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.





STEP 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

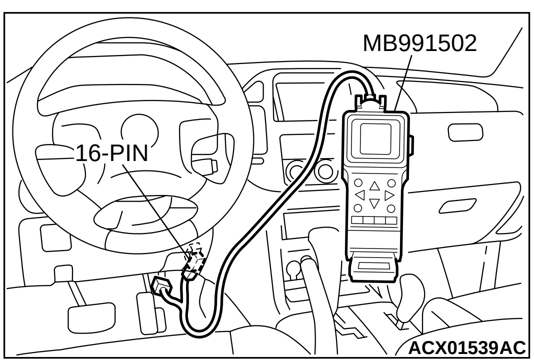
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

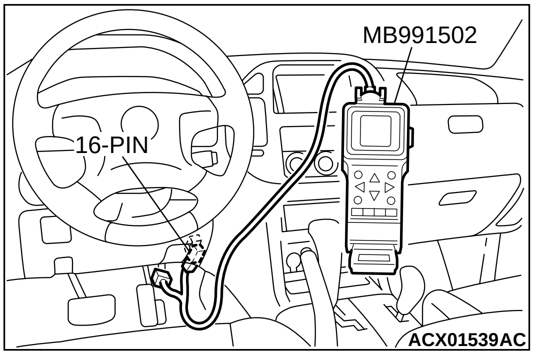
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0638 set?

YES : Replace the PCM. Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points.





STEP 8. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0638 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

P0642 Throttle Position Sensor Power Supply

TECHNICAL DESCRIPTION

- PCM checks the TPS power voltage for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 6.3 volts.

Judgement Criteria

- TPS power voltage should be 4.1 volts or less for 0.5 seconds.

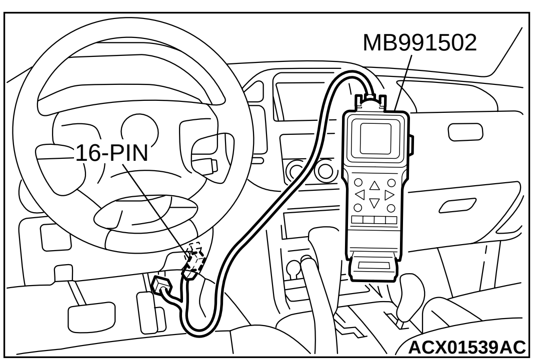
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

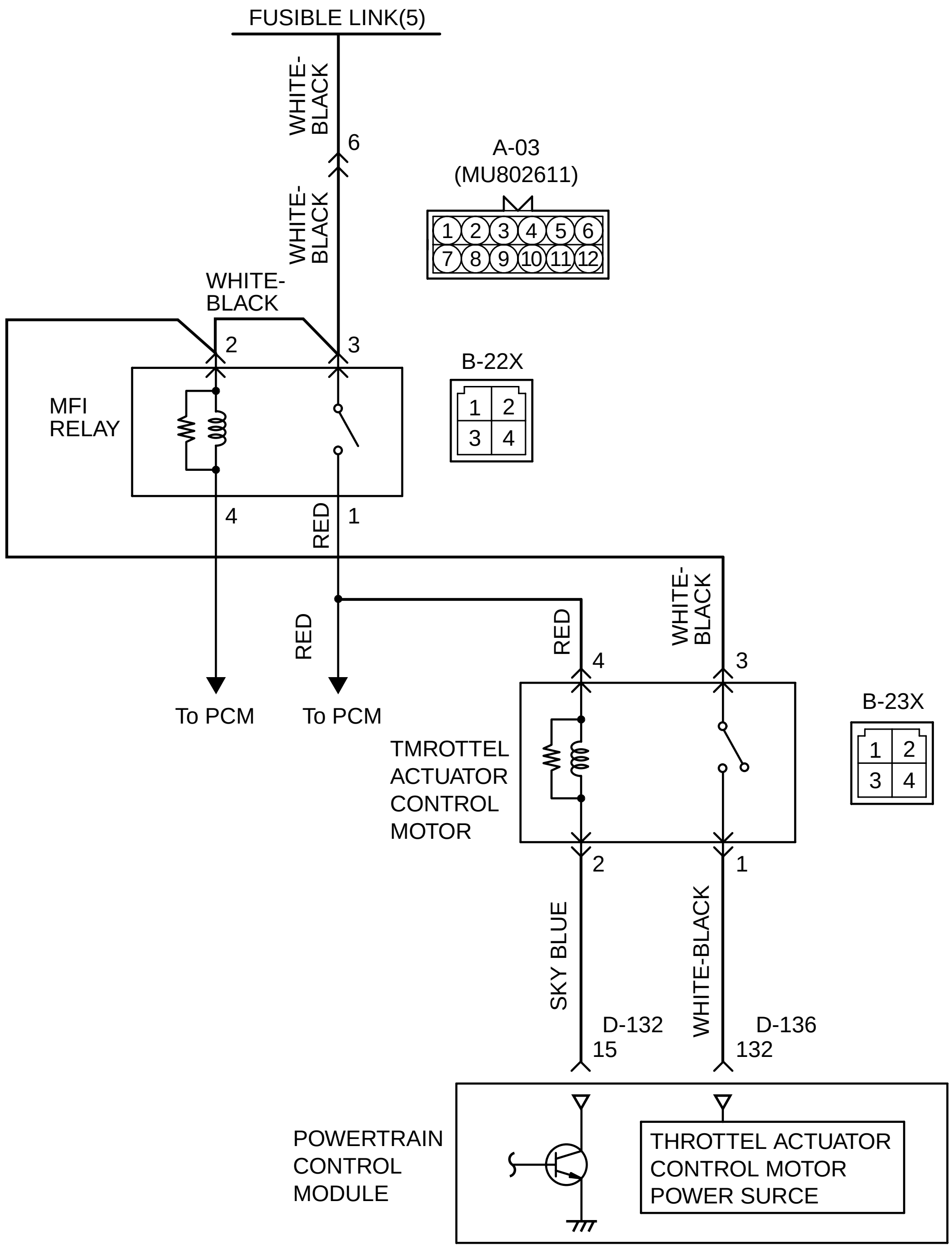
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0642 set?

YES : Replace the PCM.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

P0657 Throttle Actuator Control Motor Relay Circuit Malfunction



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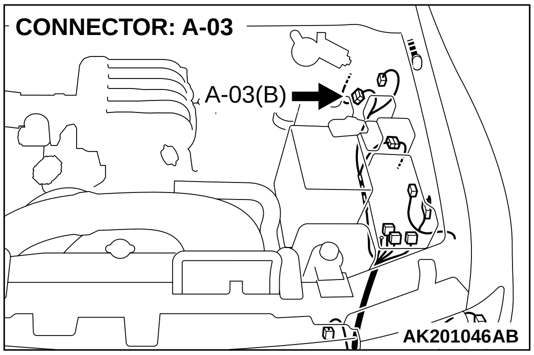
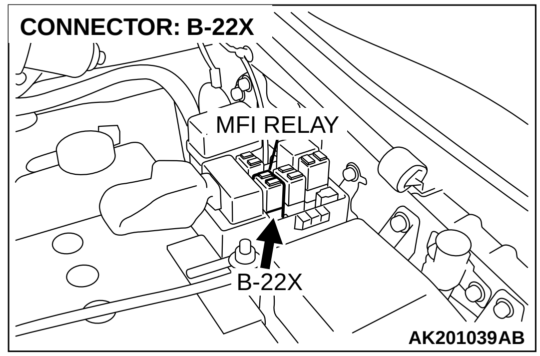
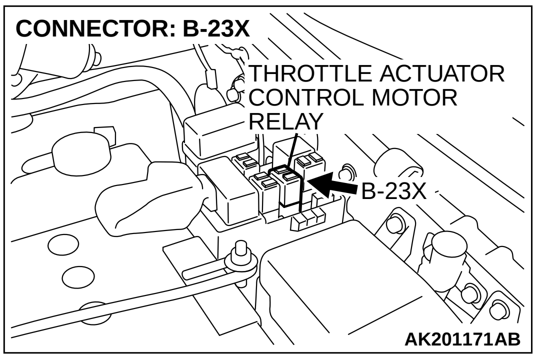
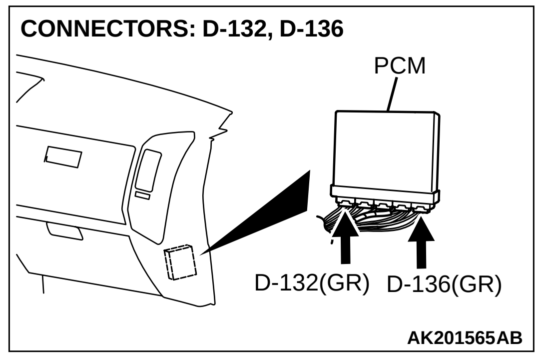








CIRCUIT OPERATION

- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 3).
- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 4) from the MFI relay (terminal No. 1).
- PCM (terminal No. 15) applies current to the throttle actuator control motor relay coil by turning ON the power transistor in the unit in order to turn the relay ON.
- When the throttle actuator control motor relay turns ON, battery positive voltage is supplied by the throttle actuator control motor relay (terminal No. 1) to the PCM (terminal No. 132).

TECHNICAL DESCRIPTION

- When the ignition switch ON signal is input into the PCM, the PCM turns ON the throttle actuator control motor relay.

DTC SET CONDITIONS

Check Condition

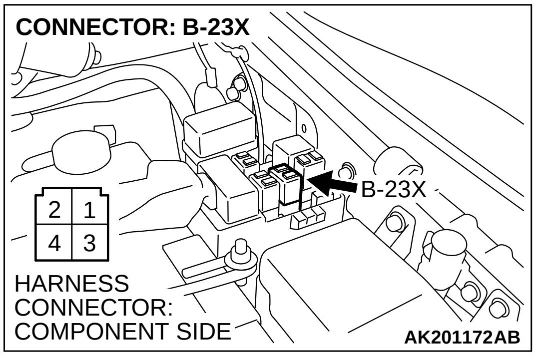
- Ignition switch "ON" position.

Judgement Criteria

- The power line voltage of the electronic controlled throttle system should be 4.9 volts or less for 0.8 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor relay failed or maladjusted.
- Open or shorted throttle actuator control motor relay circuit, or loose connector.
- PCM failed.



DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

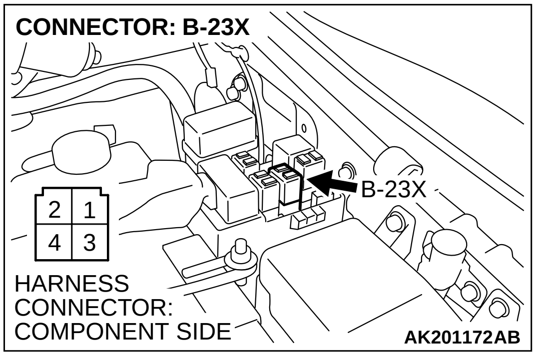
STEP 1. Check connector B-23X at throttle actuator control motor relay for damage.

Q: Is the connector in good condition?

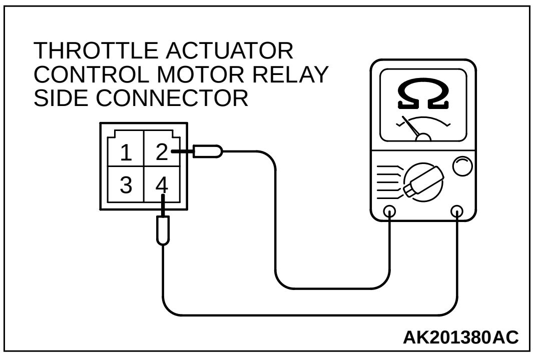
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

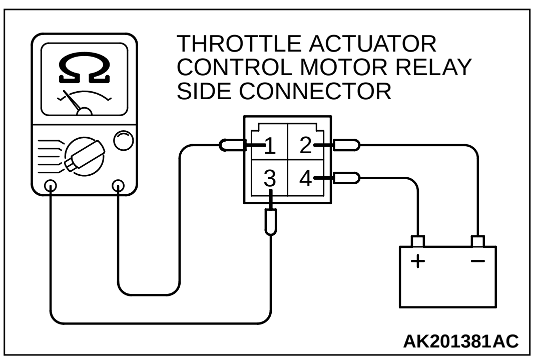
STEP 2. Check the throttle actuator control motor relay.



(1) Remove the throttle actuator control motor relay.



(2) Check for continuity between the throttle actuator control motor relay terminal No. 2 and No. 4.
- There should be continuity (approximately 70 ohms).



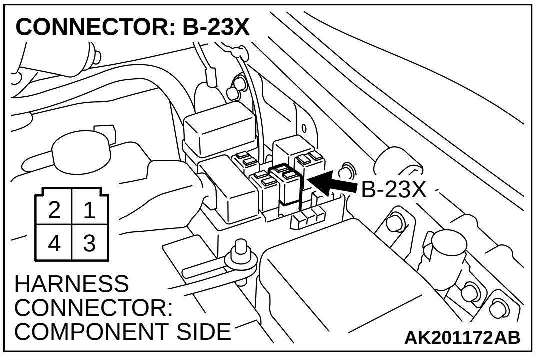
(3) Use jumper wires to connect throttle actuator control motor relay terminal No. 4 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check the continuity between the throttle actuator control motor relay terminal No. 1 and No. 3 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal connected.)
- Should be open loop. (Negative battery terminal disconnected.)

(5) Install the throttle actuator control motor relay.

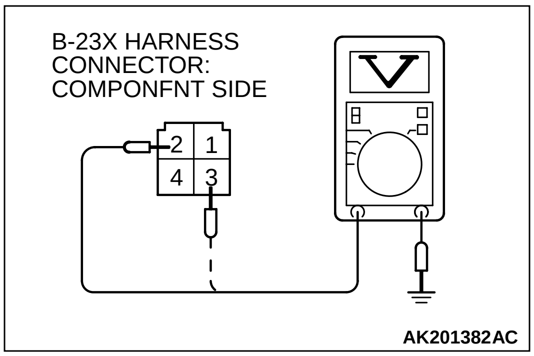
Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the throttle actuator control motor relay. Then go to Step 14.

STEP 3. Measure the power supply voltage at throttle actuator control motor relay harness side connector B-23X



(1) Disconnect the connector B-23X and measure at the harness side.



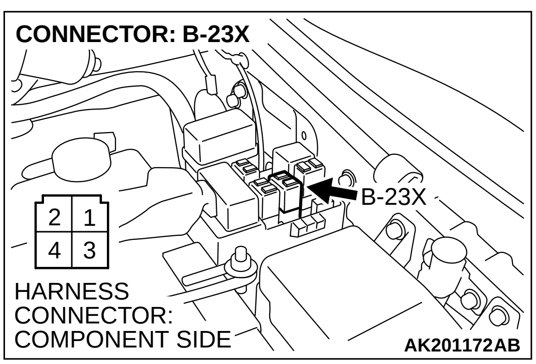
(2) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

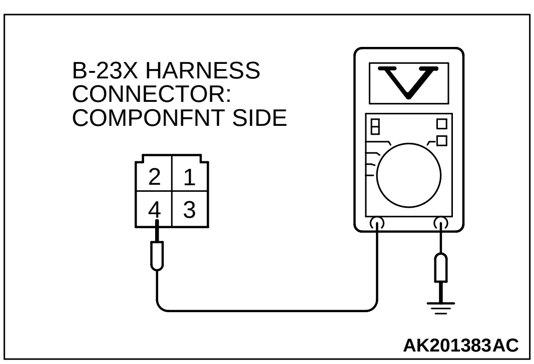
YES : Go to Step 4.

NO : Check harness connector A-03 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector A-03 is in good condition, repair it because of open circuit or short circuit to ground between fusible link (5) and throttle actuator control motor relay connector B-23X (terminal No. 3). Then go to Step 14.

STEP 4. Measure the power supply voltage at throttle actuator control motor relay harness side connector B-23X.



(1) Disconnect the connector B-23X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



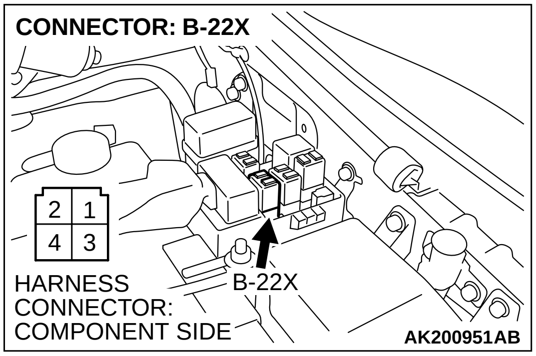
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

(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.

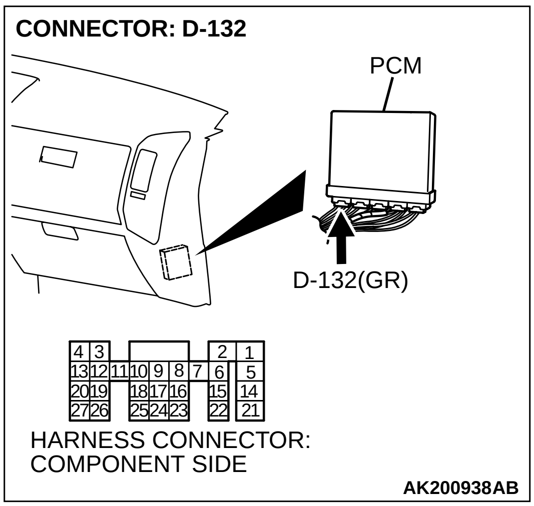


STEP 5. Check connector B-22X at MFI relay for damage.

Q: Is the connector in good condition?

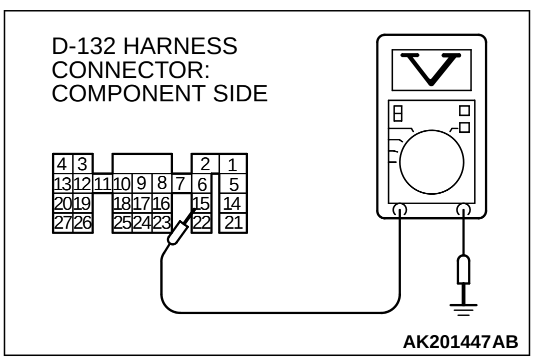
YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and throttle actuator control motor relay connector B-23X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Measure the power supply voltage at PCM harness side connector D-132.

(1) Disconnect the connector D-132 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 15 and ground.
- Voltage should be battery positive voltage.

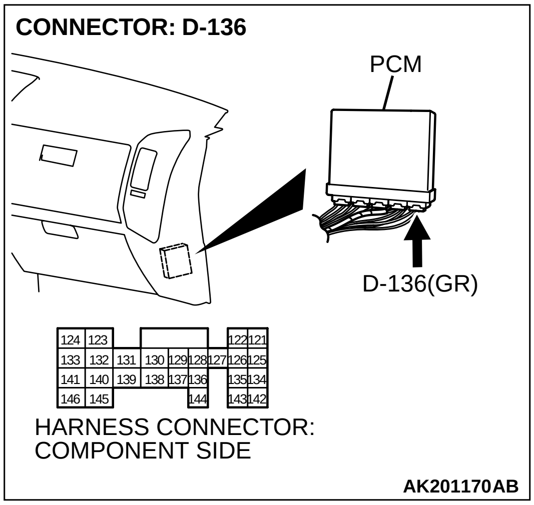
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

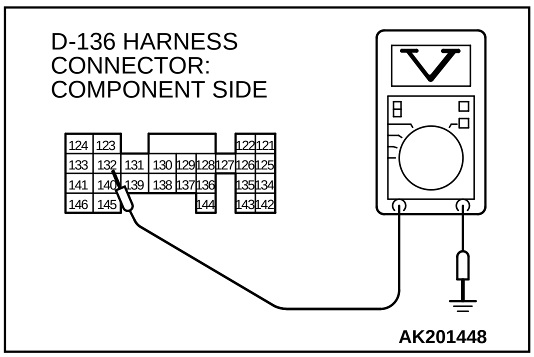
YES : Go to Step 7.

NO : Repair harness wire between throttle actuator control motor relay connector B-23X (terminal No. 2) and PCM connector D-132 (terminal No. 15) because of open circuit or short circuit to ground. Then go to Step 14.

STEP 7. Measure the power supply voltage at PCM harness side connector D-136.



(1) Disconnect the connector D-136 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

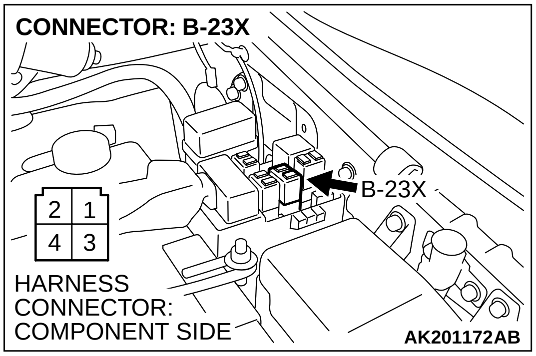


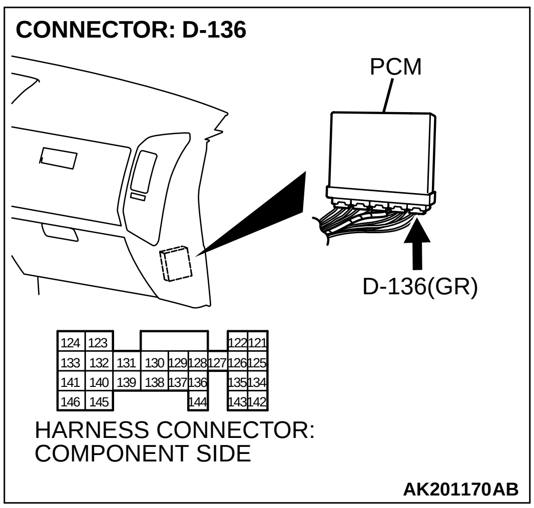
(3) Measure the voltage between terminal No. 132 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 8.



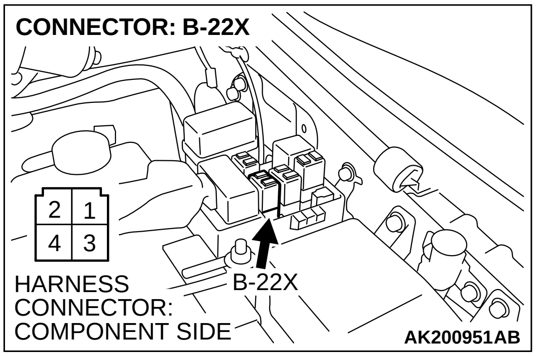


STEP 8. Check for open circuit and short circuit to ground between throttle actuator control motor relay connector B-23X (terminal No. 1) and PCM connector D-136 (terminal No. 132).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 14.

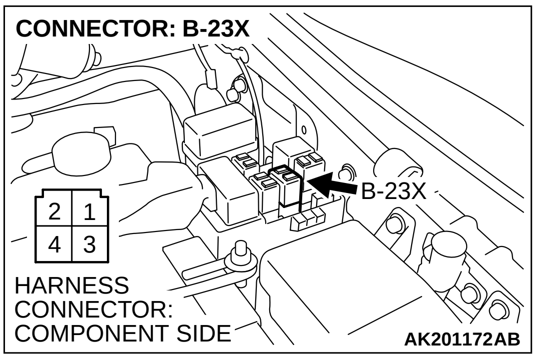


STEP 9. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and throttle actuator control motor relay connector B-23X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Repair harness wire between throttle actuator control motor relay connector B-23X (terminal No. 2) and PCM connector D-132 (terminal No. 15) because of harness damage. Then go to Step 14.

NO : Repair it. Then go to Step 14.

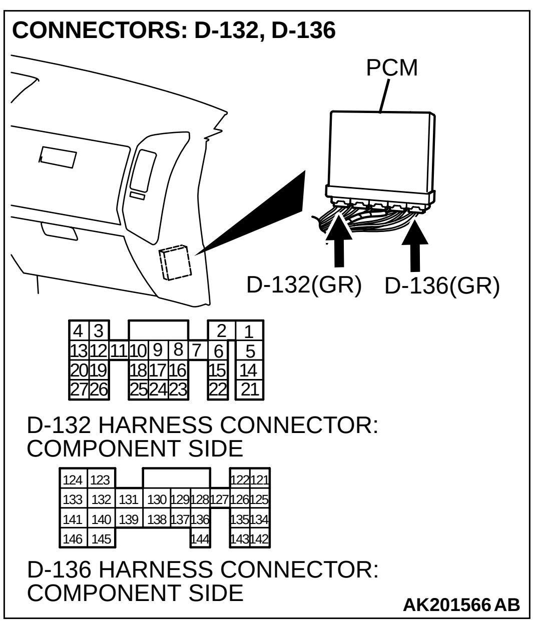


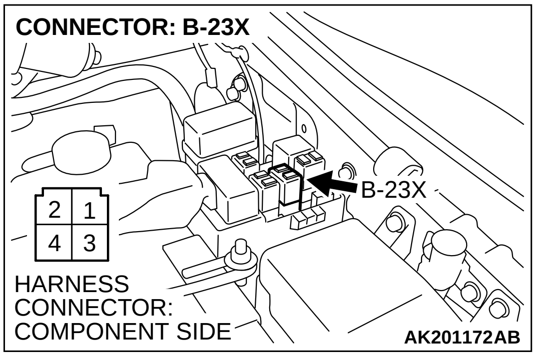
STEP 10. Check connector D-132 and D-136 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

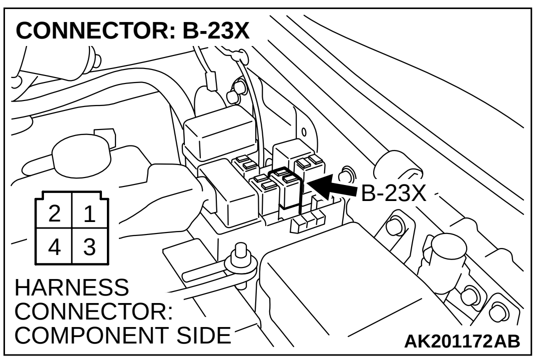


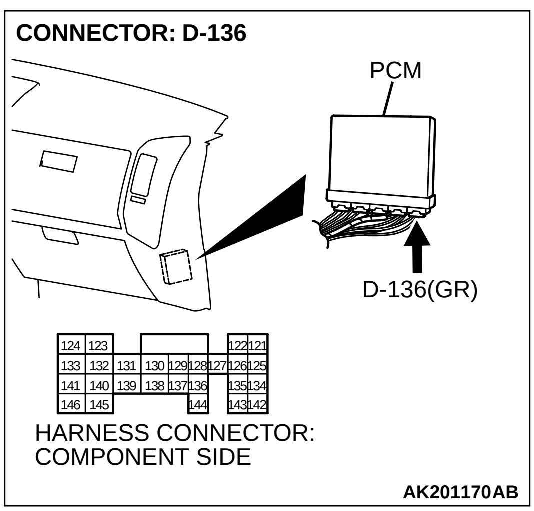


STEP 11. Check for harness damage between fusible link (5) and throttle actuator control motor relay connector B-23X (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

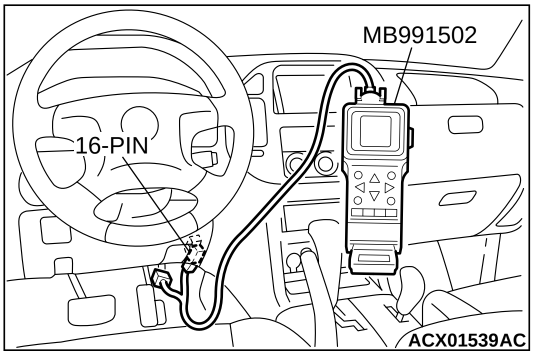




STEP 12. Check for harness damage between throttle actuator control motor relay connector B-23X (terminal No. 1) and PCM connector D-136 (terminal No. 132).

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.



STEP 13. Using scan tool MB991502, read the diagnostic trouble code (DTC).

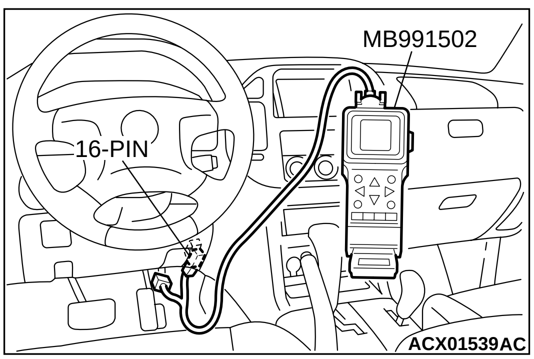
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0657 set?

YES : Replace the PCM. Then go to Step 14.
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 14. Using scan tool MB991502, read the diagnostic trouble code (DTC).

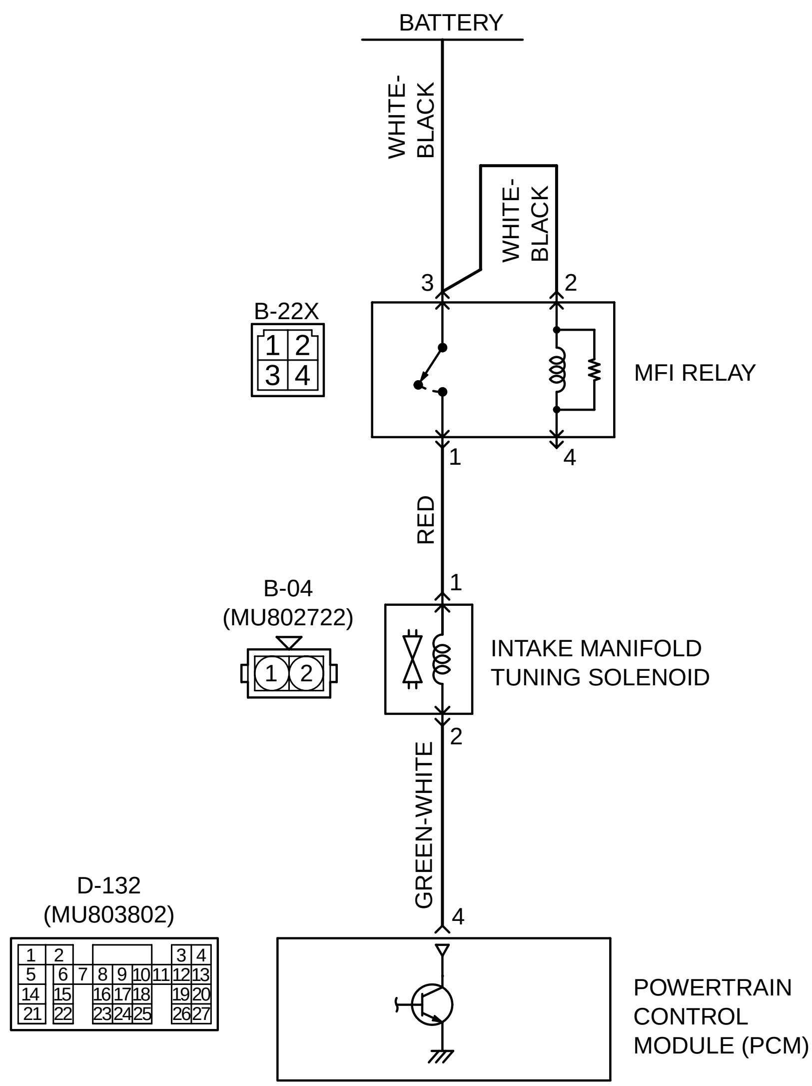
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0657 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0660: Intake Manifold Tuning Solenoid Circuit Malfunction

Intake Manifold Tuning Solenoid Circuit



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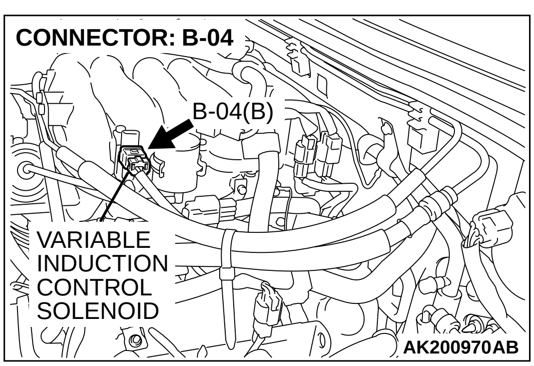
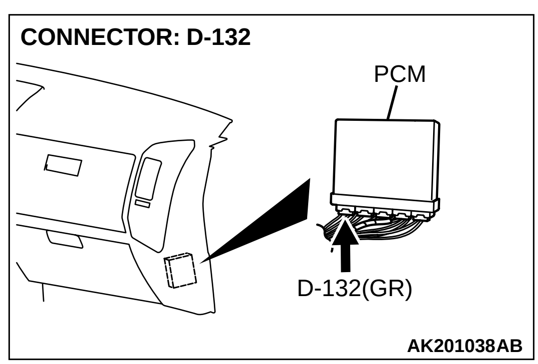
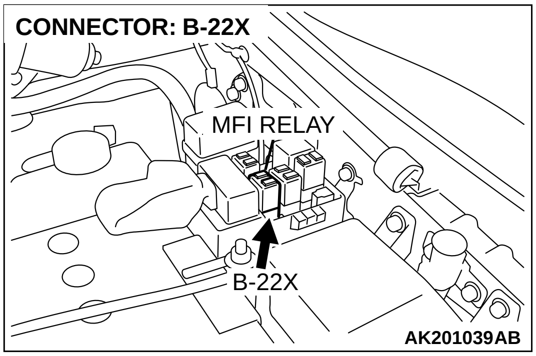






CIRCUIT OPERATION

- Power to the intake manifold tuning solenoid power is supplied from the MFI relay (terminal No. 1).
- The PCM controls ground intake manifold tuning solenoid by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the intake manifold tuning solenoid drive circuit, PCM measures the surge voltage of the intake manifold tuning solenoid coil.
- The PCM drives the intake manifold tuning solenoid. After the solenoid is turned off, the PCM will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The intake manifold tuning solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The PCM monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- Intake manifold tuning solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The intake manifold tuning solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the intake manifold tuning solenoid is turned OFF.

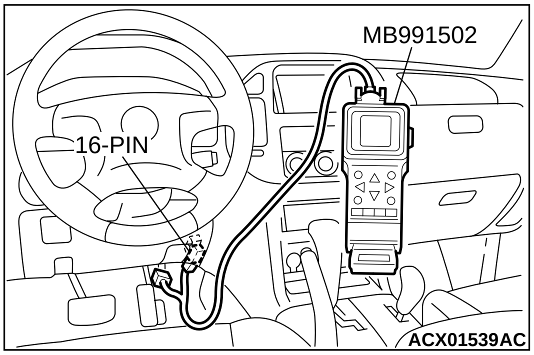
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake manifold tuning solenoid failed.
- Open or shorted intake manifold tuning solenoid circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 11: Variable Induction control Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

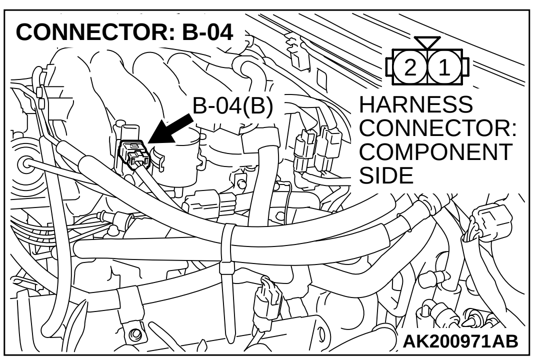
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 11, Intake manifold tuning solenoid.
  - An operation sound should be heard and vibration should be felt when the intake manifold tuning 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-04 at the intake manifold tuning solenoid for damage.

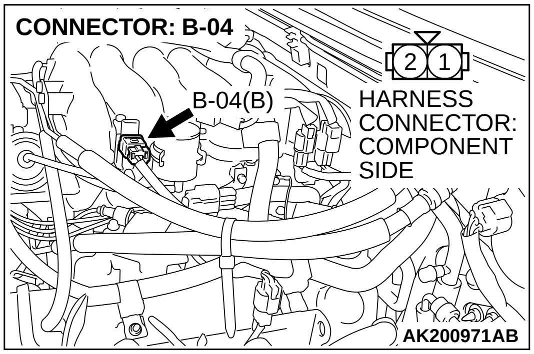
Q: Is the connector in good condition?

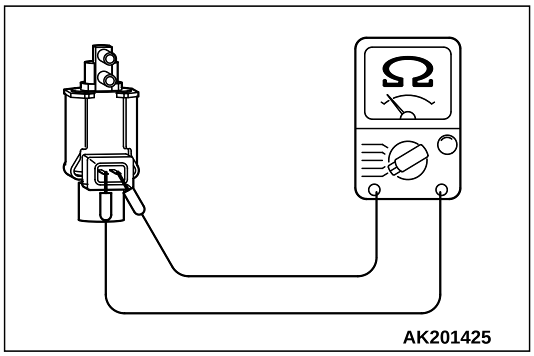
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the intake manifold tuning solenoid.

(1) Disconnect the intake manifold tuning solenoid connector B-04.





(2) Measure the resistance between intake manifold tuning 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)]?

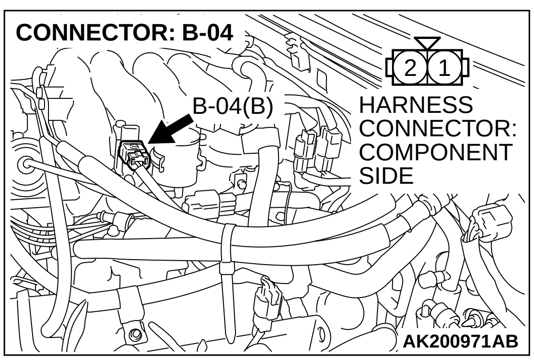
YES : Go to Step 4.

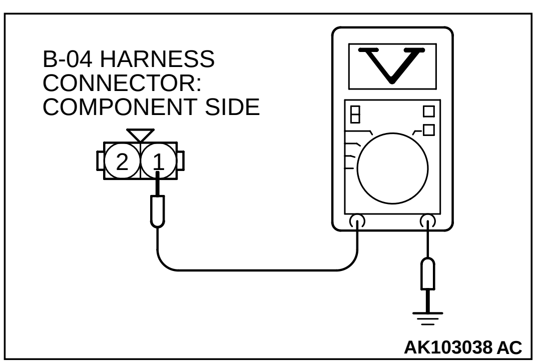
NO : Replace the intake manifold tuning solenoid. Then go to Step 12.

STEP 4. Measure the power supply voltage at intake manifold tuning solenoid harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.





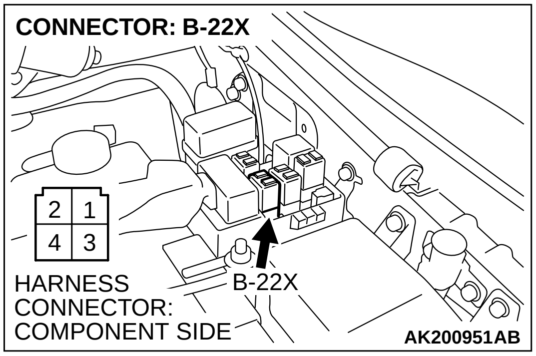
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(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.

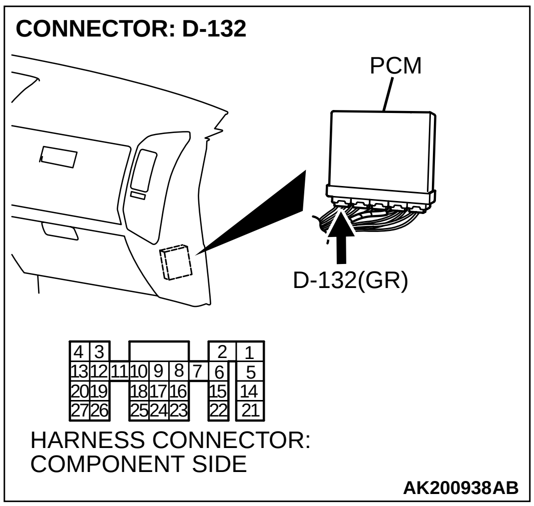


STEP 5. Check connector B-22X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X terminal No. 1 and intake manifold tuning solenoid connector B-04 terminal No. 1 because of open circuit or short circuit to ground. Then go to Step 12.

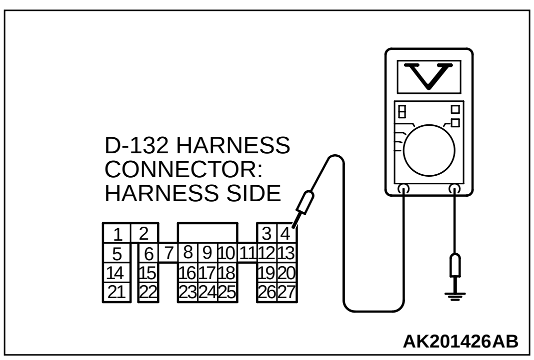
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 6. Measure the power supply voltage at PCM connector D-132 by backprobing.

(1) Do not disconnect the connector D-132.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 4 and ground by backprobing.
- Voltage should be 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.

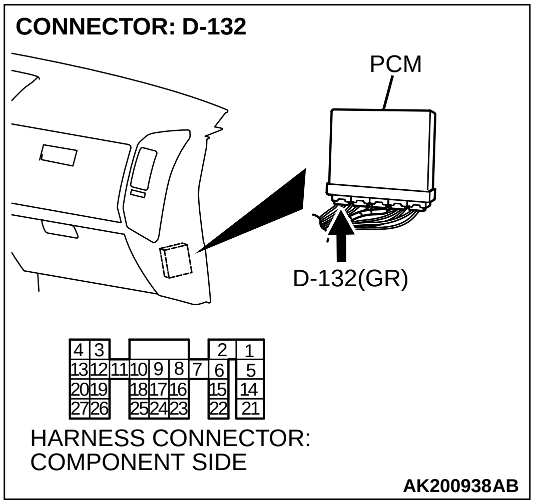
NO : Go to Step 7.

STEP 7. Check connector D-132 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

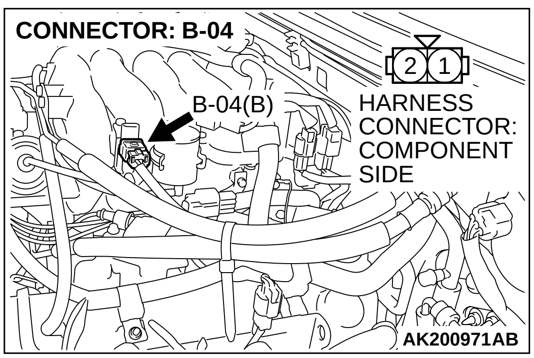


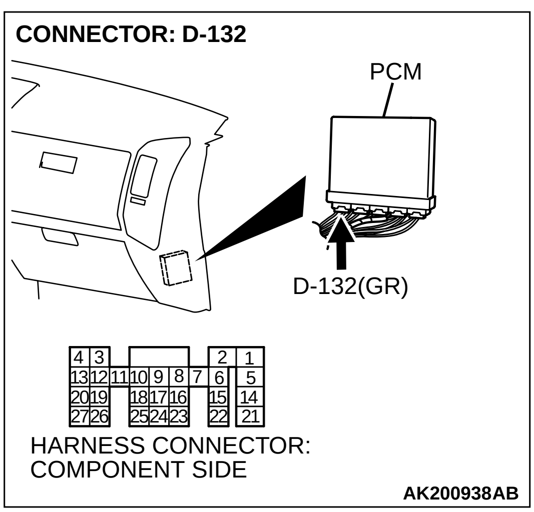
STEP 8. Check for open circuit and short circuit to ground between intake manifold tuning solenoid connector B-04 (terminal No. 2) and PCM connector D-132 (terminal No. 04).

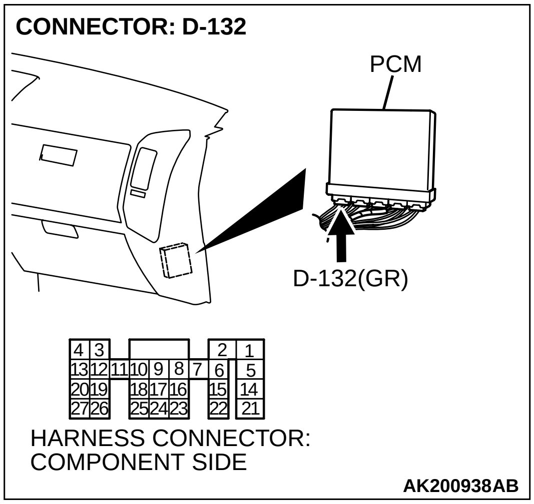
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.





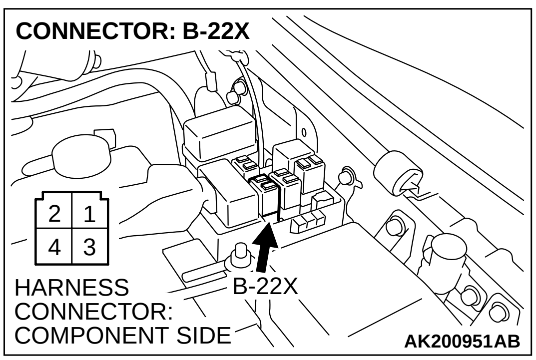


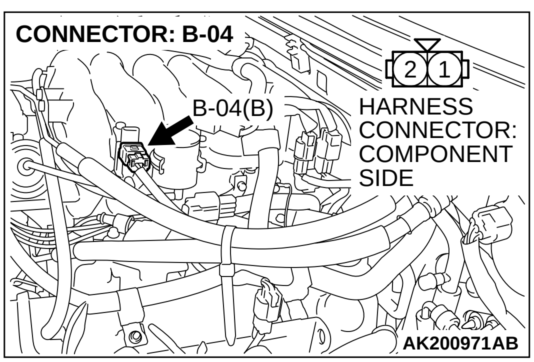
STEP 9. Check connector D-132 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





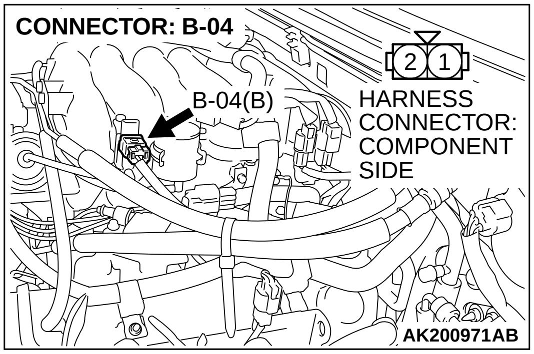
STEP 10. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and intake manifold tuning solenoid connector B-04 (terminal No. 1).

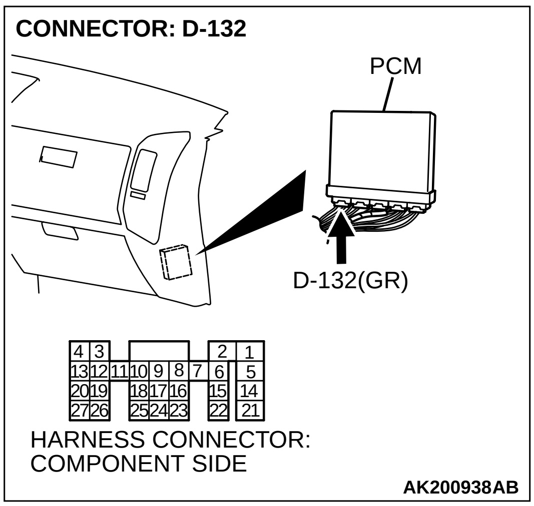
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check for harness damage between intake manifold tuning solenoid connector B-04 (terminal No. 2) and PCM connector D-132 (terminal No. 4).



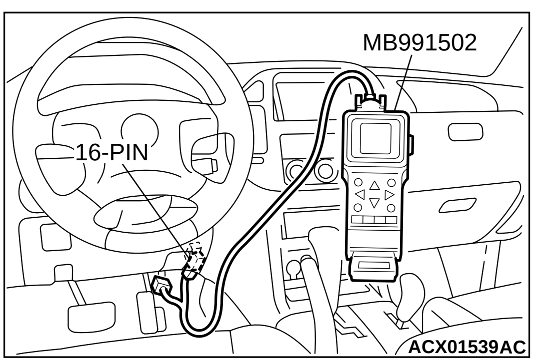


Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Using scan tool MB991502, check actuator test item 11: Variable Induction control Solenoid.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 11, Intake manifold tuning solenoid.
- An operation sound should be heard and vibration should be felt when the intake manifold tuning solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

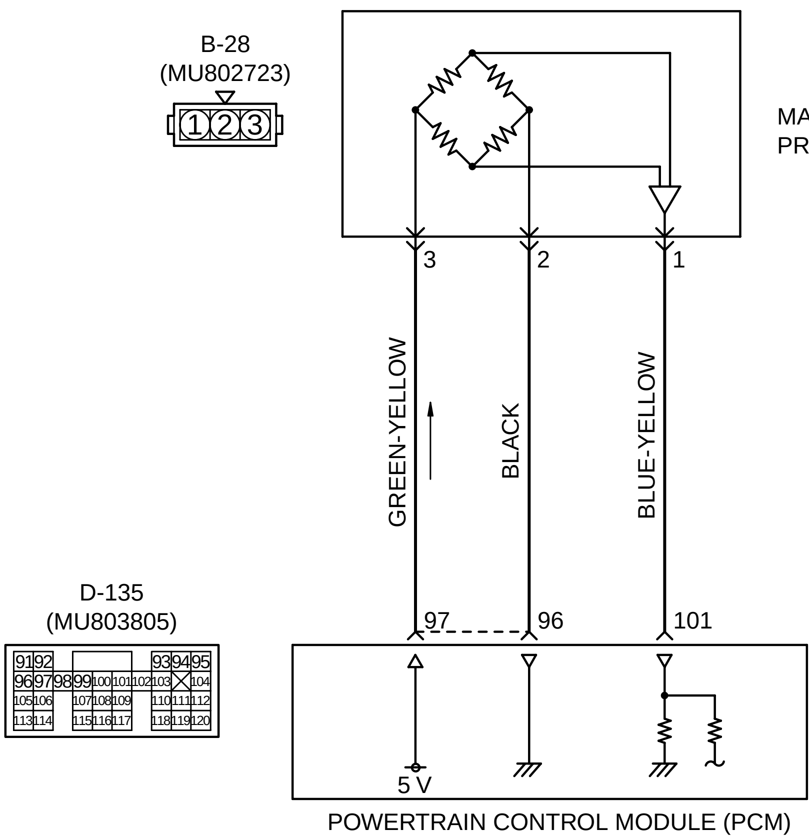
Q: Is the solenoid operating properly?

YES : The inspection is complete.

NO : Retry the troubleshooting.

DTC P1400: Manifold Defferential Pressure Sensor Circuit Malfunction

Manifold Differential Pressure Sensor Circuit



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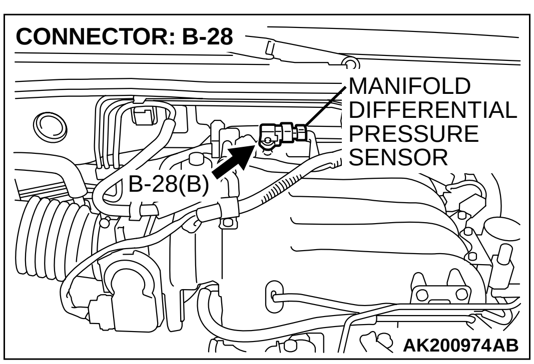
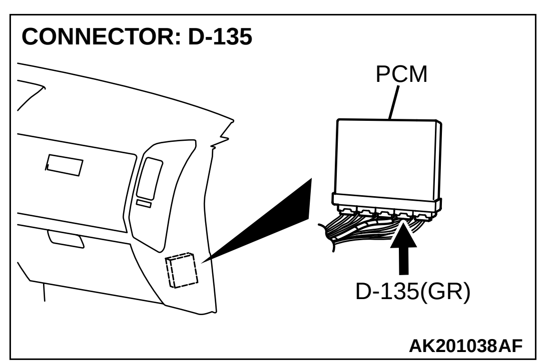




CIRCUIT OPERATION

- A 5-volt voltage is applied on the manifold differential pressure sensor power terminal (terminal No. 3) from the PCM (terminal No. 106). The ground terminal (terminal No. 2) is grounded with the PCM (terminal No. 105).
- A voltage proportional to the pressure in the intake manifold plenum is sent from the manifold differential pressure sensor output terminal (terminal No. 1) to the PCM (terminal No. 101).

TECHNICAL DESCRIPTION

- The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold.
- The PCM checks whether the voltage output by manifold differential pressure sensor is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is between 30 and 55 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.6 volts [corresponding to an absolute pressure of 118 kPa (17 psi) or higher] for 2 seconds.

or

- Manifold differential pressure sensor output voltage has continued to be lower than 0.1 volt [corresponding to an absolute pressure of 2.4 kPa (0.3 psi) or lower] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is lower than 30 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.2 volts [corresponding to an absolute pressure of 108 kPa (16 psi) or higher] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is higher than 70 percent.

Judgment Criteria

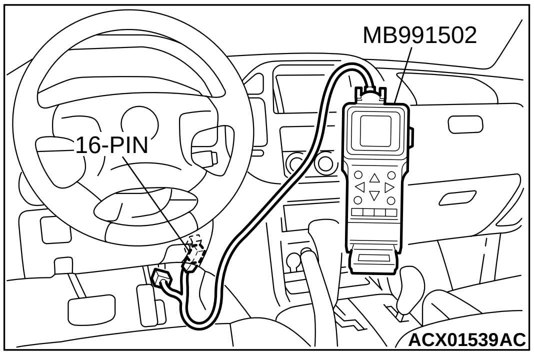
- Manifold differential pressure sensor output voltage has continued to be lower than 1.8 volts [corresponding to an absolute pressure of 46 kPa (4.6 psi) or lower] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold differential pressure sensor failed.
- Open or shorted manifold differential pressure sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

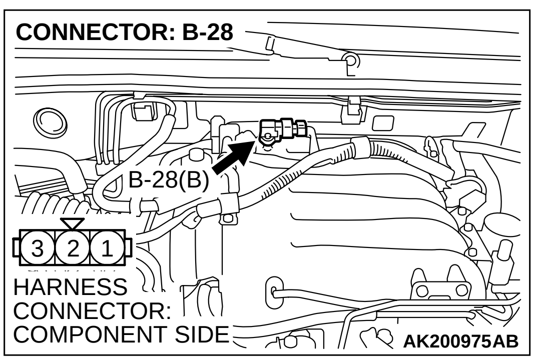
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
- While engine is idling, pressure should be between 20.6 – 34.0 kPa (6.1 – 10.0 in.Hg).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

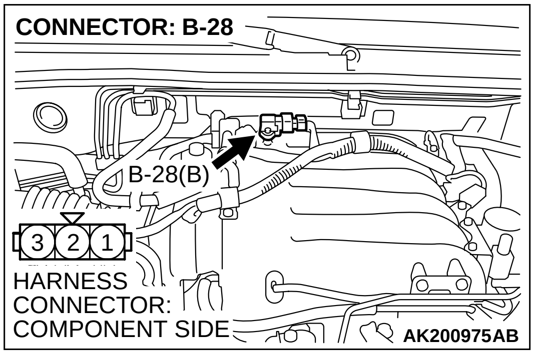
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.

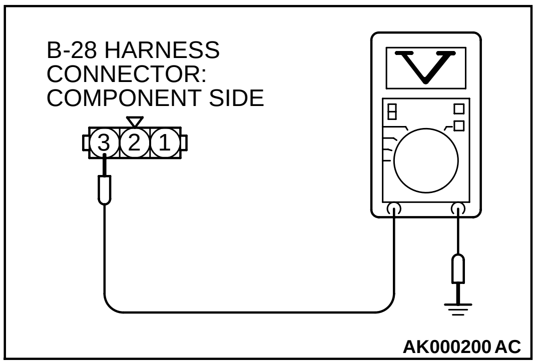


STEP 2.Check harness connector B-28 at manifold differential pressure sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection. Then go to Step12.





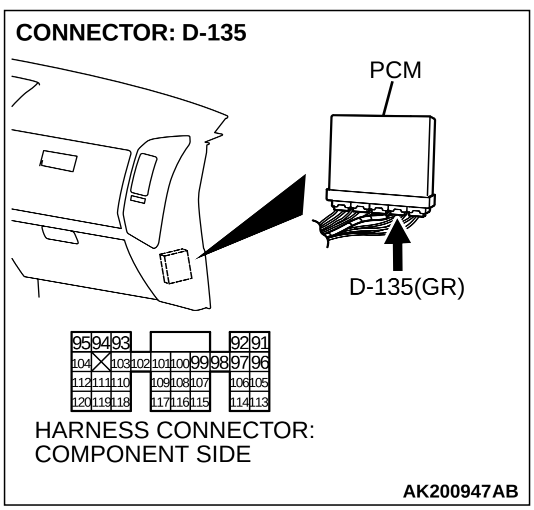
STEP 3. Measure the sensor supply voltage at manifold differential pressure sensor harness side connector B-28.

(1) Disconnect the connector B-28 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 be 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?

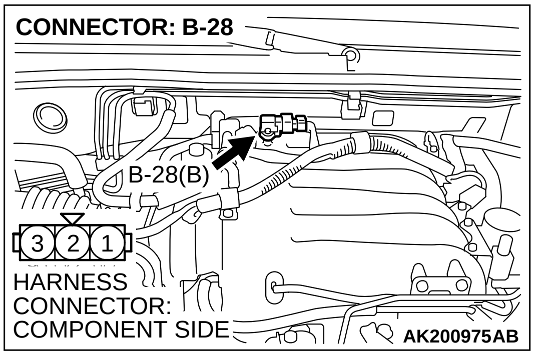
YES : Go to Step 6.
NO : Go to Step 4.

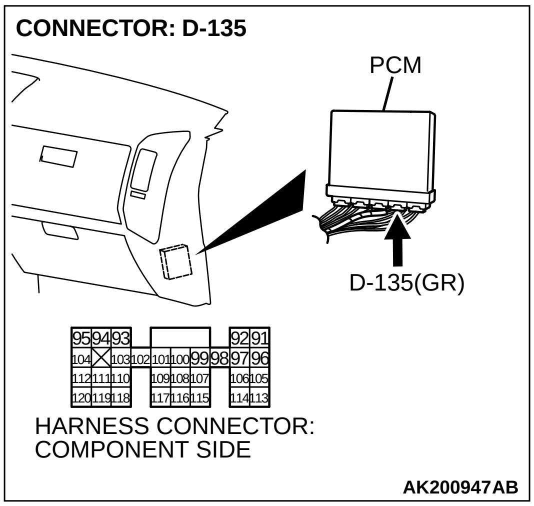


STEP 4. Check harness connector D-135 at PCM for damage.

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 12.



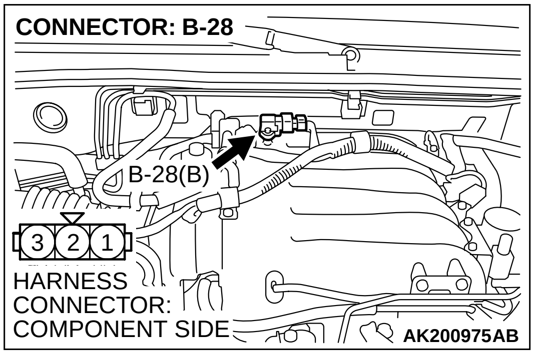


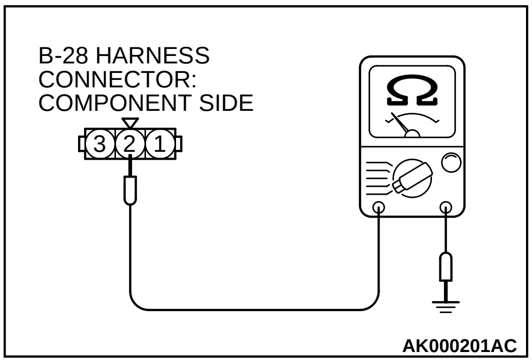
STEP 5. Check for open circuit and short circuit to ground between manifold differential pressure sensor connector B-28 (terminal No. 3) and PCM connector D-135 (terminal No. 97).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.





STEP 6. Check the continuity at manifold differential pressure sensor harness side connector B-28.

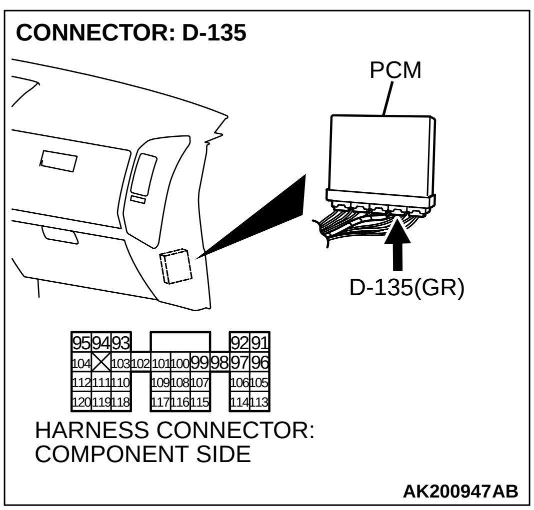
(1) Disconnect the connector B-28 and measure at the harness side.

(2) Measure the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Go to Step 7.



STEP 7. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

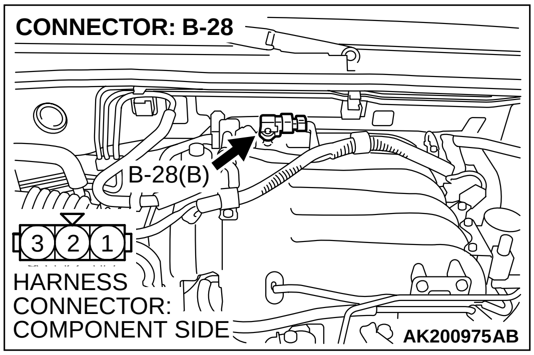
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

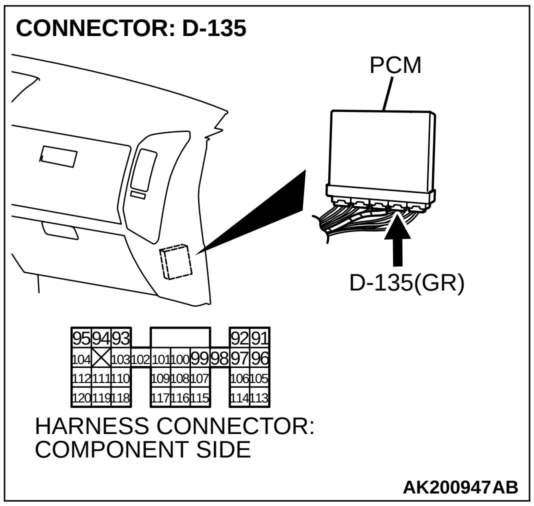
STEP 8. Check for open circuit and harness damage between manifold differential pressure sensor connector B-28 (terminal No. 2) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



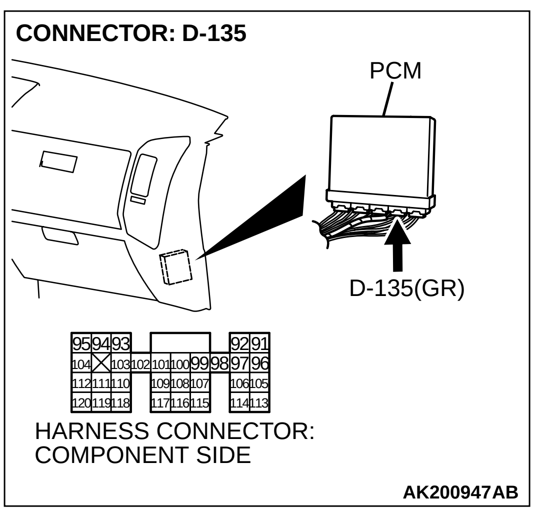


STEP 9. Check harness connector D-135 at PCM for damage.

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.

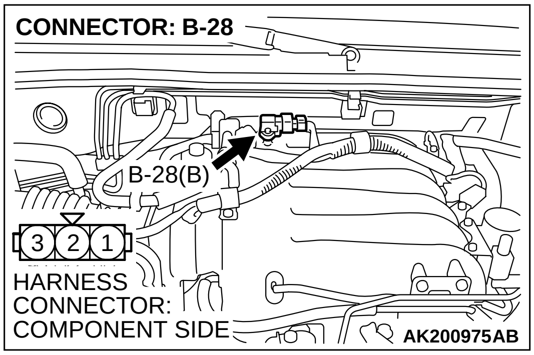


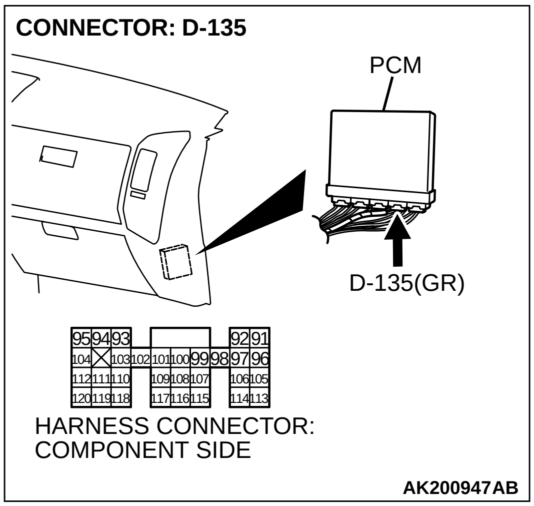
STEP 10. Check for harness damage between manifold differential pressure sensor connector B-28 (terminal No. 3) and PCM connector D-135 (terminal No. 97).

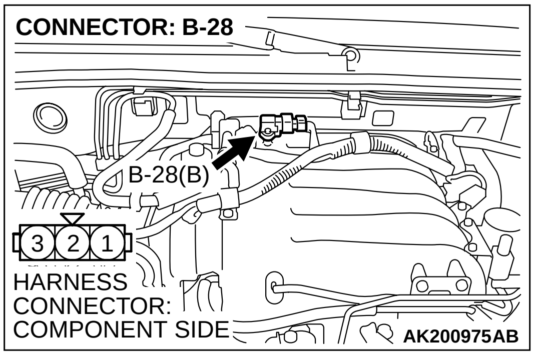
Q: Is the harness wire in good condition?

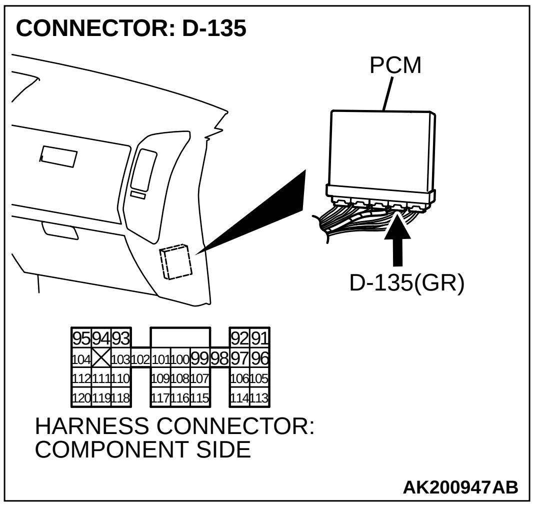
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.









STEP 11. Check for open circuit and short circuit to ground and harness damage between manifold differential pressure sensor connector B-28 (terminal No. 1) and PCM connector D-135 (terminal No. 101).

Q: Is the harness wire in good condition?

YES : Replace the manifold differential pressure sensor. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Procedure 6 – Other Monitor P.13Ab-2.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1400 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

P1601 Communication Malfunction (between PCM and Throttle Actuator Control Module)

TECHNICAL DESCRIPTION

- PCM checks the communication lines for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 6.3 volts.

Judgement Criteria

- PCM detects an error in communication with the throttle actuator control module for 0.05 seconds.
- Throttle actuator control module detects an error in communication with the PCM for 0.12 seconds.

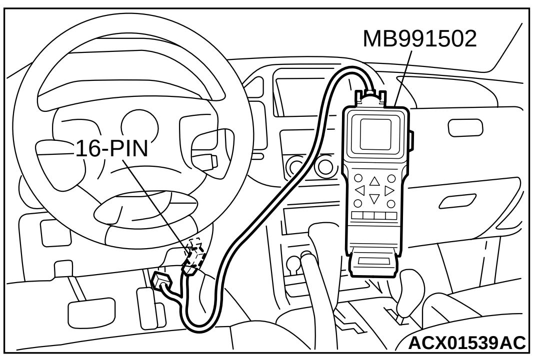
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

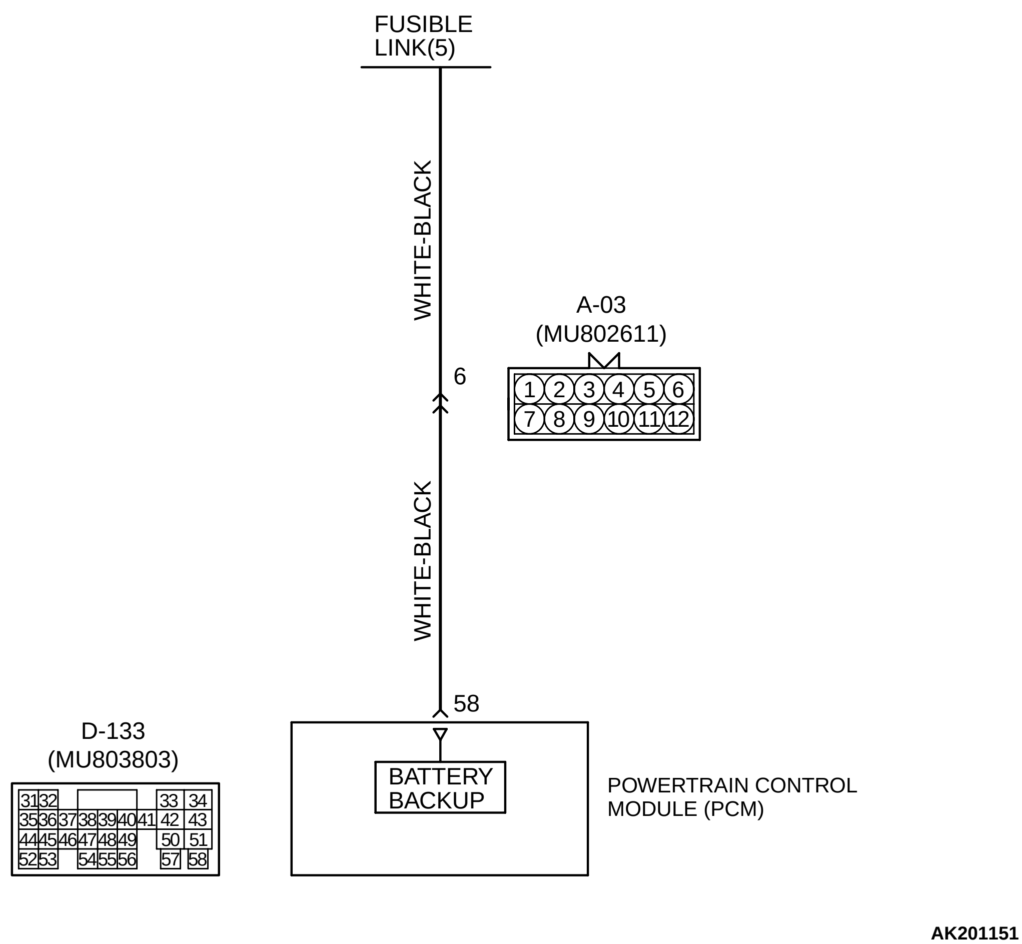
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

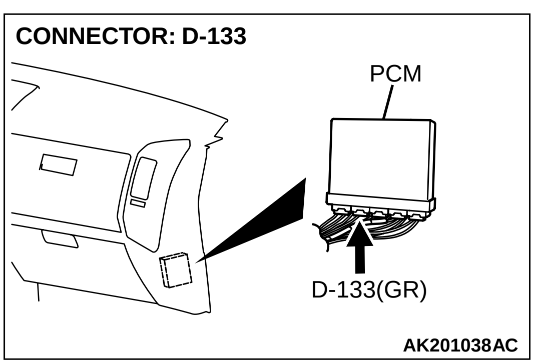
Q: Is DTC P01601 set?

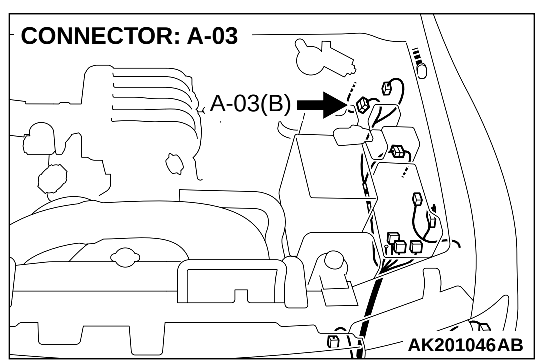
YES : Replace the PCM.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

DTC P1603: Battery Backup Line Malfunction

Battery Backup Circuit







TECHNICAL DESCRIPTION

- The PCM is checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DTC SET CONDITIONS

Check Conditions

- Starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

Judgement Criteria

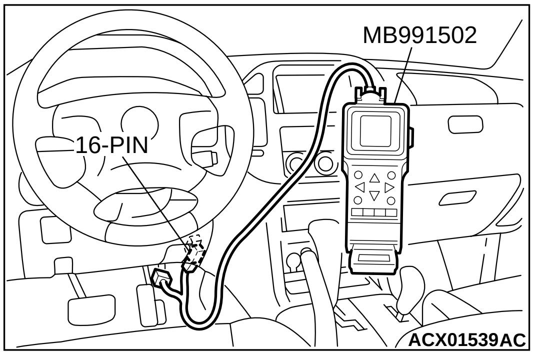
- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Open or shorted battery backup line, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

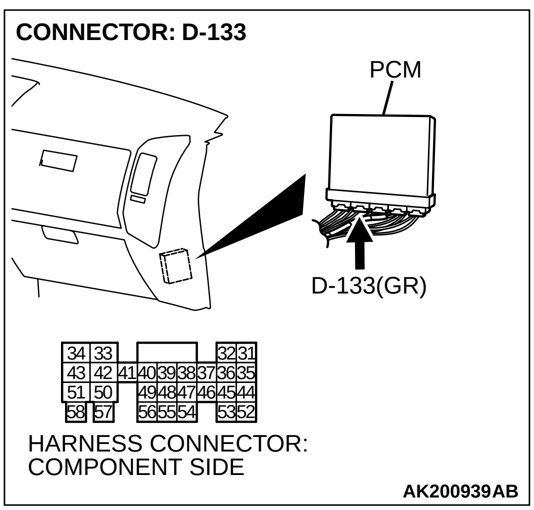
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



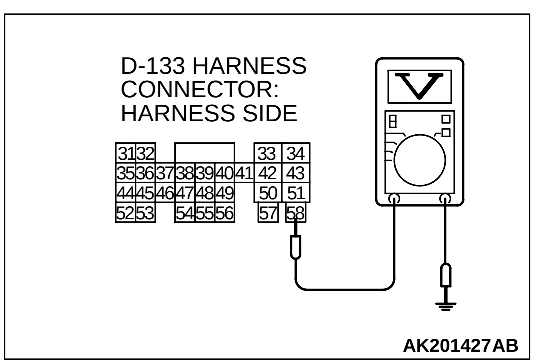
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Start the engine and run it at idle.
(5) Read the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1603 set?
YES : Go to Step 2.
NO : The inspection is complete.

STEP 2. Measure the backup power supply voltage at PCM connector D-133 by backprobing.

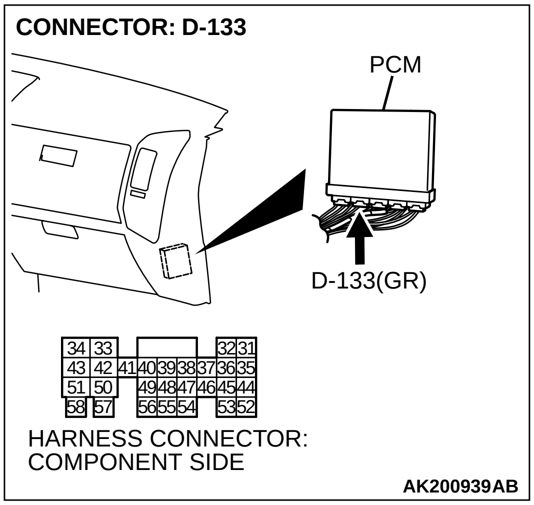


(1) Do not disconnect the PCM connector D-133.



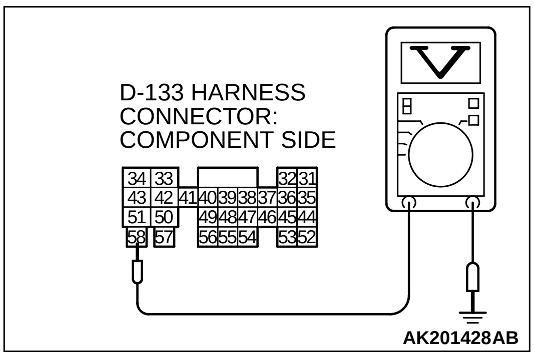
(2) Measure the voltage between terminal No. 58 and ground by backprobing.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?
YES : Go to Step 5.
NO : Go to Step 3.



STEP 3. Measure the backup power supply voltage at PCM harness side connector D-133.

(1) Disconnect the PCM connector D-133 and measure at the harness side.

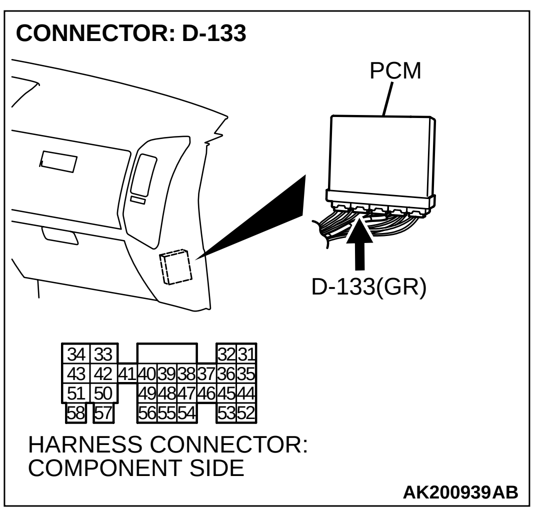


(2) Measure the voltage between terminal No. 58 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

NO : Check connector A-03 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fusible link (5) and PCM connector D-133 (terminal No. 58) because of open circuit or short circuit to ground. Then go to Step 6.

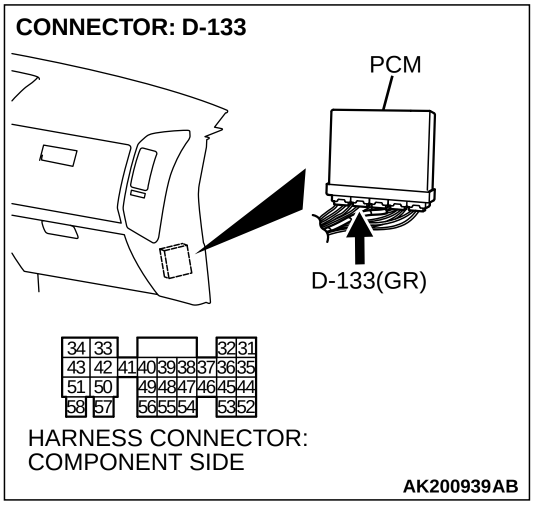


STEP 4. Check connector D-133 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check connector A-03 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 battery and PCM connector D-133 (terminal No. 58) because of harness damage. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

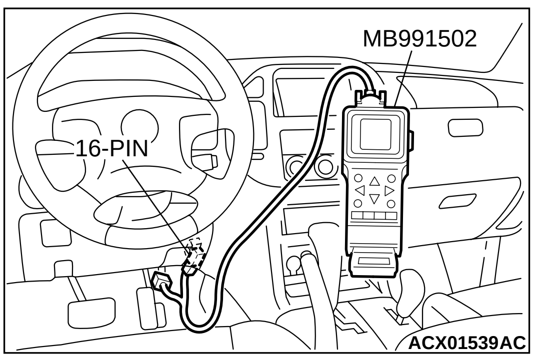


STEP 5. Check connector D-133 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

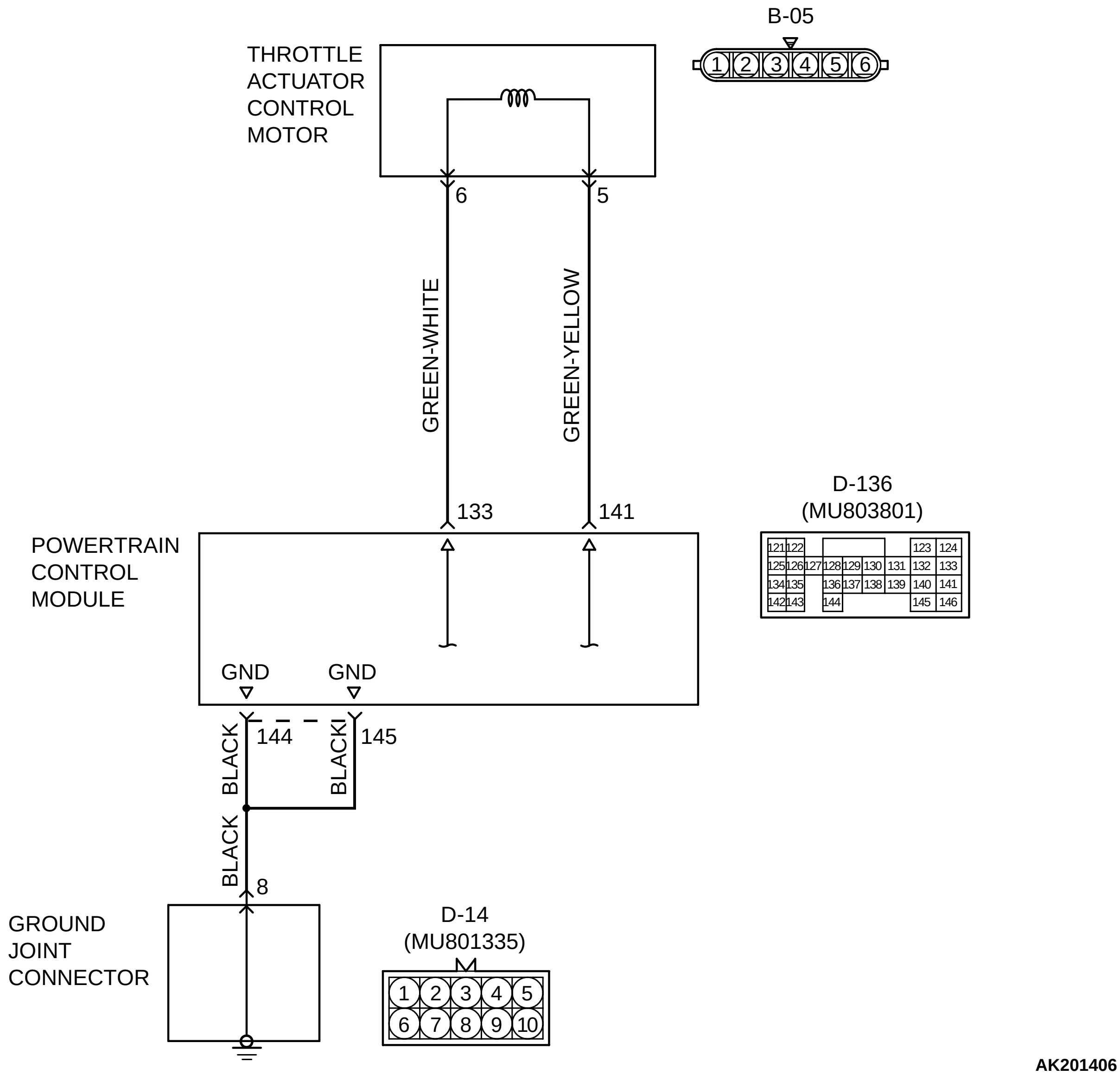
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

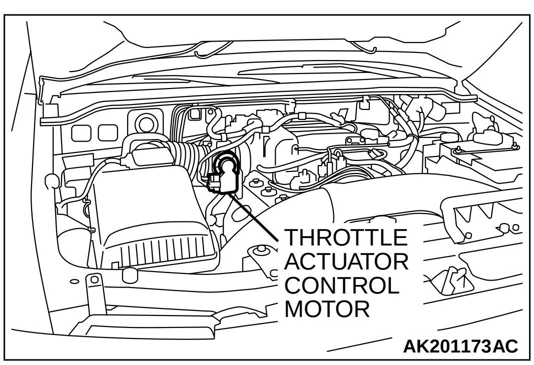
Q: Is DTC P1603 set?

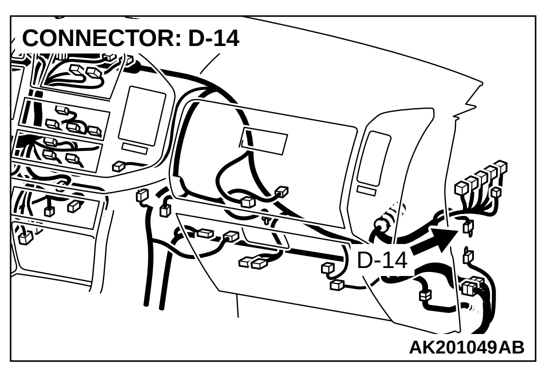
YES : Retry the troubleshooting.

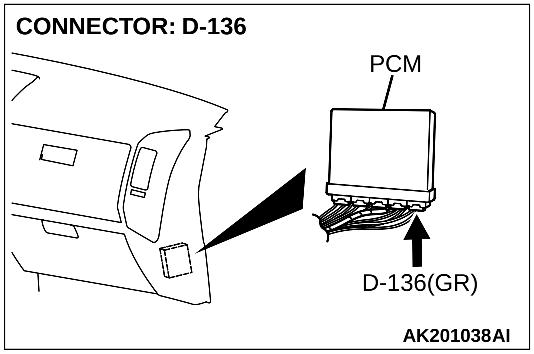
NO : The inspection is complete.

P2100 Throttle Actuator Control Motor Circuit (Open)







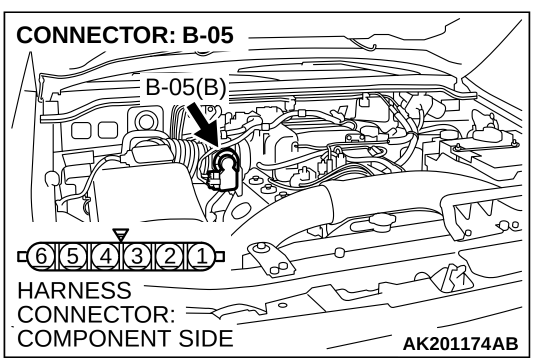


CIRCUIT OPERATION

- Controls the current that is applied from the PCM (terminals No. 133, No. 141) to the throttle actuator control motor (terminals No. 5, No. 6).

TECHNICAL DESCRIPTION

- PCM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.



DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criteria

- Throttle actuator control motor current should be 0.1 amperes or less for 0.72 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed or maladjusted.
- Open or shorted throttle actuator control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

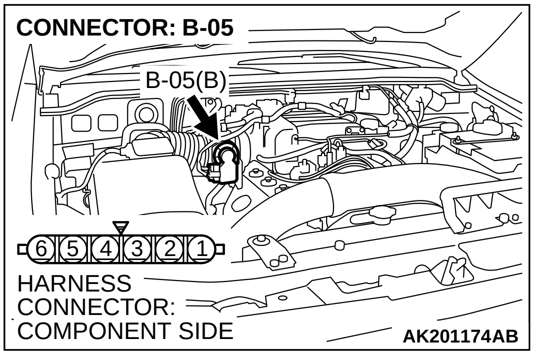
- MB991502: Scan Tool (MUT-II)

STEP 1. Check connector B-05 at throttle actuator control motor for damage.

Q: Is the connector in good condition?

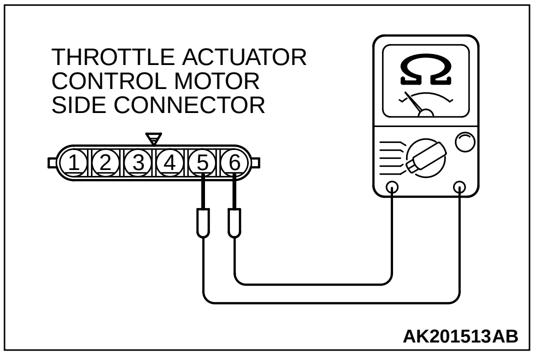
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-05.



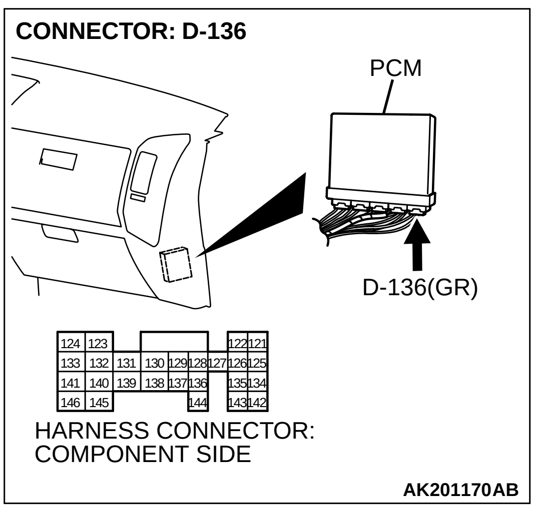
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 5 and No. 6.

Standard value: 0.3 – 100 ohms

Q: Is the measured resistance between 0.3 and 100 ohms?

YES : Go to Step 3.

NO : Replace the throttle body ASSY. Then go to Step 8.



STEP 3. Check connector D-136 at PCM for damage

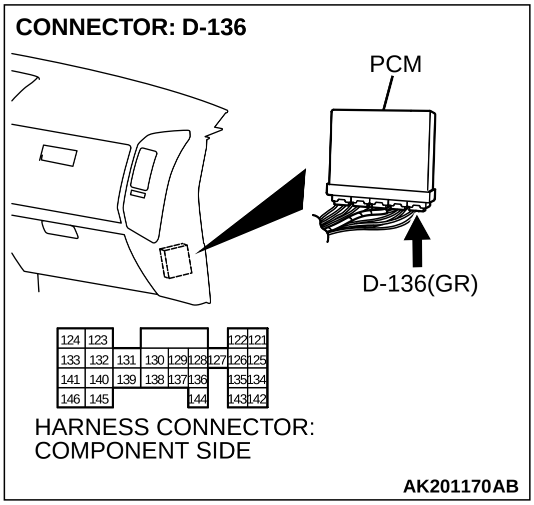
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

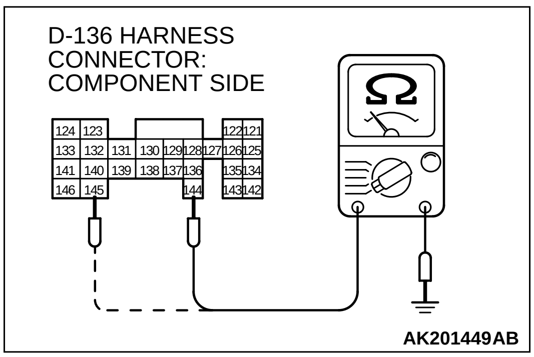
STEP 4. Check the continuity at PCM harness side connector D-136.

(1) Disconnect the connector D-136 and measure at the harness side.



(2) Measure the continuity between terminals No. 144, No. 145 and ground.

- Should be less than 2 ohms.



Q: Is the continuity normal?

YES : Go to Step 5.

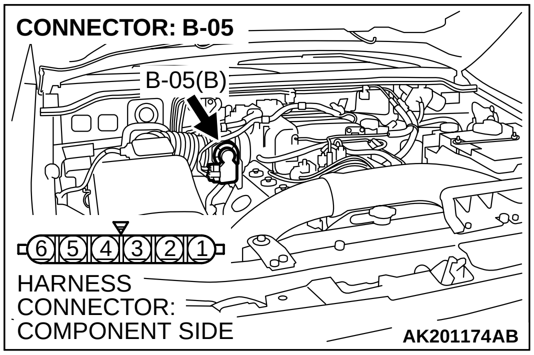
NO : Check harness connector D-14 at ground joint connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If ground joint connector D-14 is in good condition, repair it because of open circuit or harness damage between PCM connector D-136 (terminals No. 144, No. 145) and ground. Then go to Step 8.

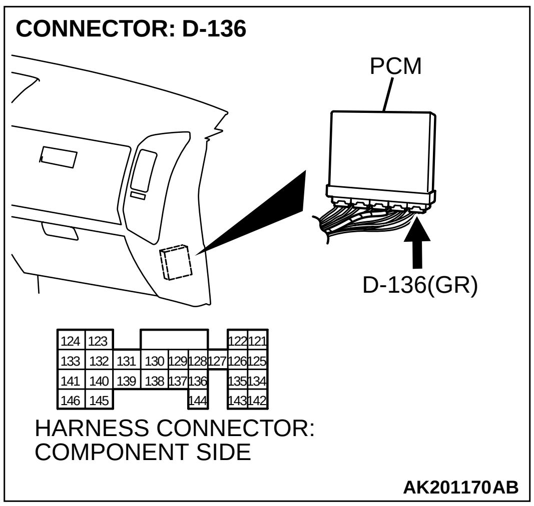
STEP 5. Check for open circuit and harness damage between throttle actuator control motor connector B-05 (terminal No. 6) and PCM connector D-136 (terminal No. 133).

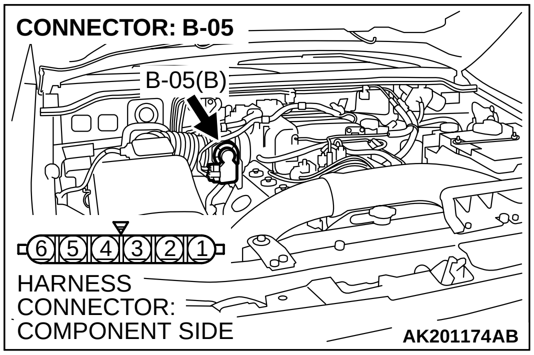
Q: Is the harness wire in good condition?

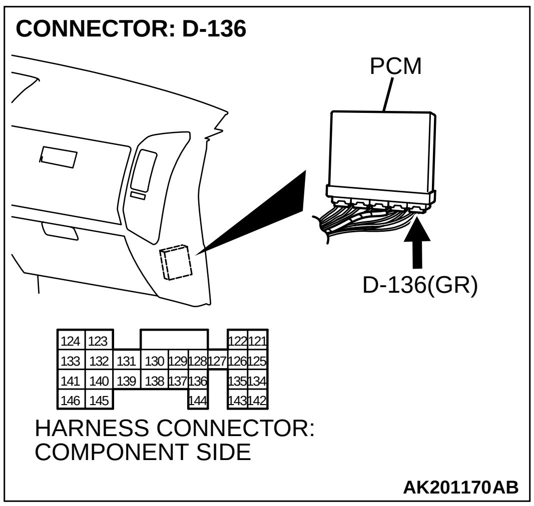
YES : Go to Step 6.

NO : Repair it. Then go to Step 8.







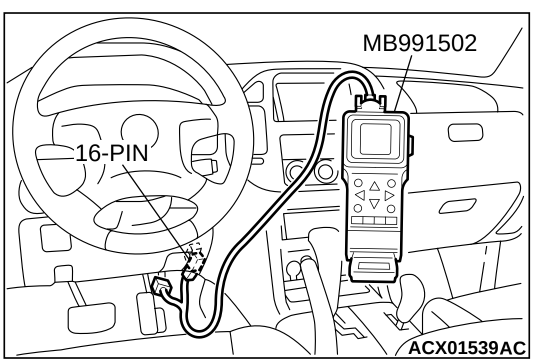


STEP 6. Check for open circuit and harness damage between throttle actuator control motor connector B-05 (terminal No. 5) and PCM connector D-136 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.



STEP 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

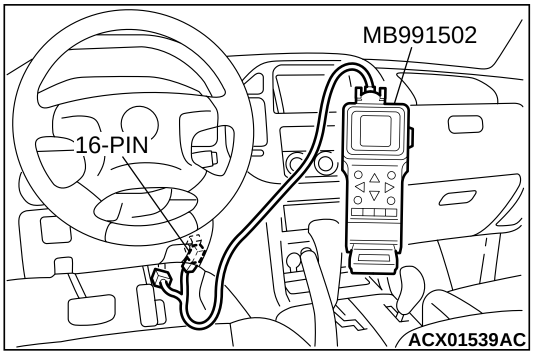
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2100 set?

YES : Replace the PCM. Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.



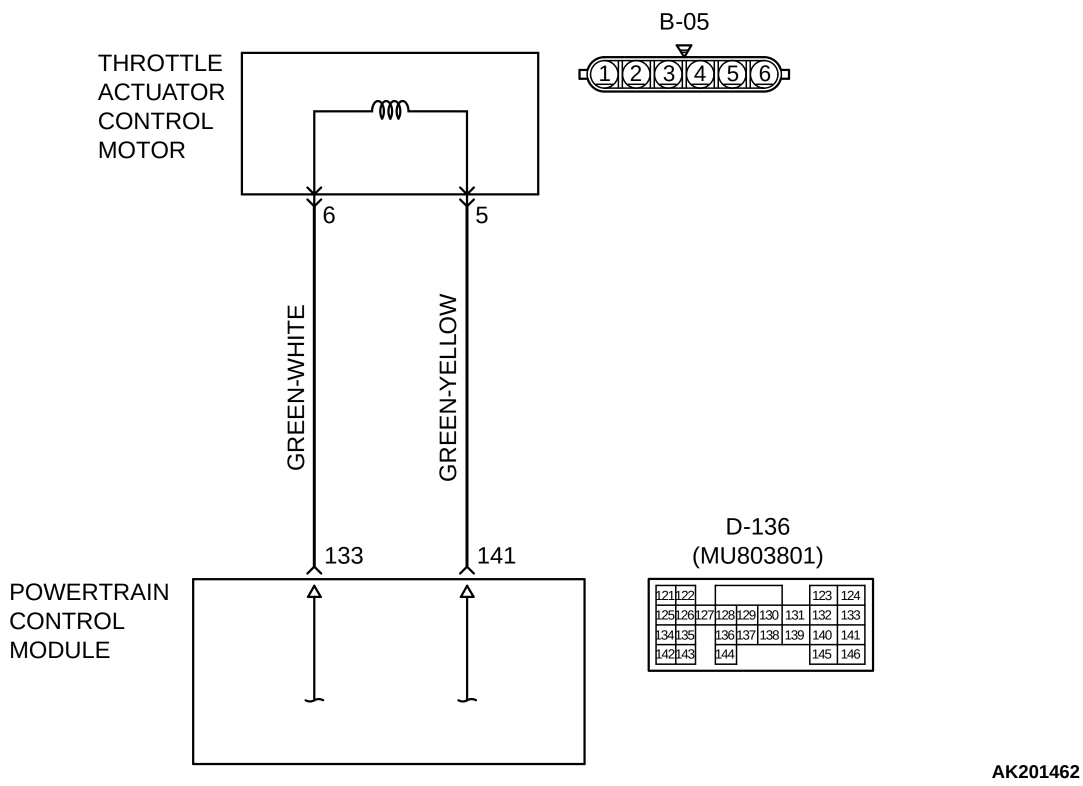
STEP 8. Using scan tool MB991502, read the diagnostic trouble code (DTC).

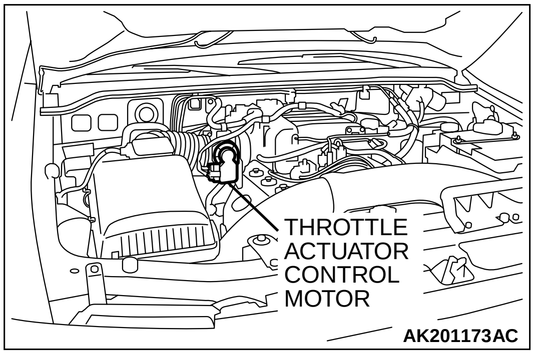
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

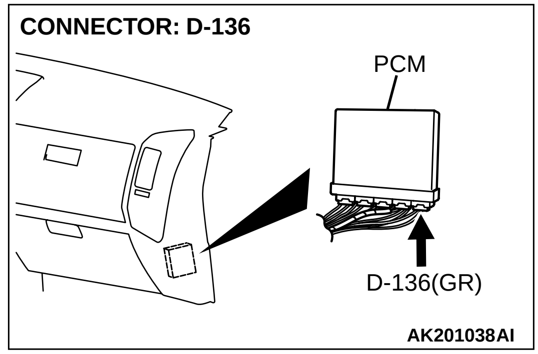
Q: Is DTC P2100 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

P2101 Throttle Actuator Control Motor Magneto Malfunction







TECHNICAL DESCRIPTION

- PCM check whether the throttle actuator control motor magneto has failed.

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criteria

- The coil temperature of the throttle actuator control motor should be 180°C (356°F) or higher for 0.16 seconds.

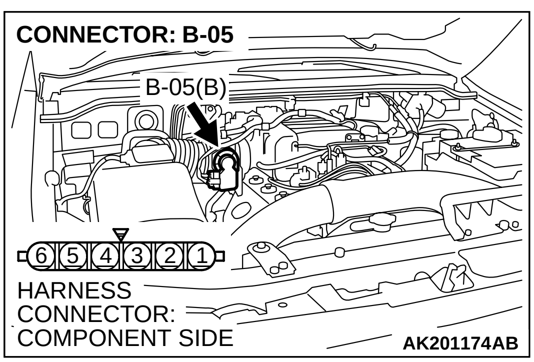
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed or maladjusted.
- Open or shorted throttle actuator control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

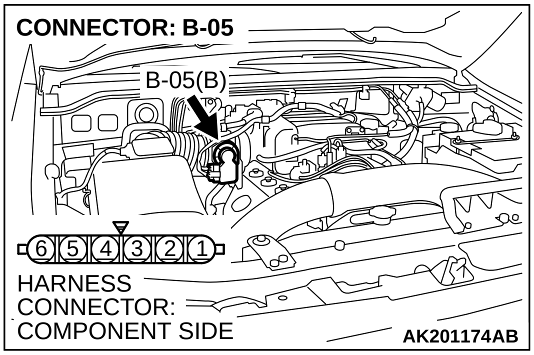


STEP 1. Check connector B-05 at throttle actuator control motor for damage.

Q: Is the connector in good condition?

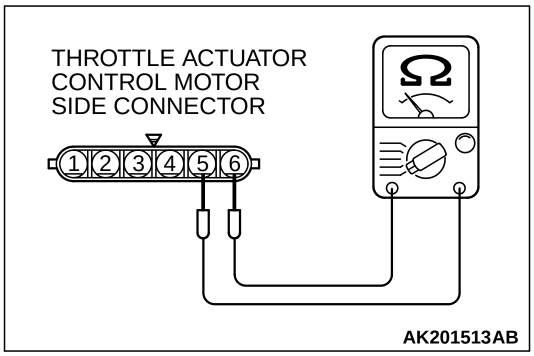
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.



STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-05.



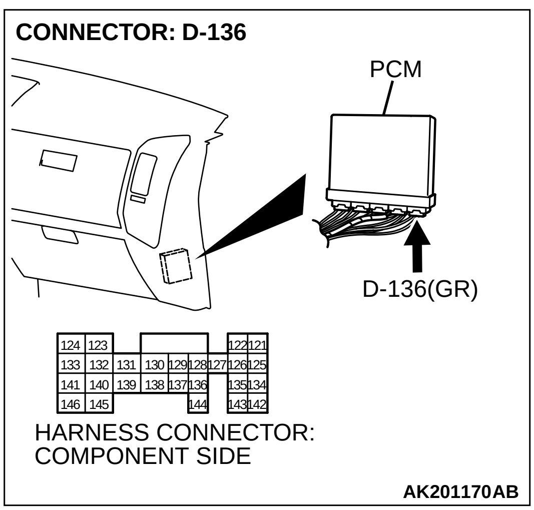
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 5 and No. 6.

Standard value: 0.3 – 100 ohms

Q: Is the measured resistance between 0.3 and 100 ohms?

YES : Go to Step 3.

NO : Replace the throttle body ASSY. Then go to Step 7.

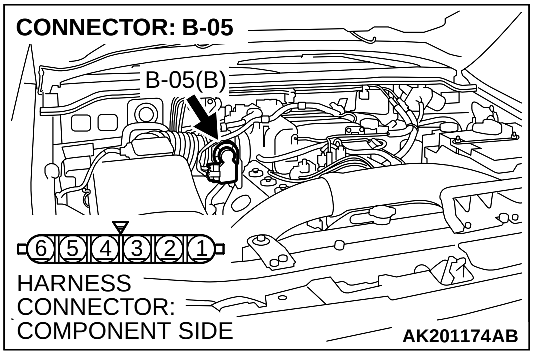


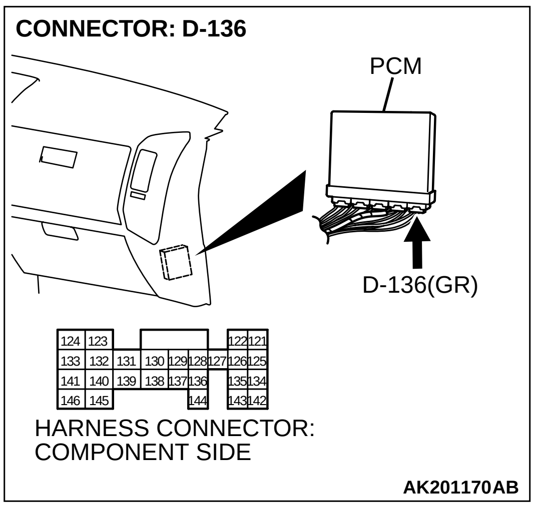
STEP 3. Check connector D-136 at PCM for damage

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

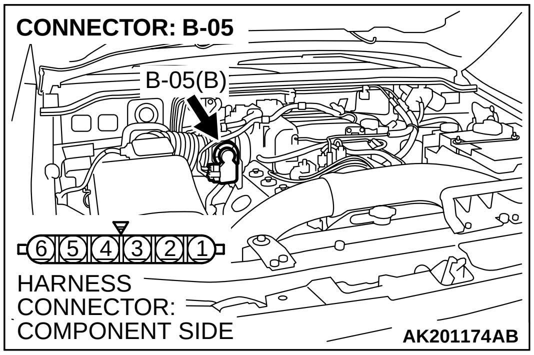


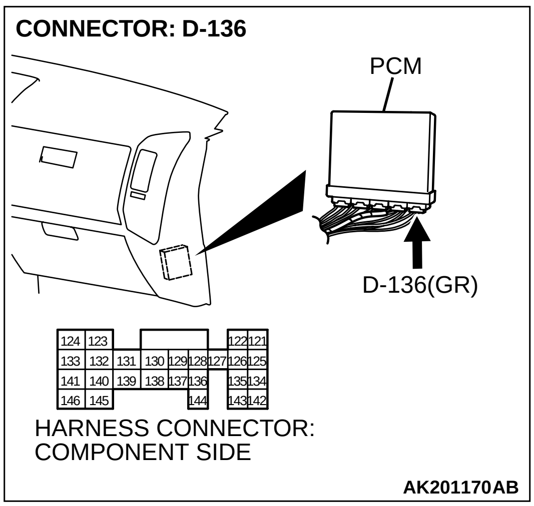


STEP 4. Check for short circuit to ground and harness damage between throttle actuator control motor connector B-05 (terminal No. 6) and PCM connector D-136 (terminal No. 133).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 7.



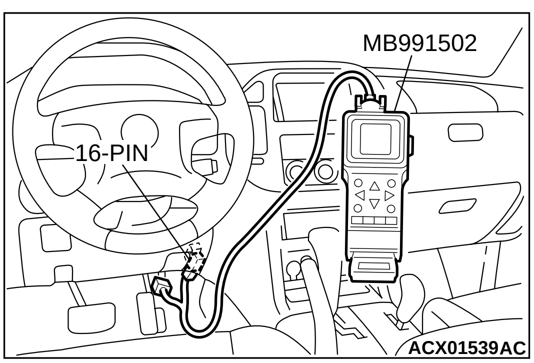


STEP 5. Check for short circuit to ground and harness damage between throttle actuator control motor connector B-05 (terminal No. 5) and PCM connector D-136 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

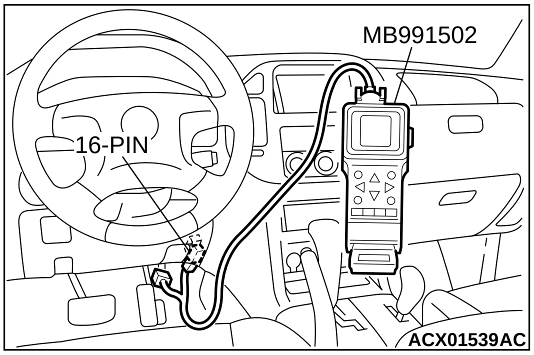
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2101 set?

YES : Replace the PCM. Then go to Step 7.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.



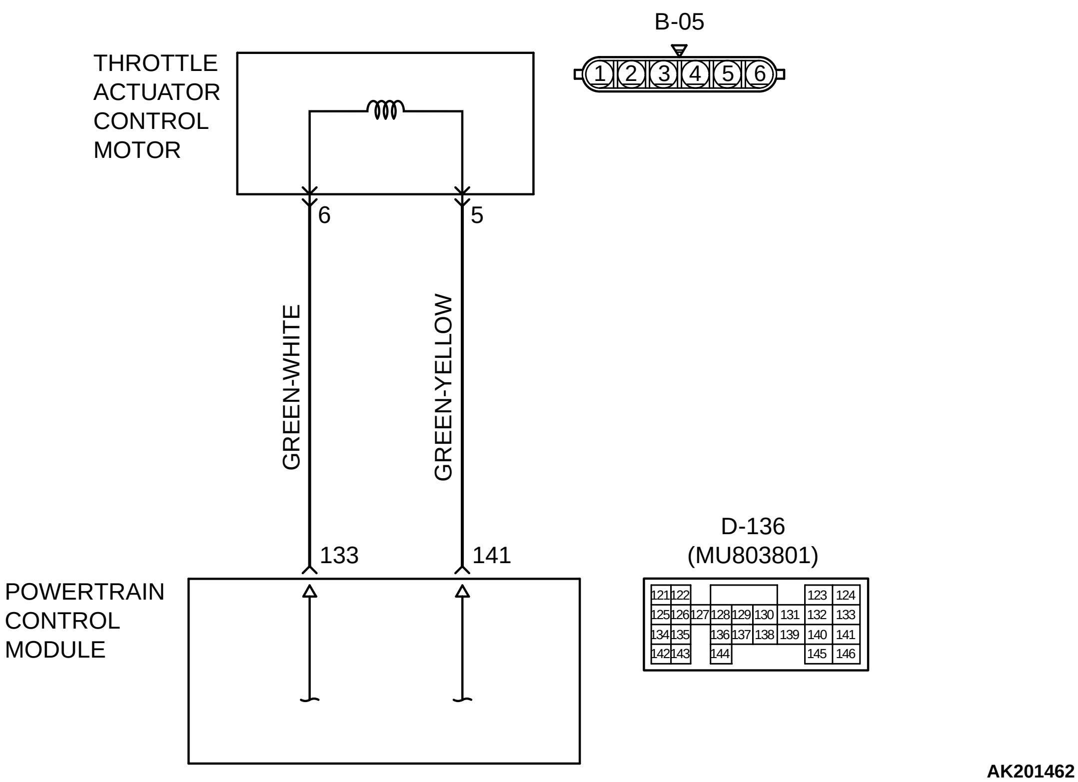
STEP 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

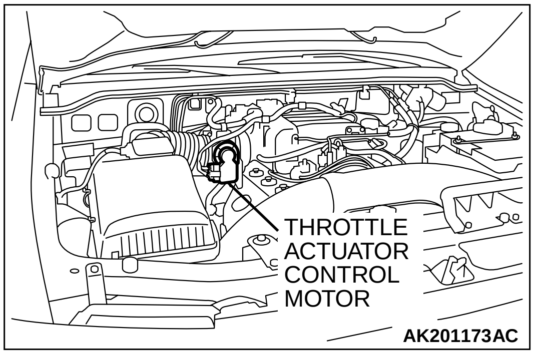
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

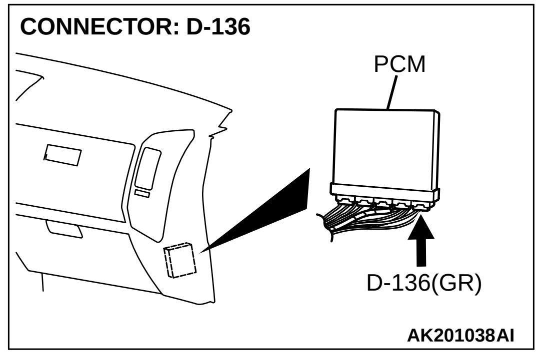
Q: Is DTC P2101 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

P2102 Throttle Actuator Control Motor Circuit (Shorted Low)







CIRCUIT OPERATION

- Controls the current that is applied from the PCM (terminals No. 133, No. 141) to the throttle actuator control motor (terminals No. 5, No. 6).

TECHNICAL DESCRIPTION

- PCM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criteria

- Throttle actuator control motor current is 12 amperes or higher for 0.16 seconds.

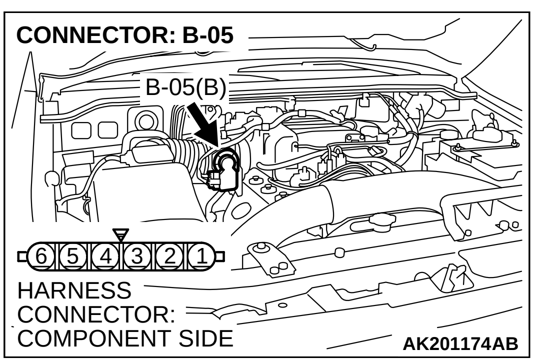
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed or maladjusted.
- Open or shorted throttle actuator control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Check connector B-05 at throttle actuator control motor for damage.

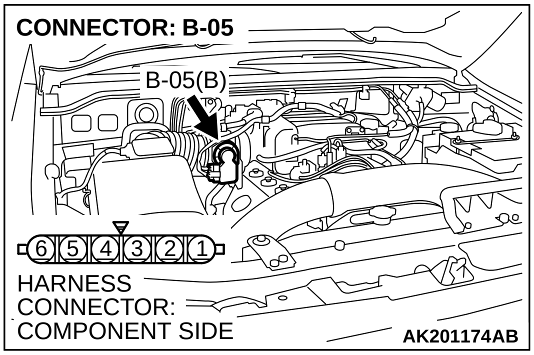
Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

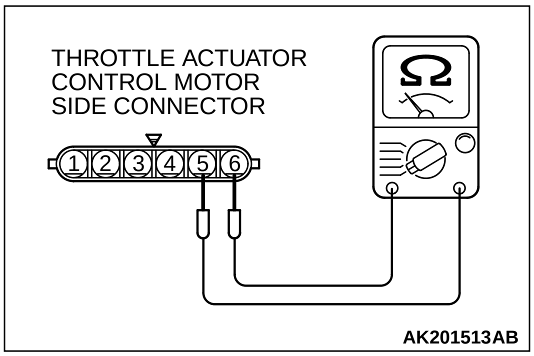
STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-05.



(2) Measure the resistance between throttle actuator control motor side connector terminals No. 5 and No. 6.

Standard value: 0.3 – 100 ohms



Q: Is the measured resistance between 0.3 and 100 ohms?

YES : Go to Step 3.

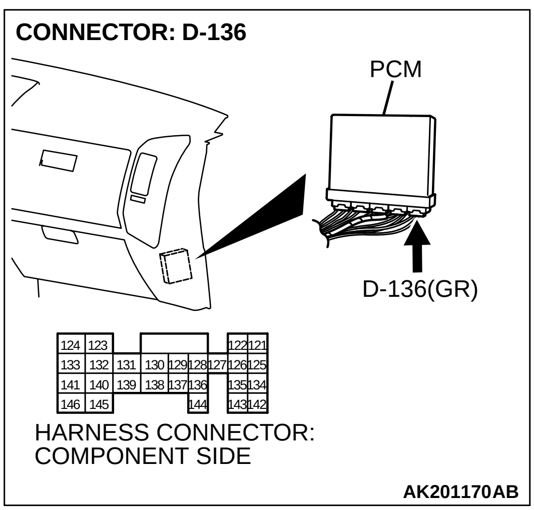
NO : Replace the throttle body ASSY. Then go to Step 7.

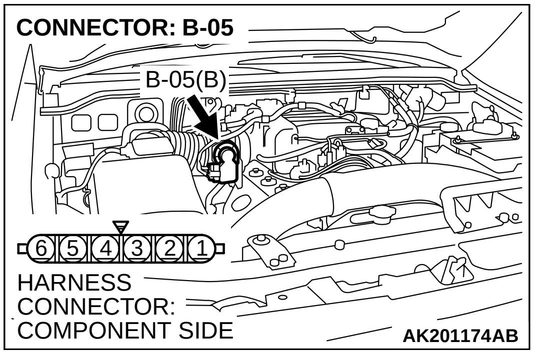
STEP 3. Check connector D-136 at PCM for damage.

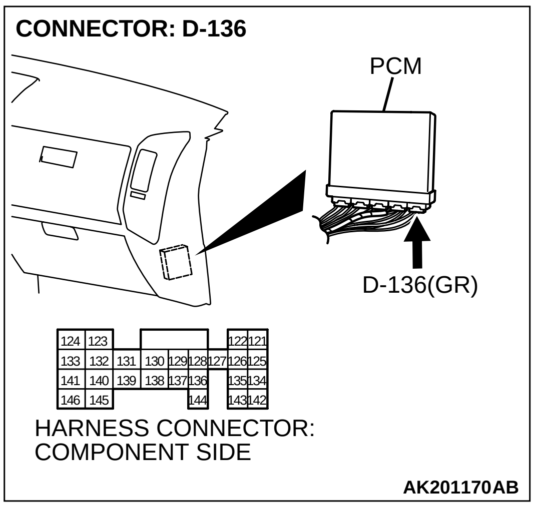
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.





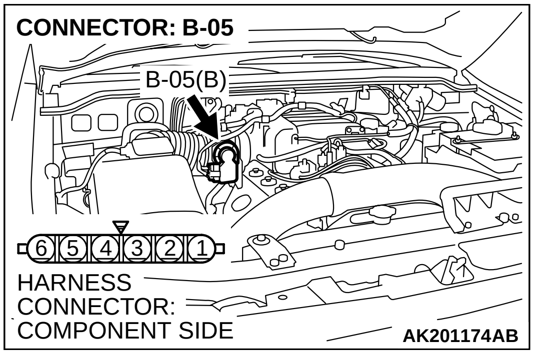


STEP 4. Check for short circuit to ground between throttle actuator control motor connector B-05 (terminal No. 6) and PCM connector D-136 (terminal No. 133).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

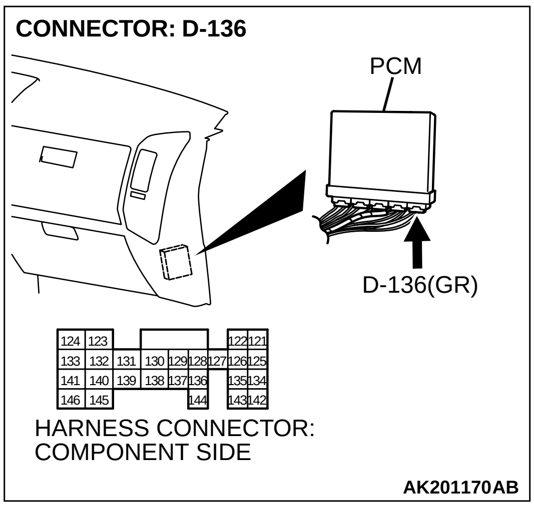
NO : Repair it. Then go to Step 7.



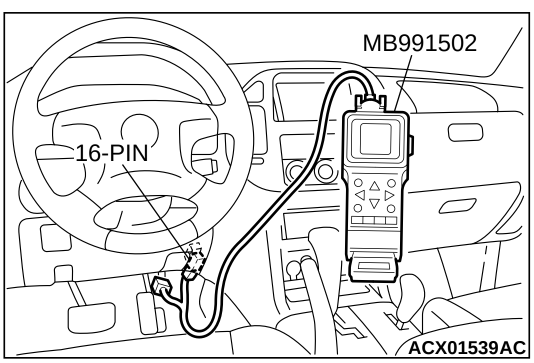
STEP 5. Check for short circuit to ground between throttle actuator control motor connector B-05 (terminal No. 5) and PCM connector D-136 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 7.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).



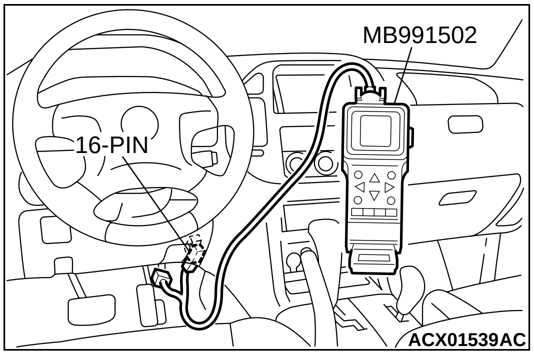
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2102 set?

YES : Replace the PCM. Then go to Step 7.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.



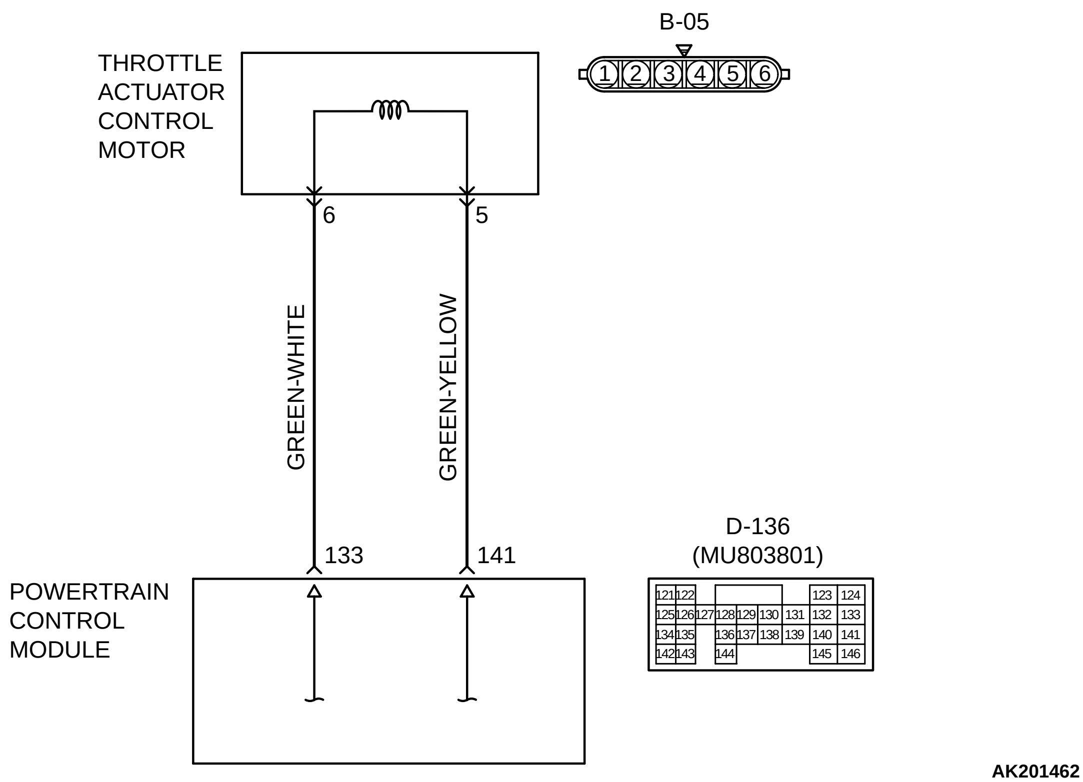
STEP 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

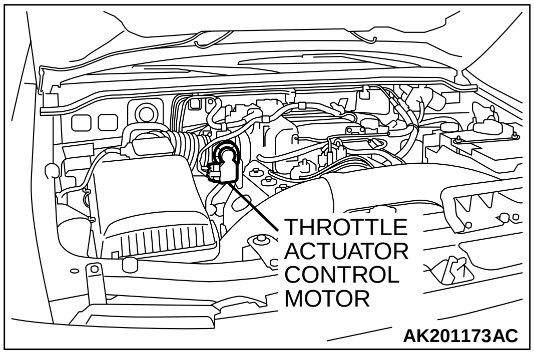
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

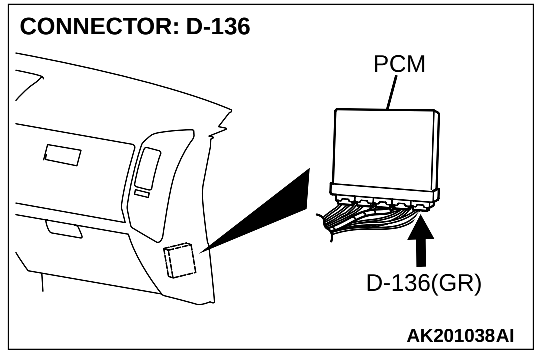
Q: Is DTC P2102 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

P2103 Throttle Actuator Control Motor Circuit (Shorted High)





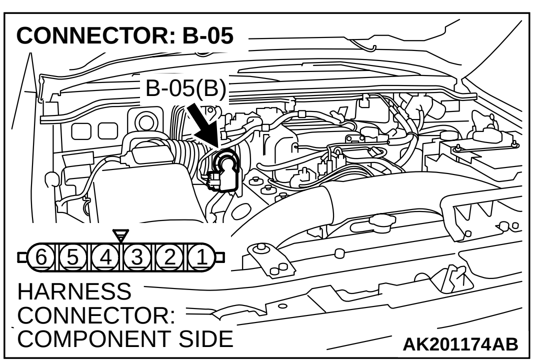


CIRCUIT OPERATION

- Controls the current that is applied from the PCM (terminals No. 133, No. 141) to the throttle actuator control motor (terminals No. 5, No. 6).

TECHNICAL DESCRIPTION

- PCM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.



DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 8.3 volts

Judgement Criteria

- Throttle actuator control motor current is 8 amperes or higher for 0.16 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed or maladjusted.
- Open or shorted throttle actuator control motor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check connector B-05 at throttle actuator control motor for damage.

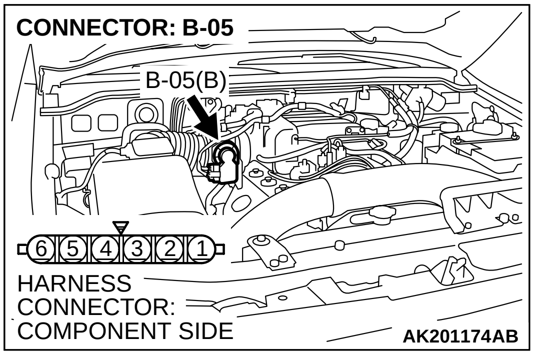
Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

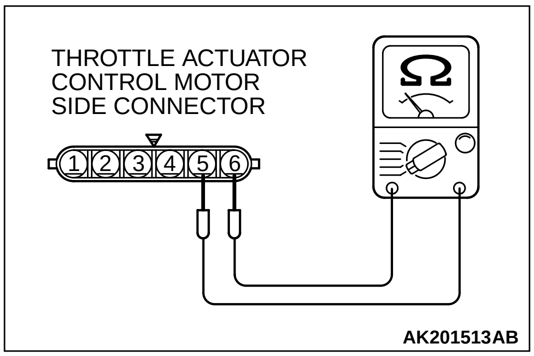
STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-05.



(2) Measure the resistance between throttle actuator control motor side connector terminals No. 5 and No. 6.

Standard value: 0.3 – 100 ohms



Q: Is the measured resistance between 0.3 and 100 ohms?

YES : Go to Step 3.

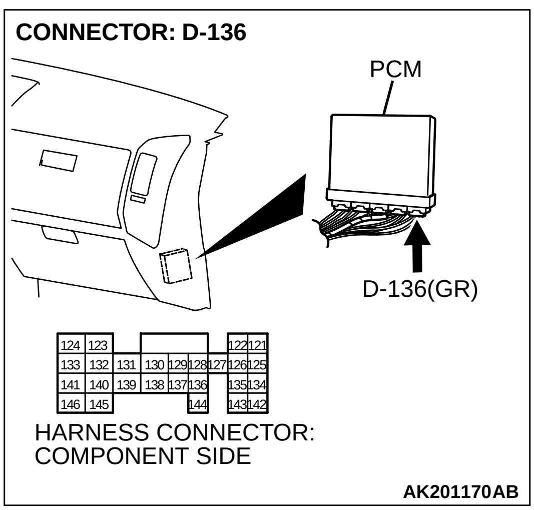
NO : Replace the throttle body ASSY. Then go to Step 7.

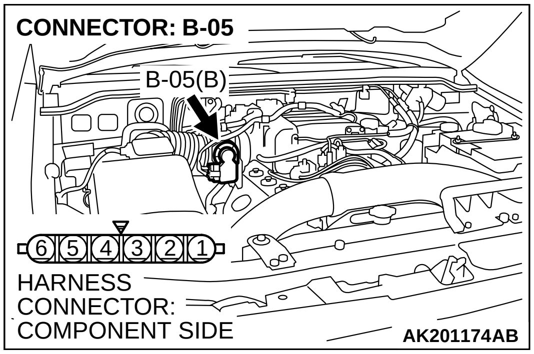
STEP 3. Check connector D-136 at PCM for damage.

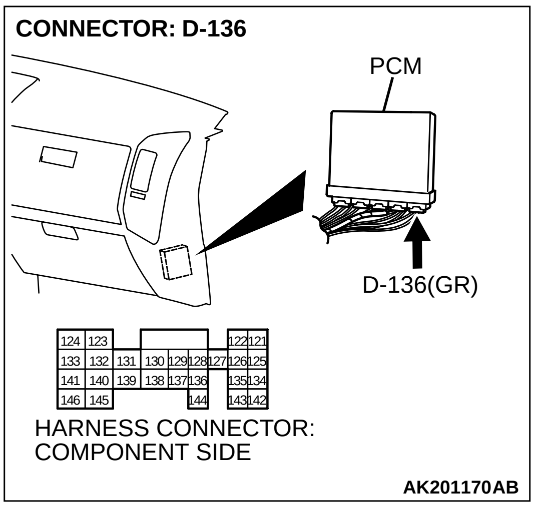
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.





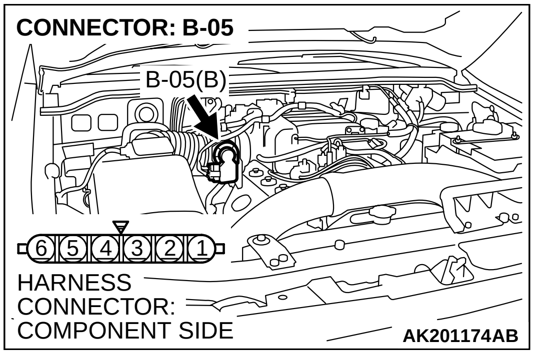


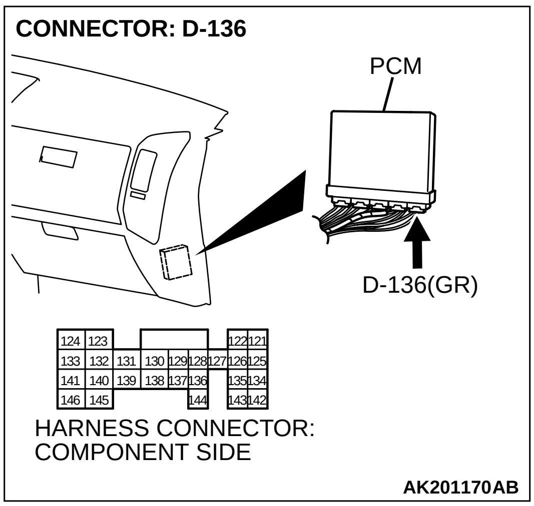
STEP 4. Check for short circuit to ground between throttle actuator control motor connector B-05 (terminal No. 6) and PCM connector D-136 (terminal No. 133).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



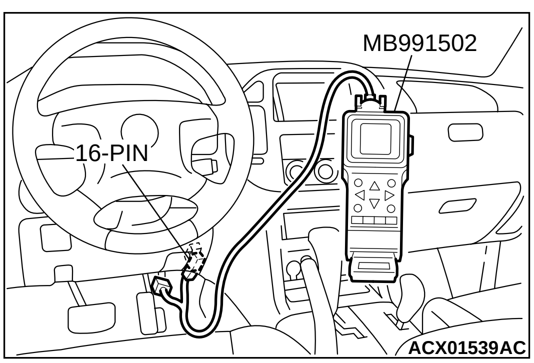


STEP 5. Check for short circuit to ground between throttle actuator control motor connector B-05 (terminal No. 5) and PCM connector D-136 (terminal No. 141).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

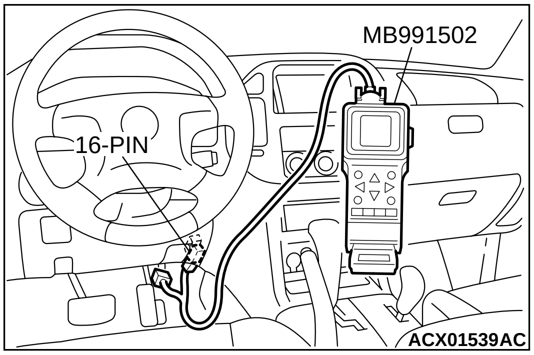
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2103 set?

YES : Replace the PCM. Then go to Step 7.

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 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2103 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

P2108 Throttle Actuator Control Module Processor Malfunction

TECHNICAL DESCRIPTION

- PCM checks the throttle actuator control module processor for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.

Judgement Criteria

- No surveillance pulse signals are input for 0.5 seconds.

Check Conditions

- TPS (main) output voltage is higher than 0.35 volts and lower than 4.8 volts.
- APS (main) is normal.
- TPS is normal.

Judgement Criteria

- Difference between the TPS (main) output voltage and the target output voltage should be 1 volt or higher for 10 seconds.

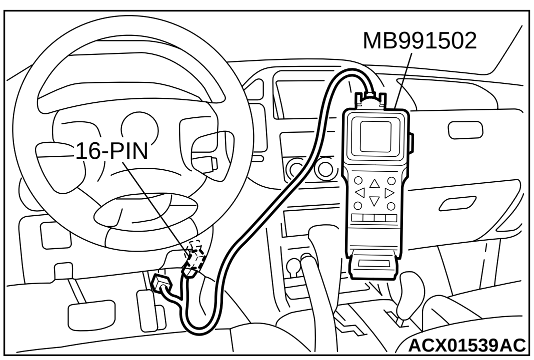
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2108 set?

YES : Replace the PCM.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection. Service Points P.00-6.

P2121 Accelerator Pedal Position Sensor (Main) Circuit Range/Performance Problem

Accelerator Pedal Position Sensor (main) Circuit Range/Performance Problem Circuit

- Refer to, DTC P2122 – Accelerator Pedal Position Sensor (main) Circuit P.13Ac-600.
- Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Accelerator Pedal Position Switch Circuit P.13Ad-110.

CIRCUIT OPERATION

- Refer to, DTC P2122 – Accelerator Pedal Position Sensor (main) Circuit P.13Ac-600.
- Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Accelerator Pedal Position Switch Circuit P.13Ad-110.

TECHNICAL DESCRIPTION

- PCM checks the APS (main) output signal characteristics for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.
- Accelerator pedal position switch: ON
- APS (sub) output voltage or 1.88 volts or less.

Judgement Criteria

- APS (main) output voltage is 1.88 volts or higher for 1 second.

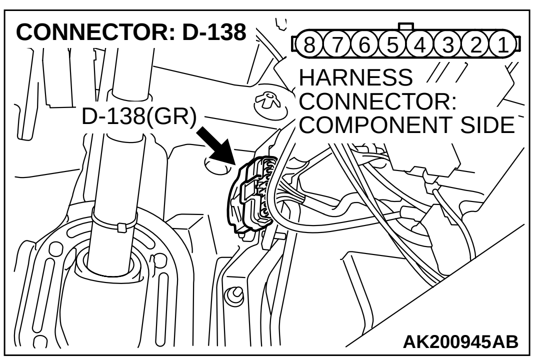
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- APS failed or maladjusted.
- Open or shorted APS (main) circuit, or loose connector.
- Accelerator pedal position switch failed or maladjusted.
- Open or shorted accelerator pedal position switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



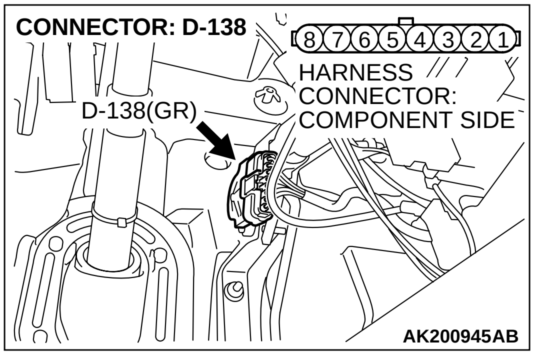
STEP 1. Check connector D-138 at accelerator pedal position sensor and accelerator pedal position switch for damage.

Q: Is the connector in good condition?

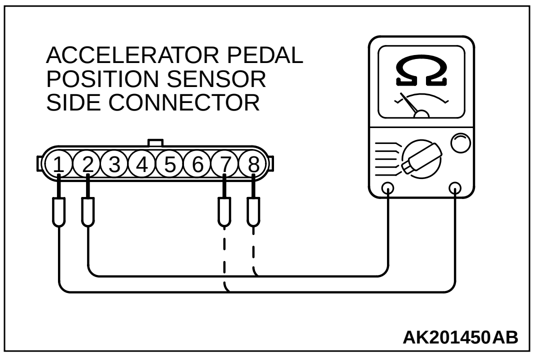
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 2. Check the accelerator pedal position sensor.

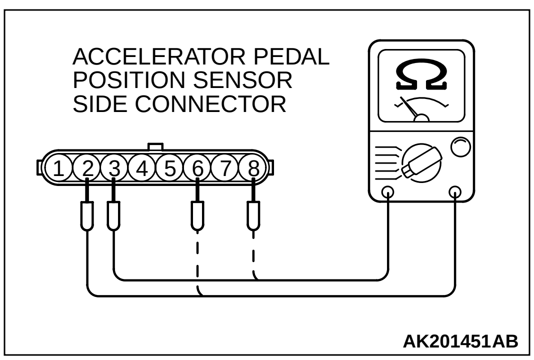


(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

(4) Move the accelerator pedal from the idle position to the full-open position.

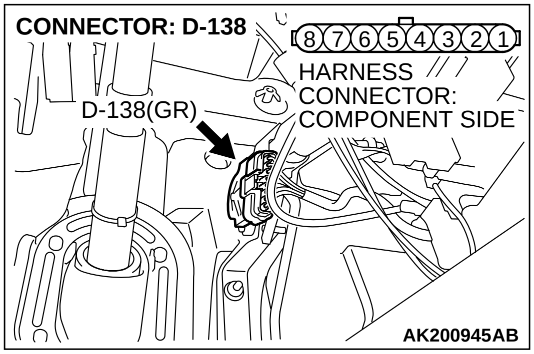
- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the accelerator pedal position sensor. Then go to Step 11.

STEP 3. Check the continuity at accelerator pedal position sensor harness side connector D-138.



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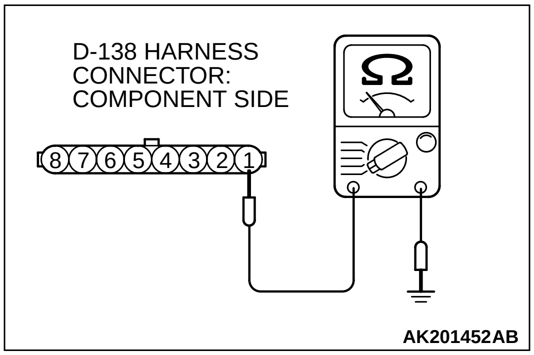
(1) Disconnect the connector D-138 and measure at the harness side.



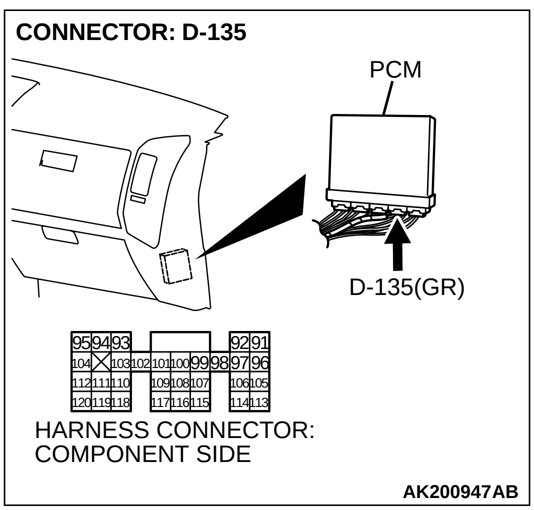
AK201452AB

(2) Measure the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check connector D-135 at PCM for damage.



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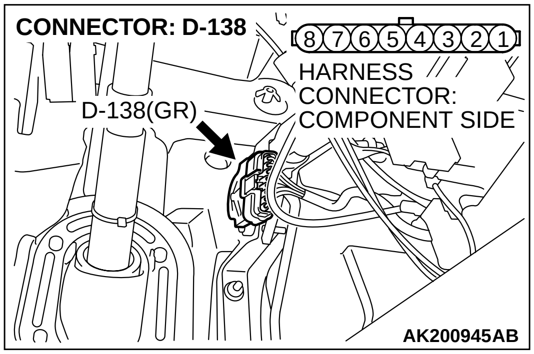
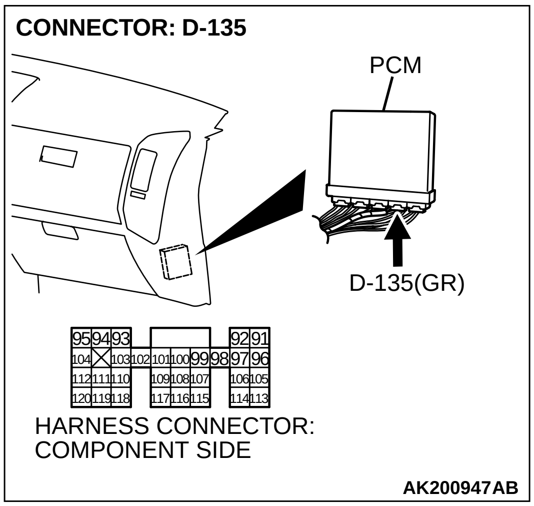
Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

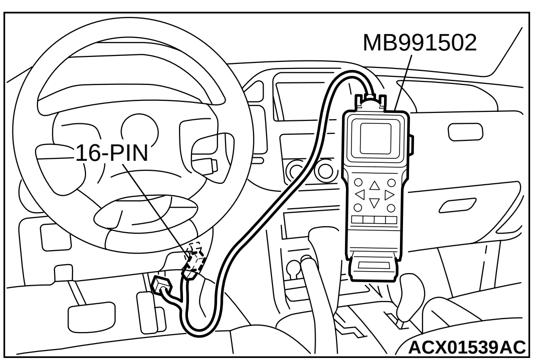
STEP 5. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 1) and PCM connector D-135 (terminal No. 91).





Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

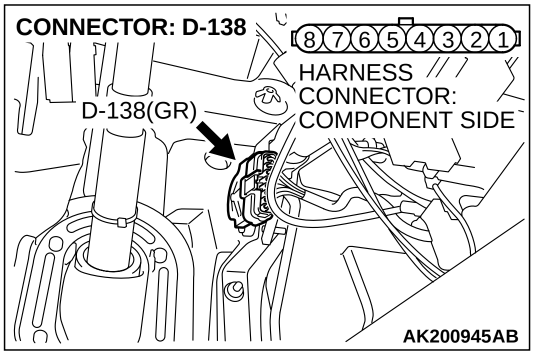
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

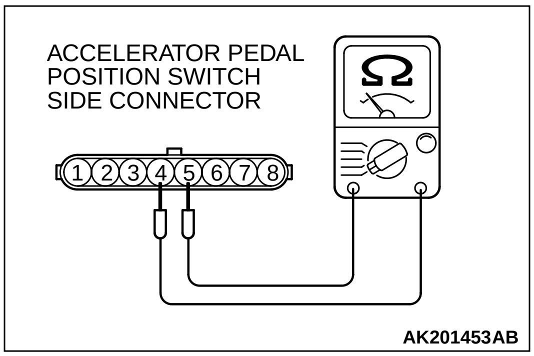
Q: Is DTC P2121 set?

YES : Replace the PCM. Then go to Step 11.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection. Service Points P.00-6.

STEP 7. Check the accelerator pedal position switch.



(1) Disconnect the accelerator pedal position switch connector D-138.



(2) Check the continuity between accelerator pedal position switch side connector terminal No. 4 and No. 5.

Standard value:

Continuity (foot released from accelerator pedal)

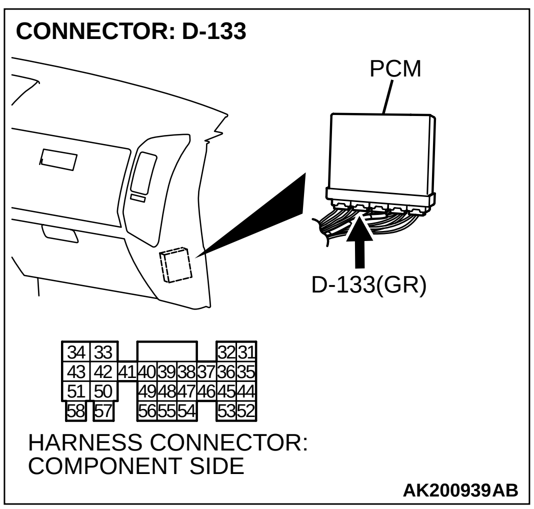
Non-continuity (accelerator pedal depressed)

Q: Is the switch operating properly?

YES : Go to Step 8.

NO : Replace the accelerator pedal position sensor. Then go to Step 11.

STEP 8. Check connector D-133 at PCM for damage.

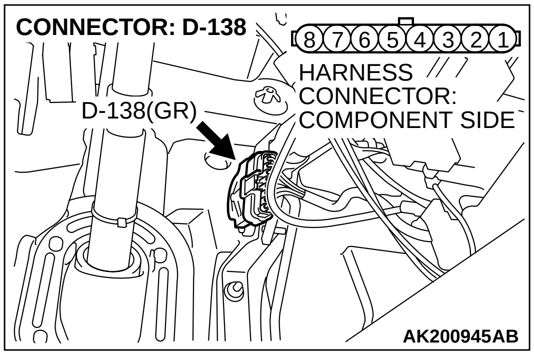


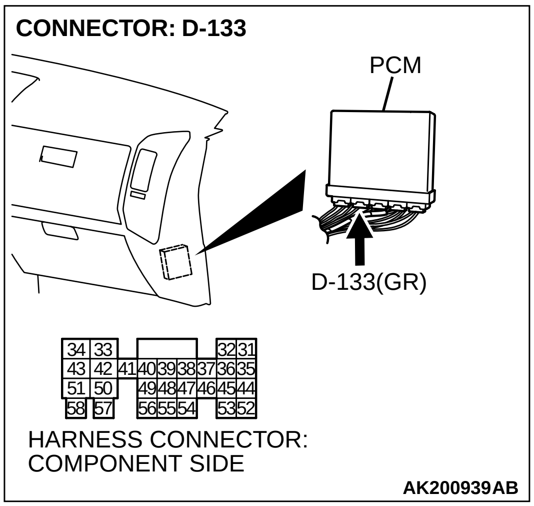
Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 9. Check for short circuit to ground between accelerator pedal position switch connector D-138 (terminal No. 4) and PCM connector D-133 (terminal No. 38).



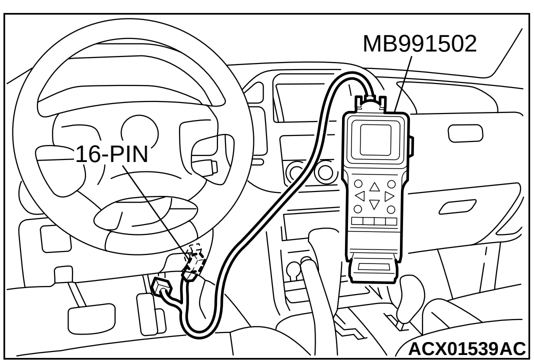


Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP 10. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

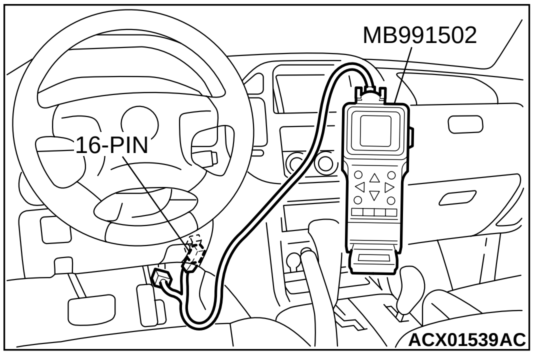
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2121 set?

YES : Replace the PCM. Then go to Step 11.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection. Service Points P.00-6.



STEP 11. Using scan tool MB991502, read the diagnostic trouble code (DTC).

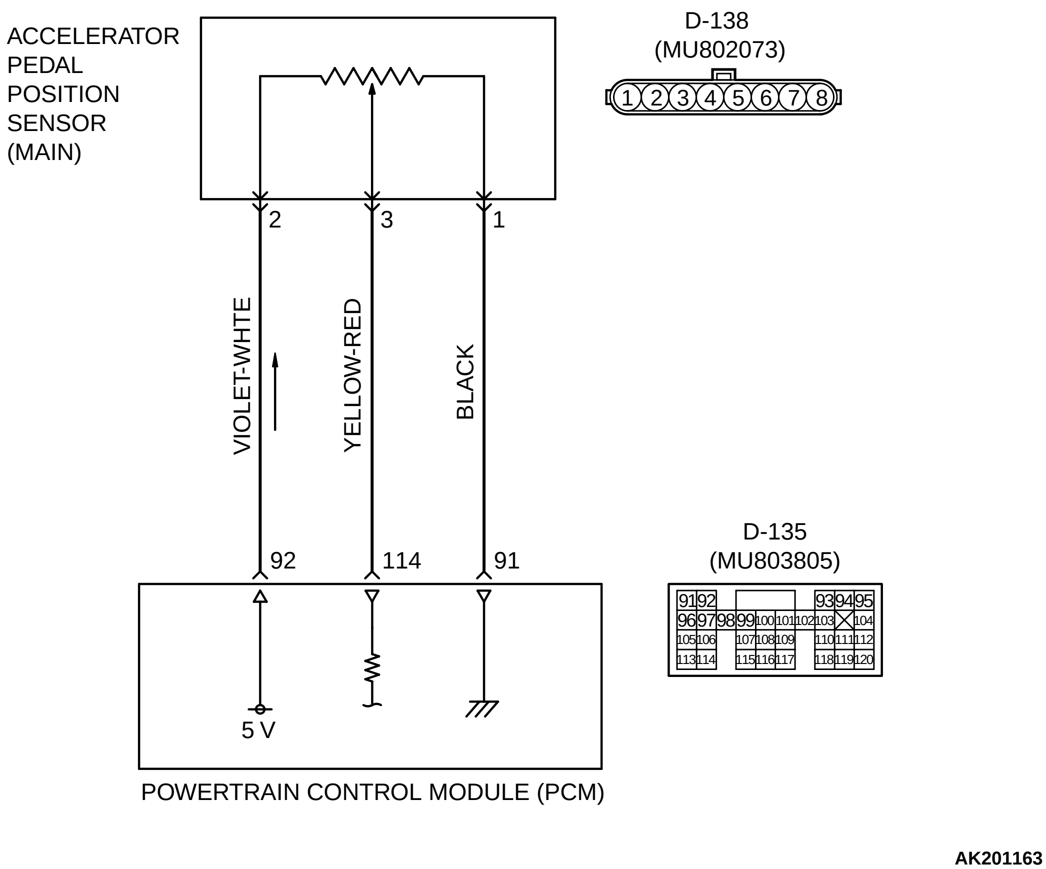
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

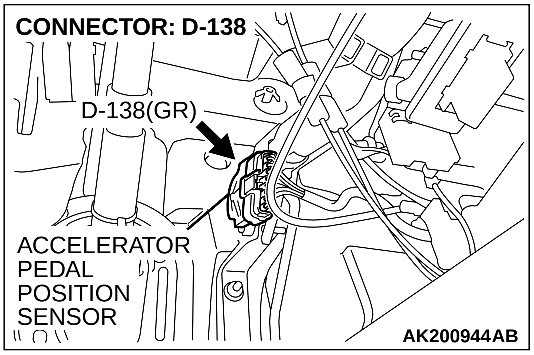
Q: Is DTC P2121 set?

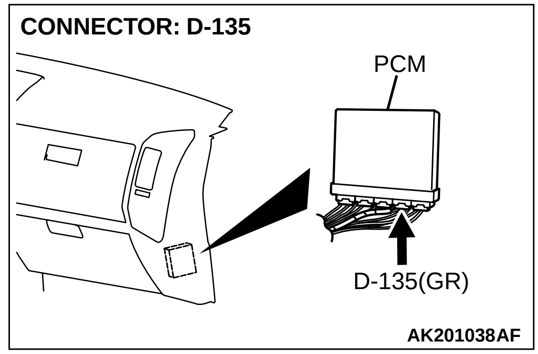
YES : Retry the troubleshooting.
NO : The inspection is complete.

P2122 Accelerator Pedal Position Sensor (Main) Circuit Low Input

Accelerator Pedal Position Sensor (Main) Circuit







CIRCUIT OPERATION

- A 5-volt power supply is applied on the APS (main) power terminal (terminal No. 2) from the PCM (terminal No. 92).
  The ground terminal (terminal No. 1) is grounded with PCM (terminal No. 91).
- When the accelerator pedal is moved from the idle position to the fully opened position, the resister between the APS (main) output terminal (terminal No. 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The APS (main) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.

Judgement Criteria

- APS (main) output voltage is 0.2 volts or less for 1 second.

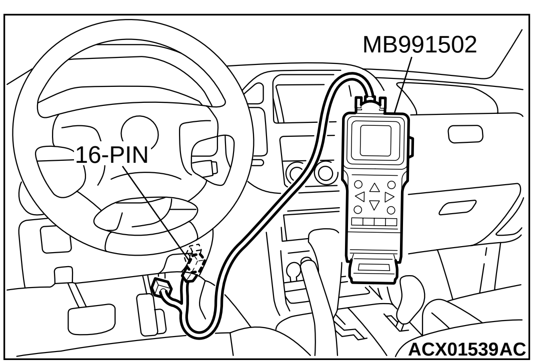
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- APS failed or maladjusted.
- Open or shorted APS (main) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 78: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

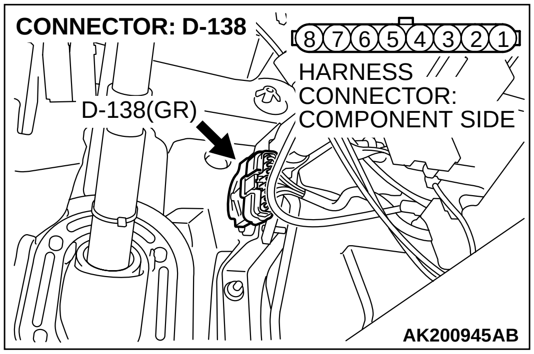
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 78, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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.

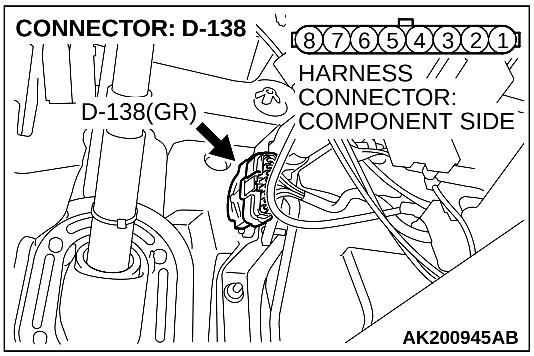


STEP 2. Check connector D-138 at accelerator pedal position sensor for damage.

Q: Is the connector in good condition?

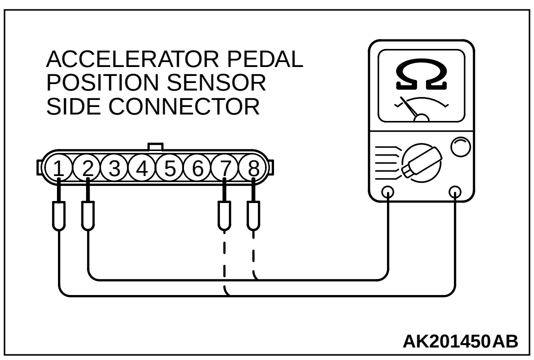
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



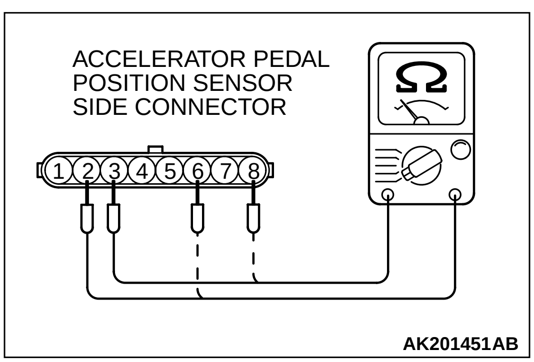
STEP 3. Check the accelerator pedal position sensor.

(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

(4) Move the accelerator pedal from the idle position to the full-open position.

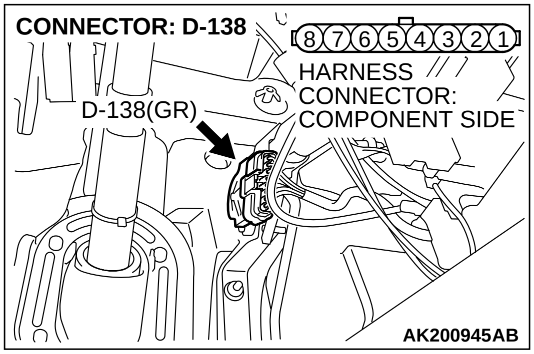
- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

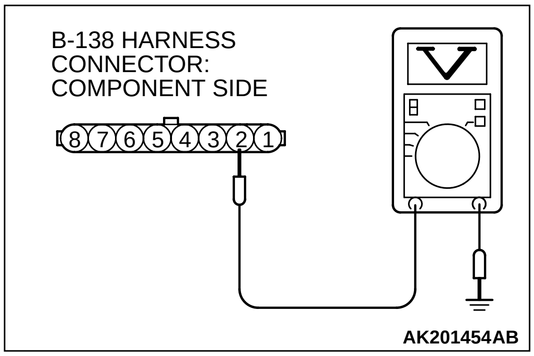
YES : Go to Step 4.

NO : Replace the accelerator pedal position sensor. Then go to Step 12.

STEP 4. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector D-138.



(1) Disconnect the connector D-138 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



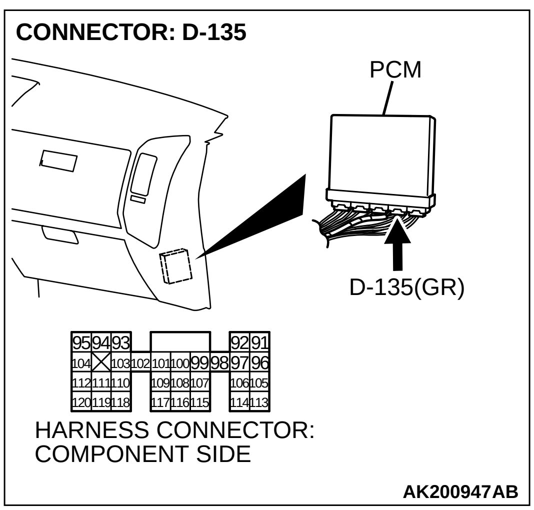
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(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 8.
NO : Go to Step 5.

STEP 5. Check connector D-135 at PCM for damage.



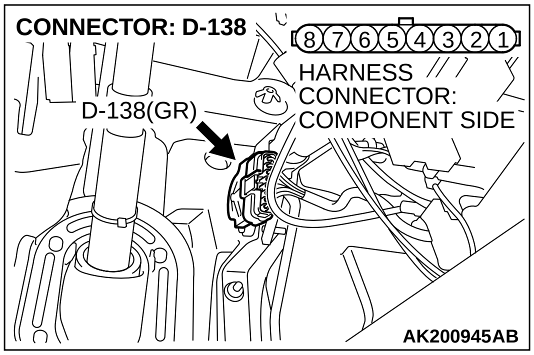
Q: Is the connector in good condition?

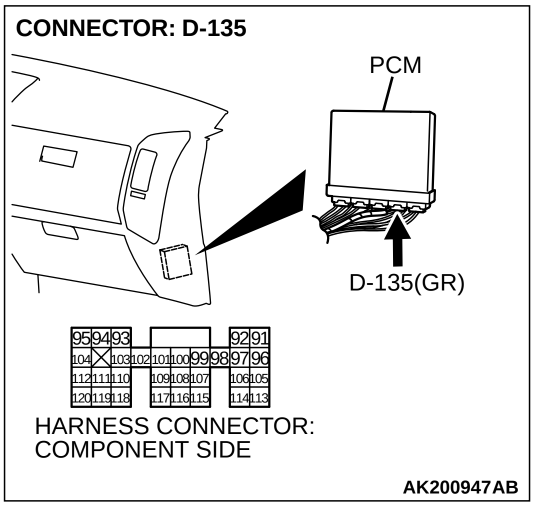
YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector D-138 (terminal No. 2) and PCM connector D-135 (terminal No. 92).

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 12.



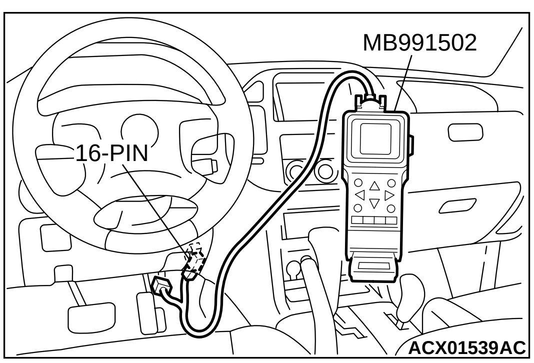


STEP 7. Using scan tool MB991502, check data list item 78: Accelerator Pedal Position Sensor (main).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

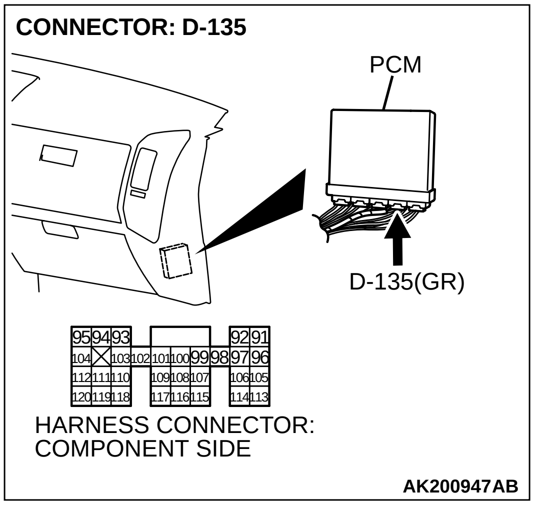
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 78, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 12.

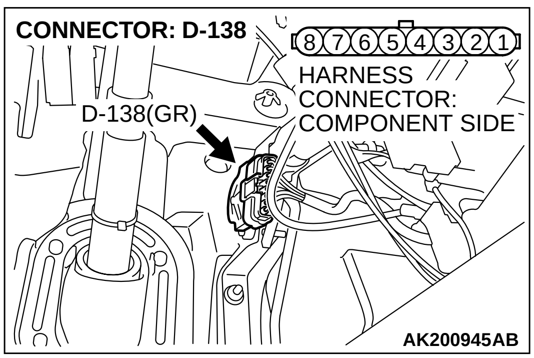


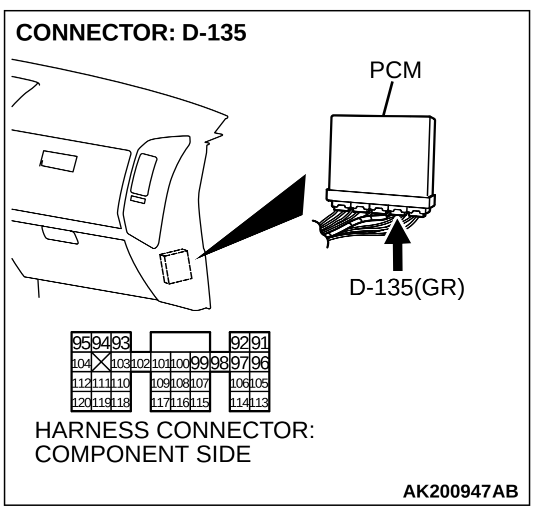
STEP 8. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



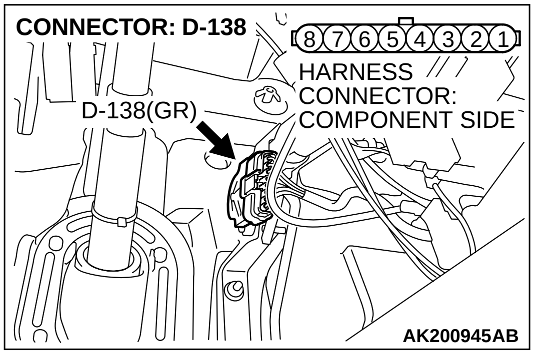


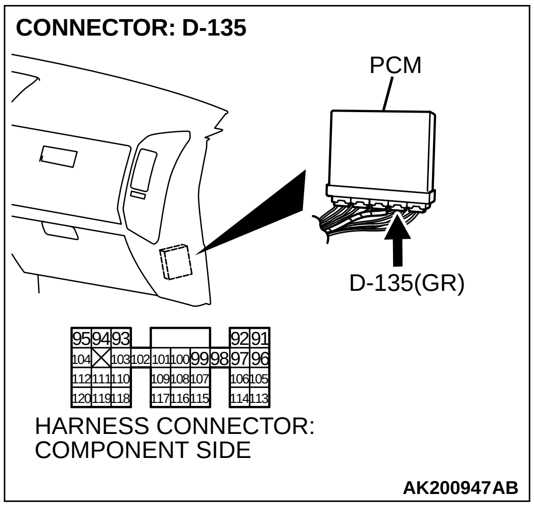
STEP 9. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 2) and PCM connector D-135 (terminal No. 92).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.





STEP 10. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 3) and PCM connector D-135 (terminal No. 114).

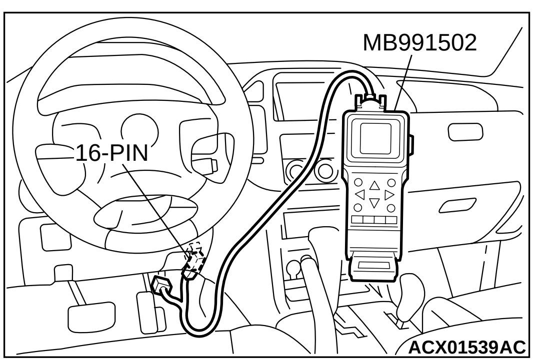
Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Using scan tool MB991502, check data list item 78: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

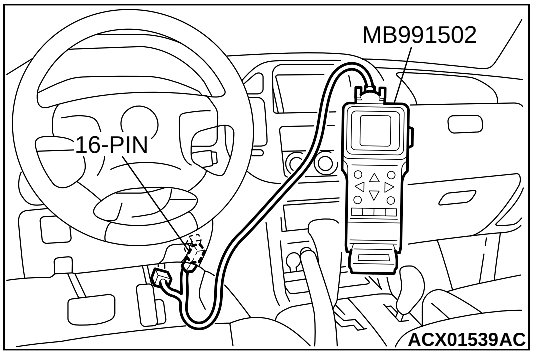


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 78, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 12.



STEP 12. Using scan tool MB991502, read the diagnostic trouble code (DTC).

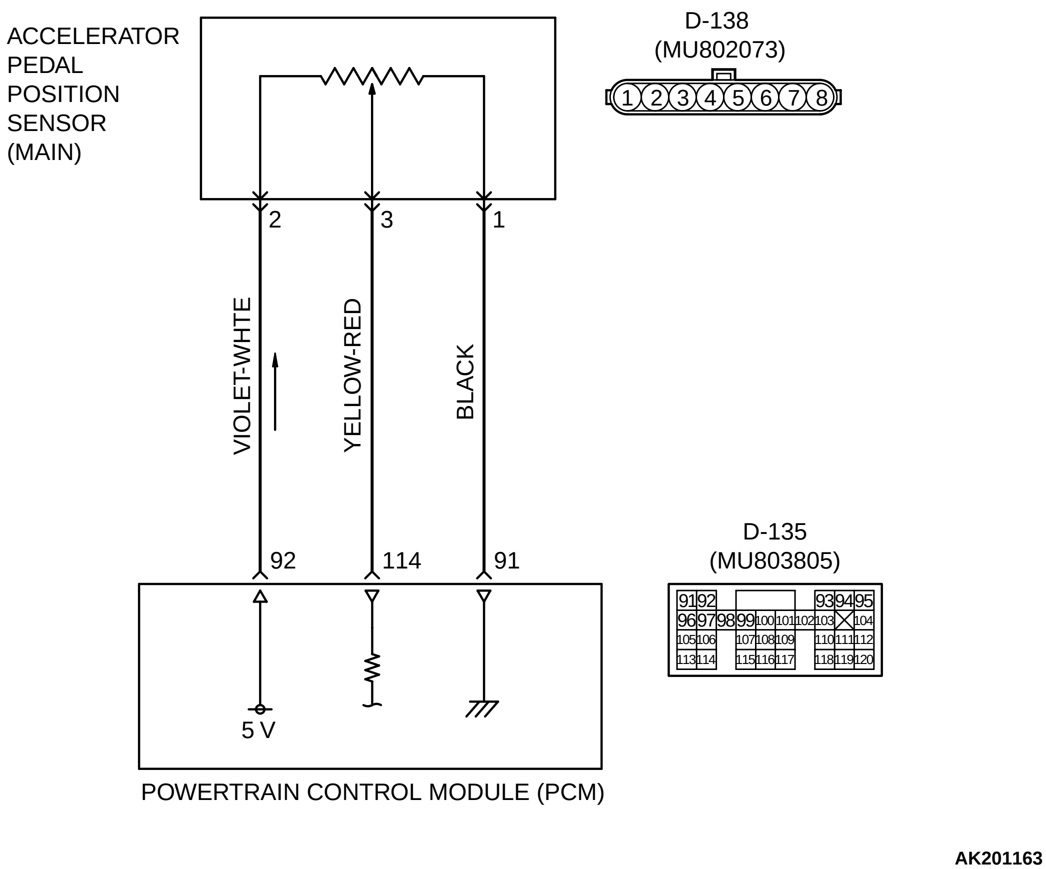
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

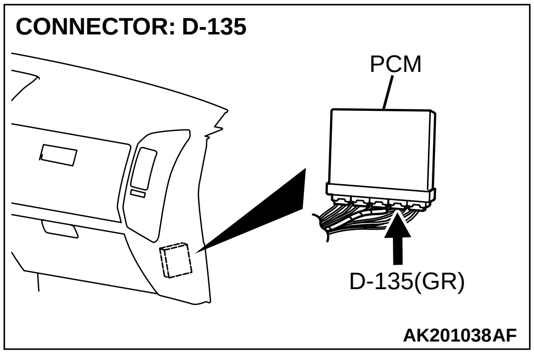
Q: Is DTC P2122 set?

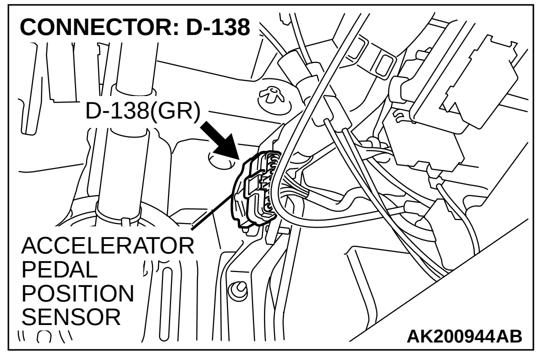
YES : Retry the troubleshooting.
NO : The inspection is complete.

P2123 Accelerator Pedal Position Sensor (Main) Circuit High Input

Accelerator Pedal Position Sensor (Main) Circuit







CIRCUIT OPERATION

- A 5-volt power supply is applied on the APS (main) power terminal (terminal No. 2) from the PCM (terminal No. 92).
  The ground terminal (terminal No. 1) is grounded with PCM (terminal No. 91).
- When the accelerator pedal is moved from the idle position to the fully opened position, the resister between the APS (main) output terminal (terminal No. 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The APS (main) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.
- APS (sub) output voltage is between 0.2 and 2.5 volts.

Judgement Criteria

- APS (sub) output voltage should be 4.5 volts or higher for 1 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

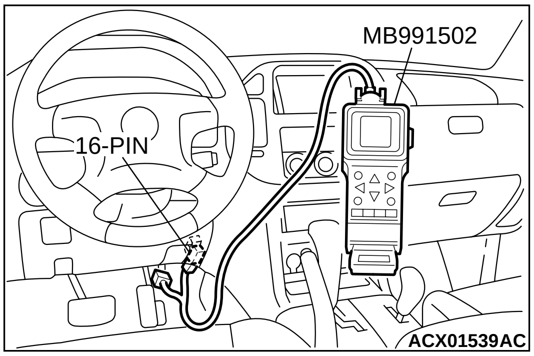
- APS failed or maladjusted.
- Open or shorted APS (main) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 78: Accelerator Pedal Position Sensor (main).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 78, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

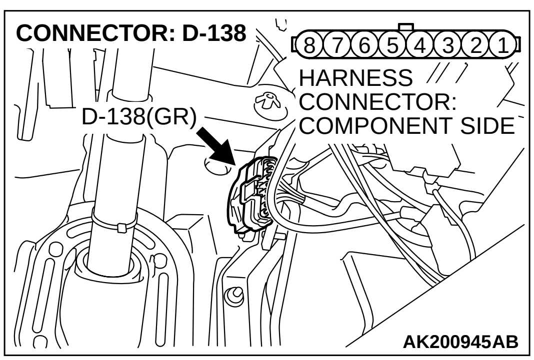
(4) Turn the ignition switch to the "LOCK"(OFF) position.

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.

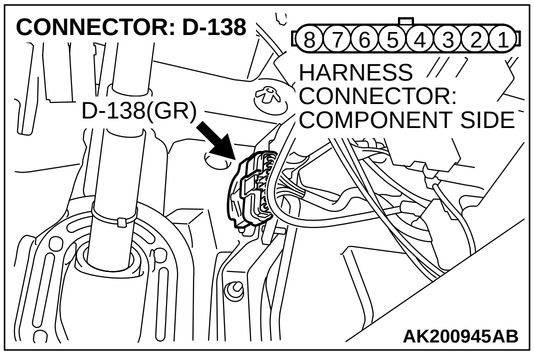
STEP 2. Check connector D-138 at accelerator pedal position sensor for damage.



Q: Is the connector in good condition?

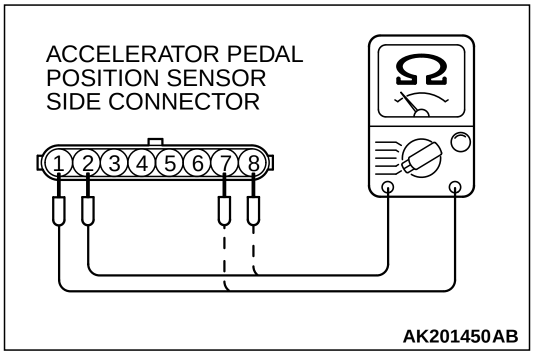
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



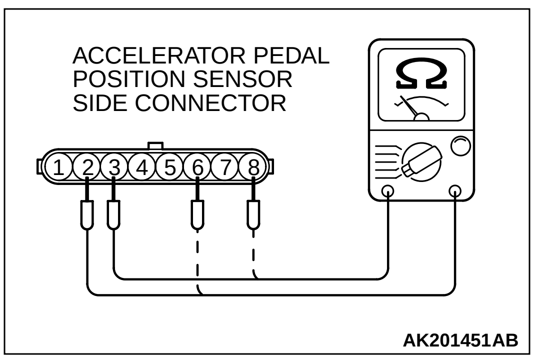
STEP 3. Check the accelerator pedal position sensor.

(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

(4) Move the accelerator pedal from the idle position to the full-open position.

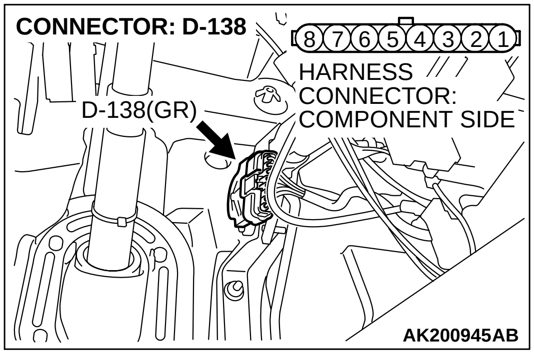
- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

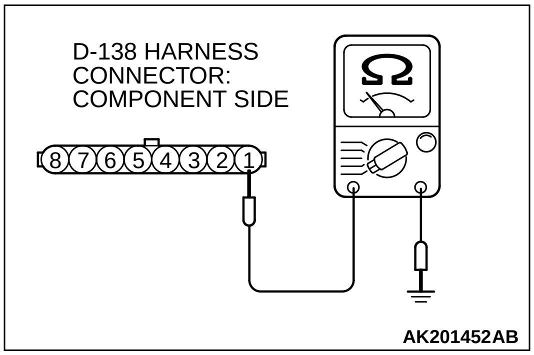
YES : Go to Step 4.

NO : Replace the accelerator pedal position sensor. Then go to Step 8.

STEP 4. Check the continuity at accelerator pedal position sensor harness side connector D-138.



(1) Disconnect the connector D-138 and measure at the harness side.

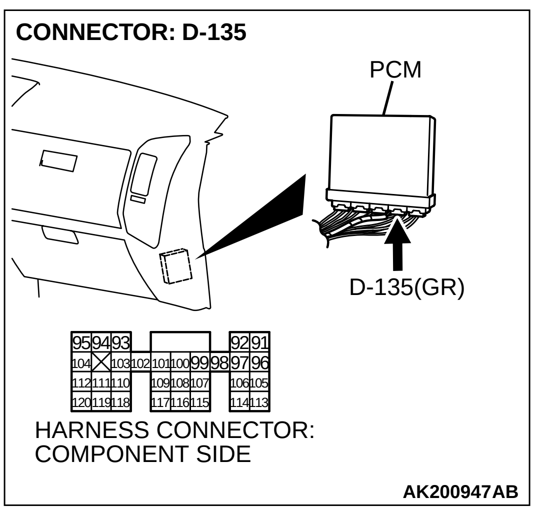


(2) Measure the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 7.
NO : Go to Step 5.

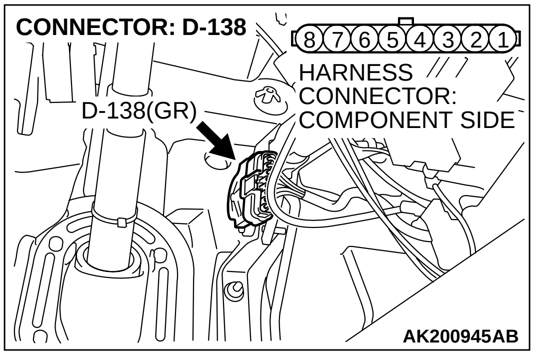
STEP 5. Check connector D-135 at PCM for damage.

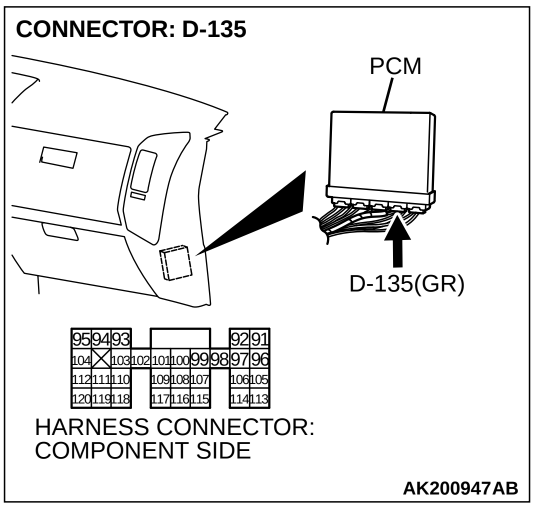


Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 6. Check for open circuit and harness damage between accelerator pedal position sensor connector D-138 (terminal No. 1) and PCM connector D-135 (terminal No. 91).





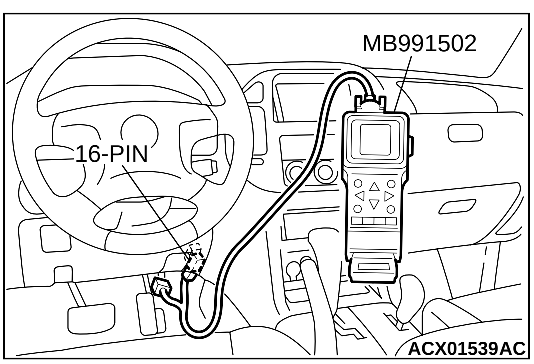
Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Using scan tool MB991502, check data list item 78: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

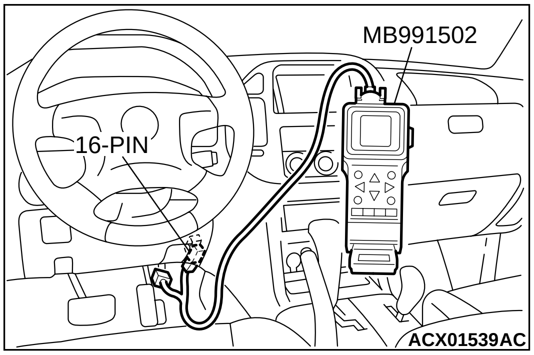


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 78, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 8.



STEP 8. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2123 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2126: Accelerator Pedal Position Sensor (Sub) Circuit Range/Performance Problem

Accelerator Pedal Position Sensor (Sub) Circuit Range/Performance Problem Circuit

- Refer to, DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit P.13Ac-619.
- Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Accelerator Pedal Position Switch Circuit P.13Ad-110.

CIRCUIT OPERATION

- Refer to, DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit P.13Ac-619.
- Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Accelerator Pedal Position Switch Circuit P.13Ad-110.

TECHNICAL DESCRIPTION

- PCM checks the APS (sub) output signal characteristics for abnormal conditions.

DTC SET CONDITIONS

Check Condition

- Ignition switch "ON" position.
- Accelerator pedal position switch: ON
- APS (main) failure detected.

Judgement Criteria

- APS (sub) output voltage is 2.5 volts or higher for 1 second.

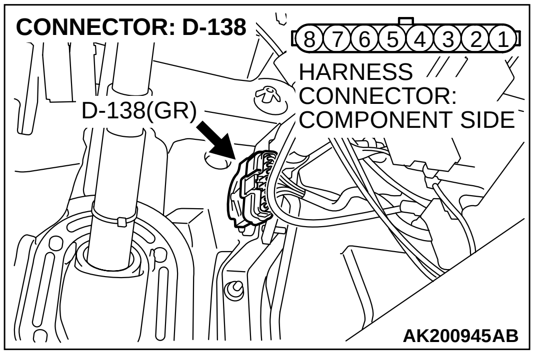
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- APS failed or maladjusted.
- Open or shorted APS (sub) circuit, or loose connector.
- Accelerator pedal position switch failed or maladjusted.
- Open or shorted accelerator pedal position switch circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

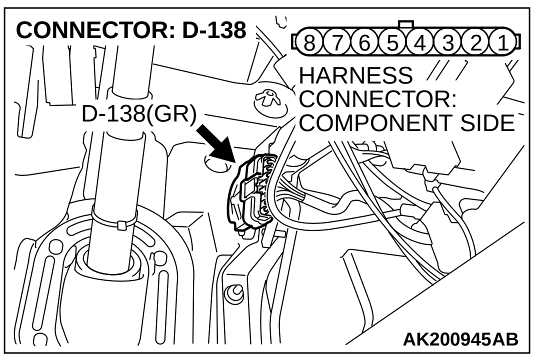


STEP 1. Check connector D-138 at accelerator pedal position sensor and accelerator pedal position switch for damage.

Q: Is the connector in good condition?

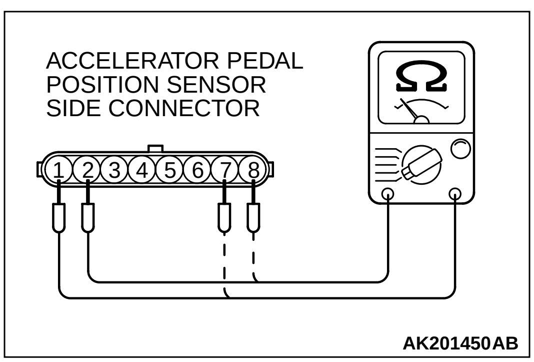
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



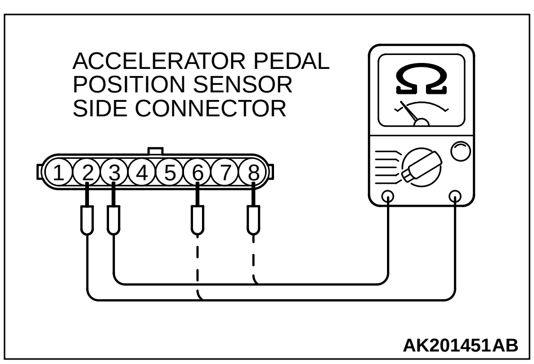
STEP 2. Check the accelerator pedal position sensor.

(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

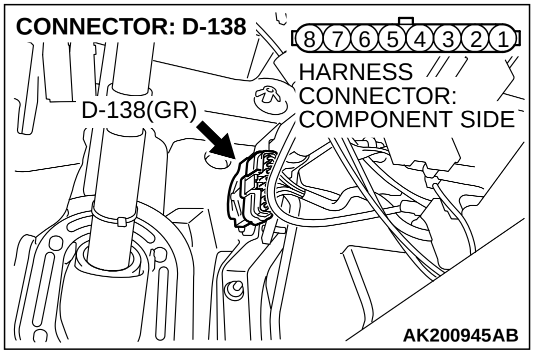
(4) Move the accelerator pedal from the idle position to the full-open position.

- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

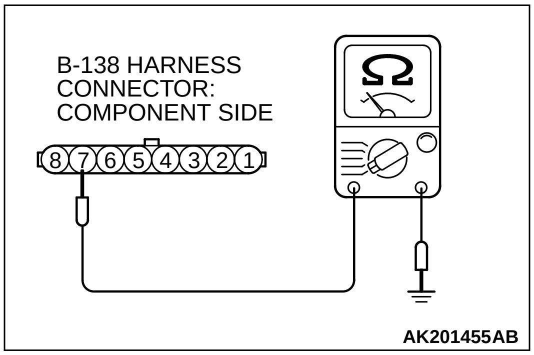
YES : YES: Go to Step 3.

NO : Replace the accelerator pedal position sensor. Then go to Step 11.



STEP 3. Check the continuity at accelerator pedal position sensor harness side connector D-138.

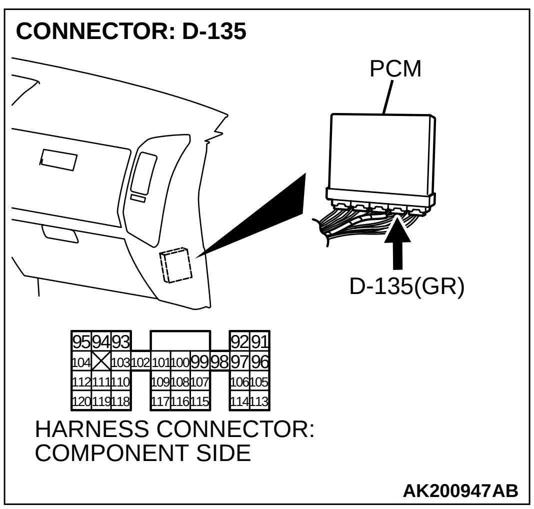
(1) Disconnect the connector D-138 and measure at the harness side.



(2) Measure the continuity between terminal No. 7 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

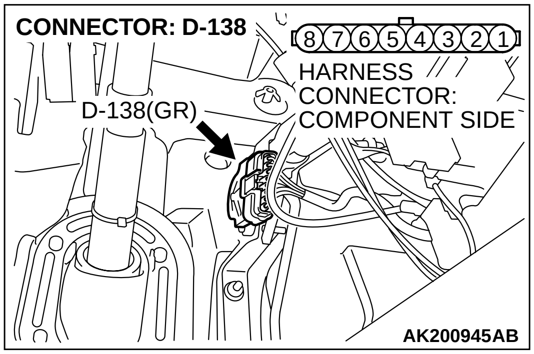
YES : Go to Step 7.
NO : Go to Step 4.

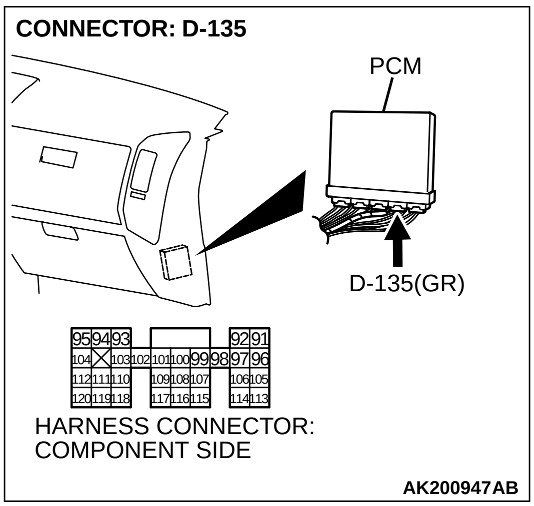


STEP 4. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



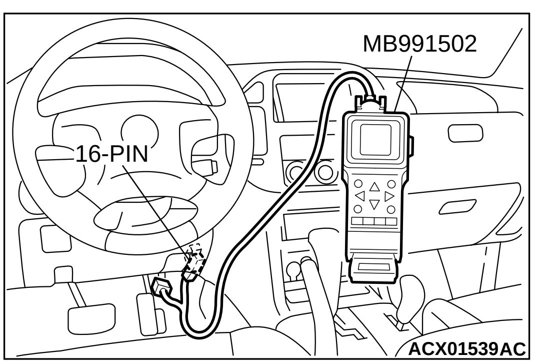


STEP 5. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 7) and PCM connector D-135 (terminal No. 96).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

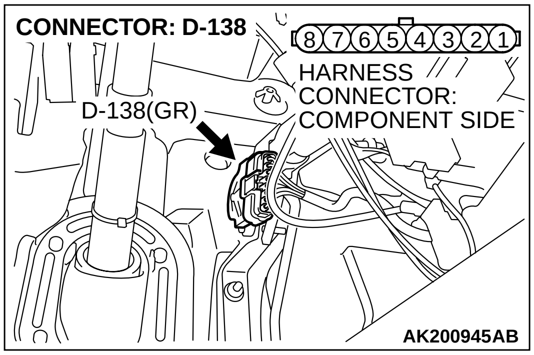
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2126 set?

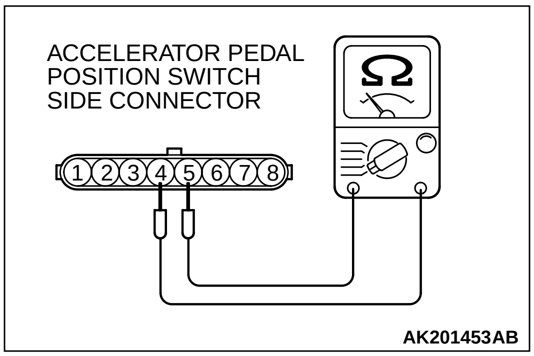
YES : Replace the PCM.Then go to Step 11.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

STEP 7. Check the accelerator pedal position switch.



(1) Disconnect the accelerator pedal position switch connector D-138.



(2) Check the continuity between accelerator pedal position switch side connector terminal No. 4 and No. 5.

Standard value:

Continuity (foot released from accelerator pedal)

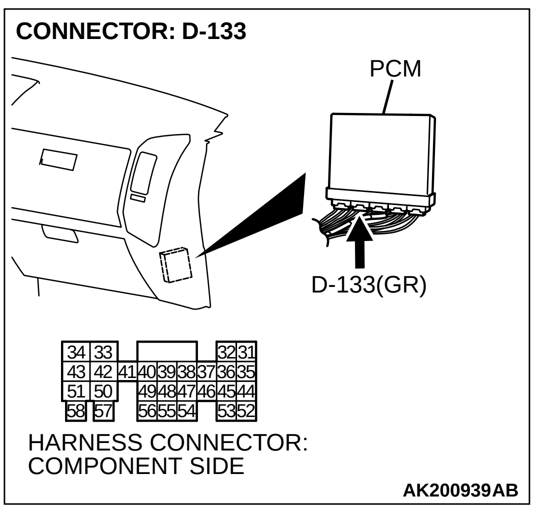
Non-continuity (accelerator pedal depressed)

Q: Is the switch operating properly?

YES : Go to Step 8.

NO : Replace the accelerator pedal position sensor. Then go to Step 11.

STEP 8. Check connector D-133 at PCM for damage.

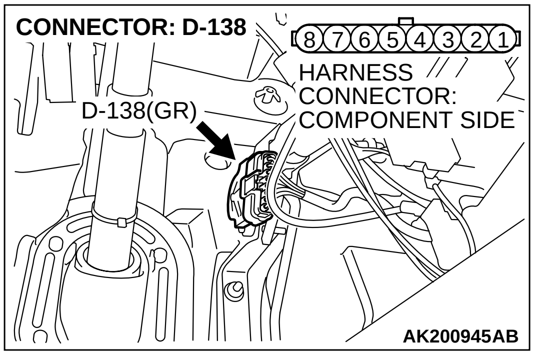


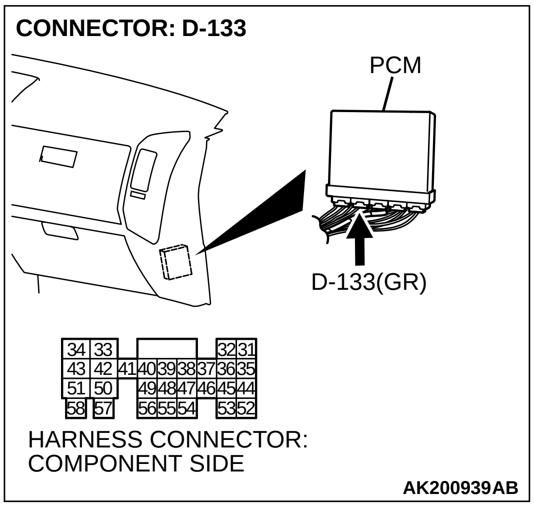
Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 9. Check for short circuit to ground between accelerator pedal position switch connector D-138 (terminal No. 4) and PCM connector D-133 (terminal No. 38).

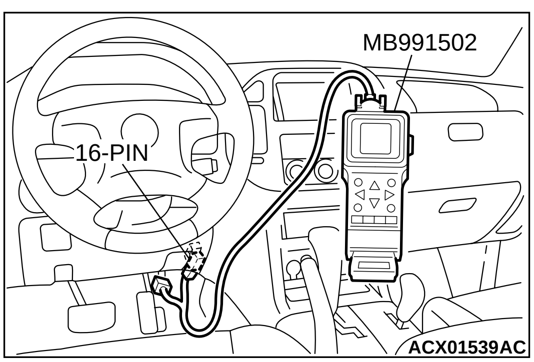




Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 11.

STEP 10. Using scan tool MB991502, read the diagnostic trouble code (DTC).



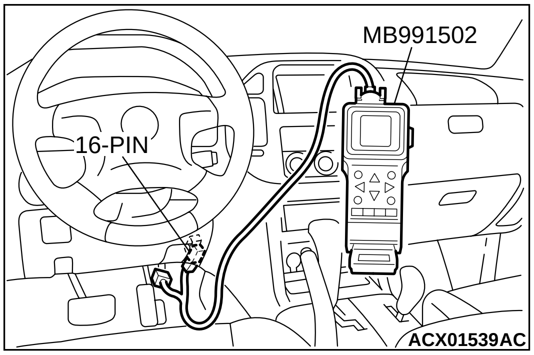
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2126 set?

YES : Replace the PCM.Then go to Step 11.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.



STEP 11. Using scan tool MB991502, read the diagnostic trouble code (DTC).

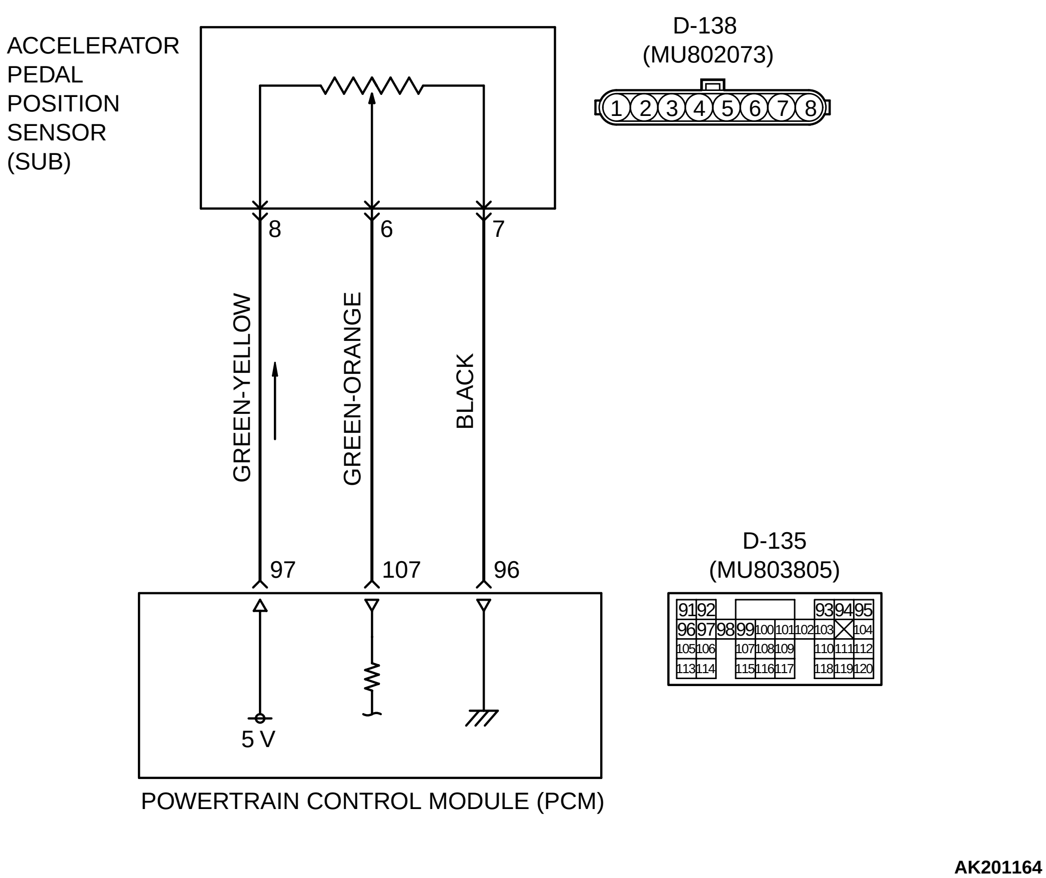
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

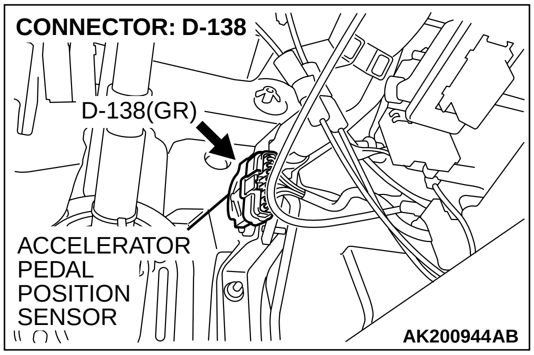
Q: Is DTC P2126 set?

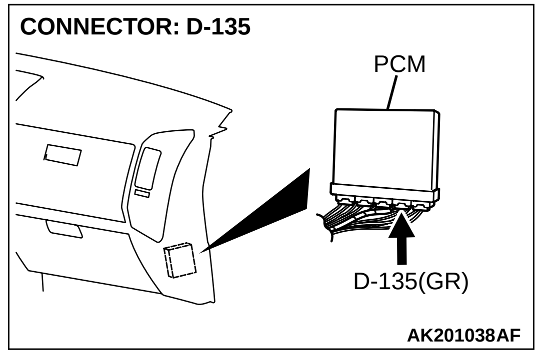
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2127: Accelerator Pedal Position Sensor (Sub) Circuit Low Input

Accelerator Pedal Position Sensor (Sub) Circuit







CIRCUIT OPERATION

- A 5-volt power supply is applied on the APS (sub) power terminal (terminal No. 8) from the PCM (terminal No. 97).
  The ground terminal (terminal No. 7) is grounded with PCM (terminal No. 96).
- When the accelerator pedal is moved from the idle position to the fully opened position, the resister between the APS (sub) output terminal (terminal No. 6) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The APS (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.

Judgement Criteria

- APS2 output voltage is 0.2 volts or less for 1 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

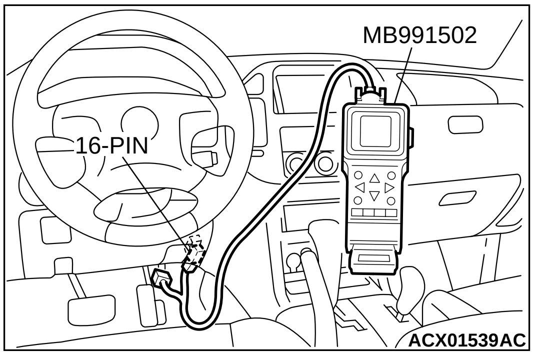
- APS failed or maladjusted.
- Open or shorted APS (sub) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 77: Accelerator Pedal Position Sensor (sub).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 77, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

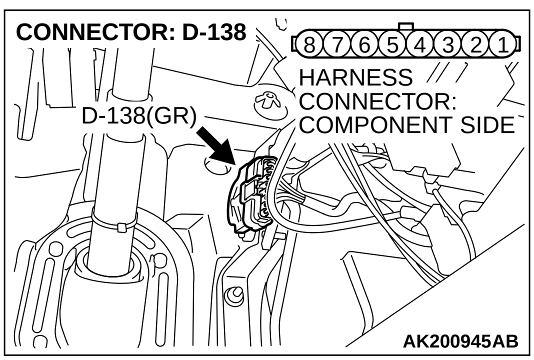
(4) Turn the ignition switch to the "LOCK"(OFF) position.

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 connector D-138 at accelerator pedal position sensor for damage.

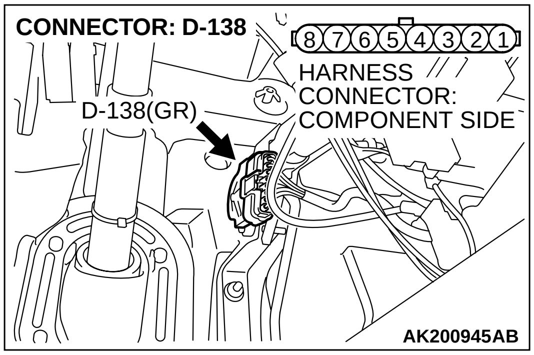


Q: Is the connector in good condition?

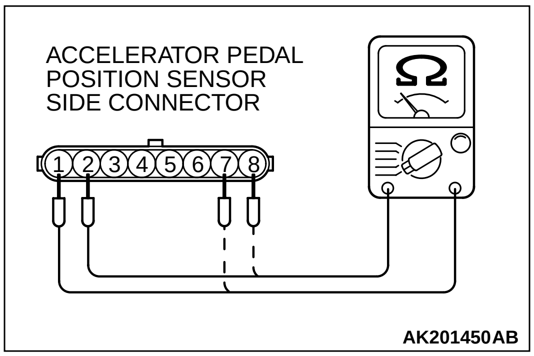
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the accelerator pedal position sensor.

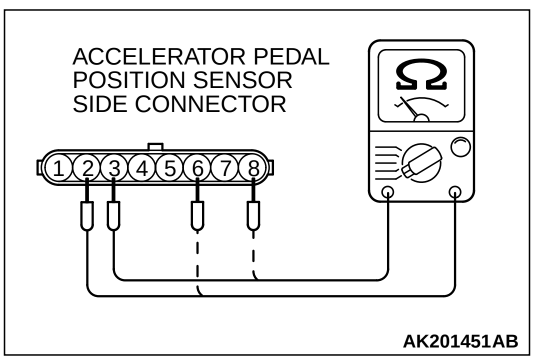


(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

(4) Move the accelerator pedal from the idle position to the full-open position.

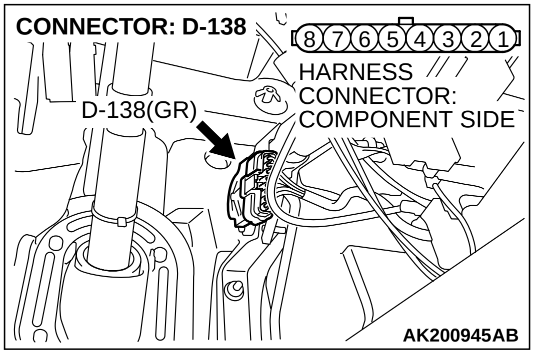
- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

YES : Go to Step 4.

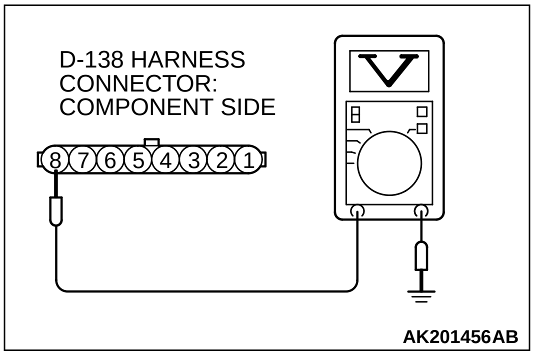
NO : Replace the accelerator pedal position sensor. Then go to Step 12.

STEP 4. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector D-138.



(1) Disconnect the connector D-138 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

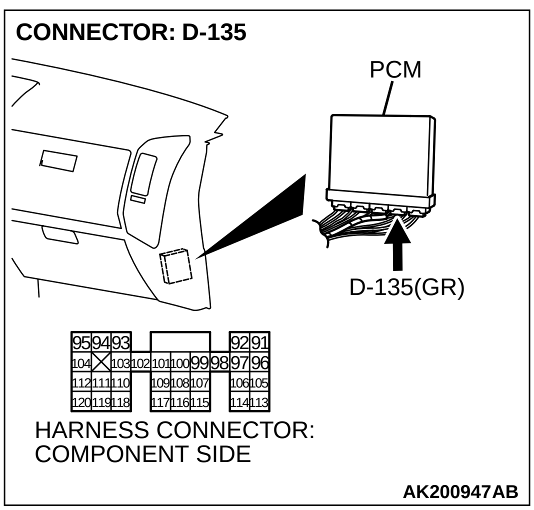
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the measured voltage between 4.8 and 5.2 volts?

YES : Go to Step 8.

NO : Go to Step 5.

STEP 5. Check connector D-135 at PCM for damage.

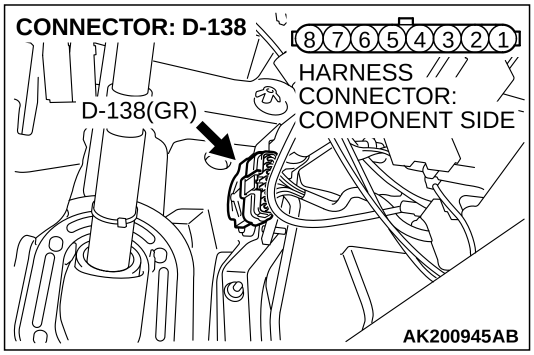


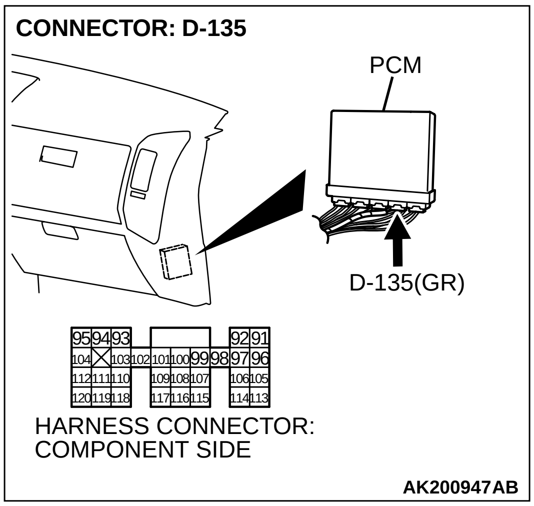
Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector D-138 (terminal No. 8) and PCM connector D-135 (terminal No. 97).



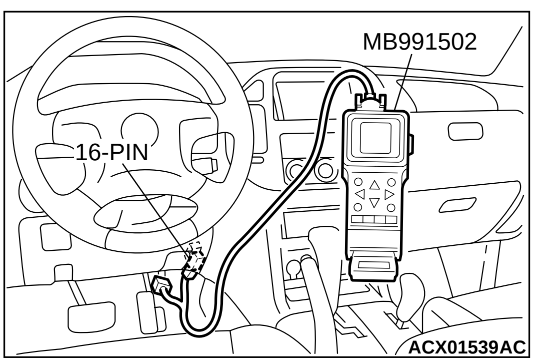


Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 12.

STEP 7. Using scan tool MB991502, check data list item 77: Accelerator Pedal Position Sensor (sub).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the data reading mode for item 77, Accelerator Pedal Position Sensor (sub).

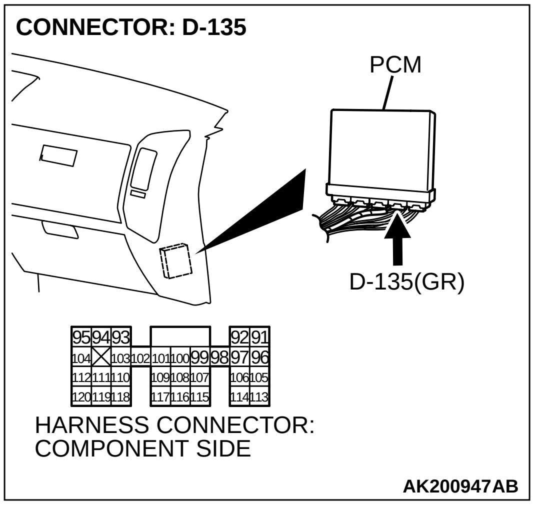
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 12.

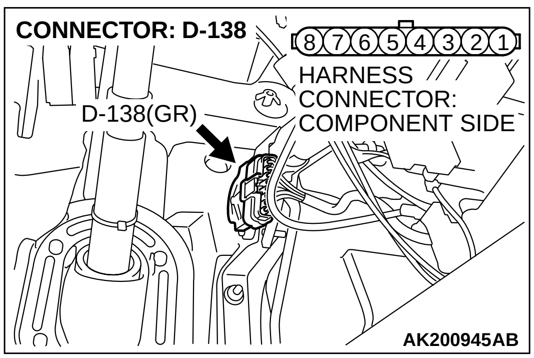


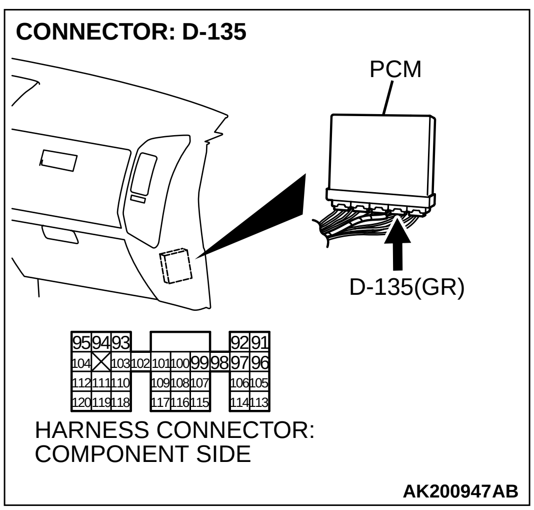
STEP 8. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



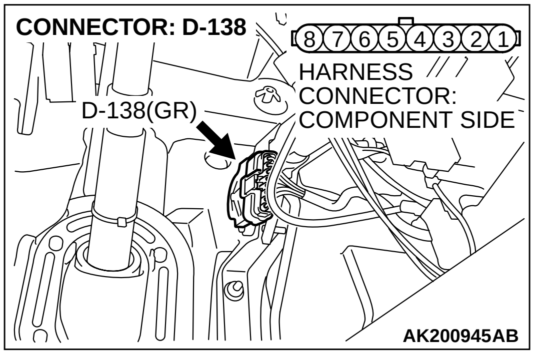


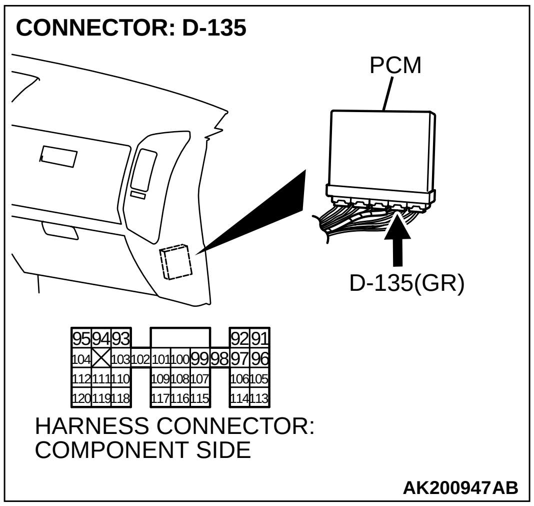
STEP 9. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 8) and PCM connector D-135 (terminal No. 97).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.

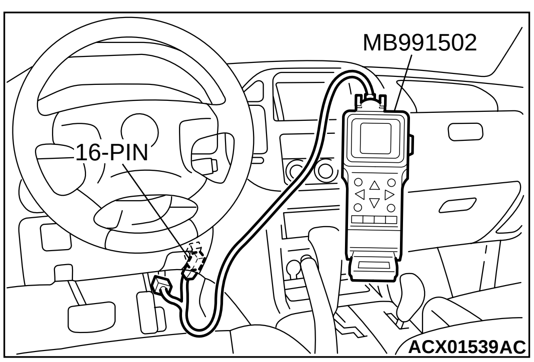




STEP 10. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 6) and PCM connector D-135 (terminal No. 107)

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.



STEP 11. Using scan tool MB991502, check data list item 77: Accelerator Pedal Position Sensor (sub).

⚠ CAUTION

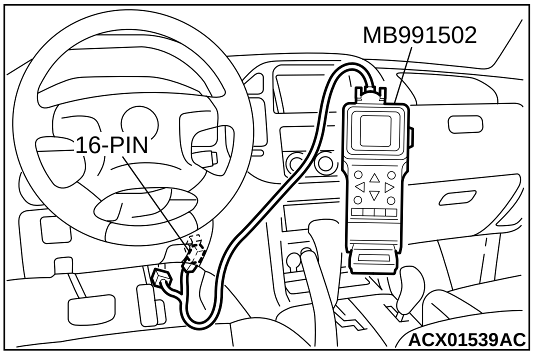
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 77, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 12.



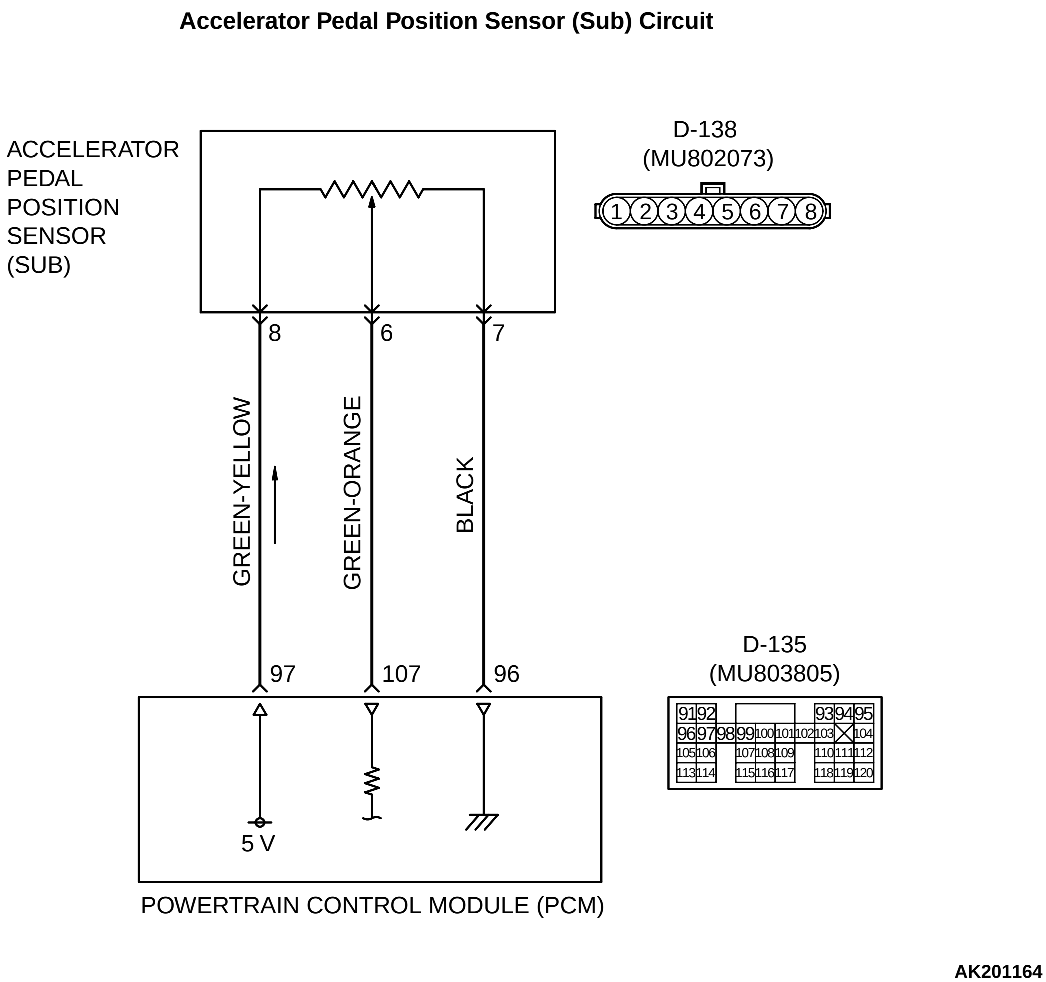
STEP 12. Using scan tool MB991502, read the diagnostic trouble code (DTC).

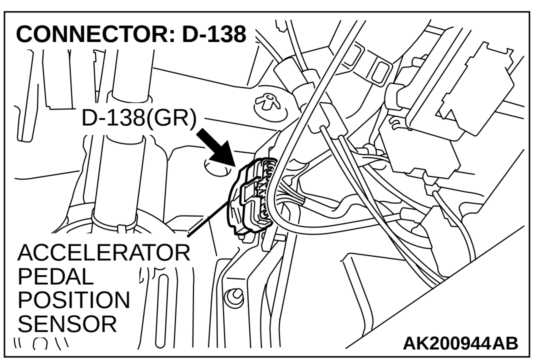
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

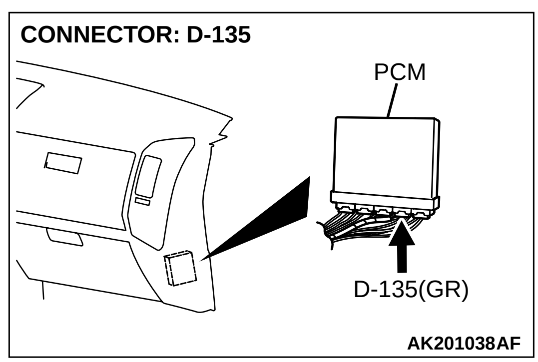
Q: Is DTC P2127 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2128: Accelerator Pedal Position Sensor (Sub) Circuit High Input







CIRCUIT OPERATION

- A 5-volt power supply is applied on the APS (sub) power terminal (terminal No. 8) from the PCM (terminal No. 97).
  The ground terminal (terminal No. 7) is grounded with PCM (terminal No. 96).
- When the accelerator pedal is moved from the idle position to the fully opened position, the resister between the APS (sub) output terminal (terminal No. 6) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The APS (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The PCM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

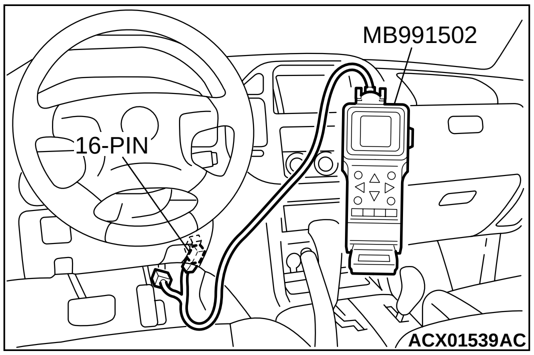
- Ignition switch "ON" position.
- APS (main) output voltage is between 0.2 and 2.5 volts.

Judgement Criteria

- APS (sub) output voltage is 4.5 volts or higher for 1 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- APS failed or maladjusted.
- Open or shorted APS (sub) circuit, or loose connector.
- PCM failed.



DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 77: Accelerator Pedal Position Sensor (sub).

⚠ CAUTION

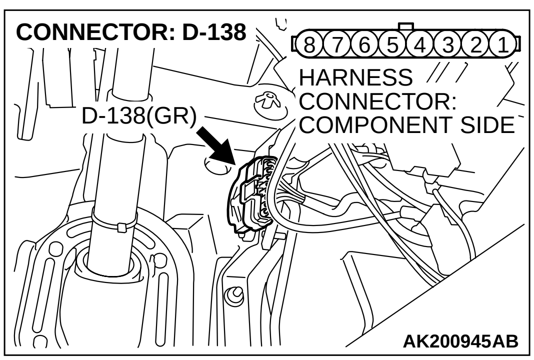
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 77, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

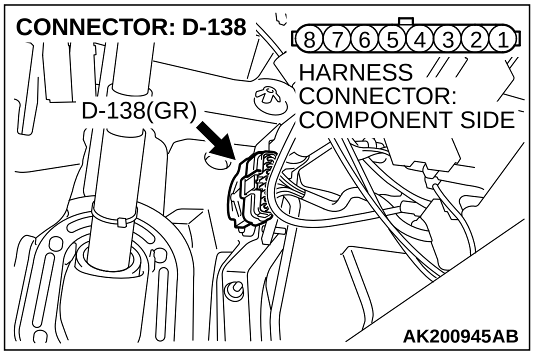
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector D-138 at accelerator pedal position sensor for damage.

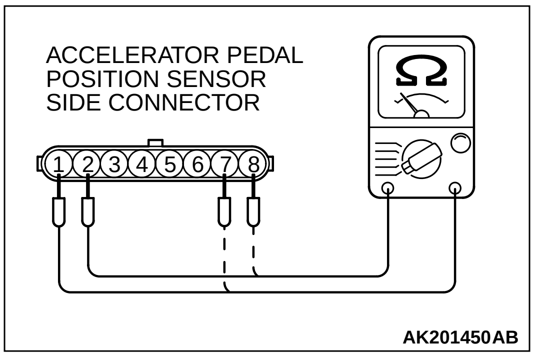
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



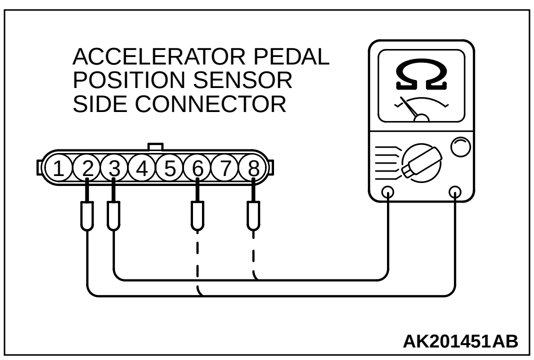
STEP 3. Check the accelerator pedal position sensor.

(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No. 1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

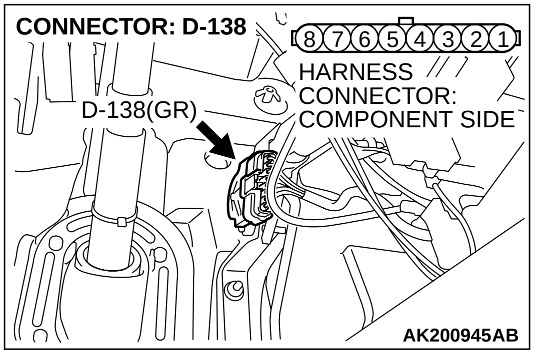
(4) Move the accelerator pedal from the idle position to the full-open position.

- Resistance value changes in accordance with the accelerator pedal depression smoothly.

Q: Is the resistance normal?

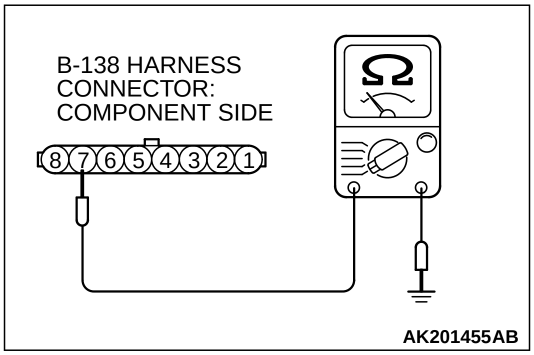
YES : Go to Step 4.

NO : Replace the accelerator pedal position sensor. Then go to Step 8.



STEP 4. Check the continuity at accelerator pedal position sensor harness side connector D-138.

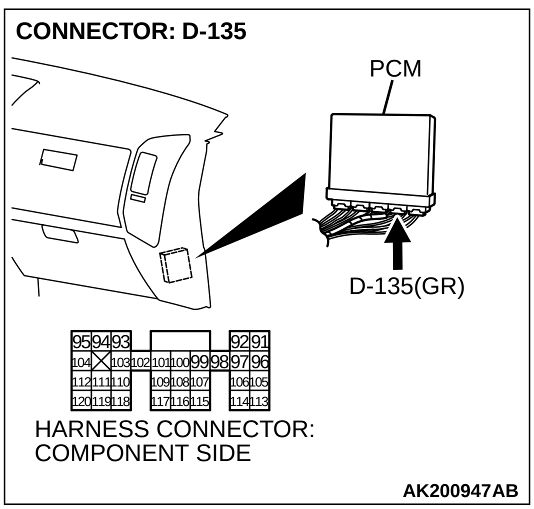
(1) Disconnect the connector D-138 and measure at the harness side.



(2) Measure the continuity between terminal No. 7 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

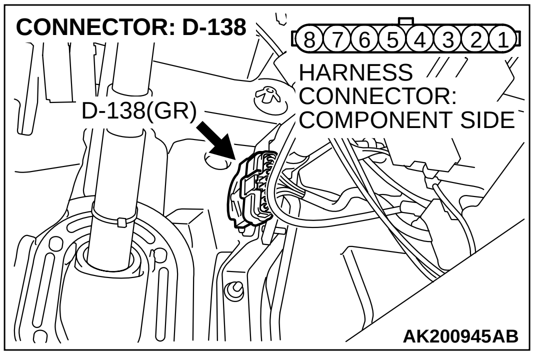
YES : Go to Step 7.
NO : Go to Step 5.

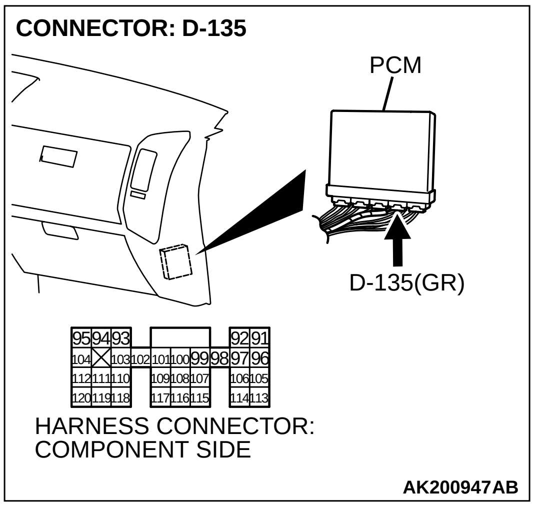


STEP 5. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

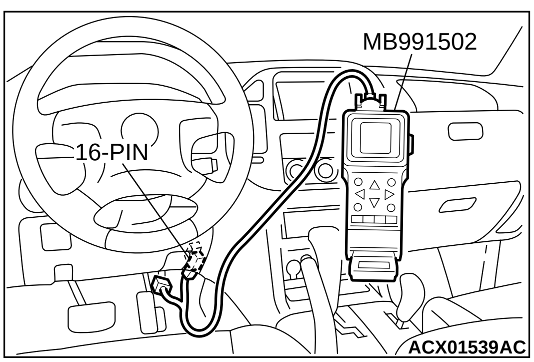




STEP 6. Check for open circuit and harness damage between accelerator pedal position sensor connector D-138 (terminal No. 7) and PCM connector D-135 (terminal No. 96.)

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.



STEP 7. Using scan tool MB991502, check data list item 77: Accelerator Pedal Position Sensor (sub).

⚠ CAUTION

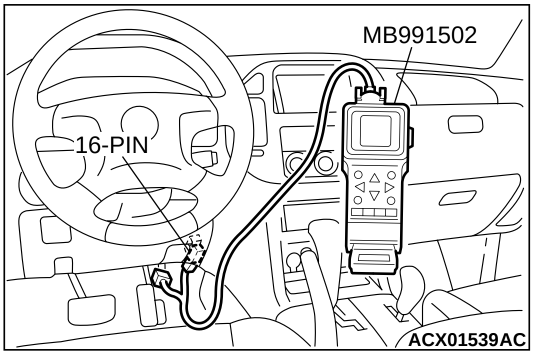
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 77, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.905 and 1.165 volts when foot is released from accelerator pedal.
- Output voltage is 4.035 volts or higher when accelerator pedal is fully depressed.

(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 PCM. Then go to Step 8.



STEP 8. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2128 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2135: Throttle Position Sensor (Main and Sub) Range/Performance Problem

Throttle Position Sensor (Main and Sub) Range/Performance Problem Circuit

- Refer to, DTC P0122 – Throttle Position Sensor (Main) Circuit P.13Ac-81.
- Refer to, DTC P0222 – Throttle Position Sensor (Sub) Circuit P.13Ac-330.

CIRCUIT OPERATION

- Refer to, DTC P0122 – Throttle Position Sensor (Main) Circuit P.13Ac-81.
- Refer to, DTC P0222 – Throttle Position Sensor (Sub) Circuit P.13Ac-330.

TECHNICAL DESCRIPTION

- PCM checks the TPS output signal characteristics for abnormal conditions.

DTC SET CONDITIONS

Check Conditions

- Ignition switch "ON" position.
- TPS (main) output voltage is higher than 0.35 volts and lower than 2.5 volts.
- TPS (sub) output voltage is higher than 2.25 volts and lower than 4.8 volts.

Judgement Criteria

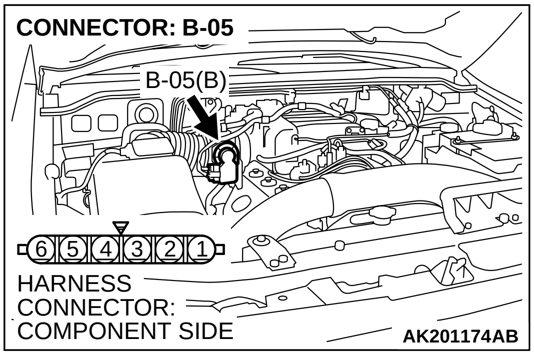
- Voltage obtained with the formula given below is 0.3 volts or higher for 0.5 seconds: TPS (main) output voltage - [TPS (sub) output voltage - 2 volts]

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS (Main) circuit, or loose connector.
- PCM failed.

DIAGNOSIS

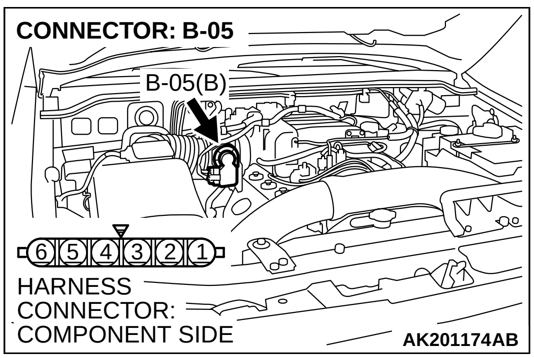
Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Check connector B-05 at throttle position sensor for damage.

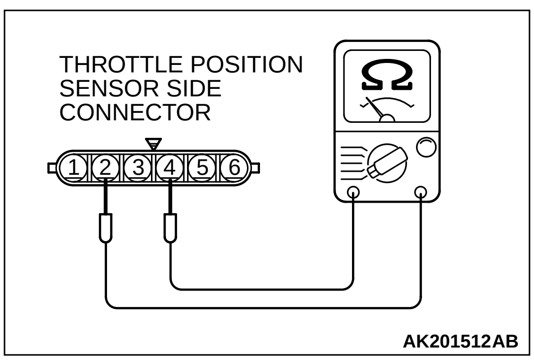
Q: Is the connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.



STEP 2. Check the throttle position sensor.

(1) Disconnect the connector B-05.

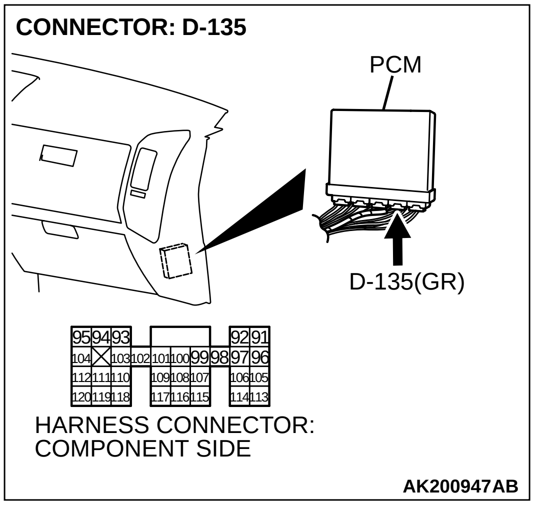


(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 4.

Standard value: 2 – 4 kiloohms

Q: Is the measured resistance between 2 and 4 kiloohms?

YES : Go to Step 3.
NO : Replace the throttle body ASSY. Then go to Step 7.



STEP 3. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

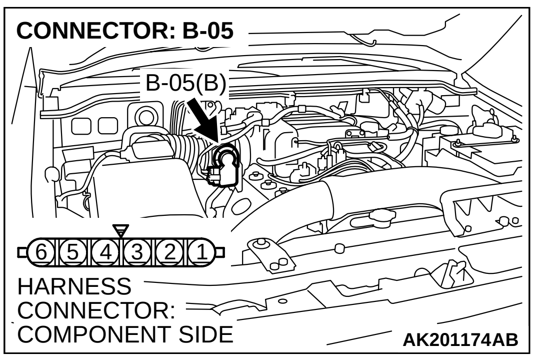
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

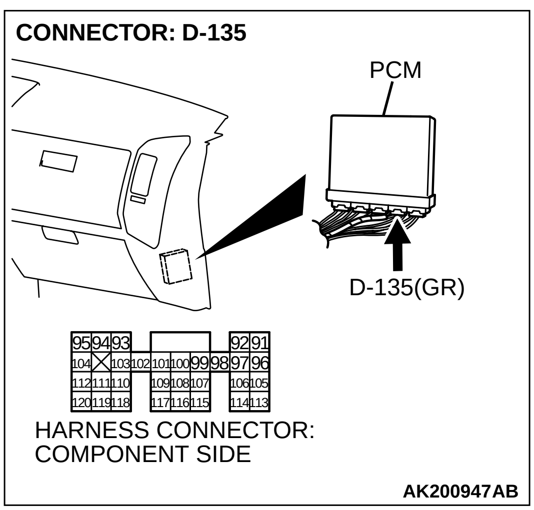
STEP 4. Check for short circuit to ground between throttle position sensor connector B-05 (terminal No. 1) and PCM connector D-135 (terminal No. 115).

Q: Is the harness wire in good condition?

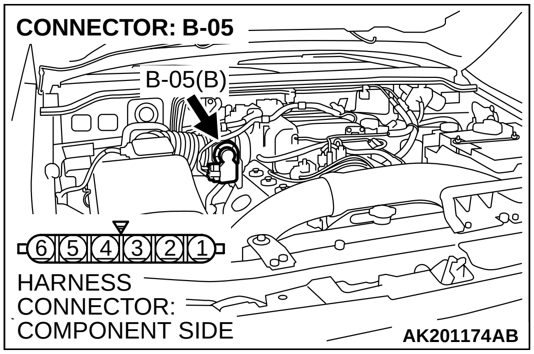
YES : Go to Step 5.

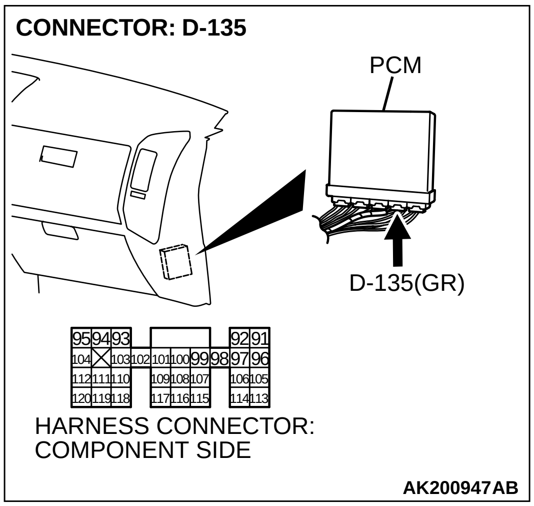
NO : Repair it. Then go to Step 7.





STEP 5. Check for short circuit to ground between throttle position sensor connector B-05 (terminal No. 3) and PCM connector D-135 (terminal No. 113).

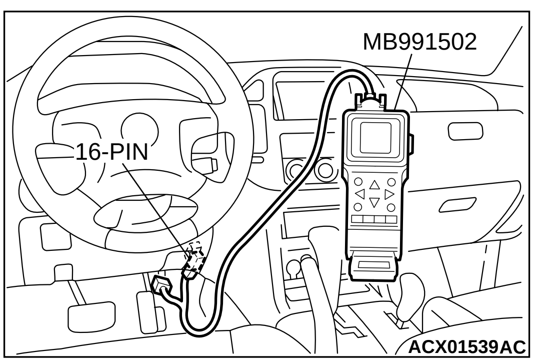




Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 7.

STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).



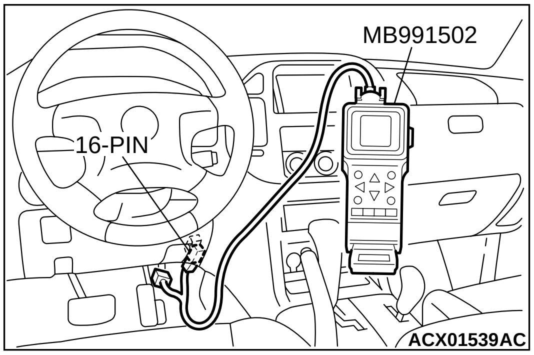
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2135 set?

YES : Replace the PCM. Then go to Step 7.
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 7. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2135 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2138: Accelerator Pedal Position Sensor (Main and Sub) Circuit Range/Performance Problem

Accelerator Pedal Position Sensor (Main and Sub) Range/Performance Problem Circuit

- Refer to, DTC P2122 – Accelerator Pedal Position Sensor (Main) Circuit P.13Ac-600.
- Refer to, DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit P.13Ac-619.

CIRCUIT OPERATION

- Refer to, DTC P2122 – Accelerator Pedal Position Sensor (Main) Circuit P.13Ac-600.
- Refer to, DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit P.13Ac-619.

TECHNICAL DESCRIPTION

- PCM checks the APS output signal characteristics for abnormal conditions.

DTC SET CONDITIONS

Check Condition

- Ignition switch "ON" position.
- APS (main) output voltage is higher than 0.5 volts and lower than 4.5 volts.
- APS (sub) output voltage is higher than 0.5 volts and lower than 4.5 volts.

Judgement Criteria

- APS (sub) output voltage minus APS (main) output voltage should be 1 volt or higher for 1 second.
- APS (main) output voltage minus APS (sub) output voltage should be 1 volt or higher for 0.2 seconds.

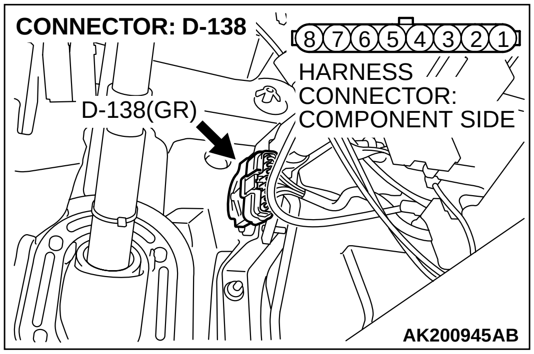
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- APS failed or maladjusted.
- Open or shorted APS circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



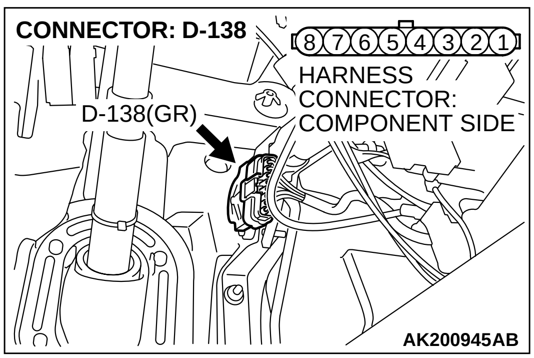
STEP 1. Check connector D-138 at accelerator pedal position sensor for damage.

Q: Is the connector in good condition?

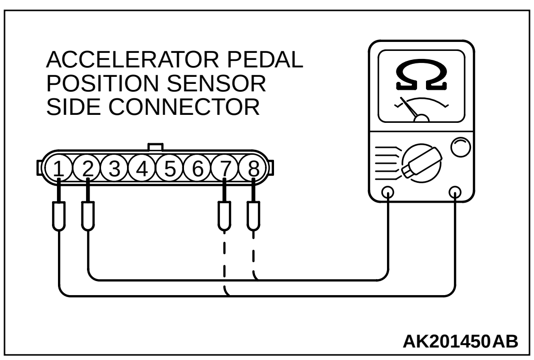
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

STEP 2. Check the accelerator pedal position sensor.

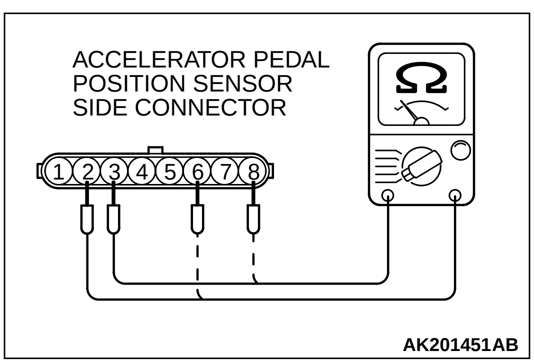


(1) Disconnect the accelerator pedal position sensor connector D-138.



(2) Measure resistance between terminal No.1 and No. 2 and between terminal No. 7 and No. 8.

Standard value: 3.5 – 6.5 kiloohms



(3) Measure resistance between terminal No. 2 and No. 3 and between terminal No. 6 and No. 8.

(4) Move the accelerator pedal from the idle position to the full-open position.

- Resistance value changes in accordance with the accelerator pedal depression smoothly.

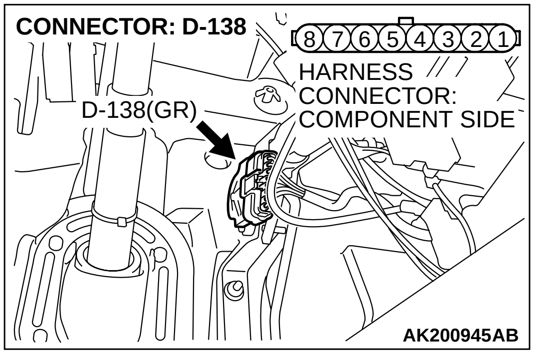
Q: Is the resistance normal?

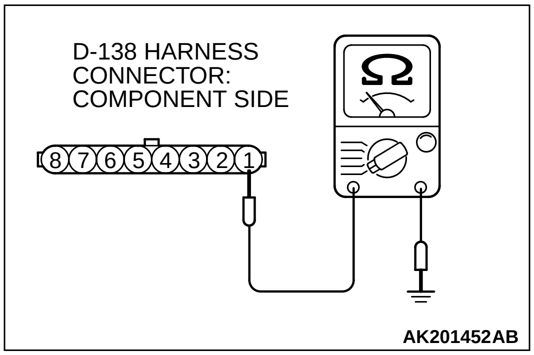
YES : Go to Step 3.

NO : Replace the accelerator pedal position sensor. Then go to Step 17.

STEP 3. Check the continuity at accelerator pedal position sensor harness side connector D-138.

(1) Disconnect the connector D-138 and measure at the harness side.





(2) Measure the continuity between terminal No. 1 and ground.

- Should be less than 2 ohms.

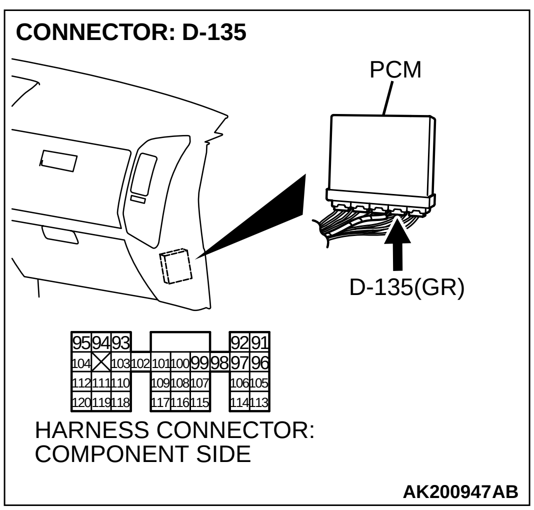
Q: Is the continuity normal?

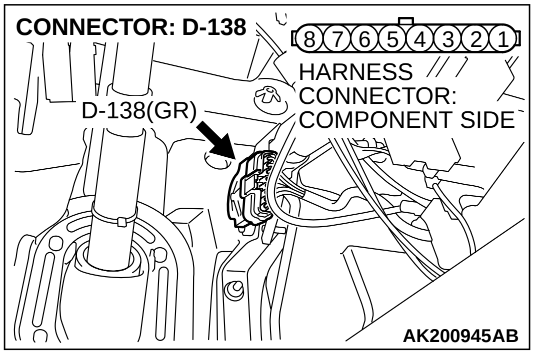
YES : Go to Step 7.
NO : Go to Step 4.

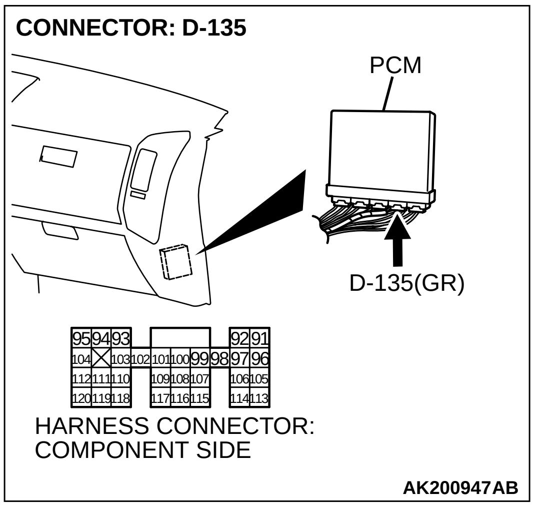
STEP 4. Check connector D-135 at PCM for damage.

Q: Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



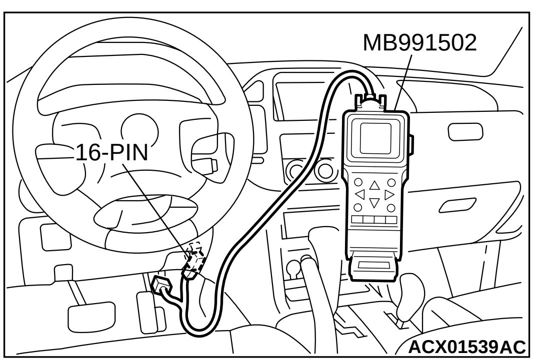




STEP 5. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 1) and PCM connector D-135 (terminal No. 91).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 17.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

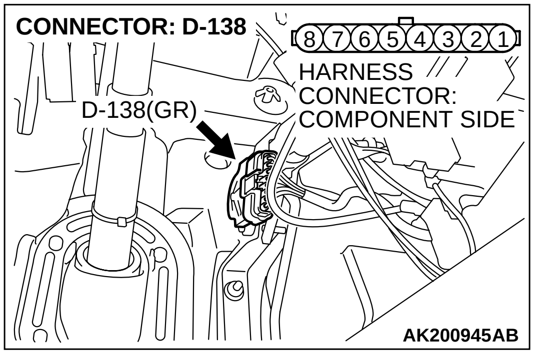
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

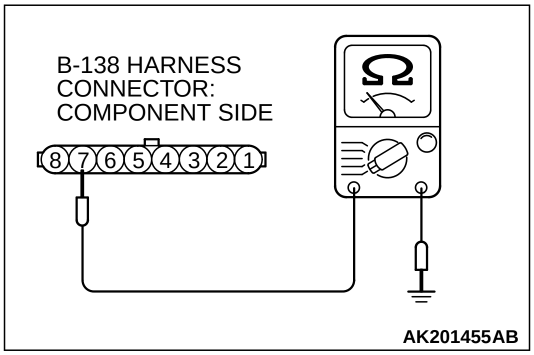
Q: Is DTC P2138 set?

YES : Replace the PCM. Then go to Step 17.
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 7. Check the continuity at accelerator pedal position sensor harness side connector D-138.



(1) Disconnect the connector D-138 and measure at the harness side.

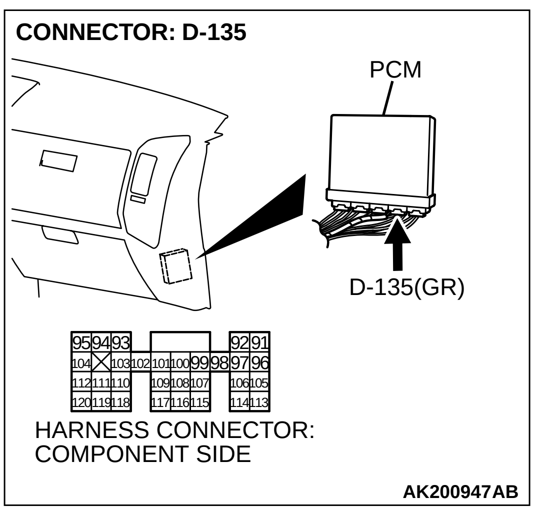


(2) Measure the continuity between terminal No. 7 and ground.
- Should be less than 2 ohms.

Q: Is the continuity normal?

YES : Go to Step 11.
NO : Go to Step 8.

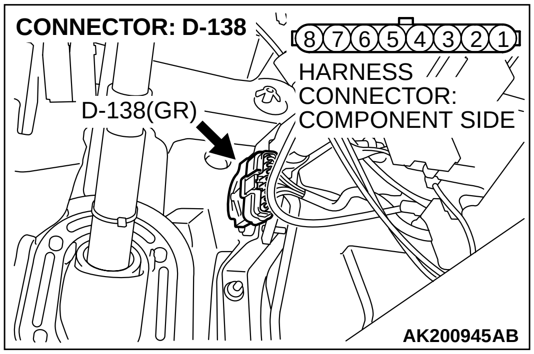
STEP 8. Check connector D-135 at PCM for damage.

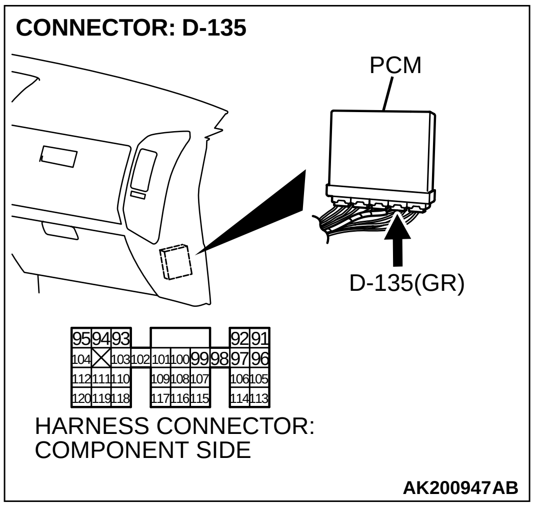


Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

STEP 9. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 7) and PCM connector D-135 (terminal No. 96).

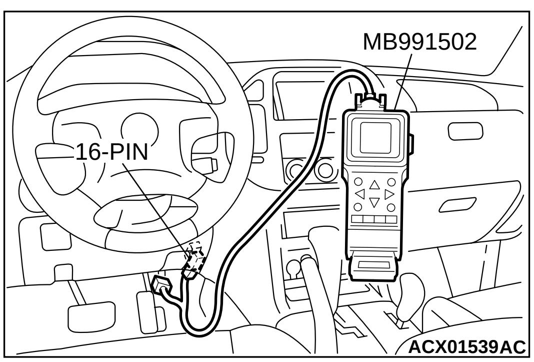




Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 17.

STEP 10. Using scan tool MB991502, read the diagnostic trouble code (DTC).

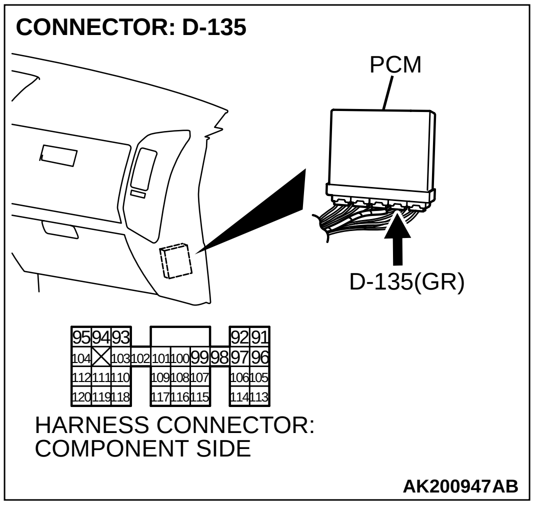


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2138 set?

YES : Replace the PCM. Then go to Step 17.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspectio Service Points P.00-6.

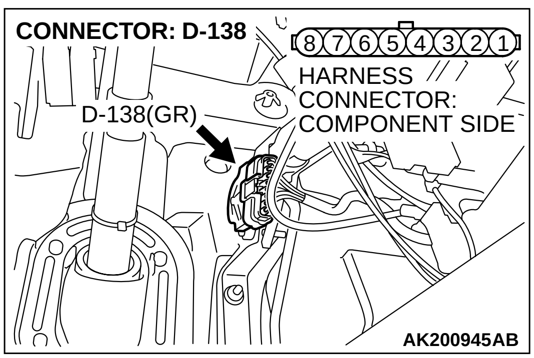


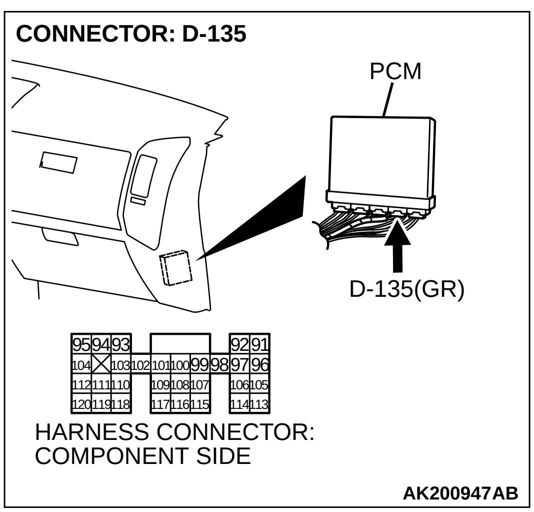
STEP 11. Check connector D-135 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



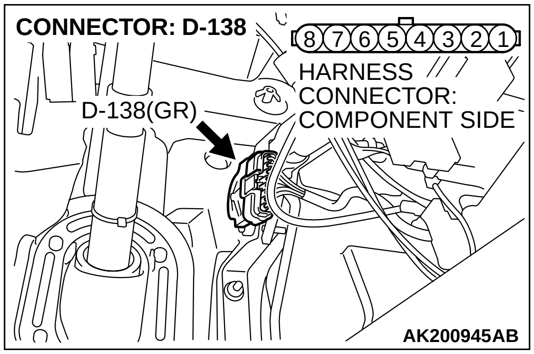


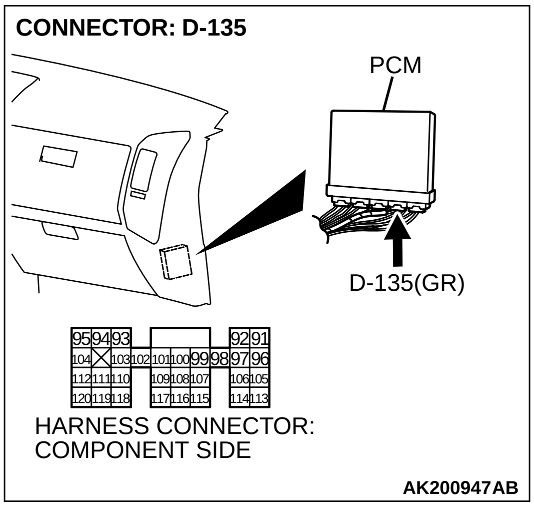
STEP 12. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 2) and PCM connector D-135 (terminal No. 92).

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 17.



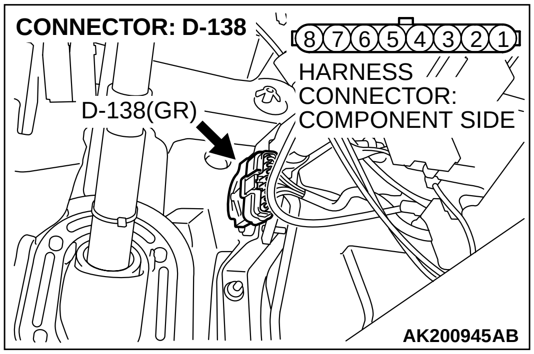


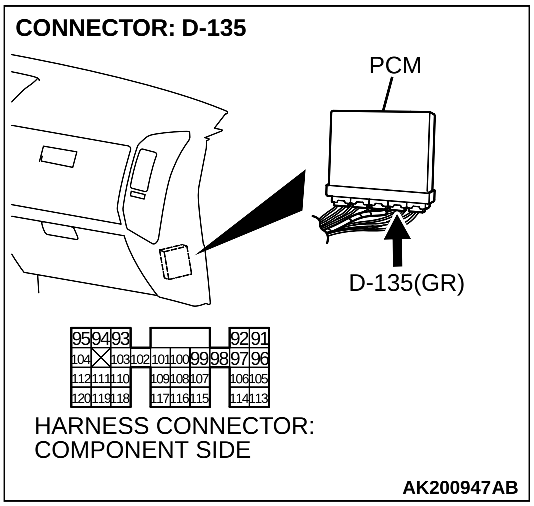
STEP 13. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 8) and PCM connector D-135 (terminal No. 97).

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to Step 17.



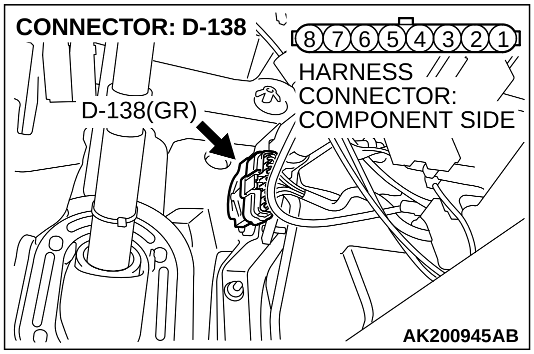


STEP 14. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 3) and PCM connector D-135 (terminal No. 114).

Q: Is the harness wire in good condition?

YES : Go to Step 15.

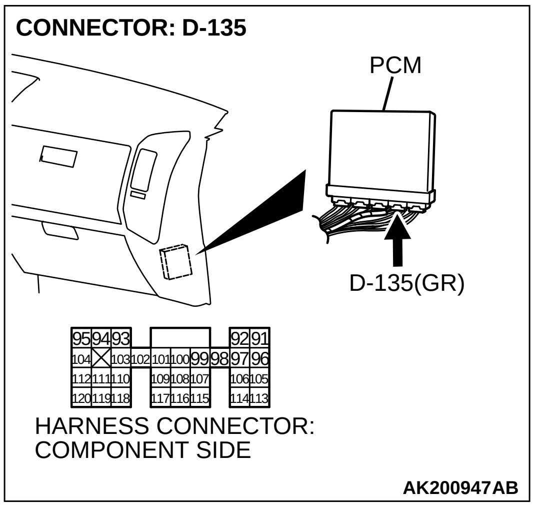
NO : Repair it. Then go to Step 17.



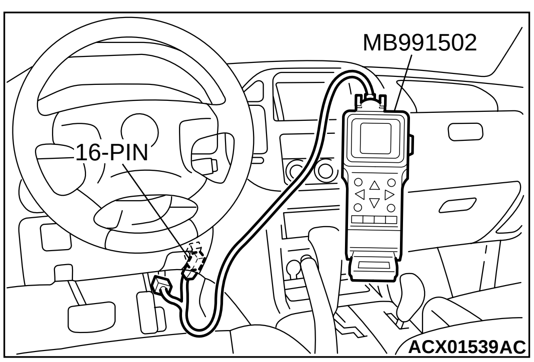
STEP 15. Check for harness damage between accelerator pedal position sensor connector D-138 (terminal No. 6) and PCM connector D-135 (terminal No. 107).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 17.



STEP 16. Using scan tool MB991502, read the diagnostic trouble code (DTC).



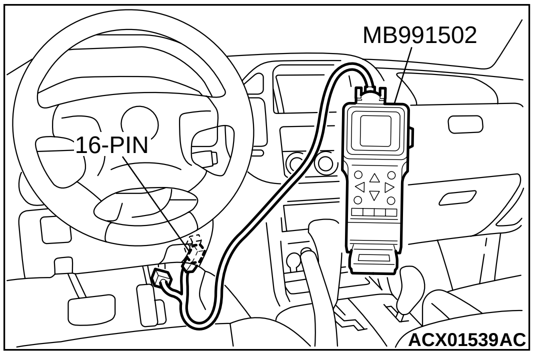
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P2138 set?

YES : Replace the PCM. Then go to Step 17.
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 17. Using scan tool MB991502, read the diagnostic trouble code (DTC).

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.