DTC P0069: Abnormal Correlation Between Manifold Absolute Pressure Sensor And Barometric Pressure Sensor

TECHNICAL DESCRIPTION

- The ECM <M/T> or the PCM <A/T> detects abnormality in the sensor by comparing the manifold absolute pressure sensor output with the barometric pressure sensor output.

DESCRIPTIONS OF MONITOR METHODS

The ECM <M/T> or the PCM <A/T> compares the manifold absolute pressure sensor output with the barometric pressure sensor output while the engine control relay is in "ON" position after the ignition switch is in "LOCK" (OFF) position. When the difference exceeds the specified value between them, the ECM <M/T> or the PCM <A/T> determines whether the manifold absolute pressure sensor / the barometric pressure sensor has malfunction or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

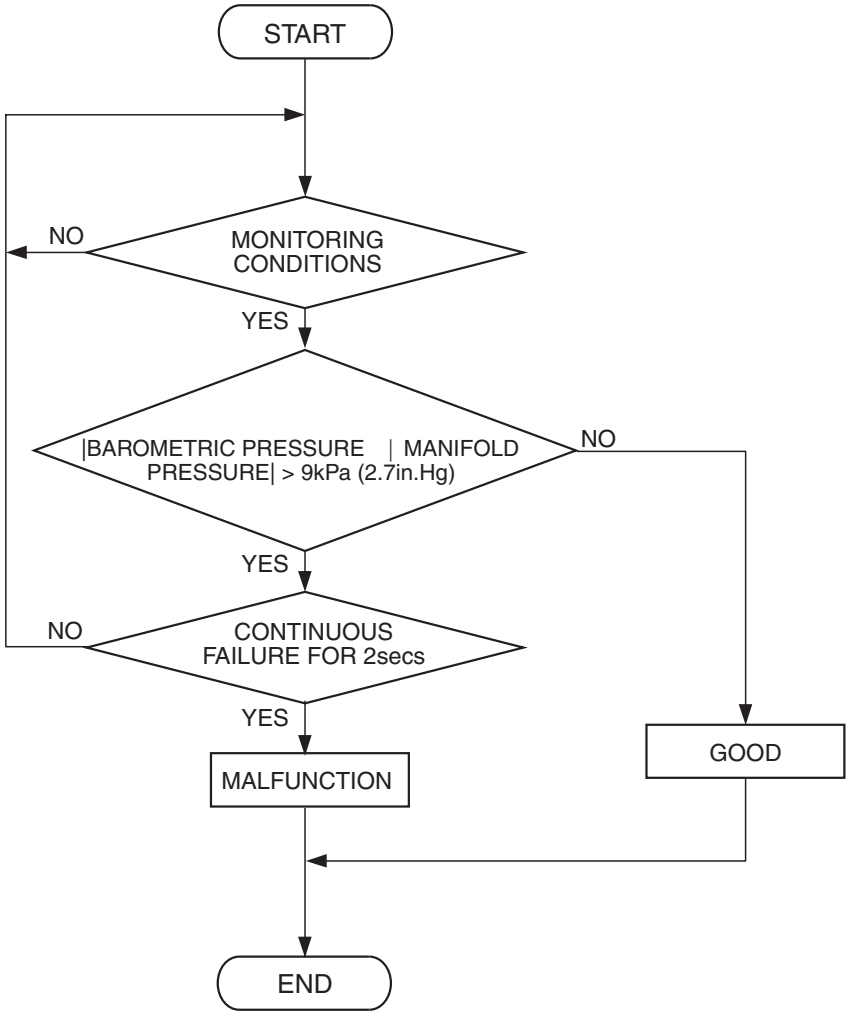
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Ignition switch is in "LOCK" (OFF) position.
- After two seconds pass from the time when the engine is stopped.
- Engine coolant temperature is higher than 0° C (32° F).

Judgement Criterion

- Difference between manifold absolute pressure sensor output and barometric pressure sensor output is more than 9 kPa (2.7 in.Hg) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Manifold absolute pressure sensor failed.
- Barometric pressure sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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

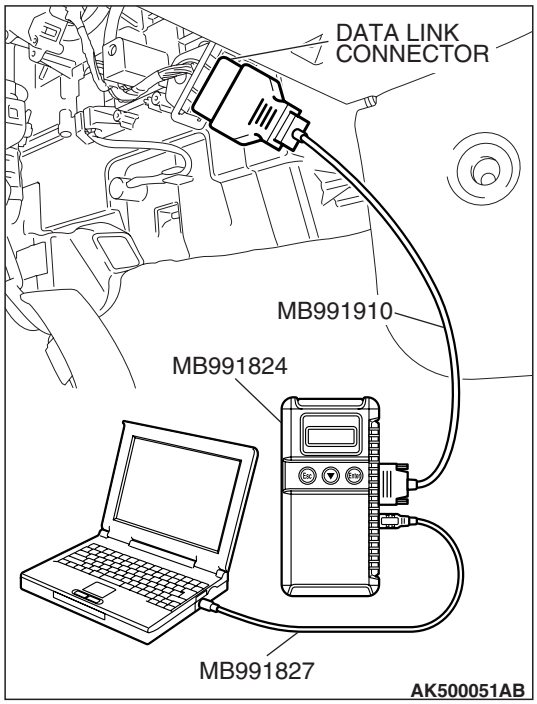
⚠ CAUTION

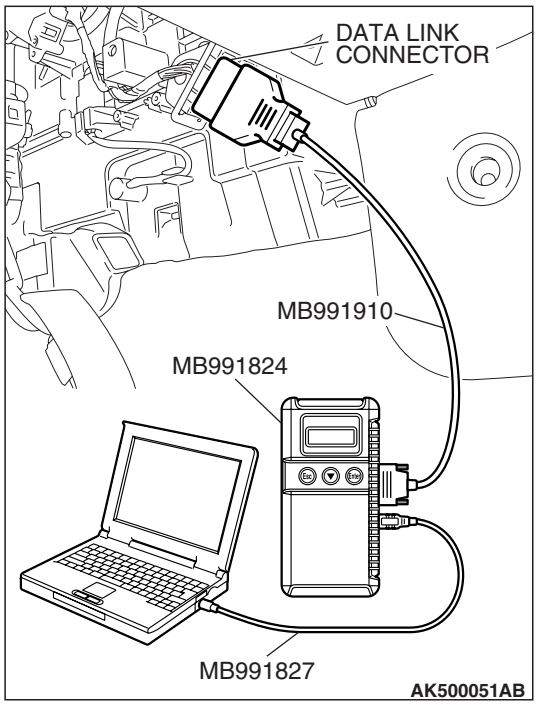
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

Q: Is the diagnostic trouble code other than P0069 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-43.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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).

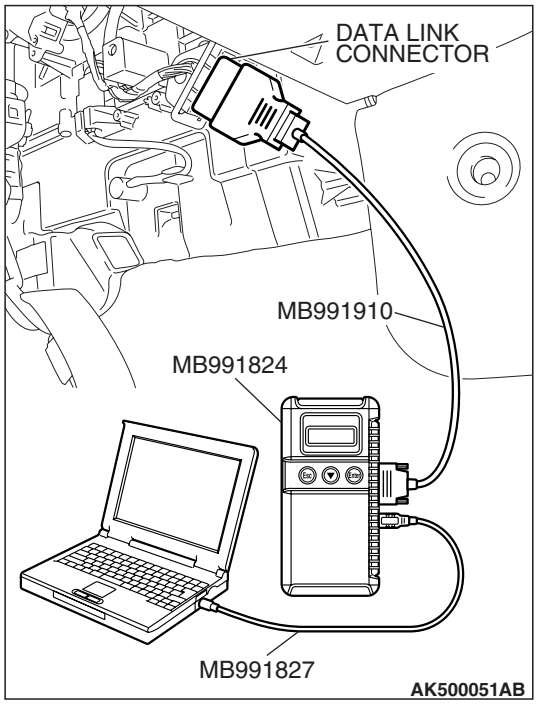
(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(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 P0106 –Manifold Absolute Pressure Circuit Range/Performance Problem P.13B-131, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-142, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13B-152.



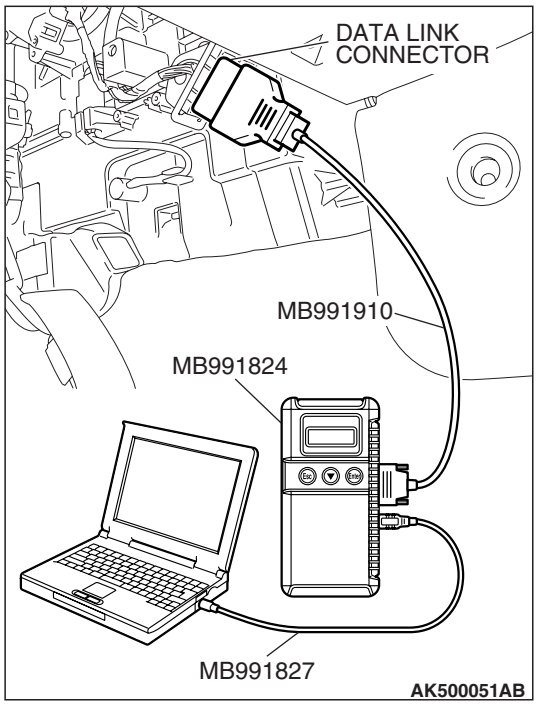
STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 4.

NO : 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 Malfunctions P.00-14.



STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

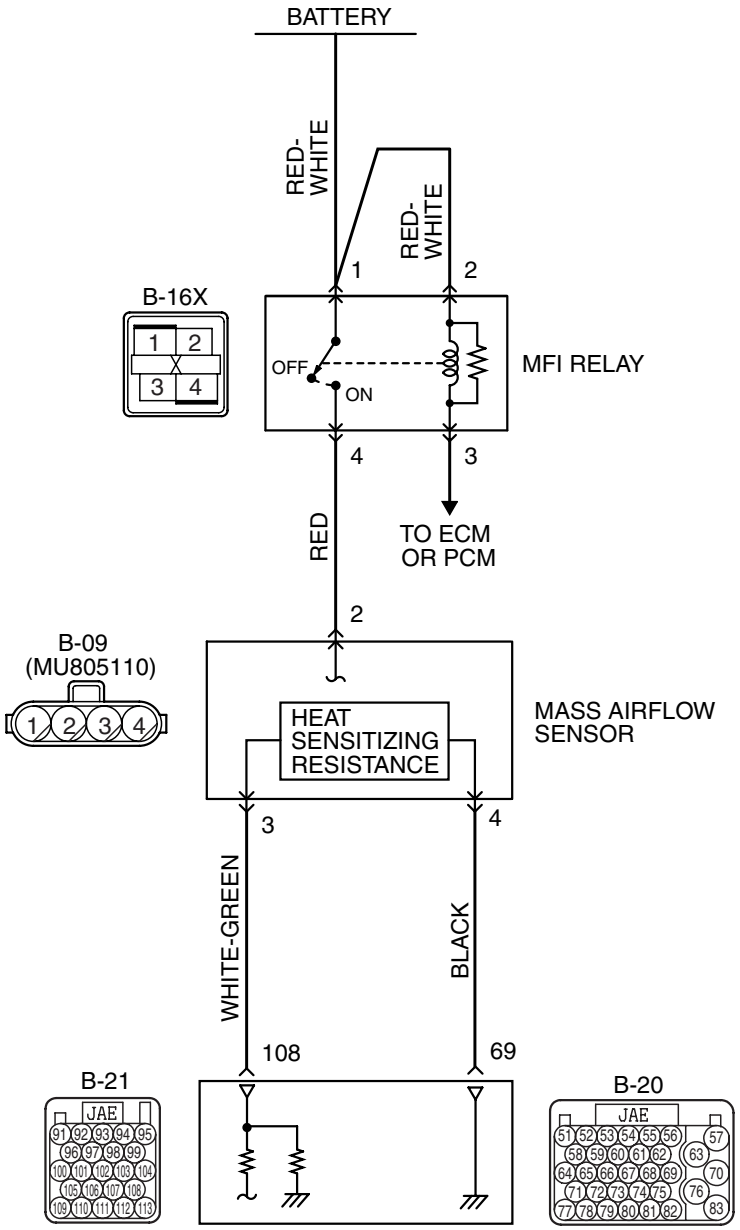
Q: Is DTC P0069 set?

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

DTC P0101: Mass Airflow Circuit Range/Performance Problem

⚠ CAUTION
If DTC P0101 has been set, TCL related DTC U1120 is also set. After P0101 has been diagnosed, don't forget to erase DTC U1120.

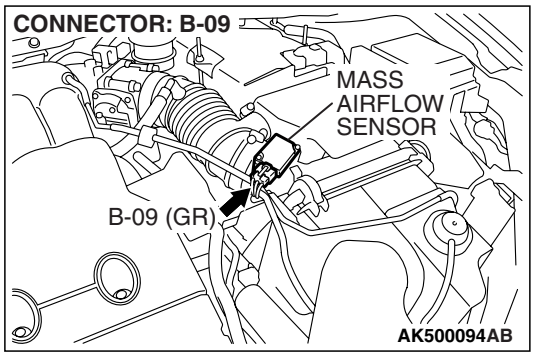
Mass Airflow Sensor Circuit

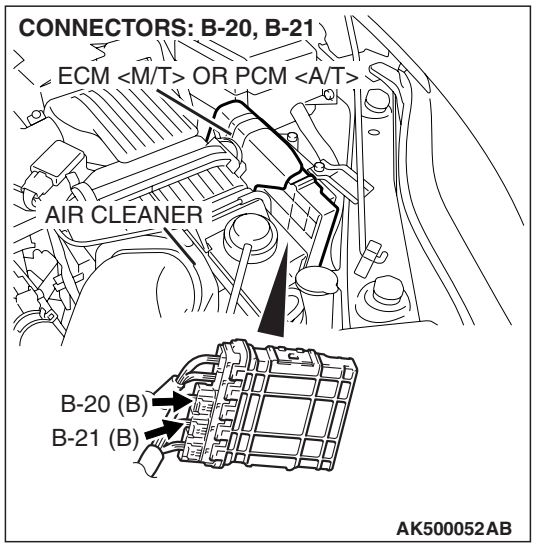


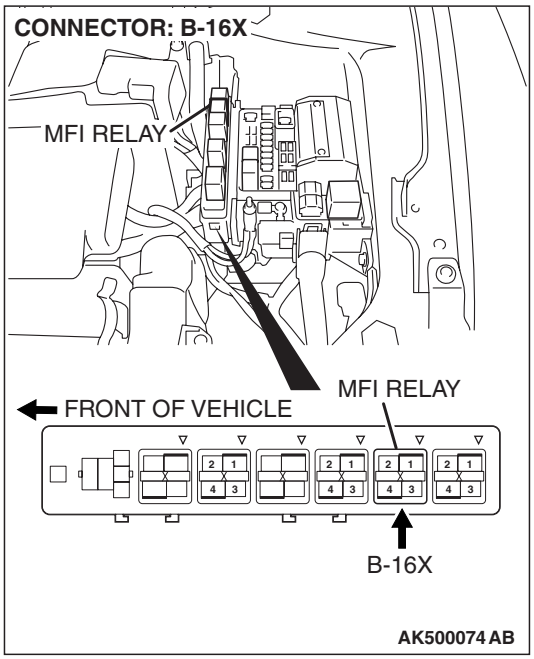
ENGINE CONTROL MODULE (ECM) <M/T> OR POWERTRAIN CONTROL MODULE (PCM) <A/T>

AK403677

TSB Revision







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM <M/T> or the PCM <A/T> (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with mass airflow sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

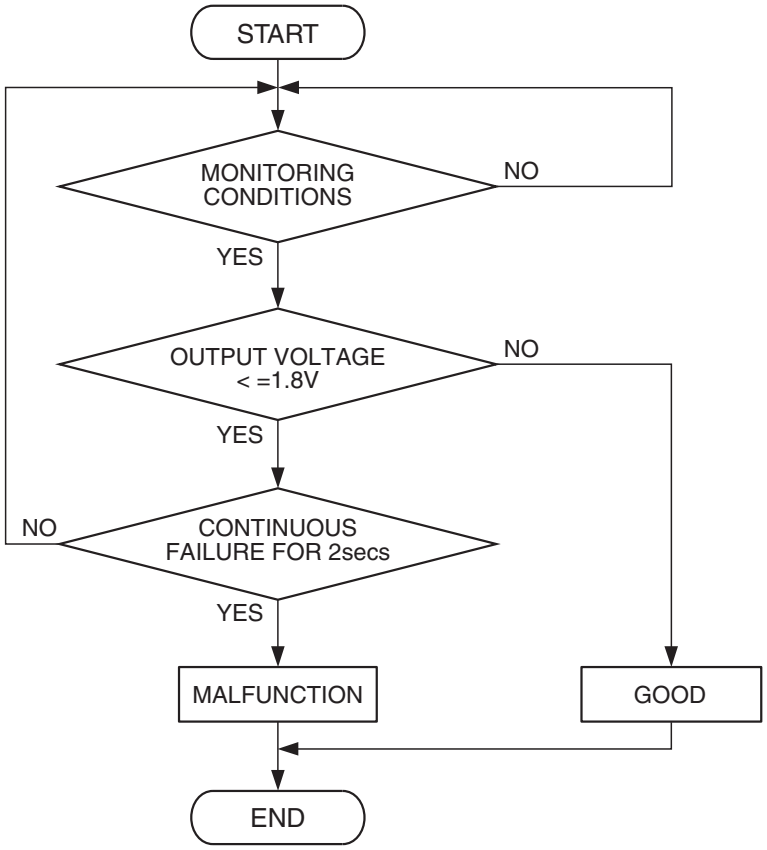
Sensor (The sensor below is determined to be normal)

- Throttle position sensor

TSB Revision

DTC SET CONDITIONS <Range/Performance problem - low input>

Logic Flow Chart



AK401683

Check Conditions

- Throttle position sensor output voltage is 1.5 volt or higher.
- Mass airflow sensor output voltage is 0.2 volt or higher.

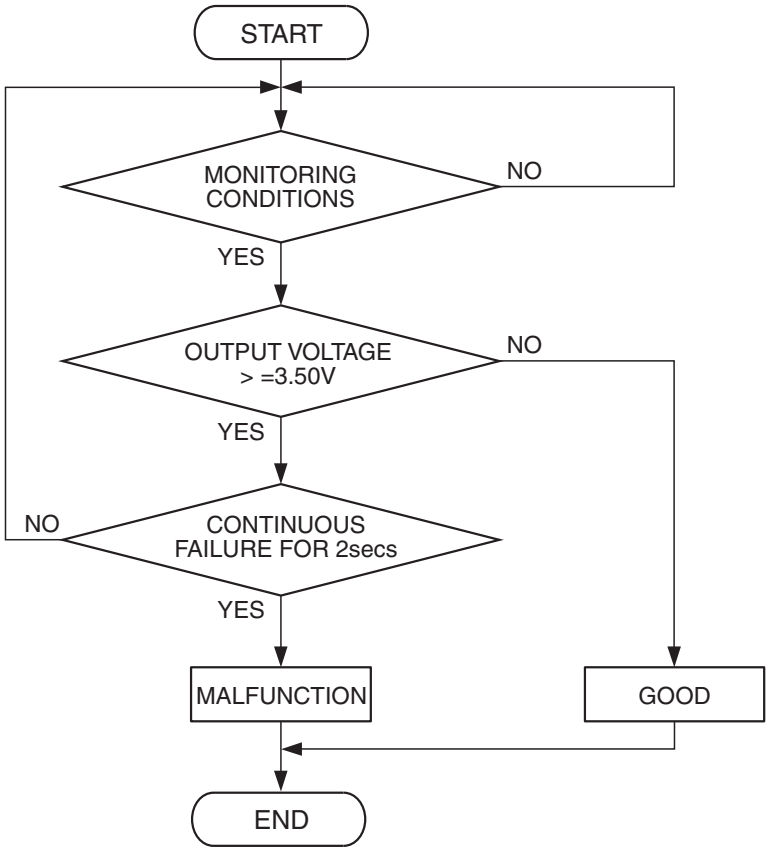
Judgement Criterion

- Mass airflow sensor output voltage has continued to be 1.8 volts or lower for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem - high input>

Logic Flow Chart



AK302375

Check Conditions

- Throttle position sensor output voltage is 1.0 volt or lower.
- Mass airflow sensor output voltage is 4.9 volts or lower.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 3.5 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13B-6.

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

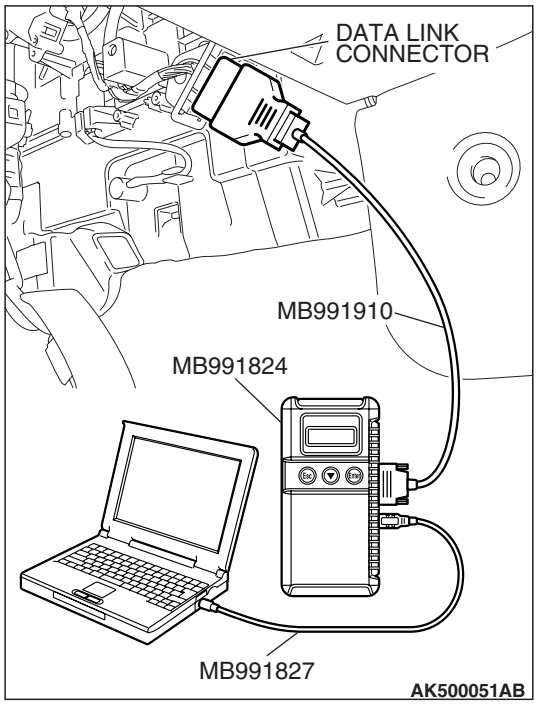
- Mass airflow sensor failed.
- Mass airflow sensor circuit harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

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

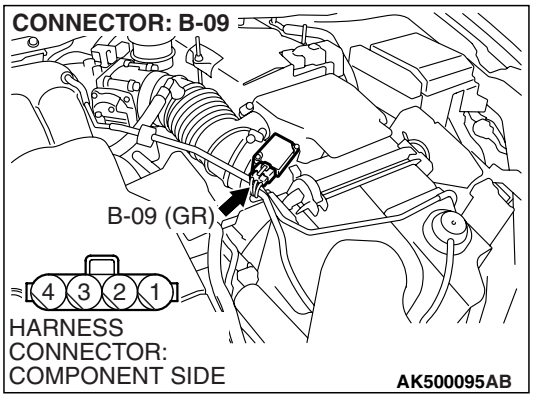
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,360 and 1,650 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

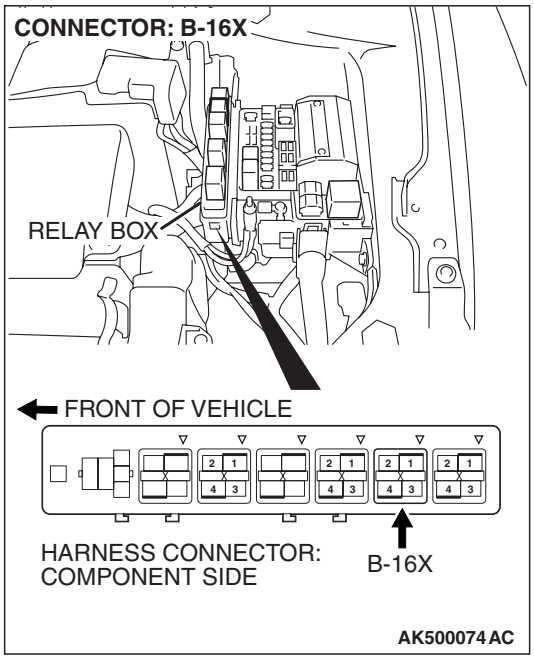
(5) Turn the ignition switch to the "LOCK" (OFF) position.

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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



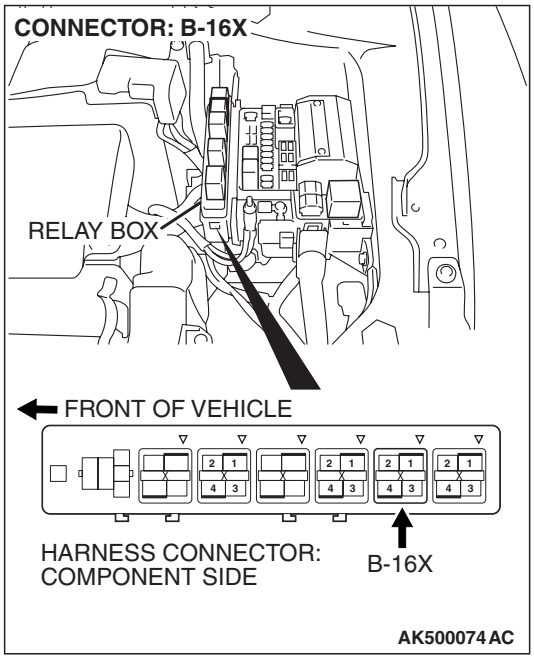


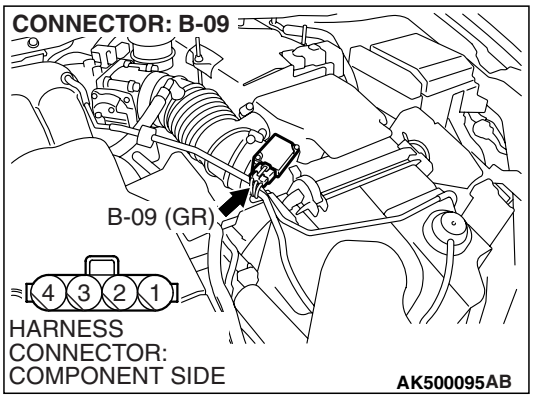
STEP 2. Check harness connector B-09 at mass airflow sensor and harness connector B-16X at MFI relay for damage.

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 9.



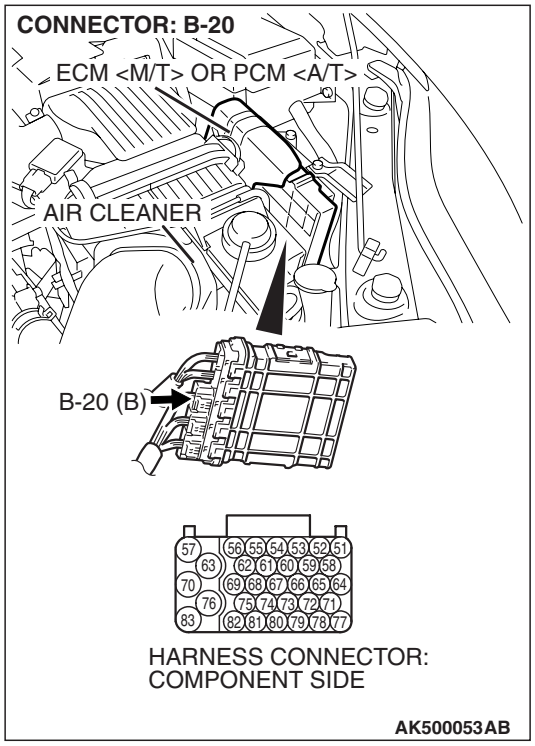


STEP 3. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and mass airflow sensor connector B-09 (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 9.

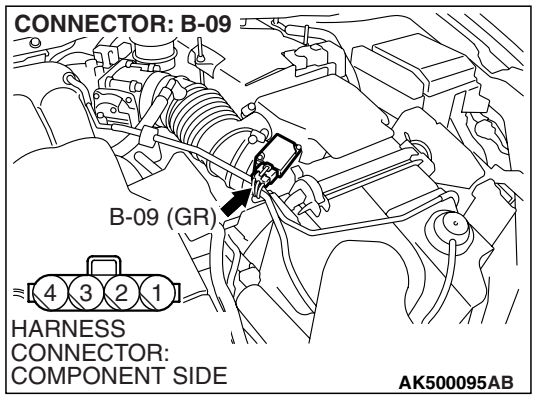


STEP 4. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

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 9.



STEP 5. Check the continuity at mass airflow sensor harness side connector B-09.

(1) Disconnect the connector B-09 and measure at the harness side.

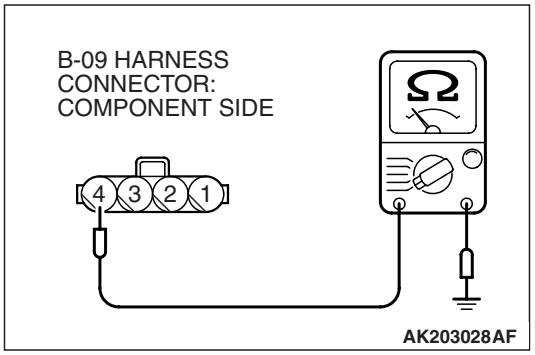
(2) Check for the continuity between terminal No. 4 and ground.

- Should be less than 2 ohms.

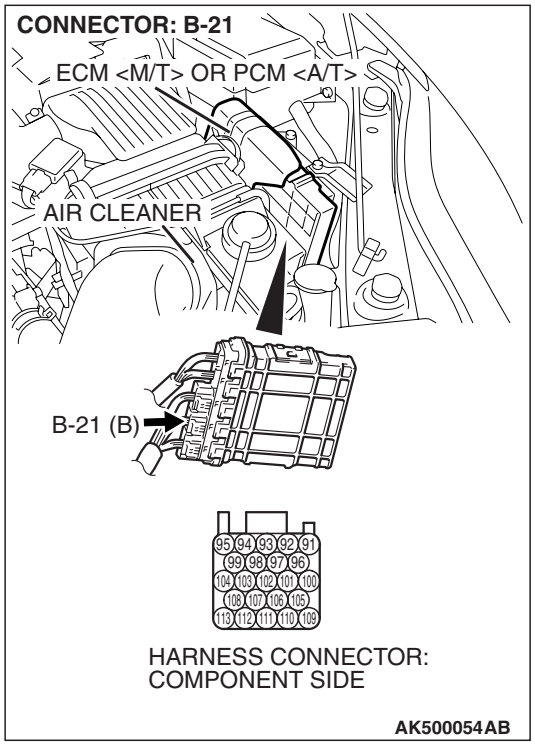
Q: Does continuity exist?

YES : Go to Step 6.

NO : Repair harness wire between mass airflow sensor connector B-09 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69) because of harness damage. Then go to Step 9.



TSB Revision



STEP 6. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

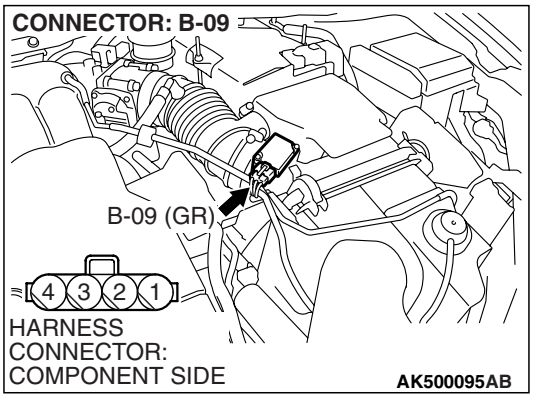
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

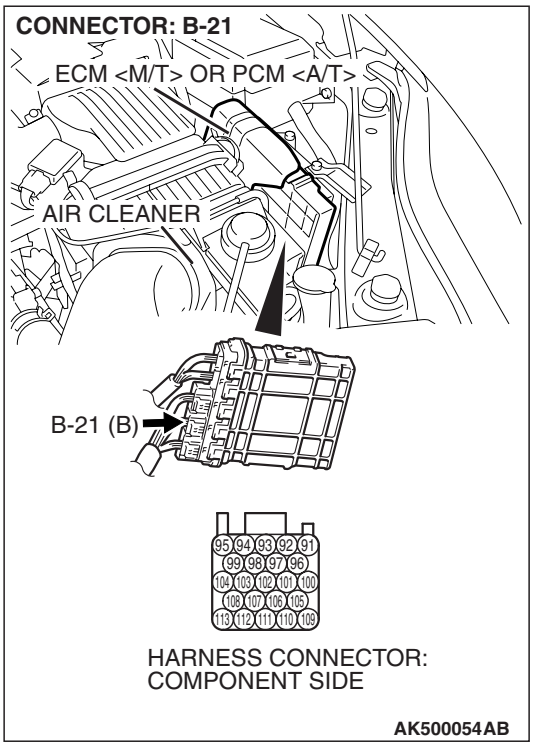
STEP 7. Check for harness damage between mass airflow sensor connector B-09 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 108).

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 mass airflow sensor.

(1) Replace the mass airflow sensor.

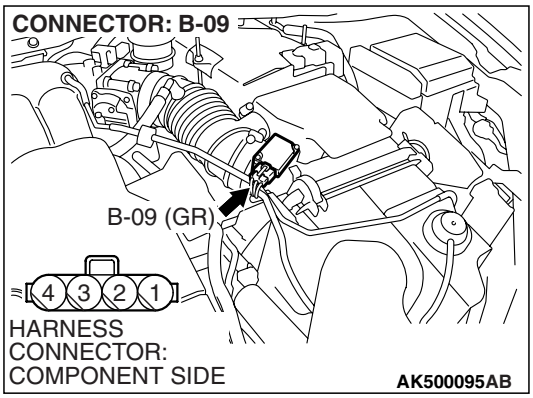
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13B-6.

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

Q: Is DTC P0101 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13B-6.

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

Q: Is DTC P0101 set?

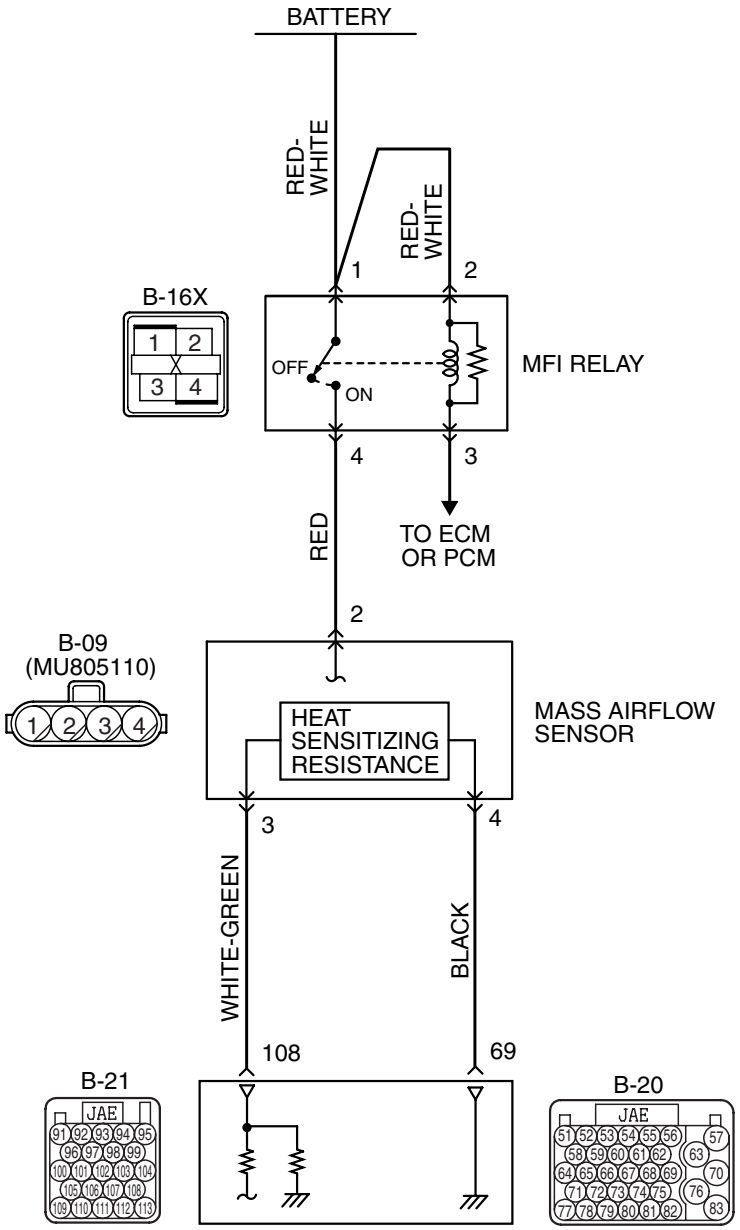
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0102: Mass Airflow Circuit Low Input

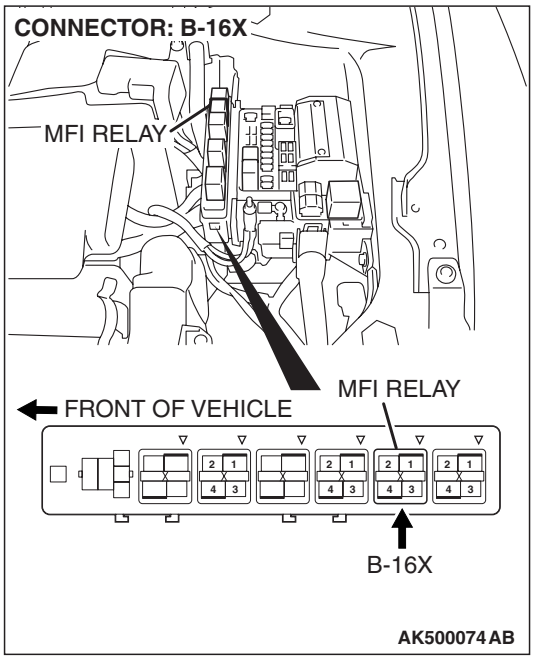
⚠ CAUTION
If DTC P0102 has been set, TCL related DTC U1120 is also set. After P0102 has been diagnosed, don't forget to erase DTC U1120.

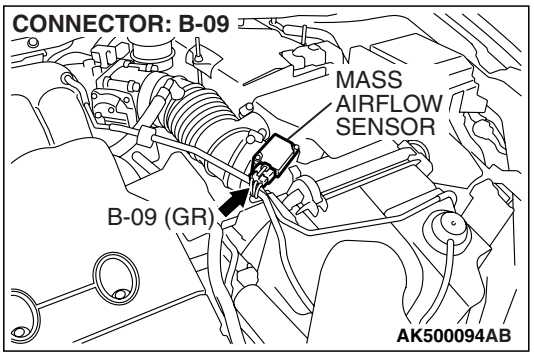
Mass Airflow Sensor Circuit

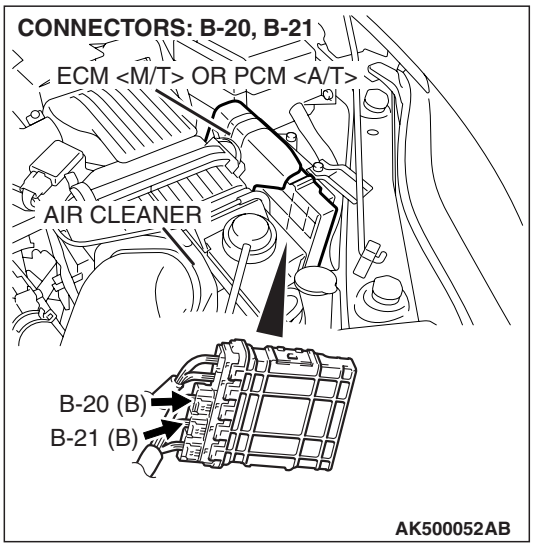


AK403677

TSB Revision







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM <M/T> or the PCM <A/T> (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

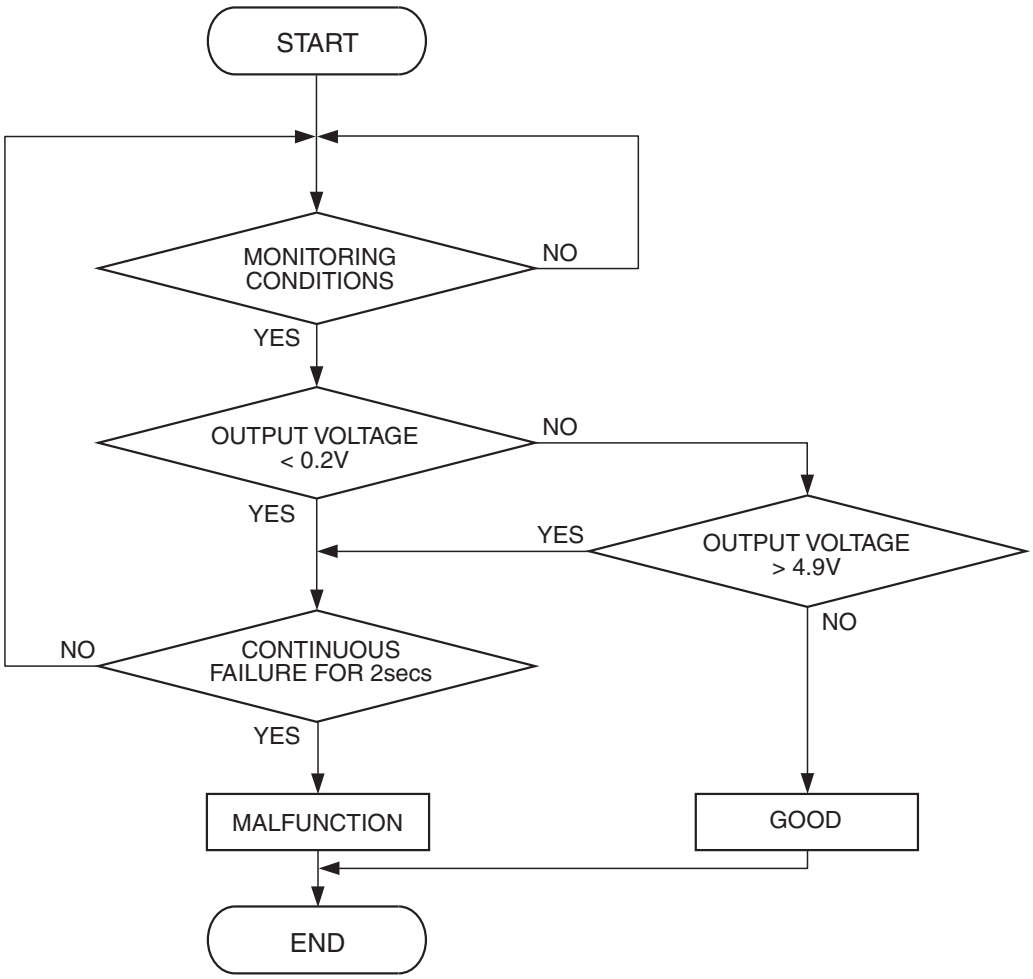
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK302377

Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be lower than 0.2 volt for 2 seconds.

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

- Mass airflow sensor failed.
- Open or shorted mass airflow sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

TSB Revision

DIAGNOSIS

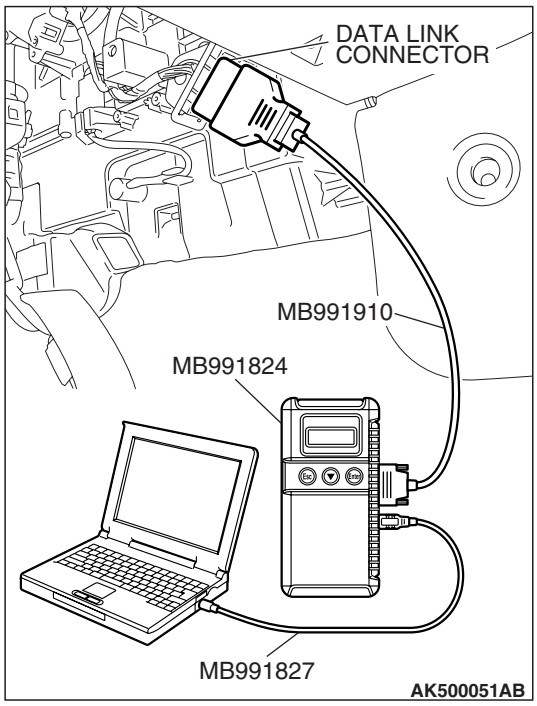
Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

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

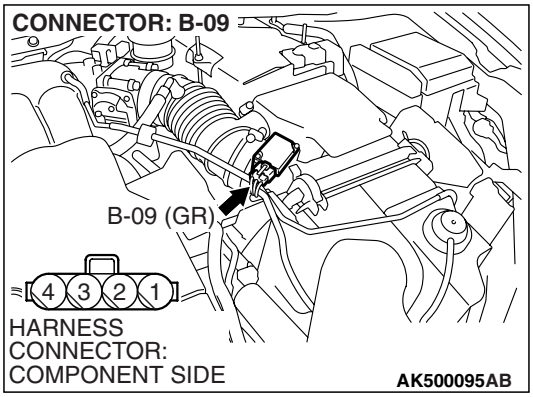


(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The standard value during idling should be between 1,360 and 1,650 millivolts.
  - When the engine is revved, the mass airflow rate 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?

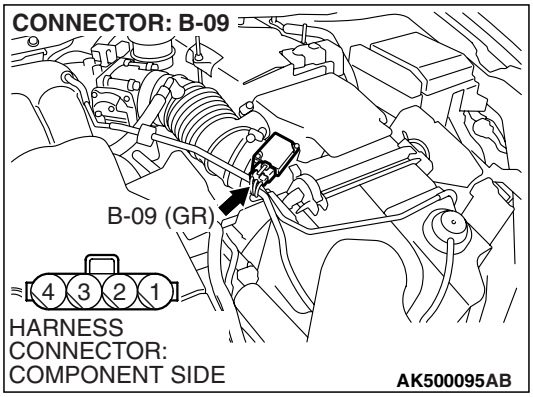
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.
NO : Go to Step 2.

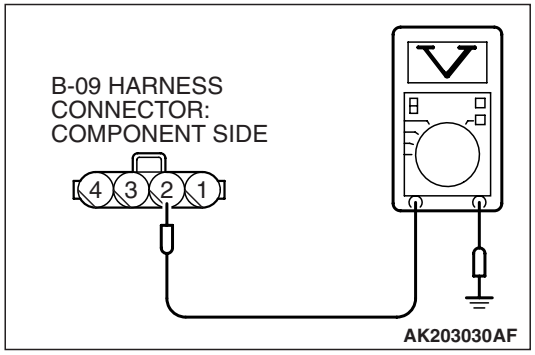
STEP 2. Check harness connector B-09 at mass airflow sensor for damage.



Q: Is the harness connector in good condition?

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





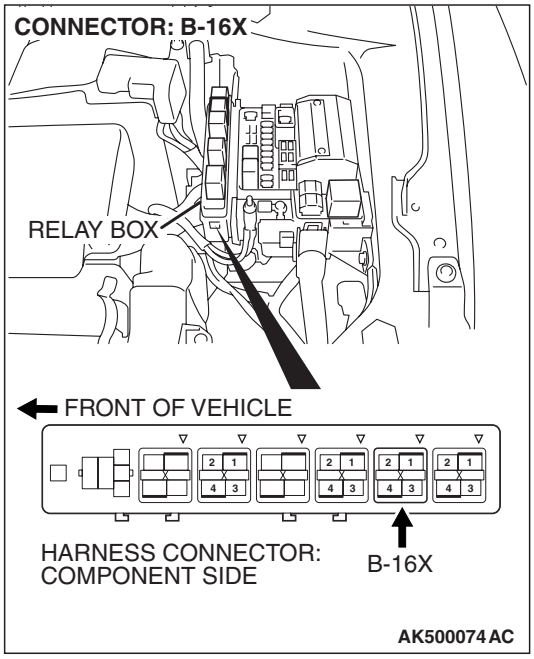
STEP 3. Measure the power supply voltage at mass airflow sensor harness side connector B-09.

(1) Disconnect the connector B-09 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?

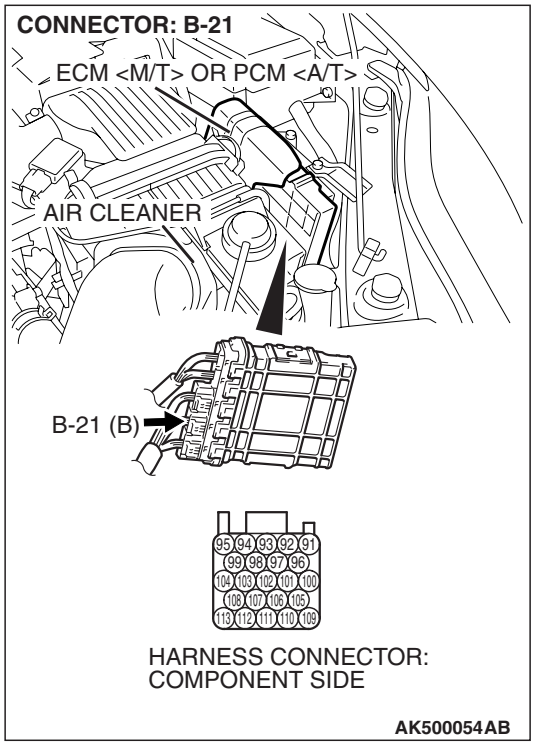
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and mass airflow sensor connector B-09 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 5. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

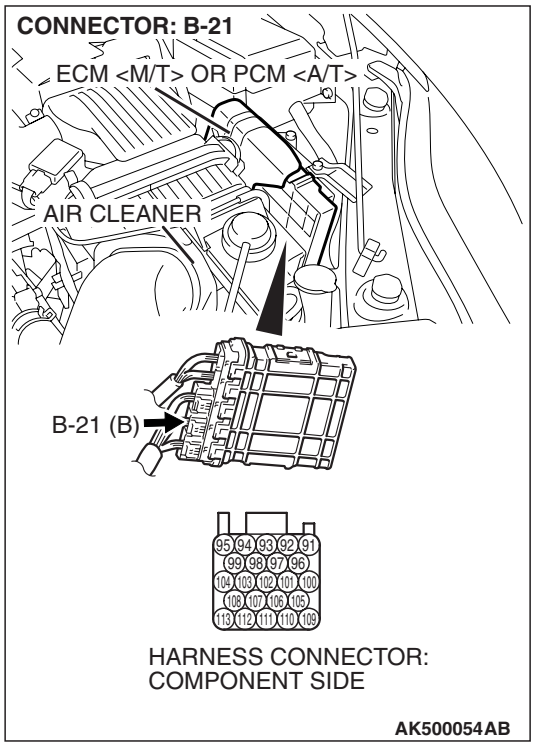
Q: Is the harness connector in good condition?

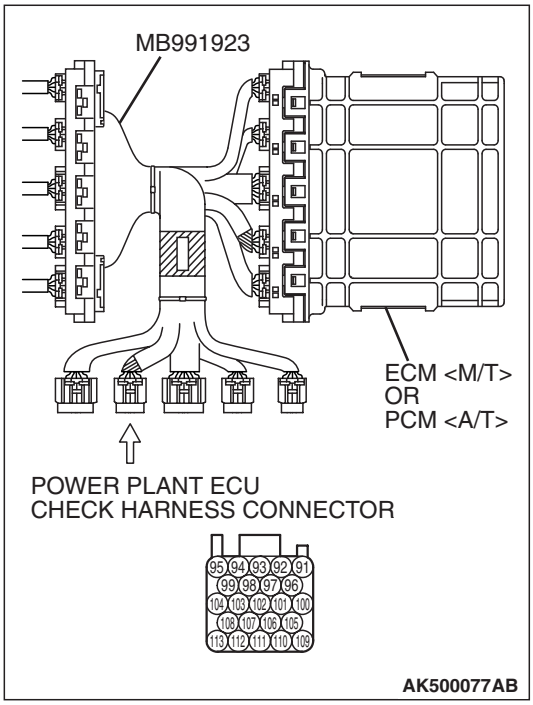
YES : Go to Step 6.

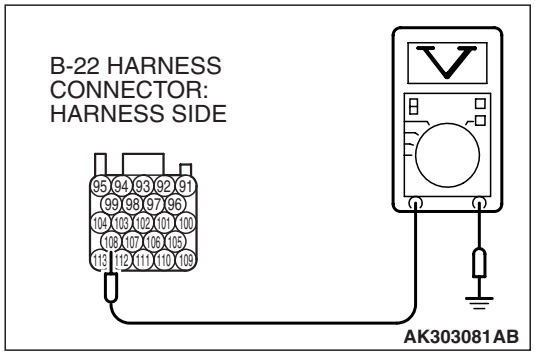
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 6. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.







(3) Measure the voltage between terminal No. 108 and ground.
- When the engine is revved, voltage should be increase in response to revving.

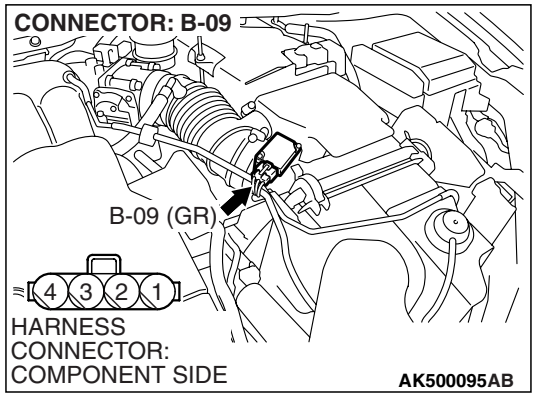
Q: Is the measured voltage normal?

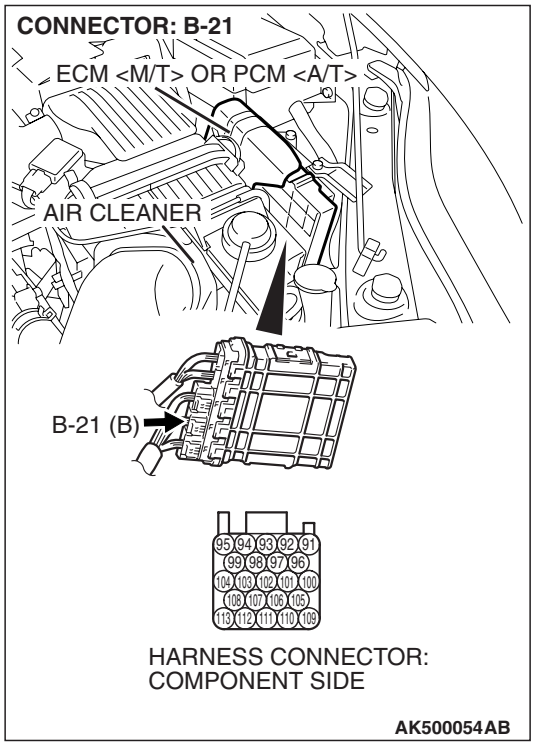
YES : Go to Step 9.
NO : Go to Step 7.

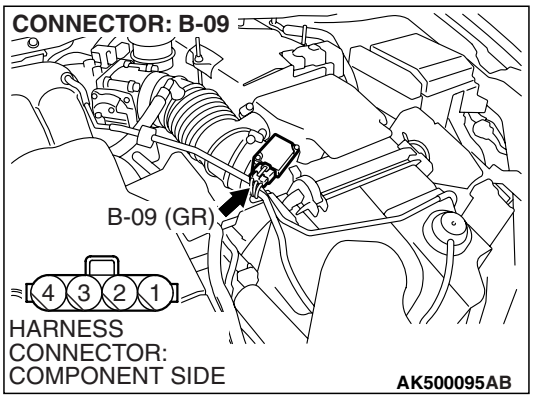
STEP 7. Check for open circuit or short circuit to ground between mass airflow sensor connector B-09 (terminal No. 3) and PCM connector B-21 (terminal No. 108).

Q: Is the harness wire in good condition?

YES : Replace the mass airflow sensor. Then go to Step 8.
NO : Repair it. Then go to Step 11.





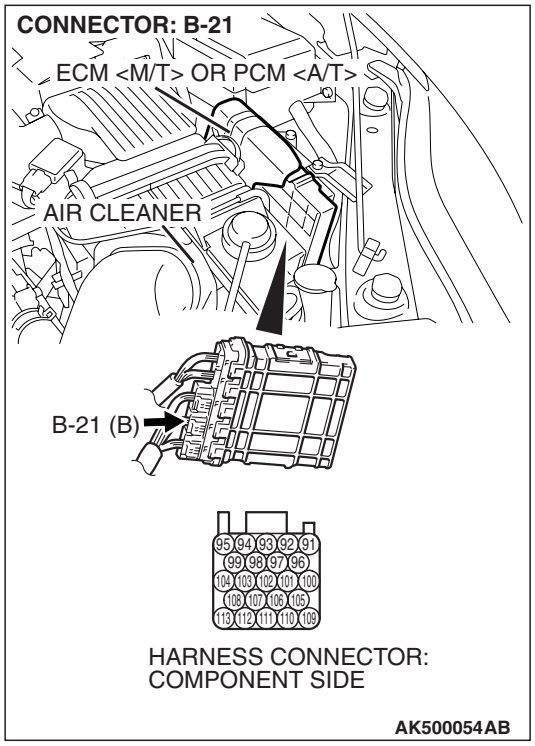


STEP 8. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 set?

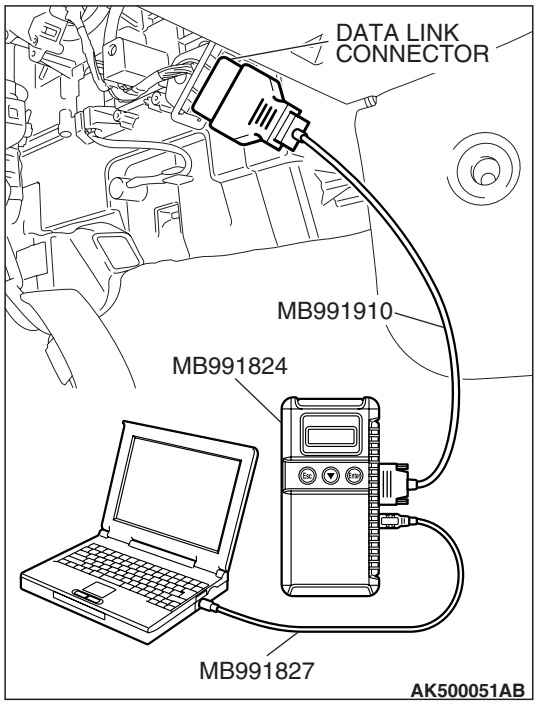
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.
NO : The inspection is complete.



STEP 9. Check harness connector B-21 at ECM <M/T> or PCM <A/T> 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 10.



STEP 10. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass 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 between 1,360 and 1,650 millivolts.
- When the engine is revved, the mass airflow rate 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 –How to Cope with Intermittent Malfunctions P.00-14.
NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

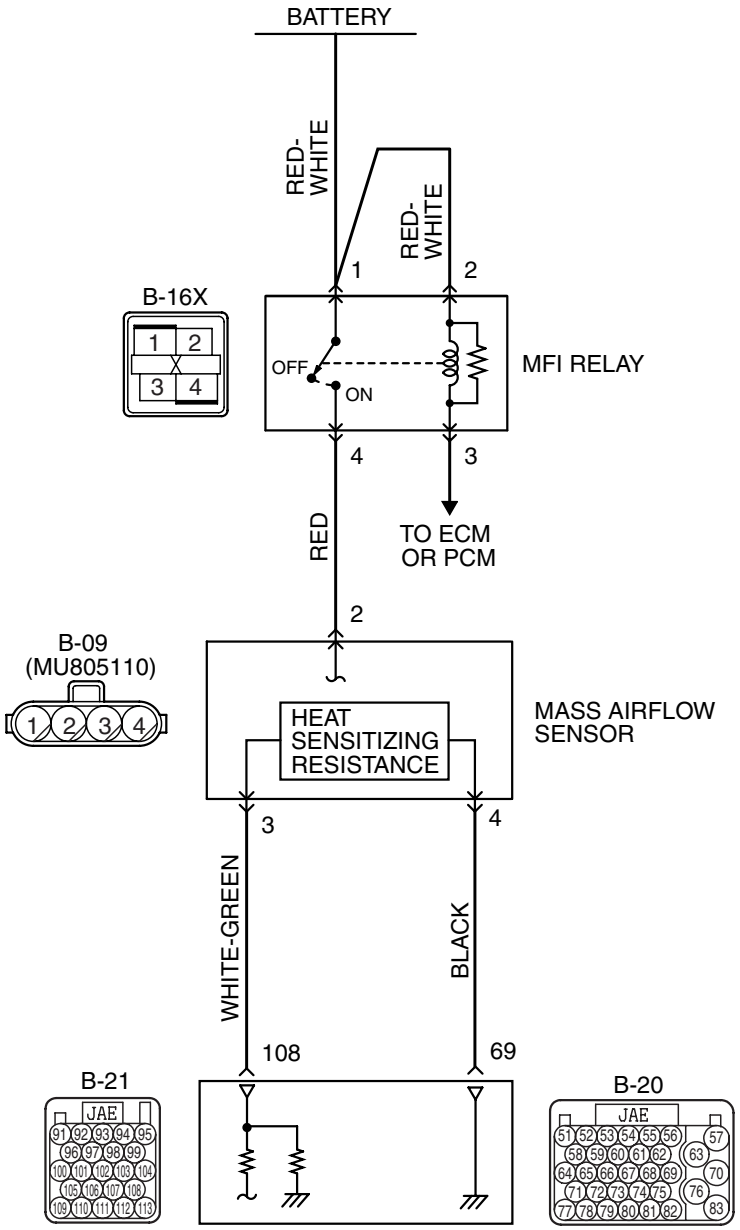
Q: Is DTC P0102 set?

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

DTC P0103: Mass Airflow Circuit High Input

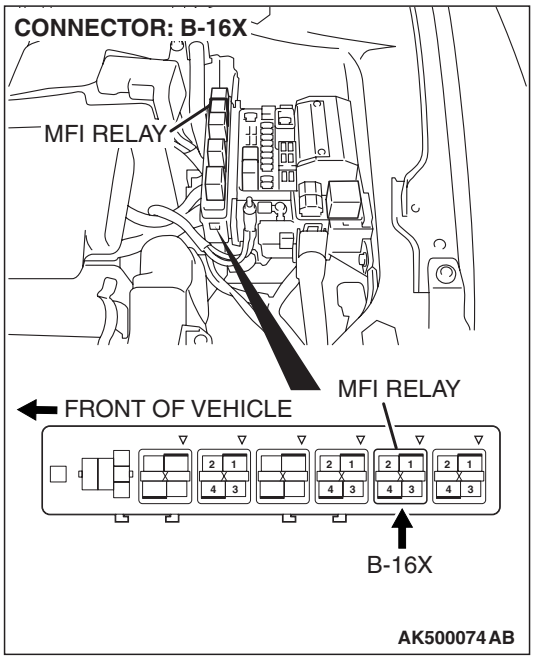
⚠ CAUTION
If DTC P0103 has been set, TCL related DTC U1120 is also set. After P0103 has been diagnosed, don't forget to erase DTC U1120.

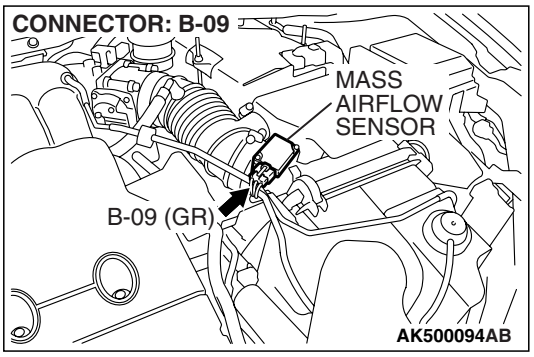
Mass Airflow Sensor Circuit

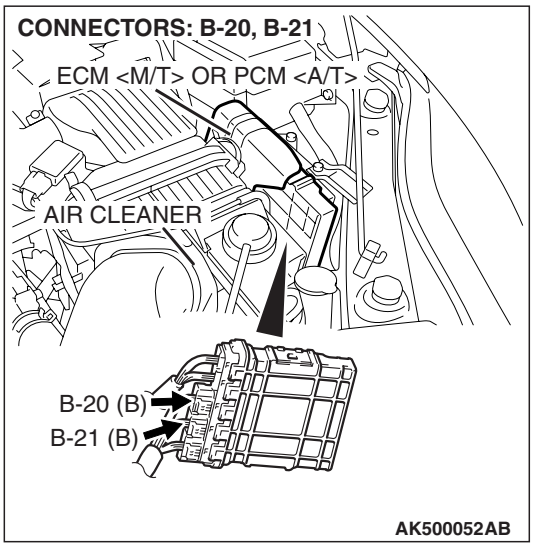


AK403677

TSB Revision







CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM <M/T> or the PCM <A/T> (terminal No. 69).
- A voltage that is according to the mass airflow rate is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 108) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

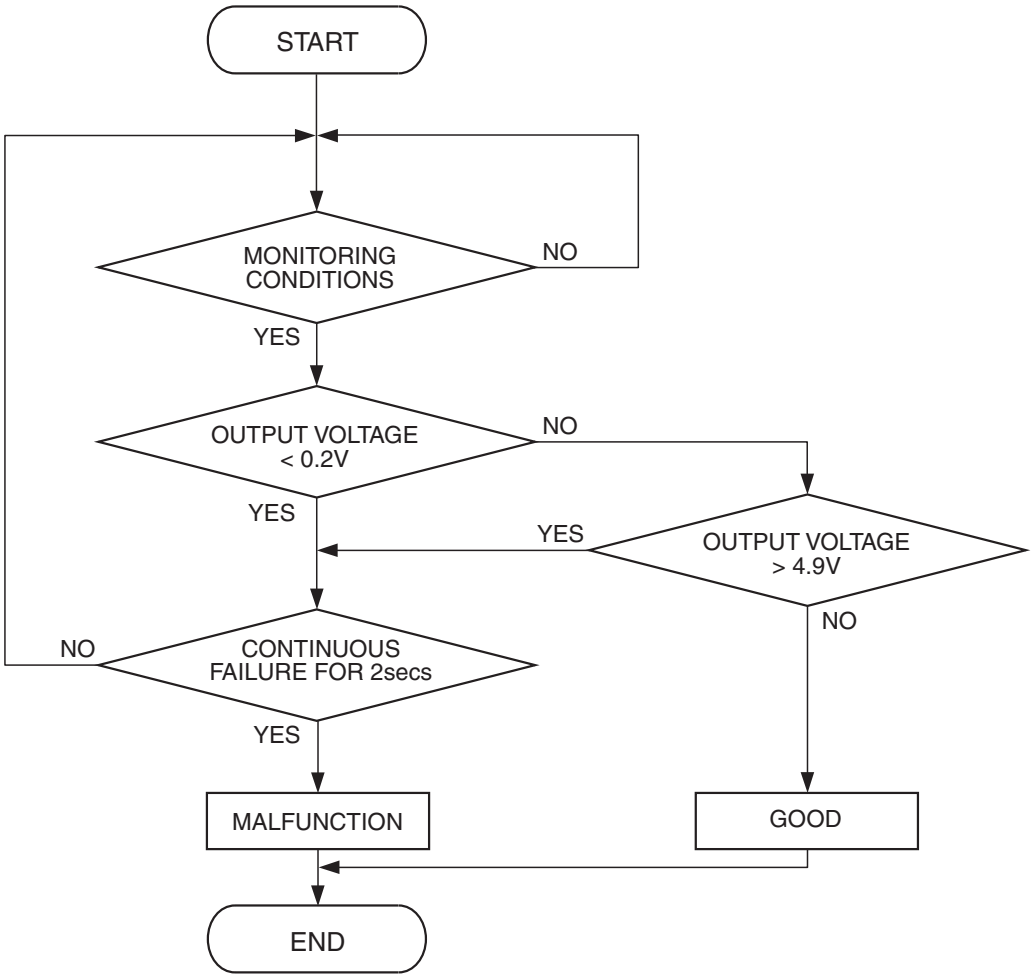
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK302377

Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be higher than 4.9 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Mass airflow sensor failed.
- Open mass airflow sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

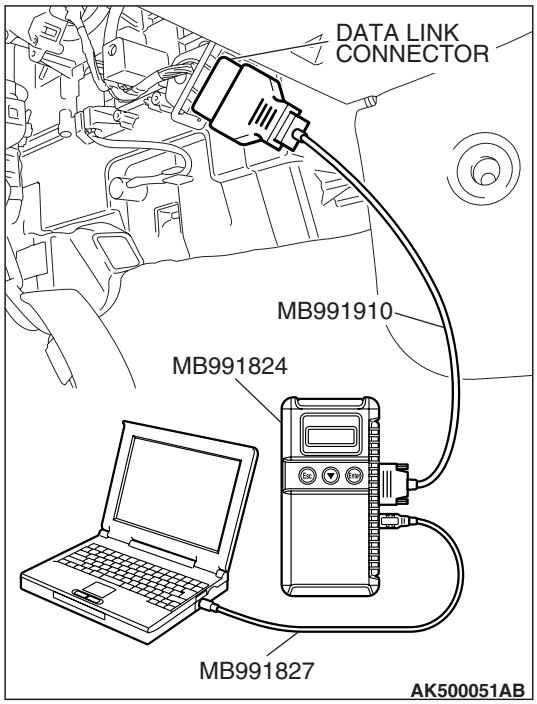
- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass 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 between 1,360 and 1,650 millivolts.
  - When the engine is revved, the mass airflow rate 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 –How to Cope with Intermittent Malfunctions P.00-14.

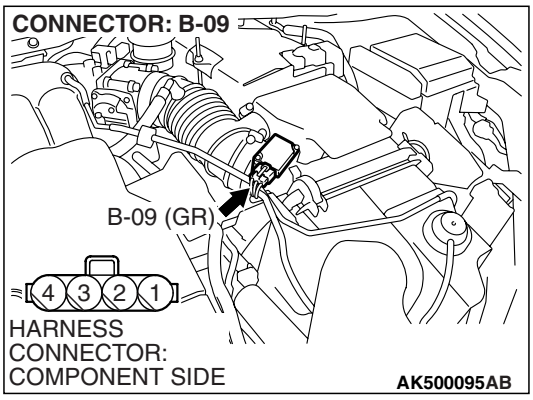
NO : Go to Step 2.

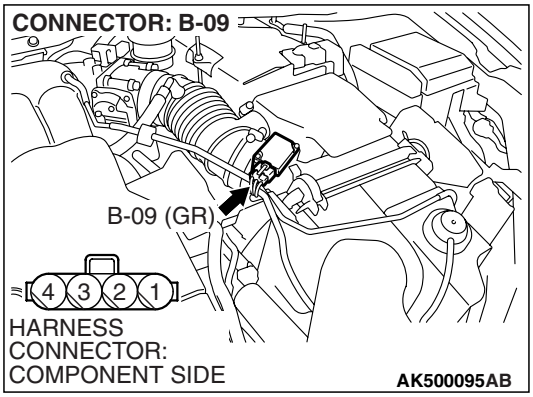
STEP 2. Check harness connector B-09 at mass airflow sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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





STEP 3. Check the continuity at mass airflow sensor harness side connector B-09.

(1) Disconnect the connector B-09 and measure at the harness side.

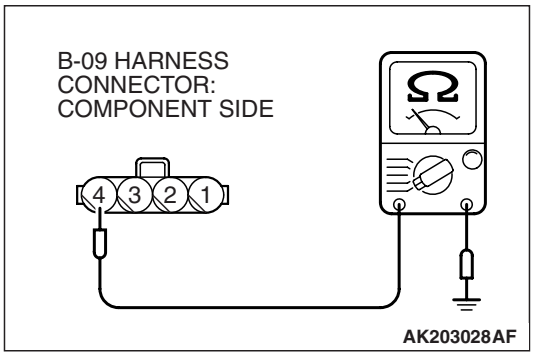
(2) Check for the continuity between terminal No. 4 and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.

NO : Go to Step 4.

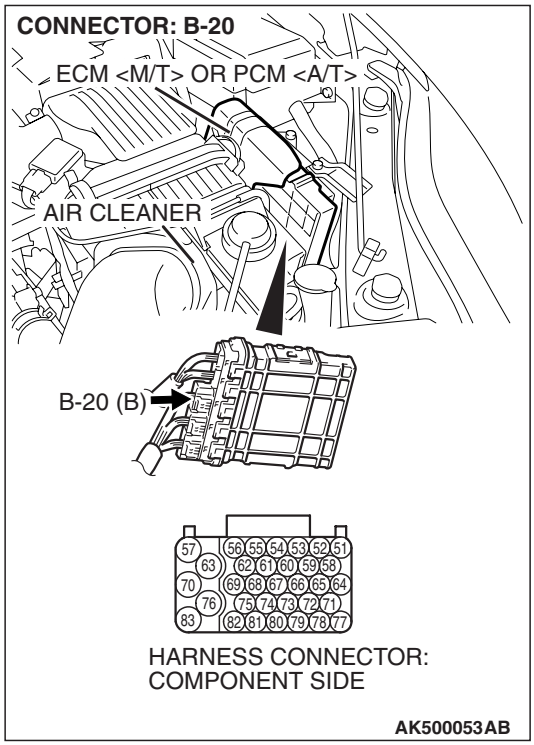


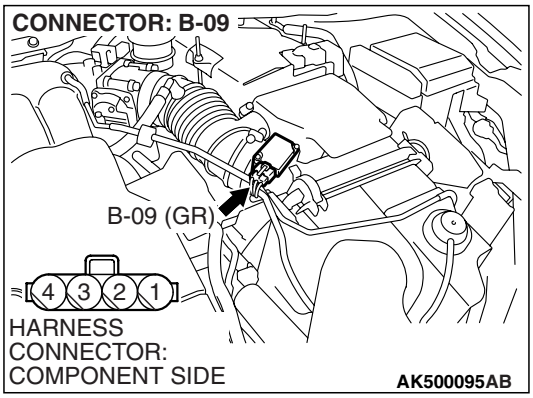
STEP 4. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

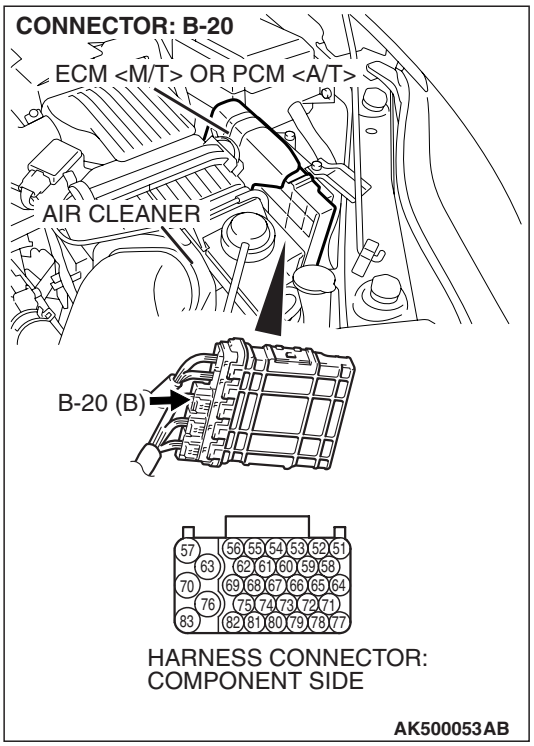
Q: Is the harness connector in good condition?

YES : Go to Step 5.

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





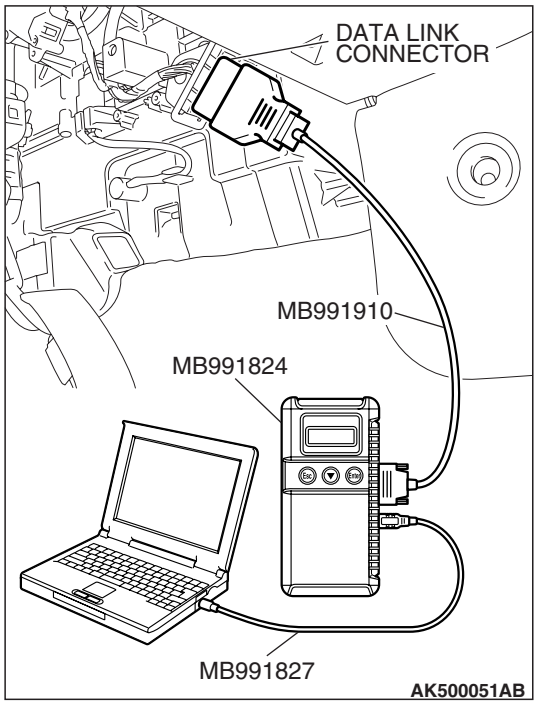


STEP 5. Check for open circuit between mass airflow sensor connector B-09 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

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

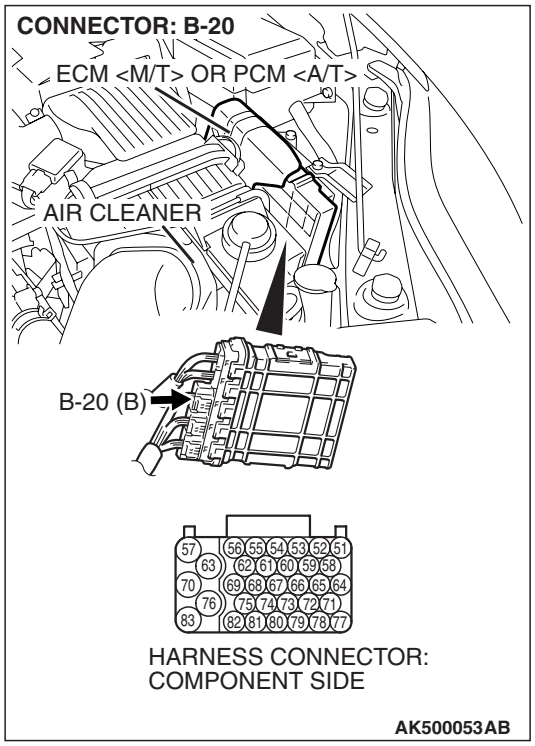
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,360 and 1,650 millivolts.
- When the engine is revved, the mass airflow rate 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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 8.



STEP 7. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the mass airflow sensor. Then go to Step 8.

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

TSB Revision

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

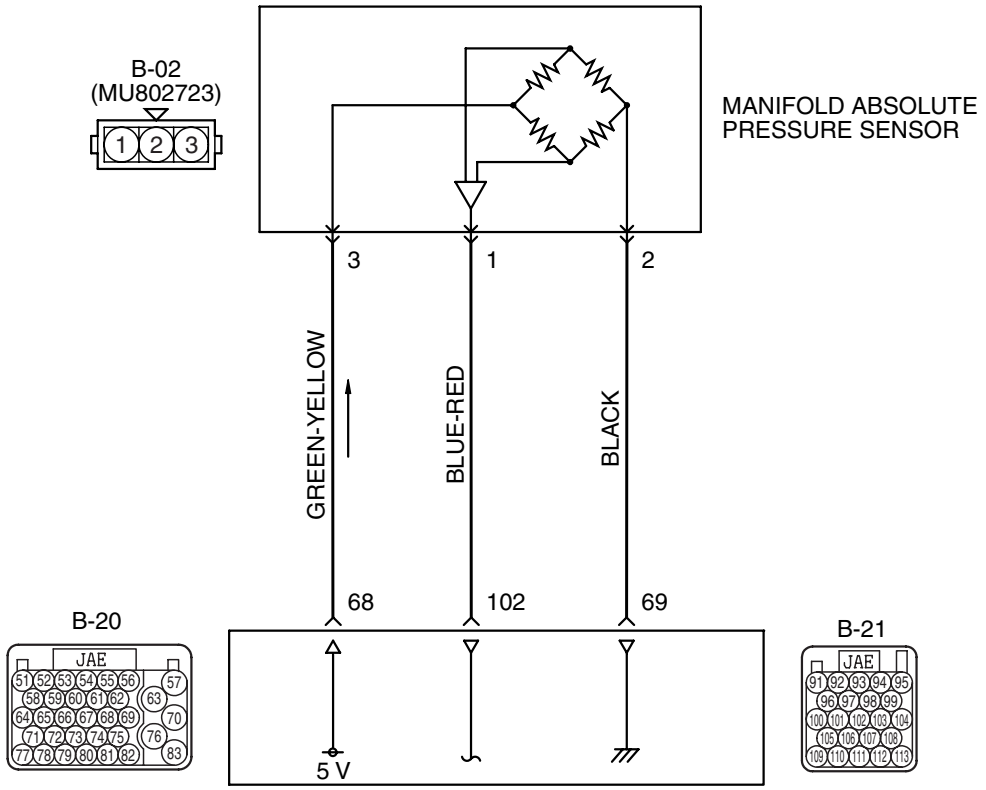
Q: Is DTC P0103 set?

YES : Retry the troubleshooting.

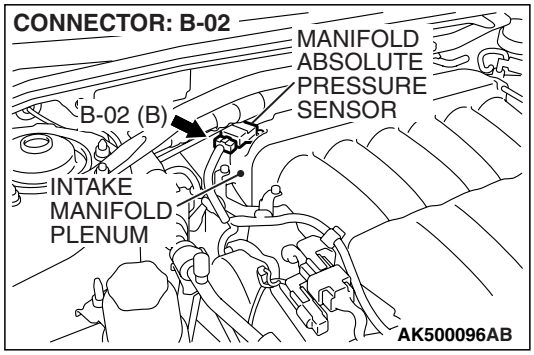
NO : The inspection is complete.

DTC P0106: Manifold Absolute Pressure Circuit Range/Performance Problem

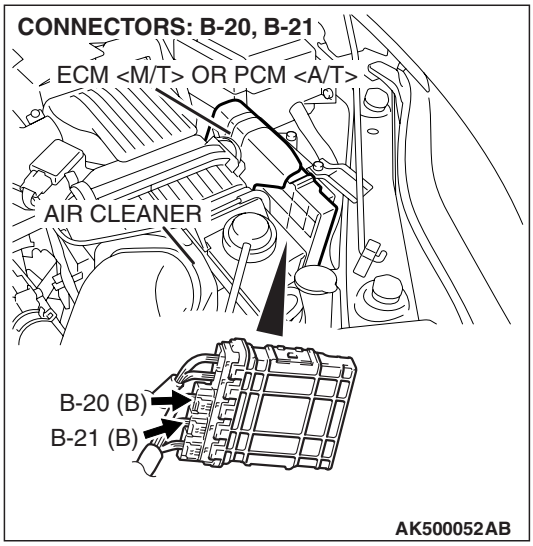
Manifold Absolute Pressure Sensor Circuit



AK403678



TSB Revision



CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM <M/T> or the PCM <A/T> (terminal No. 68). The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with manifold absolute pressure sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

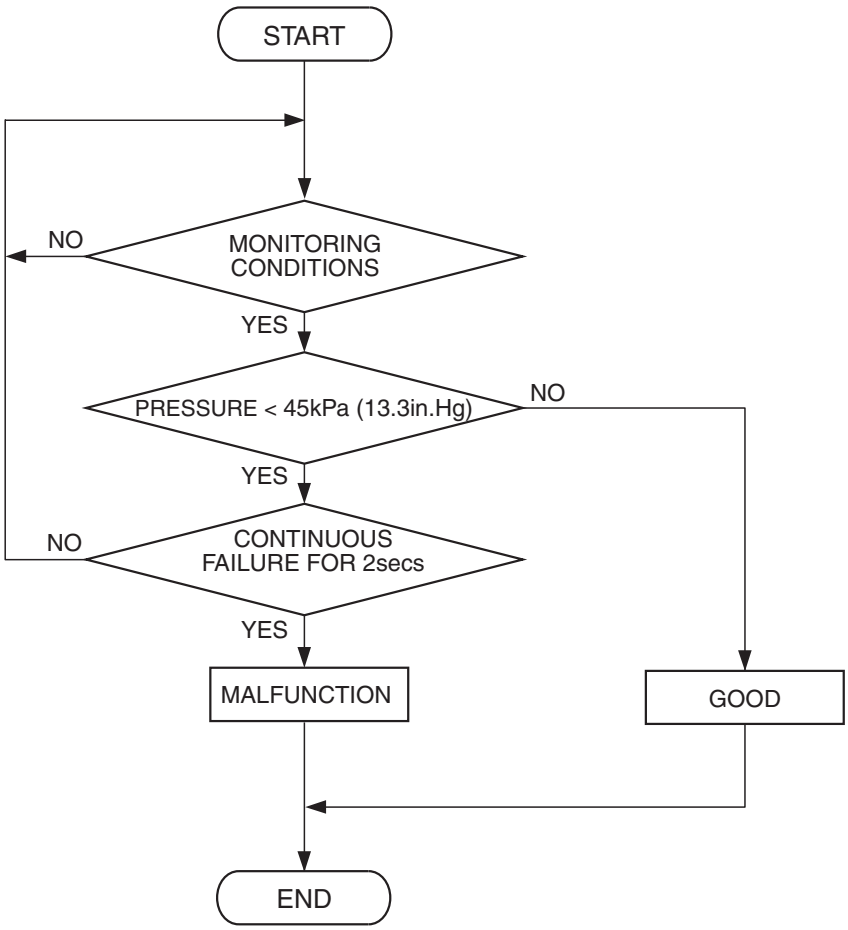
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS <Range/Performance problem - low input>

Logic Flow Chart



AK401474

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Engine speed is higher than 1,500 r/min.
- Throttle position sensor output voltage is higher than 3.5 volts.

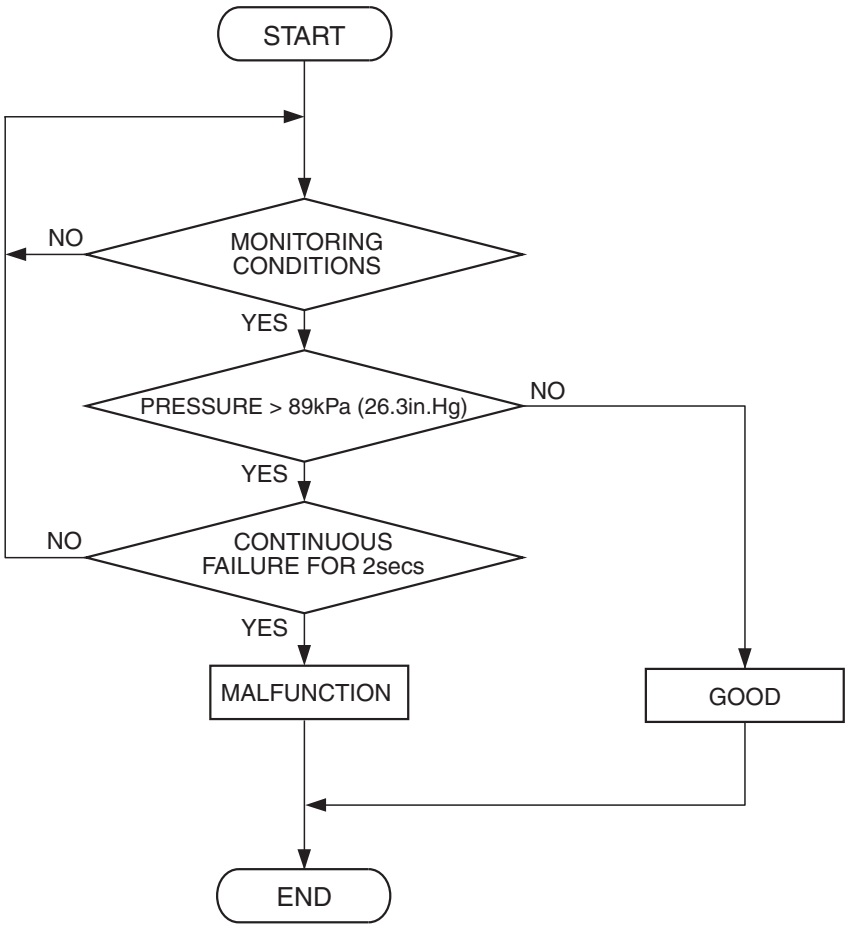
Judgement Criterion

- Manifold absolute pressure is 45 kPa (13.3 in.Hg) or lower for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem - high input>

Logic Flow Chart



AK401473

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Engine speed is lower than 1,500 r/min.
- Throttle position sensor output voltage is lower than 0.9 volt.

Judgement Criterion

- Manifold absolute pressure is 89 kPa (26.3 in.Hg) or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13B-6.

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

- Manifold absolute pressure sensor failed.
- Harness damage.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

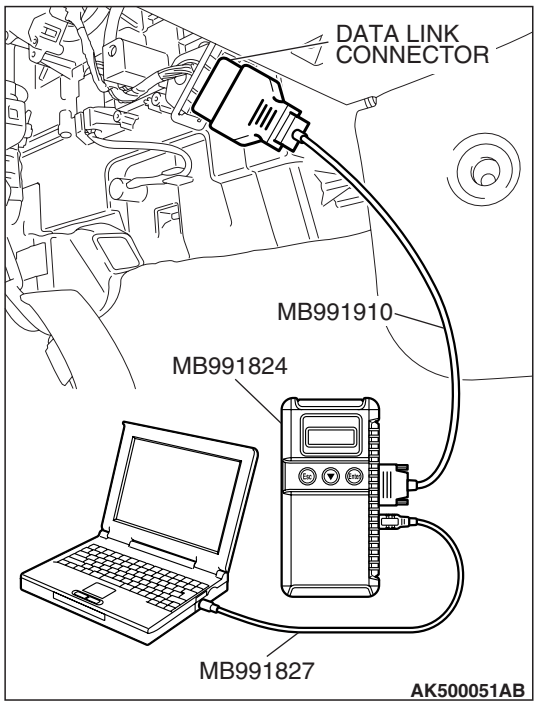
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



⚠ CAUTION

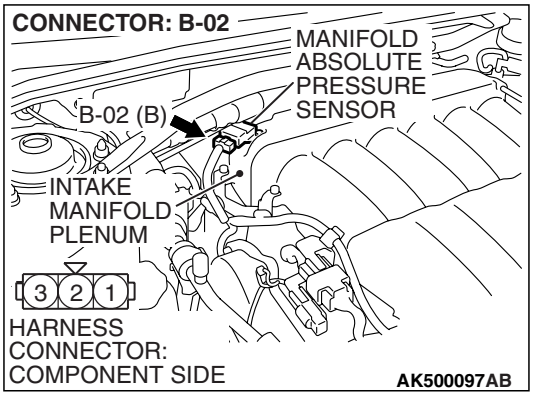
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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) Start the engine.
  - When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

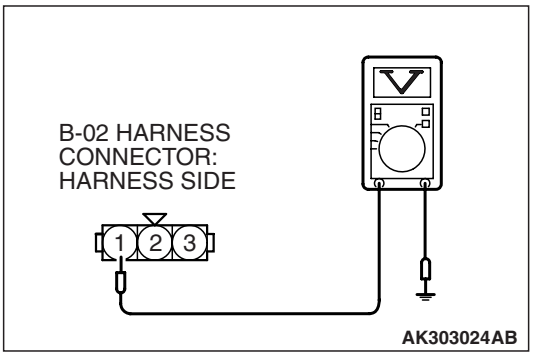
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at Manifold Absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.

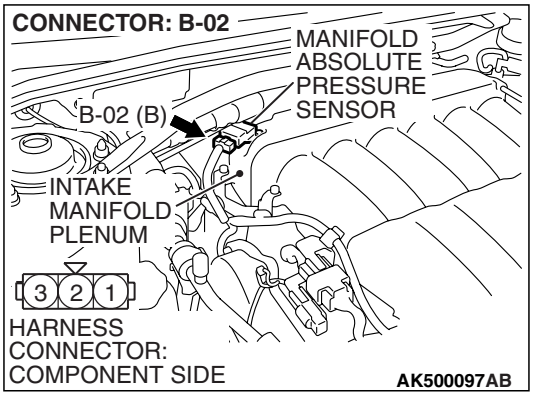


(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When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

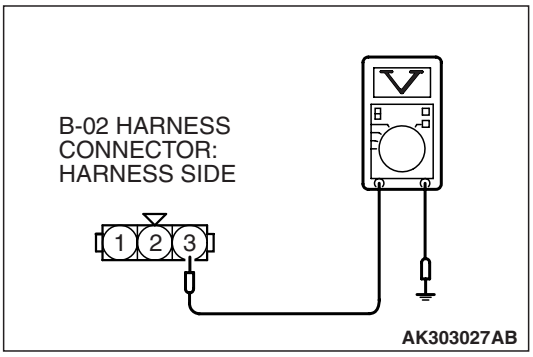
Q: Is measured the voltage normal?

YES : Go to Step 10.
NO : Go to Step 3.



STEP 3. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.

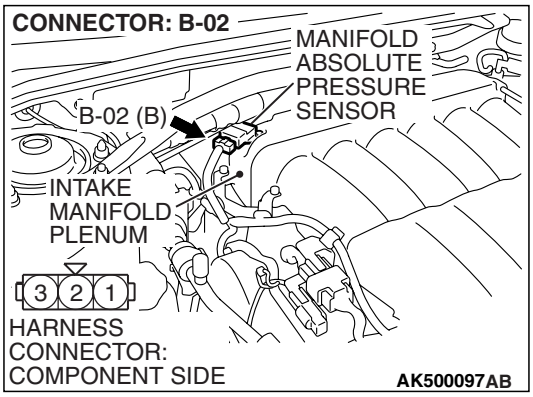


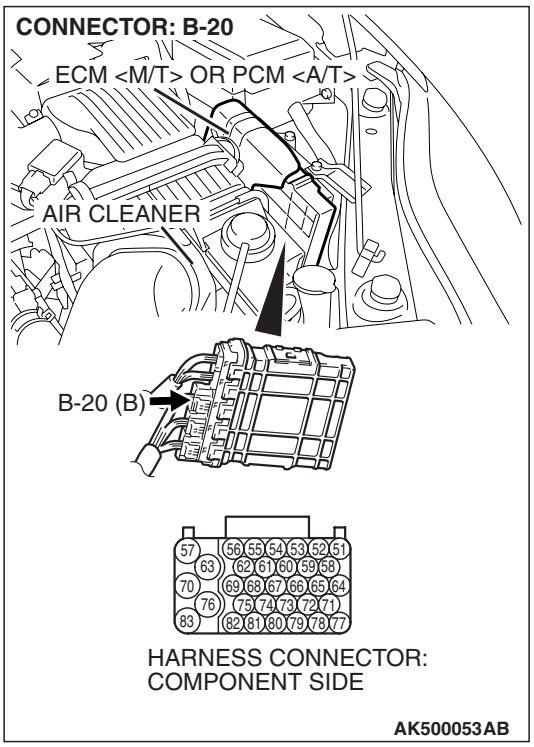
(3) Measure the voltage between terminal No. 3 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

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

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



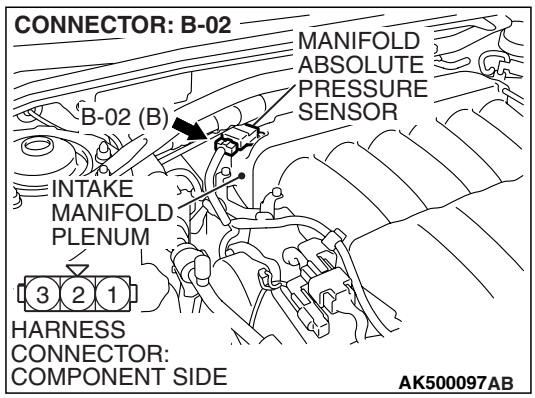


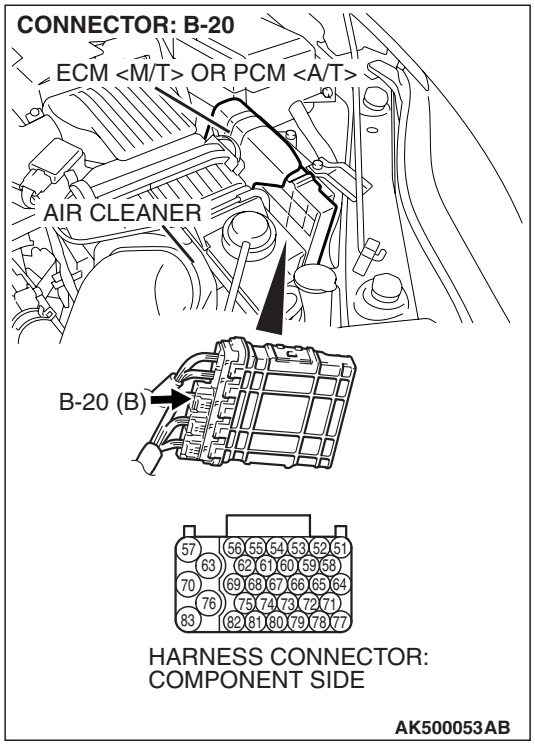
STEP 4. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-20 at PCM for damage.

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 13.



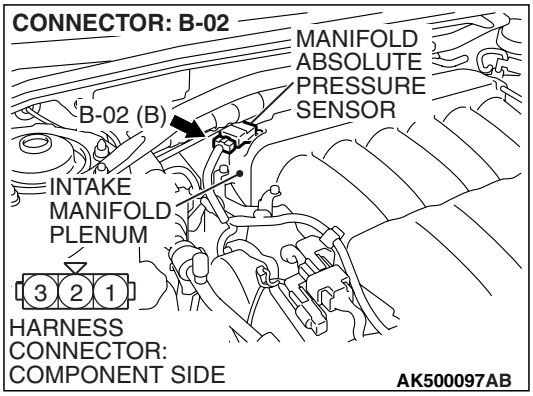


STEP 5. Check for harness damage between manifold absolute pressure sensor connector B-02 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 68).

Q: Is the harness wire in good condition?

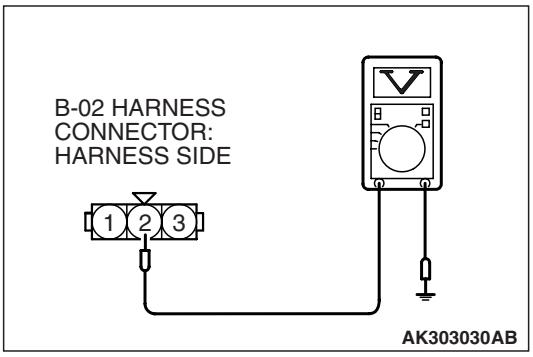
YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



STEP 6. Measure the ground voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.

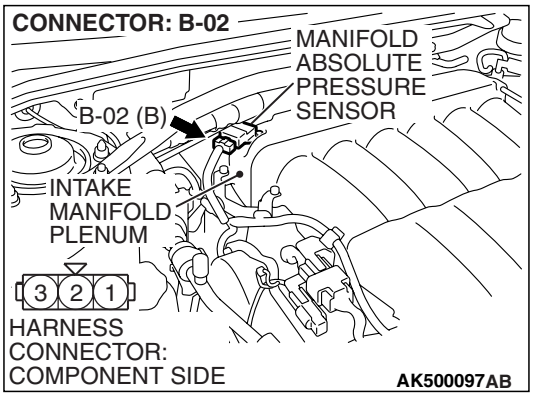


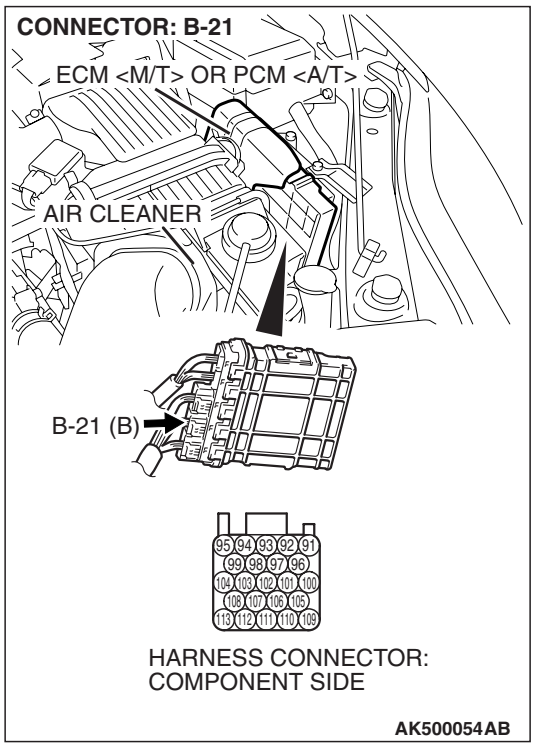
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

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





STEP 7. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

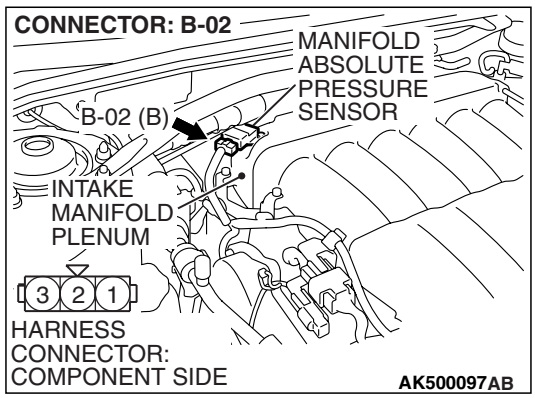
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

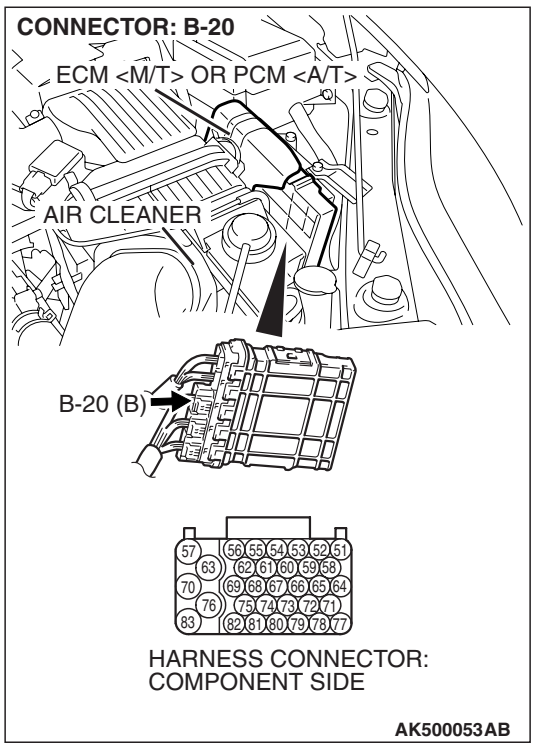
STEP 8. Check for harness damage between manifold absolute pressure sensor connector B-02 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



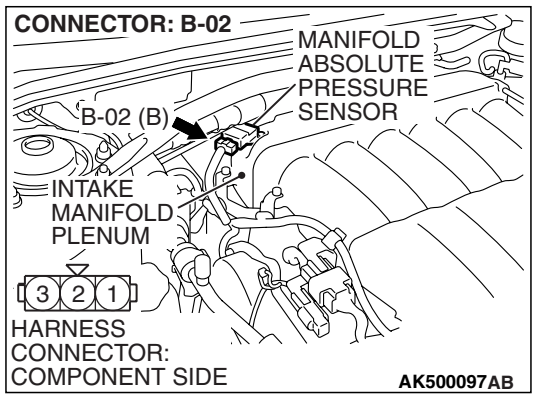


STEP 9. Check harness connector B-02 at manifold absolute pressure sensor for damage.

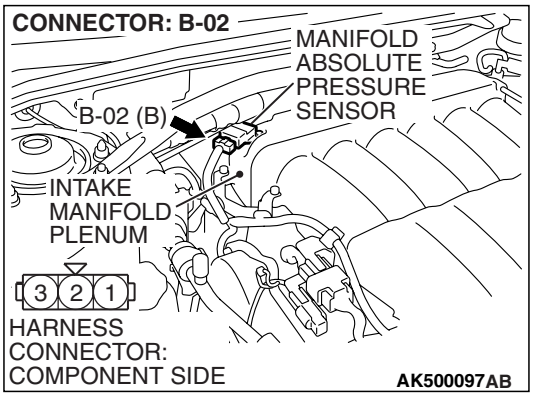
Q: Is the harness connector in good condition?

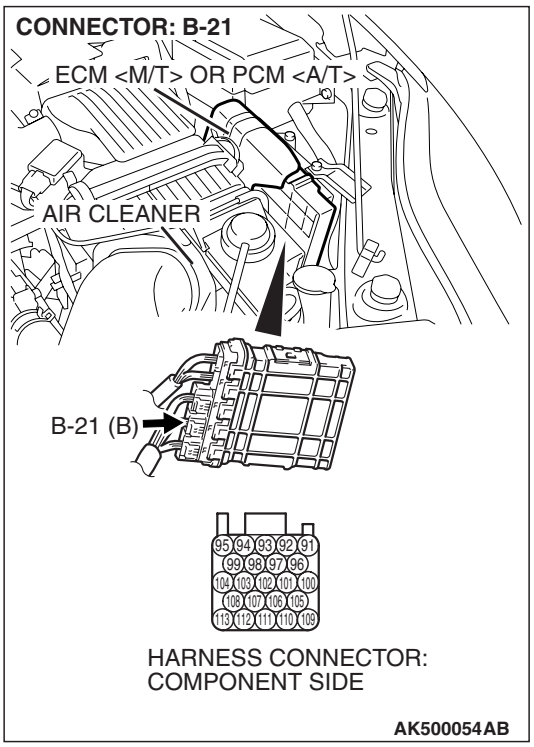
YES : Replace the manifold absolute pressure sensor. Then go to Step 13.

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



TSB Revision



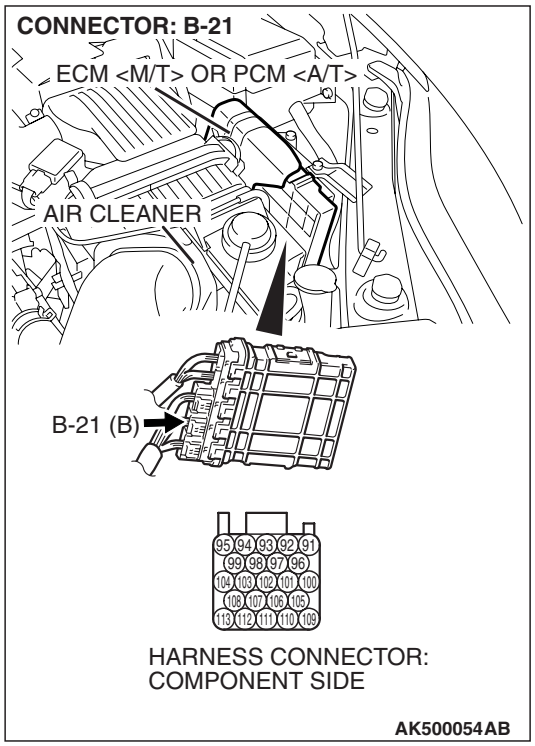


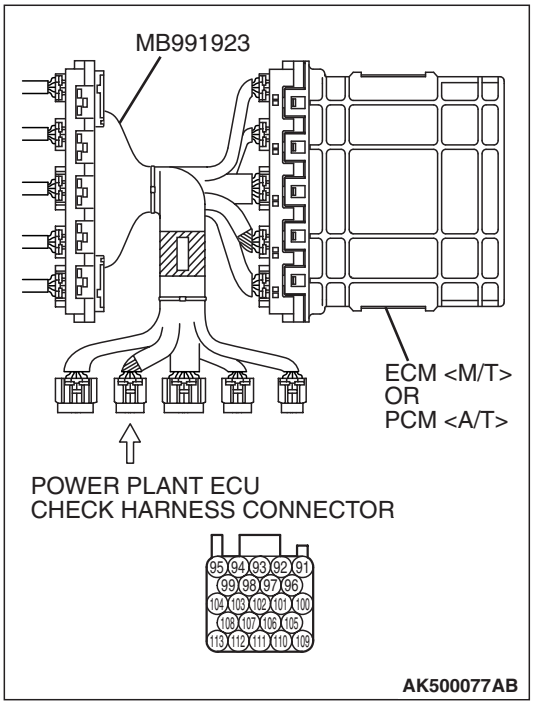
STEP 10. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

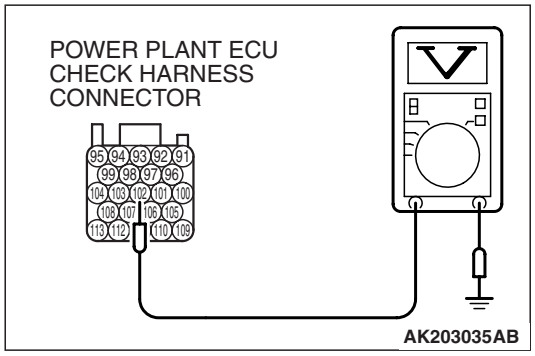
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





STEP 11. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 102 and ground.
- 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.

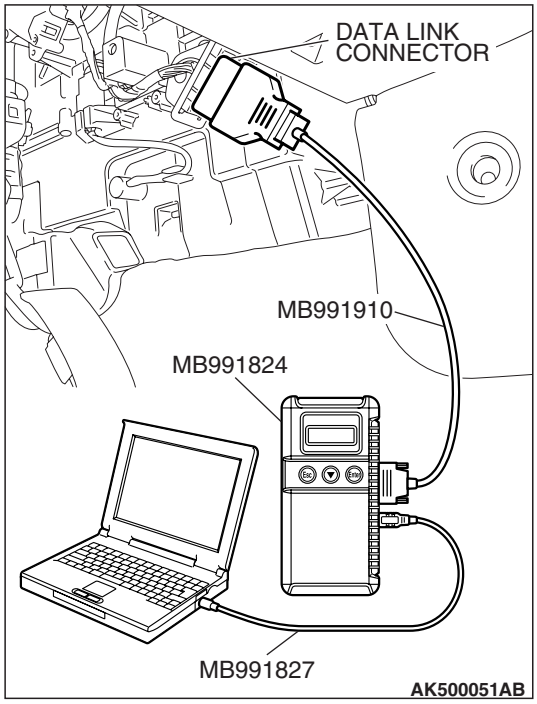
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : Go to Step 12.

NO : Repair harness wire between manifold absolute pressure sensor connector B-02 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 102) because of harness damage. Then go to Step 13.

STEP 12. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



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

(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13B-6.

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

Q: Is DTC P0106 set?

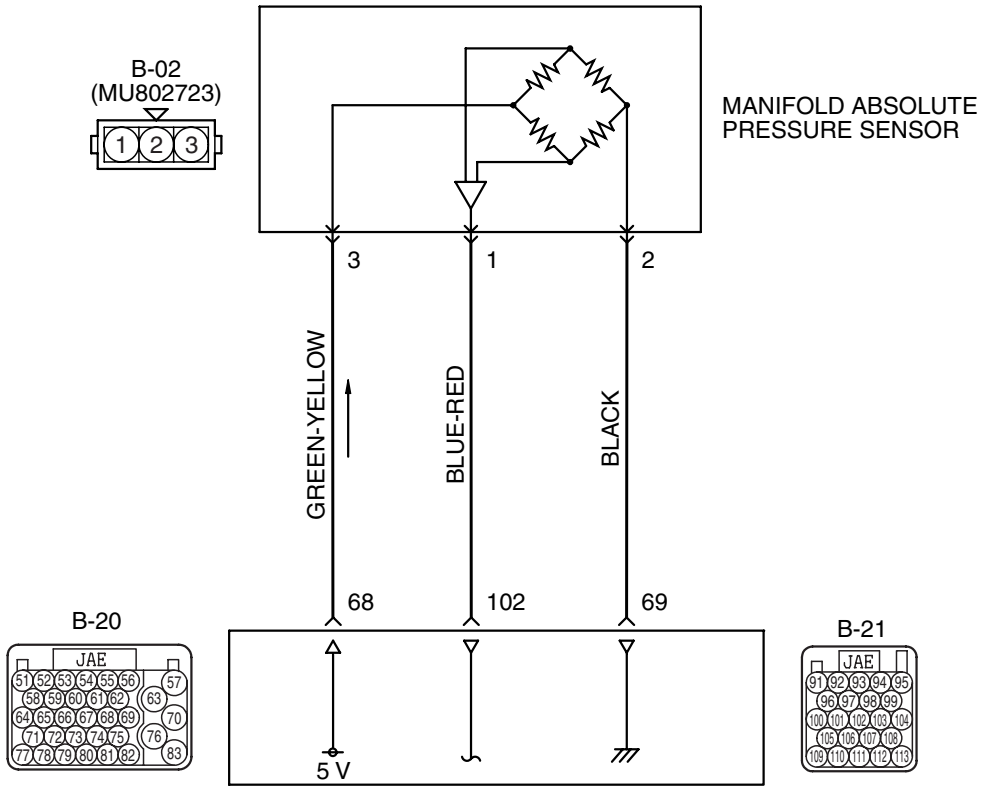
YES : Retry the troubleshooting.

NO : The inspection is complete.

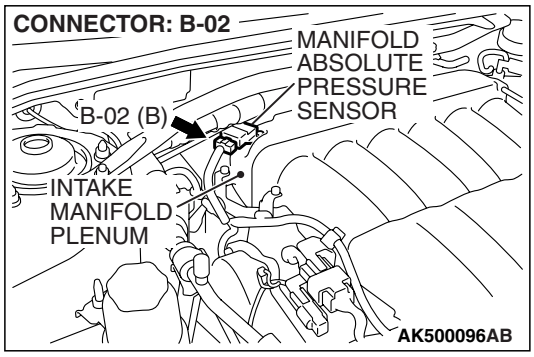
TSB Revision

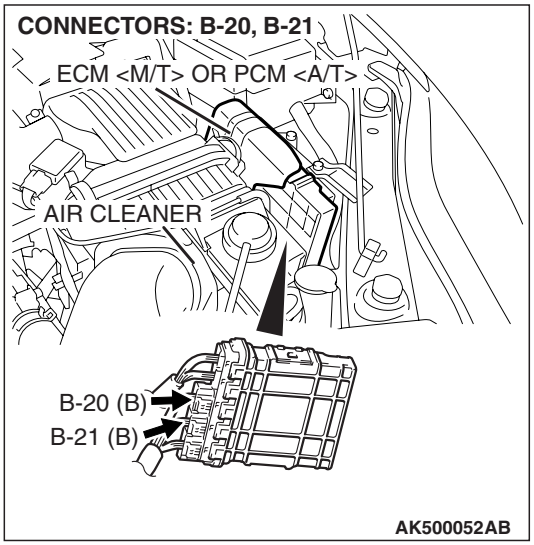
DTC P0107: Manifold Absolute Pressure Circuit Low Input

Manifold Absolute Pressure Sensor Circuit



AK403678





TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM <M/T> or the PCM <A/T> (terminal No. 68). The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

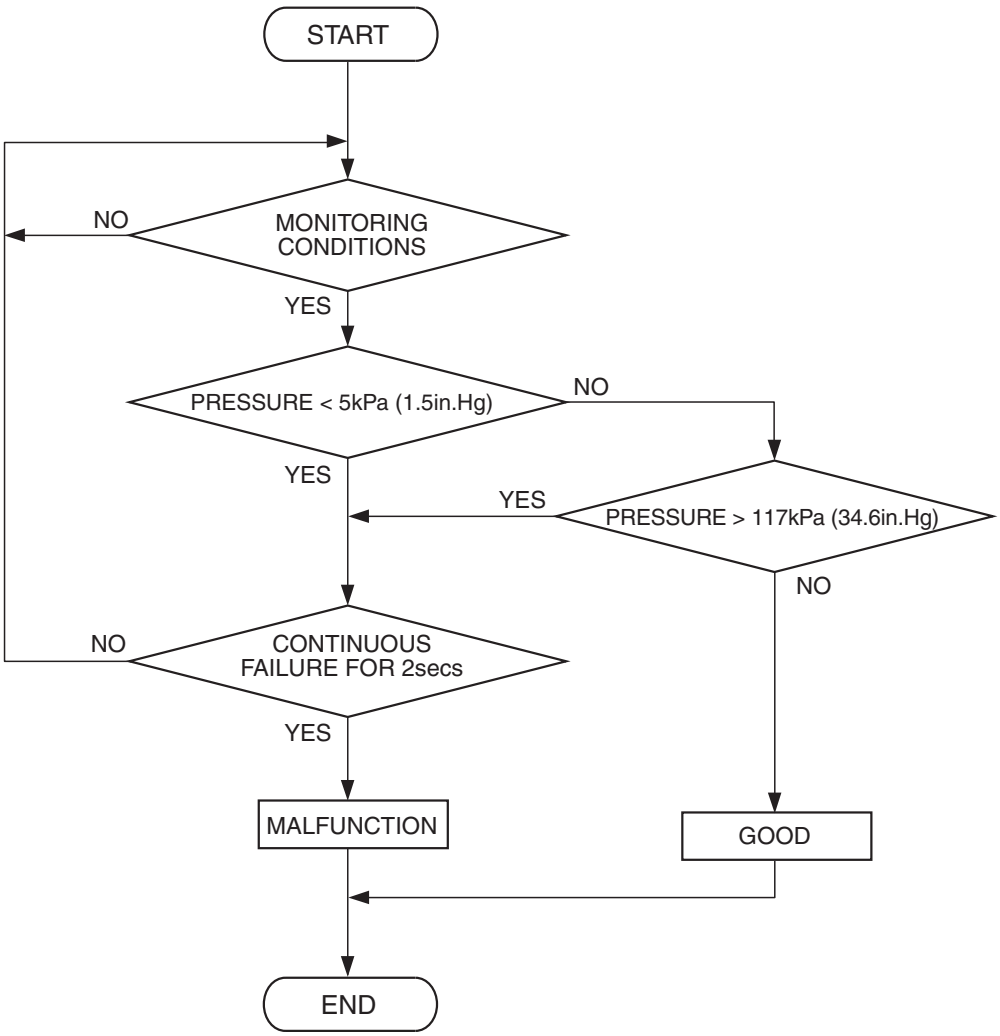
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302382

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Volumetric efficiency is higher than 20 percent.

Judgement Criterion

- Manifold absolute pressure is 5 kPa (1.5 in.Hg) or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13B-6.

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

- Manifold absolute pressure sensor failed.
- Open or shorted manifold absolute pressure sensor circuit, harness damage or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

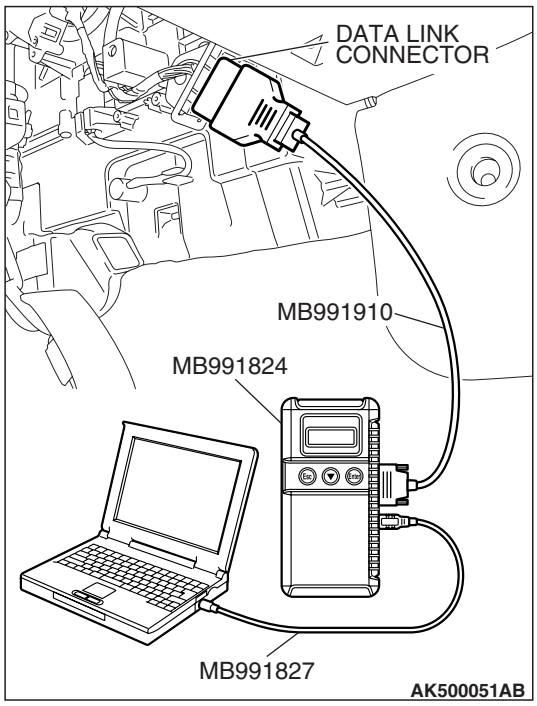
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



⚠ CAUTION

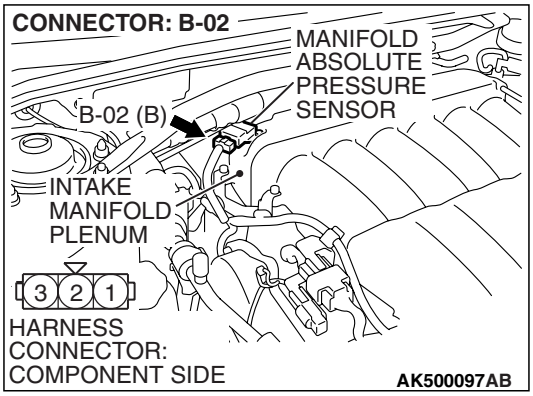
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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) Start the engine.
  - When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

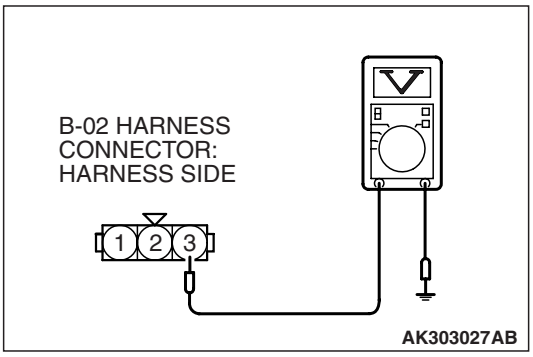
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 3 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

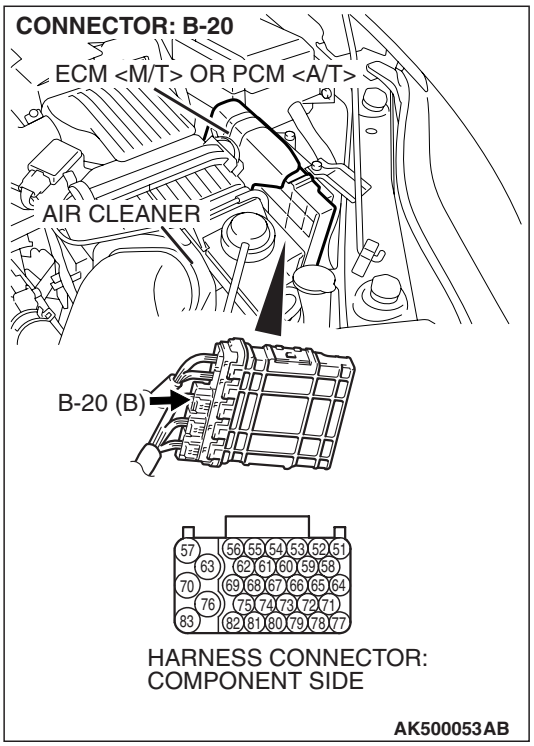
Q: Is the measured voltage between 4.9 and 5.1 volts?

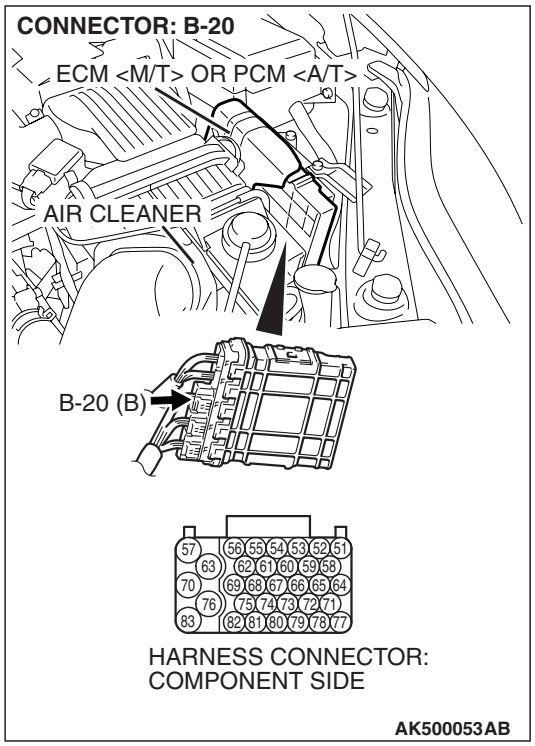
YES : Go to Step 8.
NO : Go to Step 3.

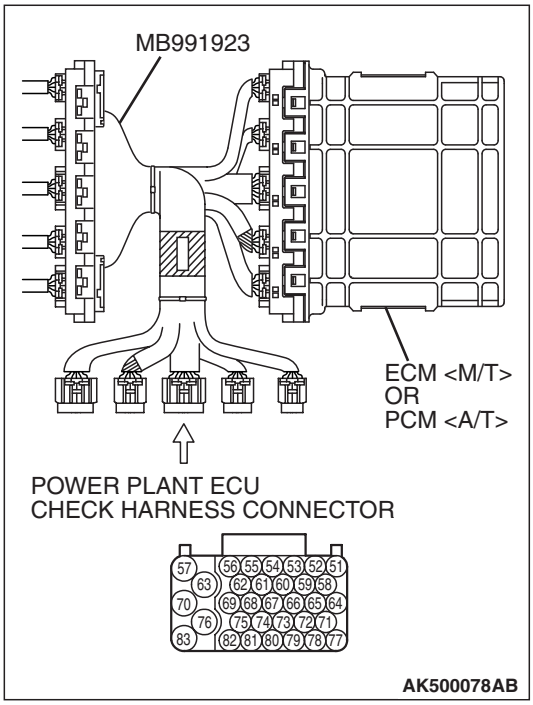
STEP 3. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

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 12.

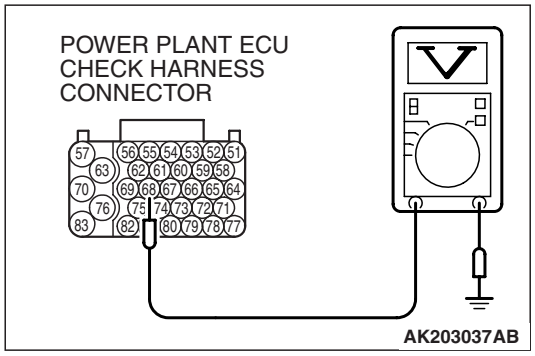






STEP 4. Measure the sensor supply voltage at ECM <M/T> or PCM <A/T> connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.

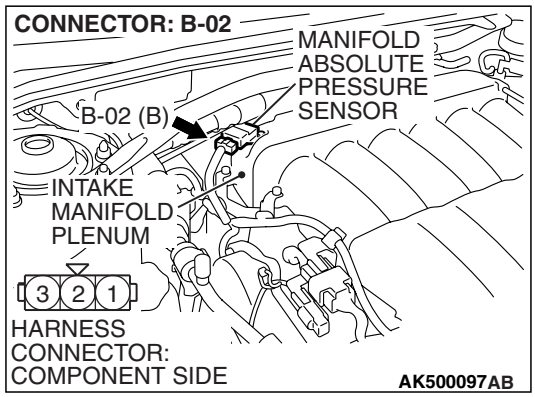


(3) Measure the voltage between terminal No. 68 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

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



STEP 5. Check harness connector B-02 at the manifold absolute pressure sensor for damage.

Q: Is the connector in good condition?

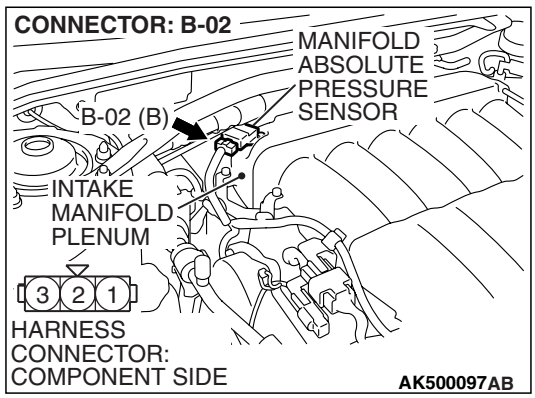
YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

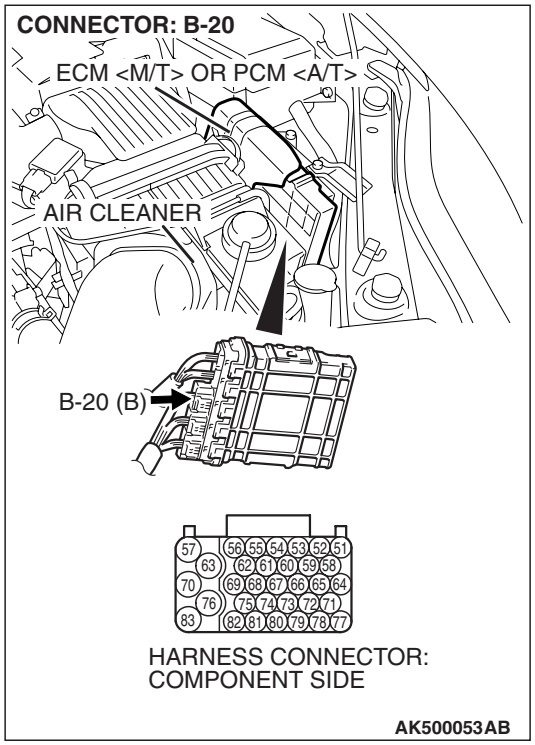
STEP 6. Check for short circuit to ground between manifold absolute pressure sensor connector B-02 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 68).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



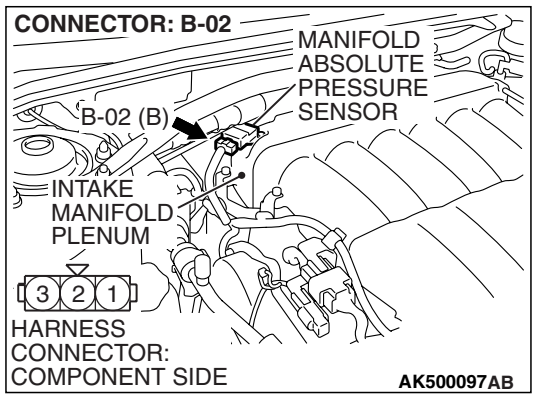


STEP 7. Check harness connector B-02 at the manifold absolute pressure sensor for damage.

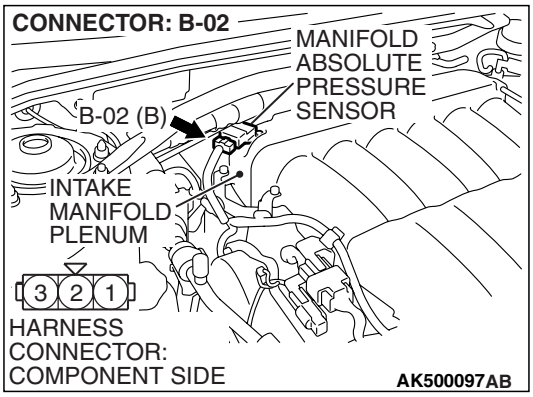
Q: Is the connector in good condition?

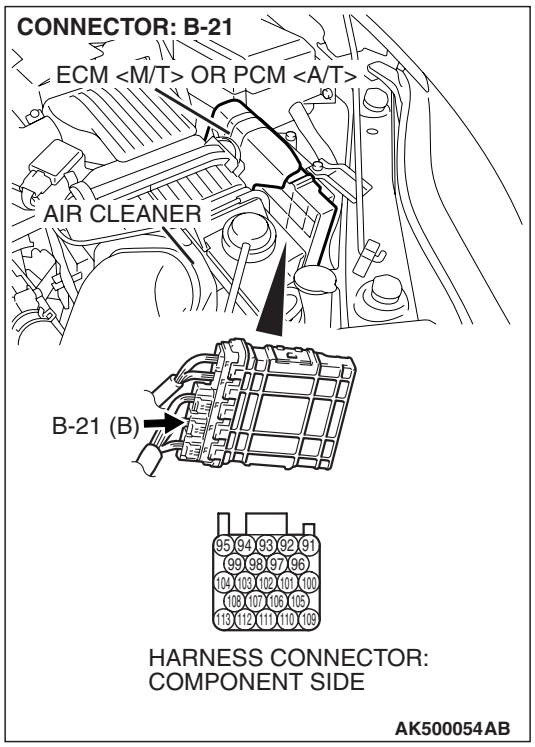
YES : Repair harness wire between manifold absolute pressure sensor connector B-02 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 68) because of open circuit. Then go to Step 12.

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



TSB Revision



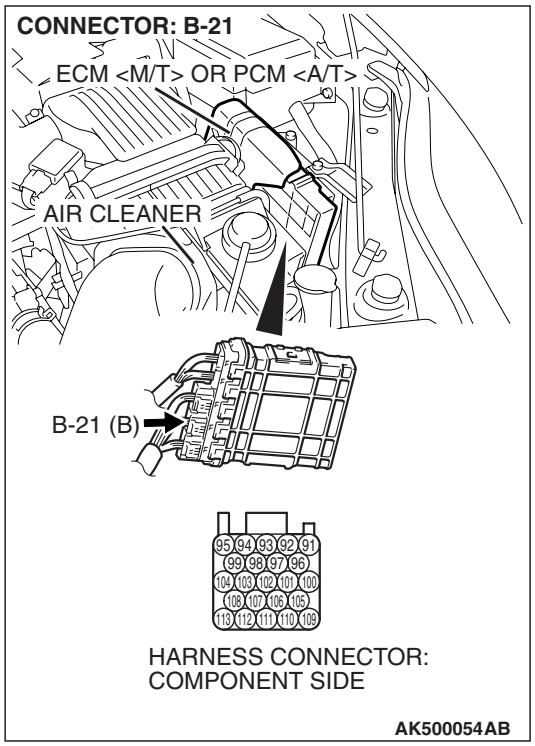


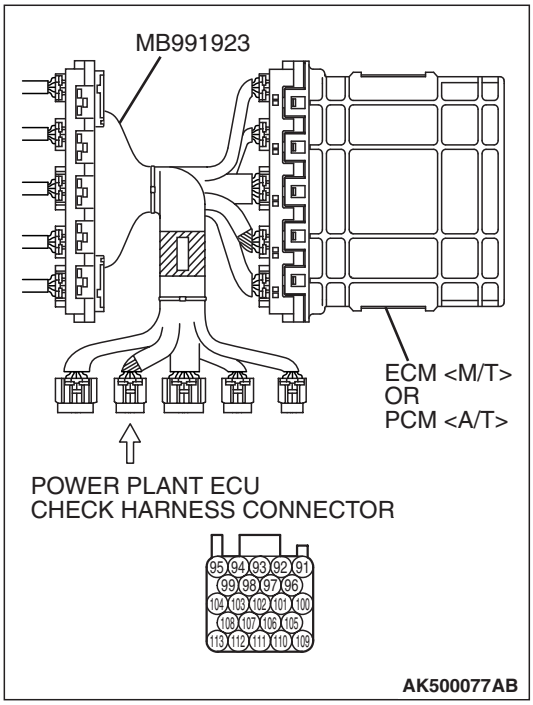
STEP 8. Check harness connector B-02 at the manifold absolute pressure sensor and connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

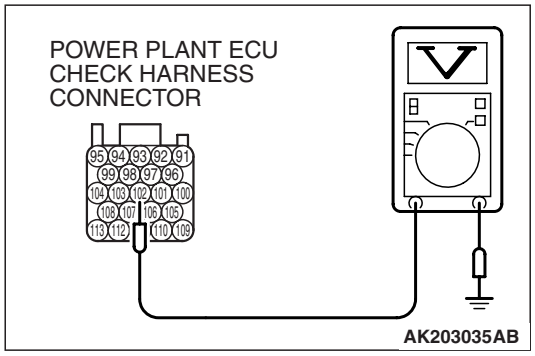
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 9. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 102 and ground.
- 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.

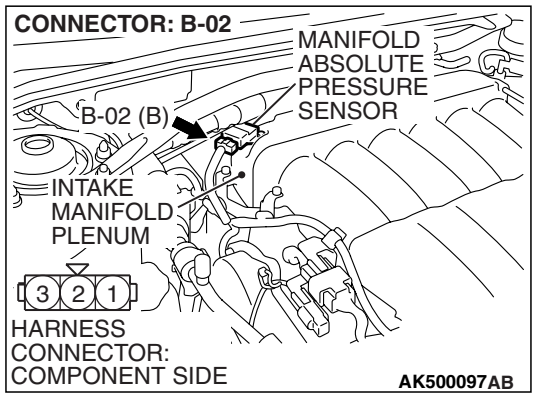
Q: Is the measured voltage normal?

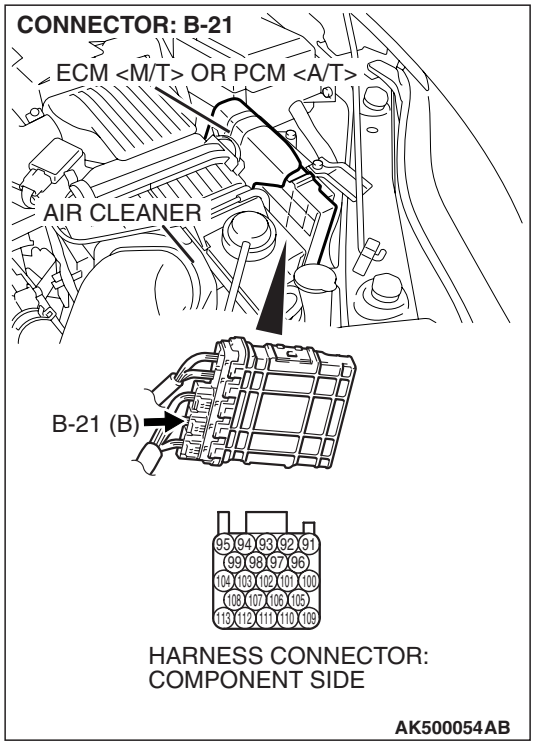
YES : Go to Step 11.
NO : Go to Step 10.

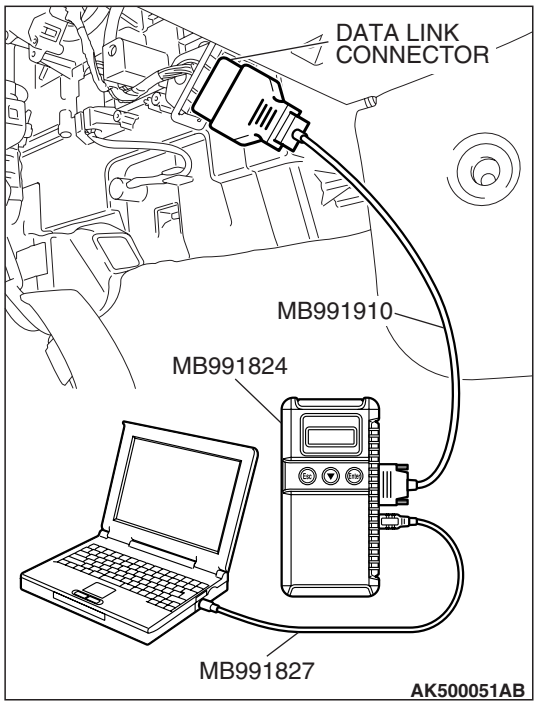
STEP 10. Check for open or short circuit to ground between manifold absolute pressure sensor connector B-02 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 102).

Q: Is the harness wire in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 12.
NO : Repair it. Then go to Step 12.







STEP 11. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

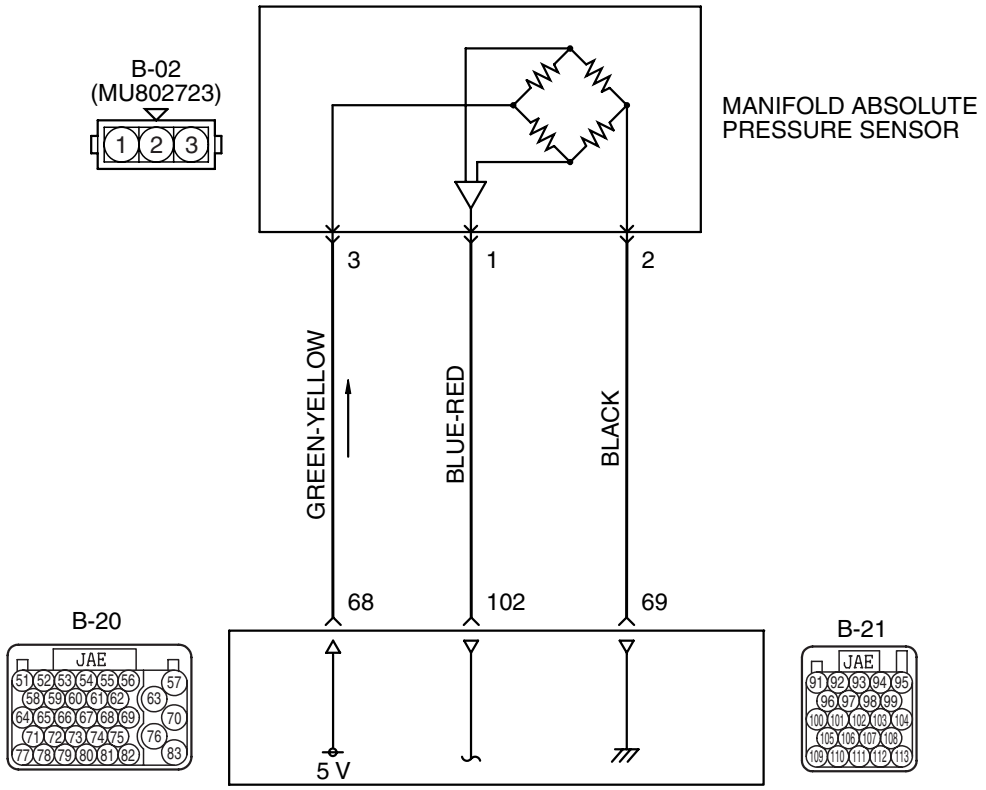
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0107 set?

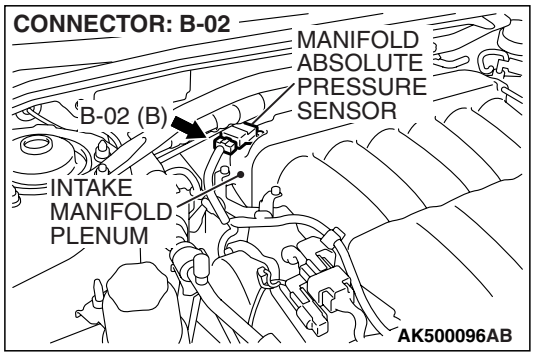
YES : Retry the troubleshooting.
NO : The inspection is complete.

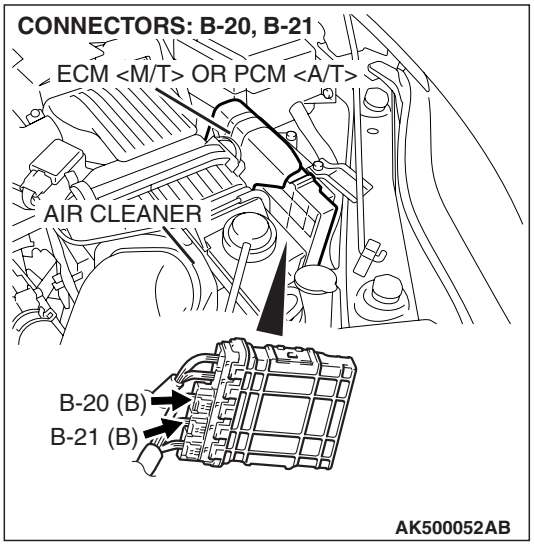
DTC P0108: Manifold Absolute Pressure Circuit High Input

Manifold Absolute Pressure Sensor Circuit



AK403678





TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from ECM <M/T> or PCM <A/T> (terminal No. 68). The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 102) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

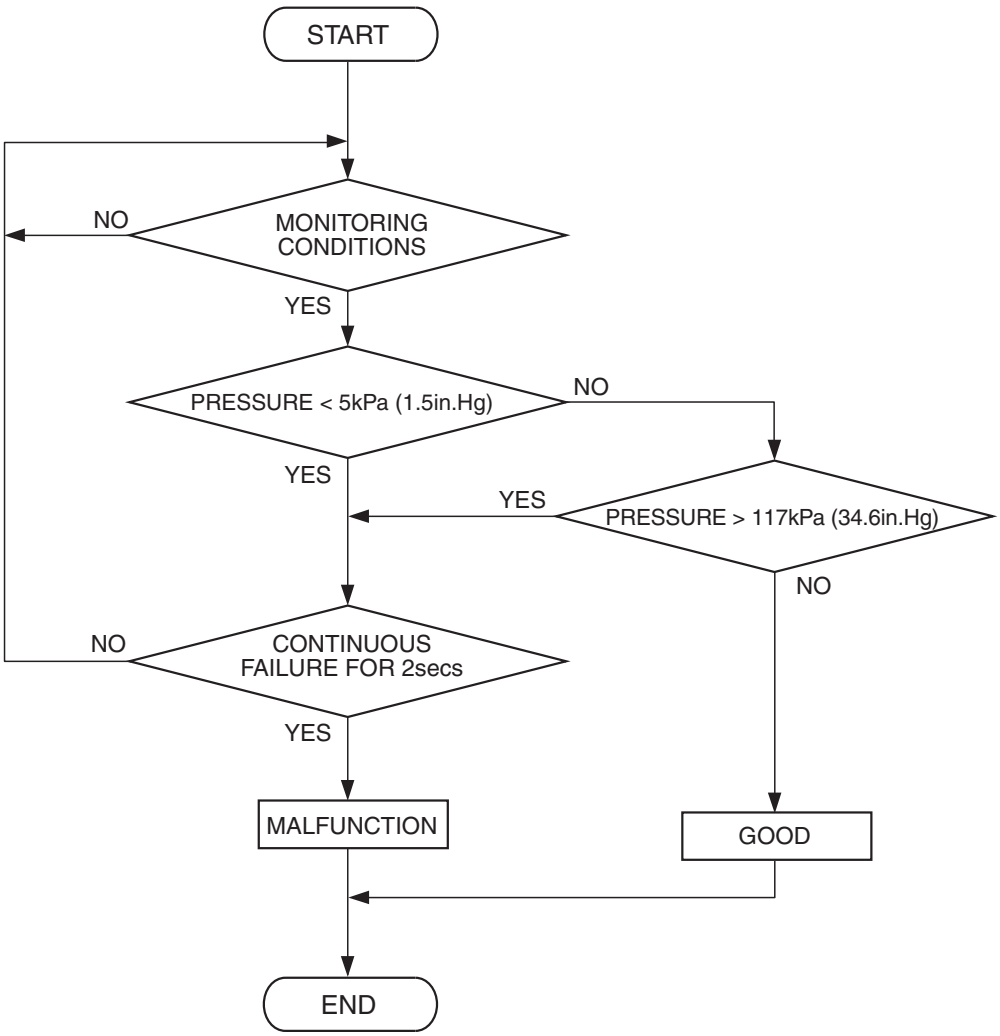
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302382

Check Condition

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.

Judgement Criterion

- Manifold absolute pressure is 117 kPa (34.6 in.Hg) or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Manifold absolute pressure sensor failed.
- Open manifold absolute pressure sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

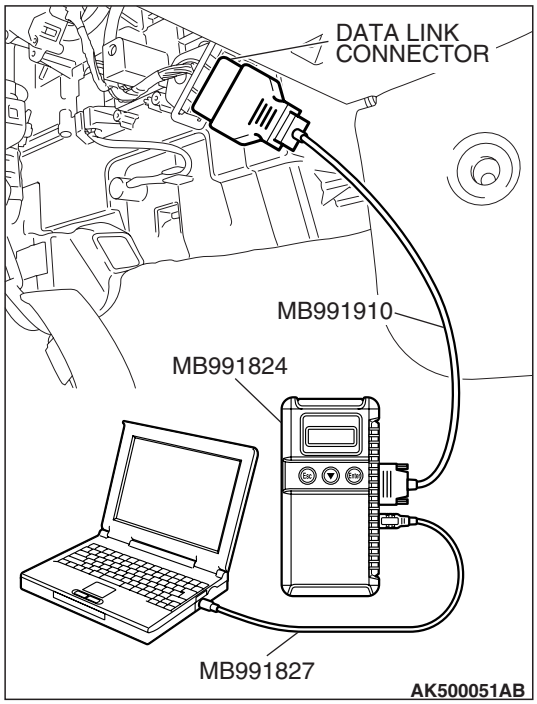
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



⚠ CAUTION

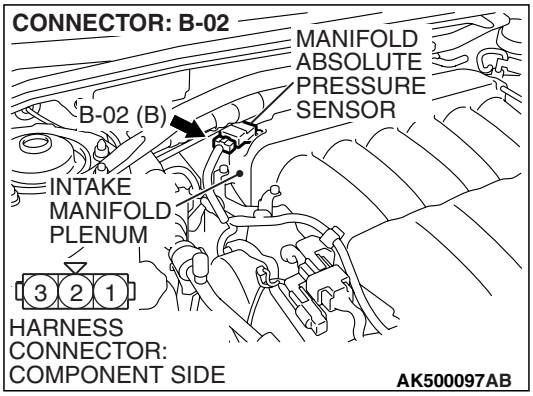
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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) Start the engine.
  - When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

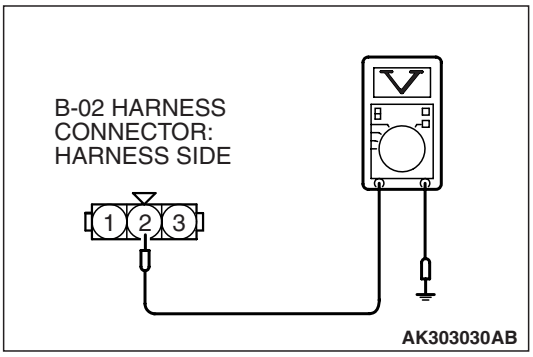
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Measure the ground voltage at manifold absolute pressure sensor connector B-02 by backprobing.

(1) Do not disconnect the connector B-02.
(2) Turn the ignition switch to the "ON" position.

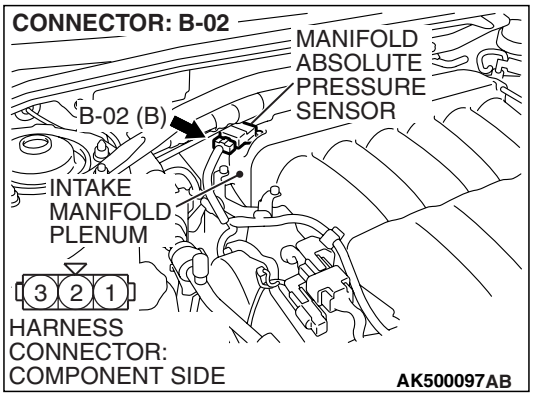


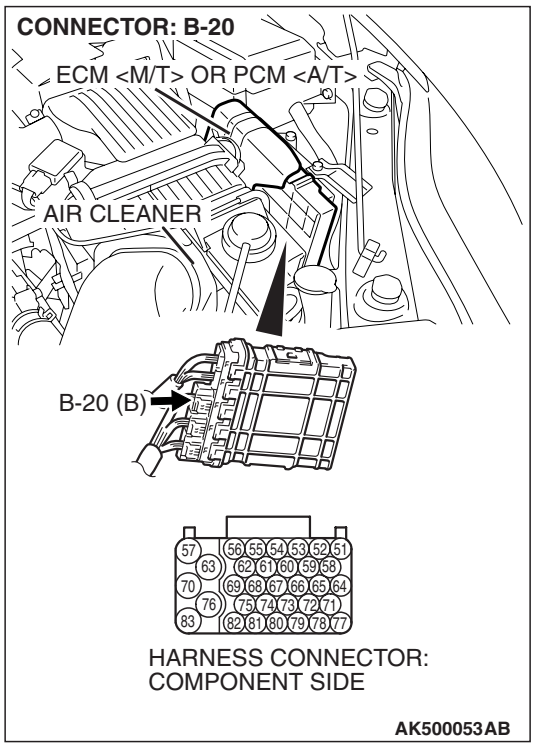
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- Voltage should be 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 3.



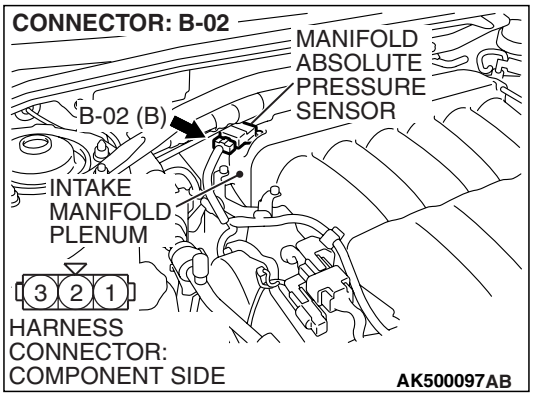


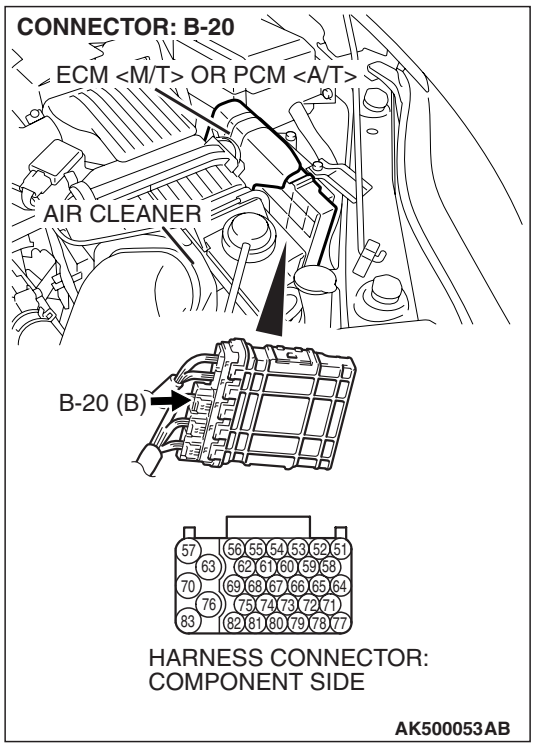
STEP 3. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

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 7.



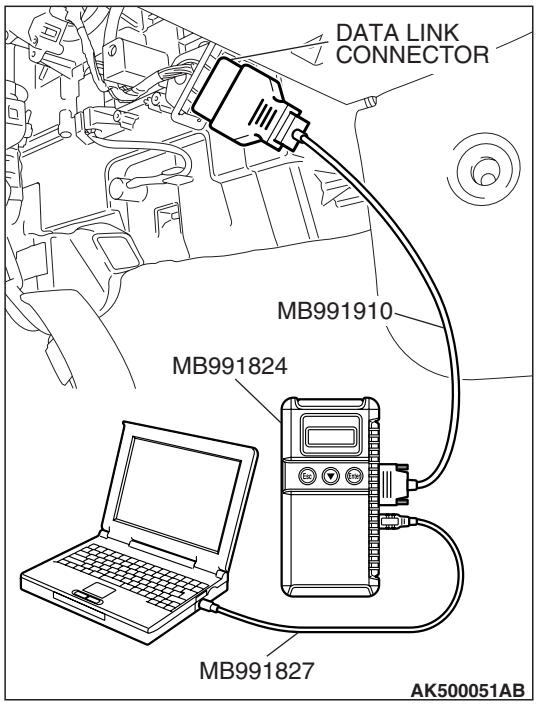


STEP 4. Check for open circuit between manifold absolute pressure sensor connector B-02 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.



STEP 5. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute 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).

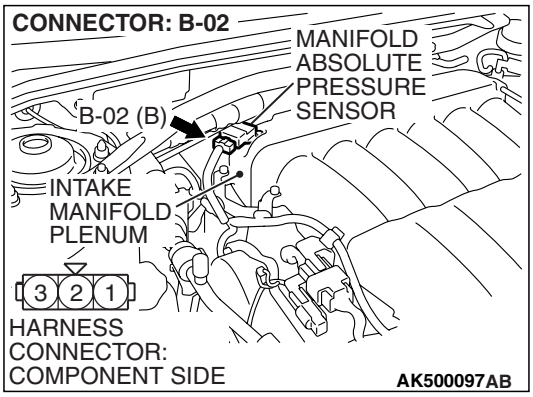
(3) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

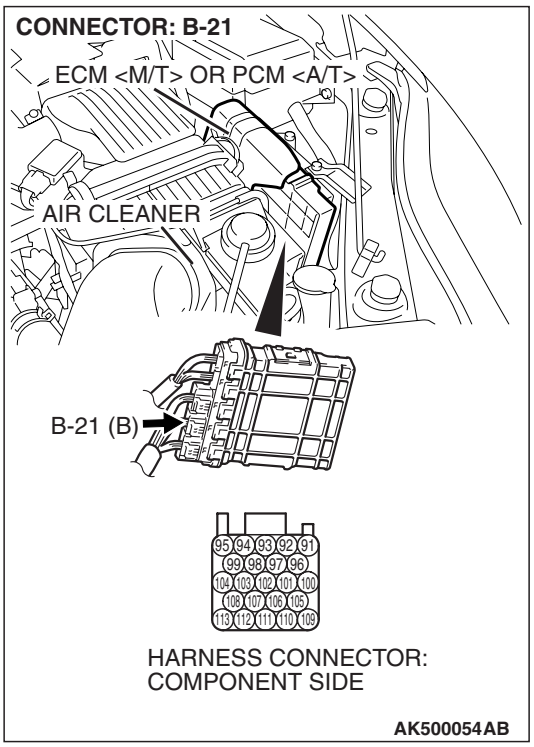
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 7.





STEP 6. Check harness connector B-02 at the manifold absolute pressure sensor and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 7.

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

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

Q: Is DTC P0108 set?

YES : Retry the troubleshooting.

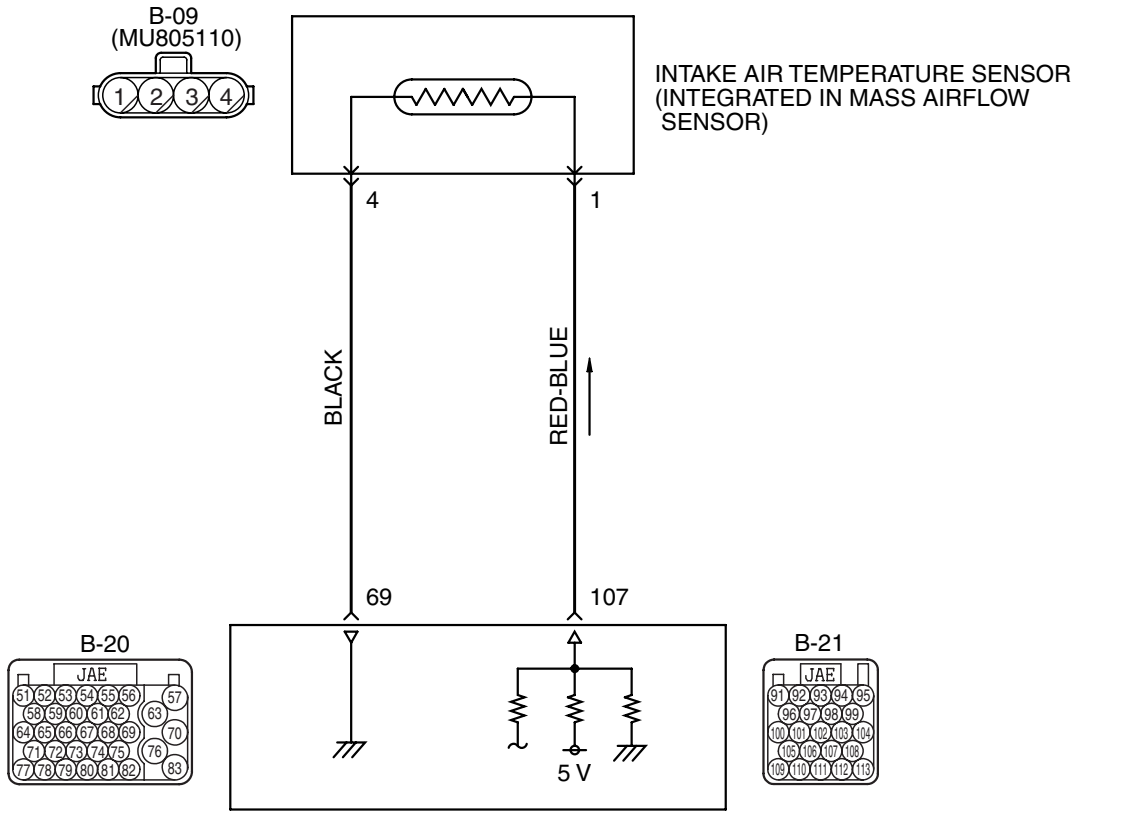
NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

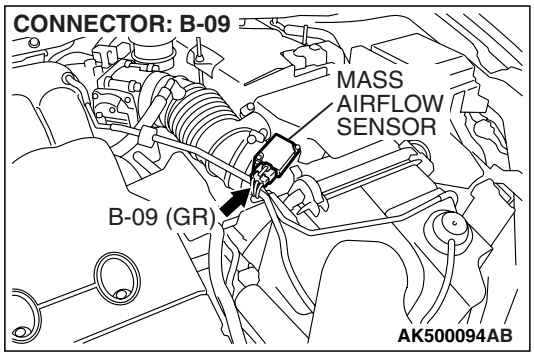
⚠ CAUTION

If DTC P0111 has been set, TCL related DTC U1120 is also set. After P0111 has been diagnosed, don't forget to erase DTC U1120.

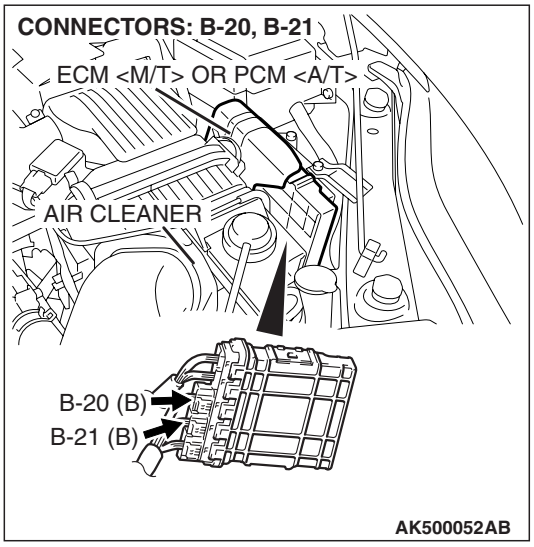
Intake Air Temperature Sensor Circuit



AK403679



AK500094AB



AK500052AB

TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 107) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 4) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage does not change when specified go/stop operations are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

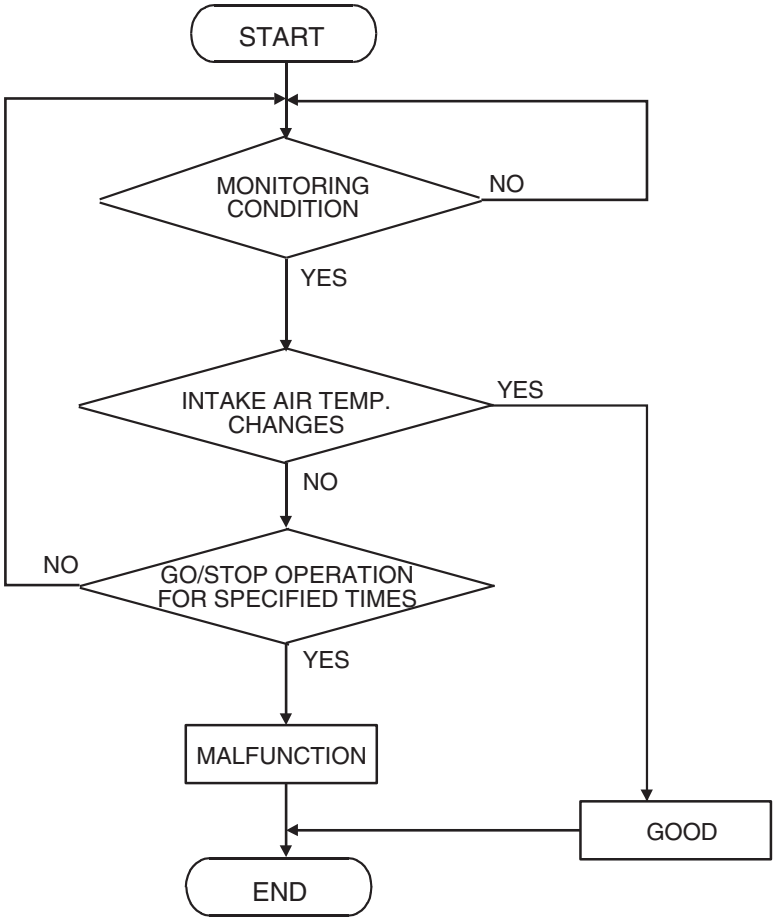
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302383

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Repeat 2 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 (1.0 mph) lasting more than 30 seconds.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 8 P.13B-6.

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

- Intake air temperature sensor failed.
- Open or intake air temperature sensor circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

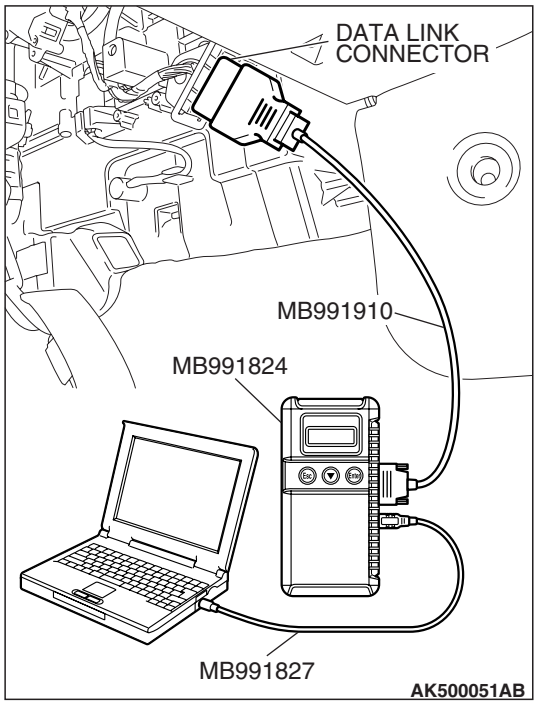
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

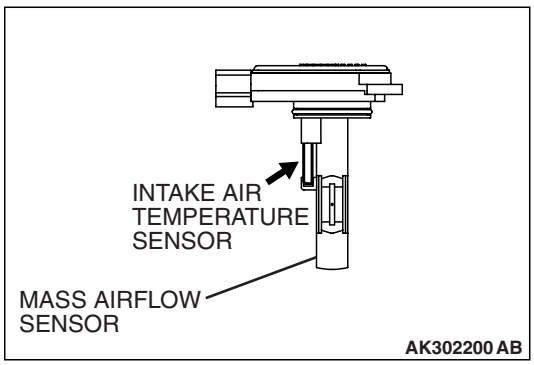
STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Remove the mass airflow sensor from the air intake hose.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.





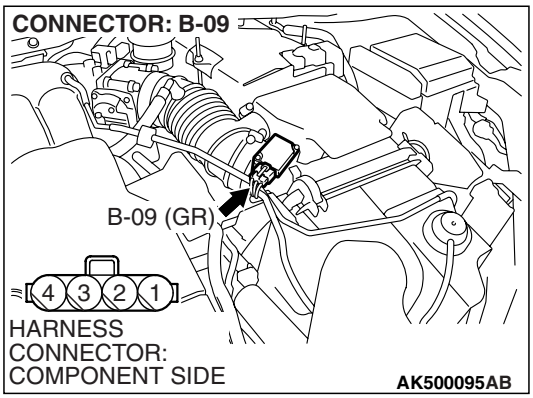
(5) Heating the sensor using a hair drier.
  - The indicated temperature increases.

  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 mass airflow sensor.

Q: Is the sensor operating properly?

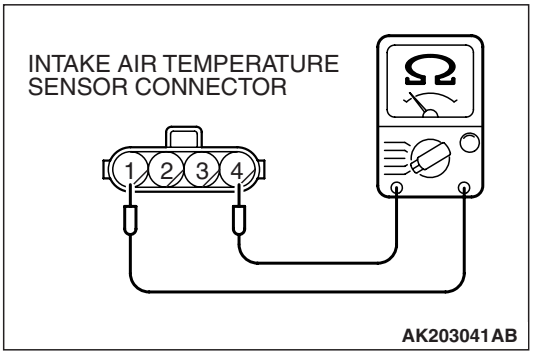
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

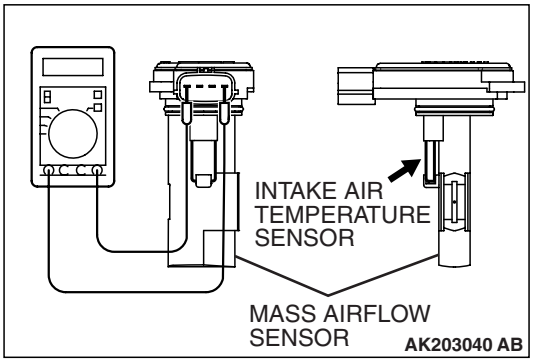


STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-09.



(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.



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

Standard value:
13 – 17 kΩ [at –20° C (–4° F)]
5.3 – 6.7 kΩ [at 0° C (32° F)]
2.3 – 3.0 kΩ [at 20° C (68° F)]
1.0 – 1.5 kΩ [at 40° C (104° F)]
0.56 – 0.76 kΩ [at 60° C (140° F)]
0.30 – 0.45 kΩ [at 80° C (176° F)]

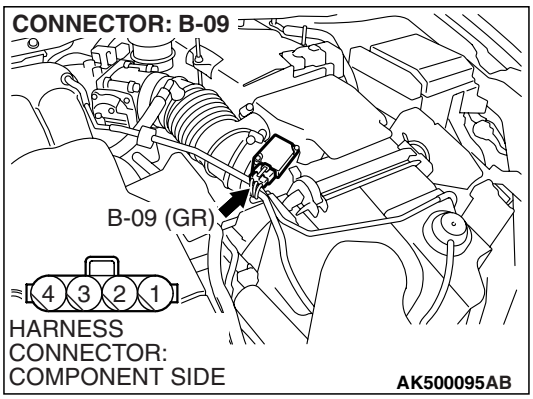
Q: Is the measured resistance at the standard value?

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

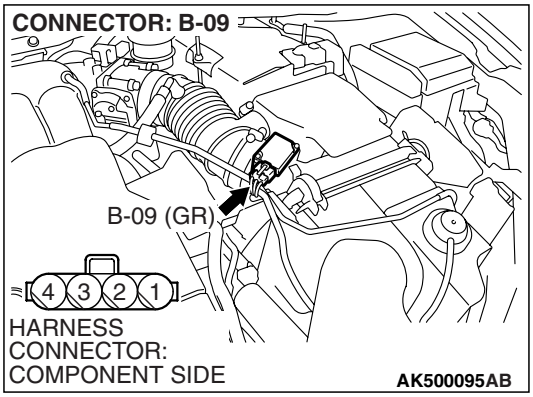
STEP 3. Check harness connector B-09 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

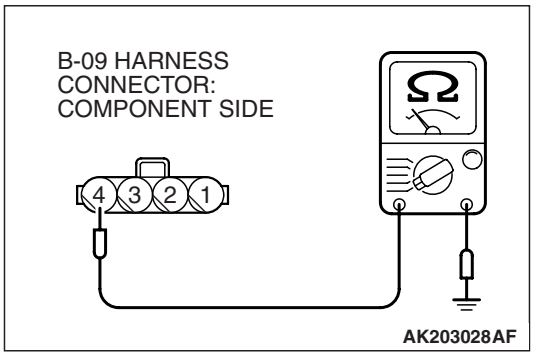
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



STEP 4. Check the continuity at intake air temperature sensor harness side connector B-09.



(1) Disconnect the connector B-09 and measure at the harness side.

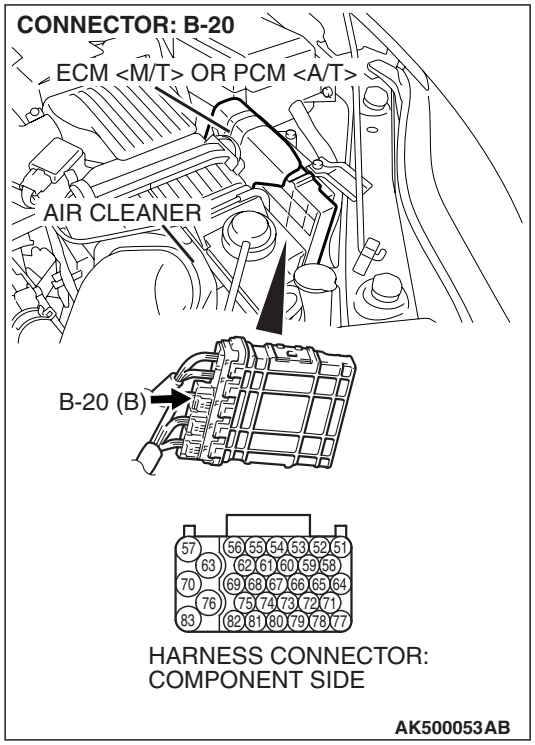


(2) Check for the continuity between terminal No. 4 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

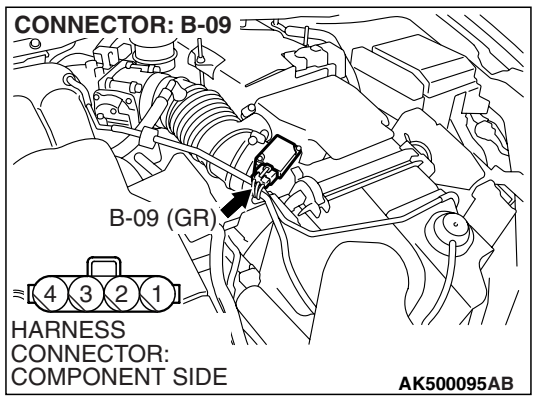
YES : Go to Step 7.
NO : Go to Step 5.

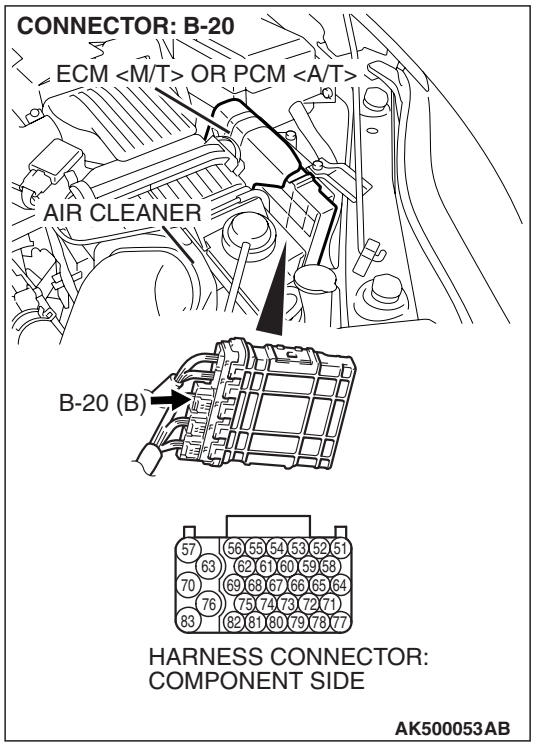
STEP 5. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.



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.



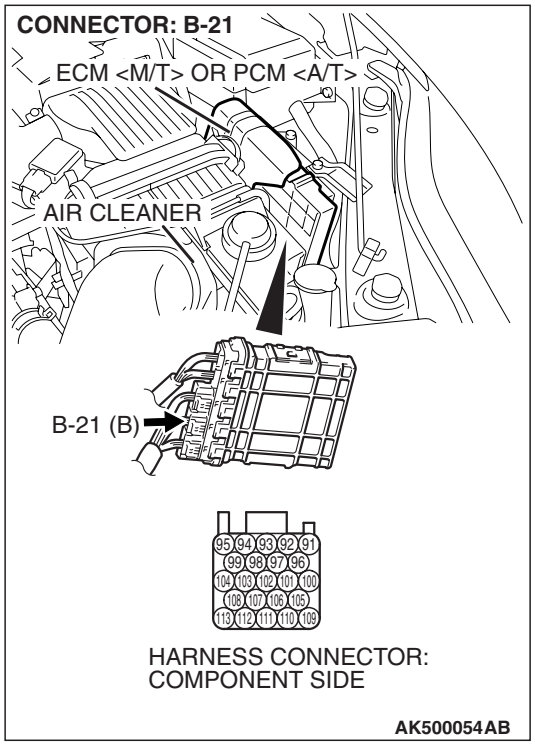


STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-09 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 9.

NO : Repair it. Then go to Step 9.

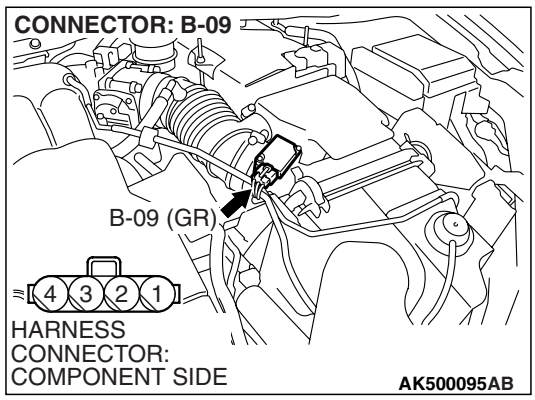


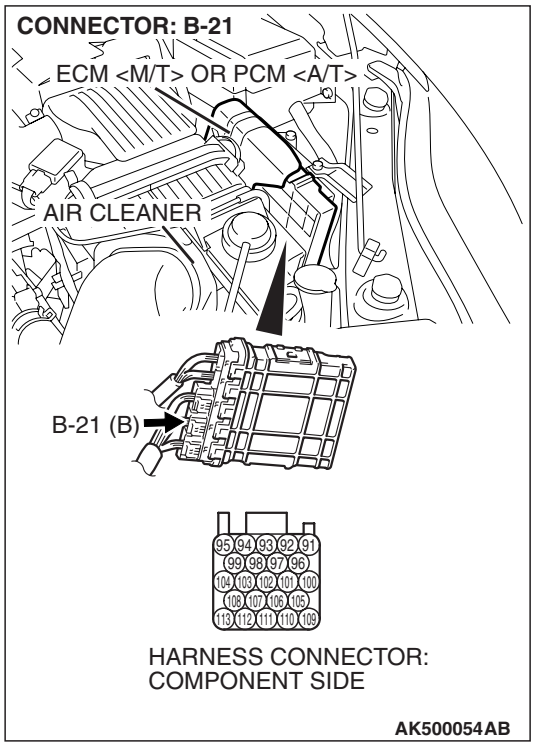
STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 9.





STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-09 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 107).

Q: Is the harness wire in good condition?

YES : Replace the ECM or 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 8 P.13B-6.

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

Q: Is DTC P0111 set?

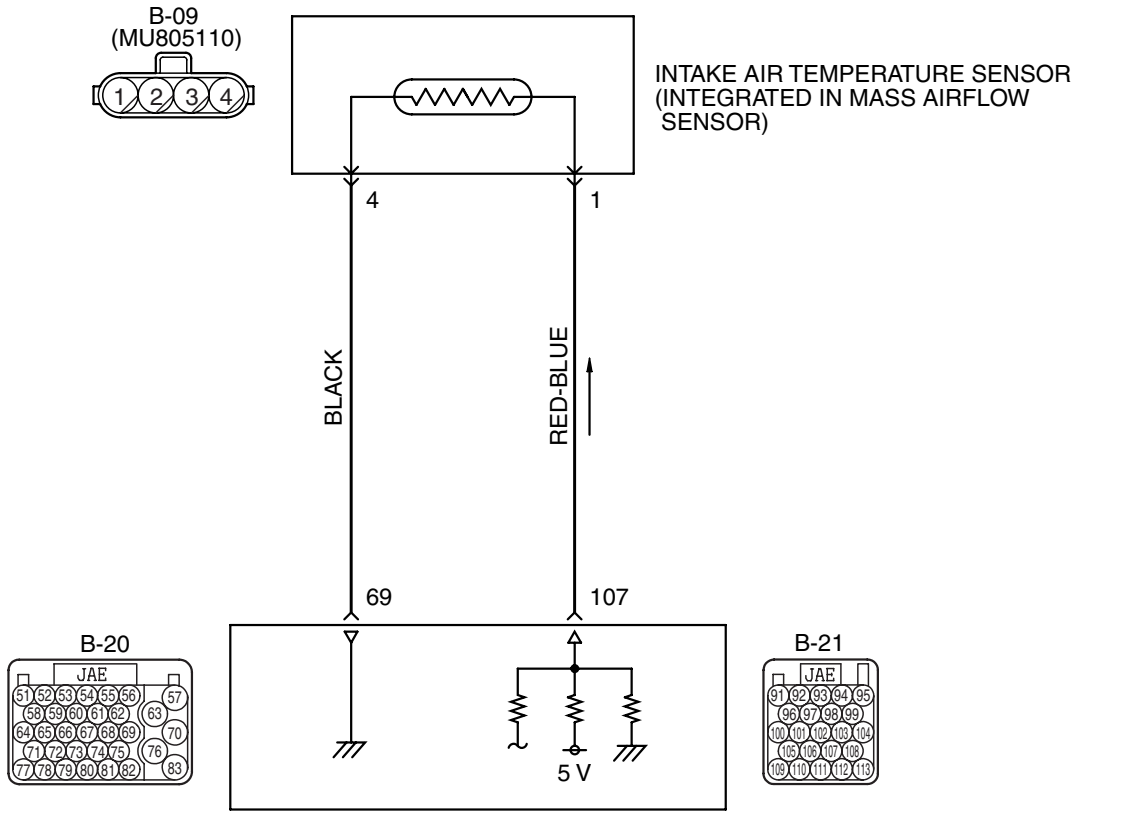
YES : Retry the troubleshooting.

NO : The inspection is complete.

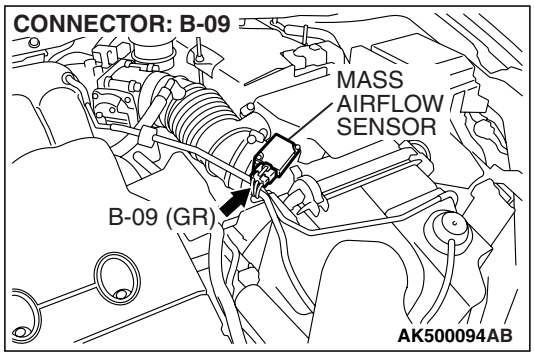
DTC P0112: Intake Air Temperature Circuit Low Input

⚠ CAUTION
If DTC P0112 has been set, TCL related DTC U1120 is also set. After P0112 has been diagnosed, don't forget to erase DTC U1120.

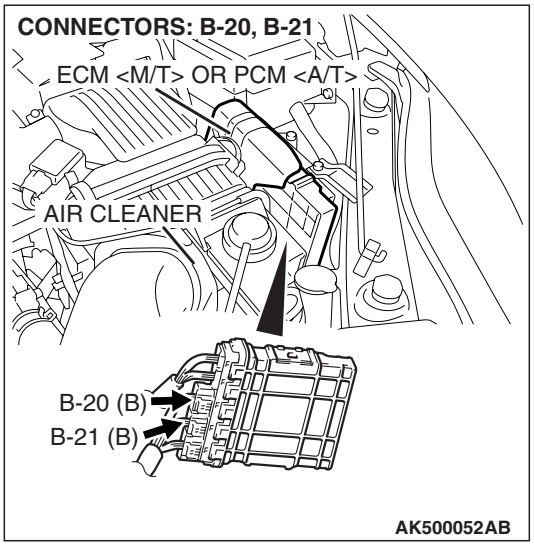
Intake Air Temperature Sensor Circuit



AK403679



AK500094AB



AK500052AB

TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 107) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 4) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

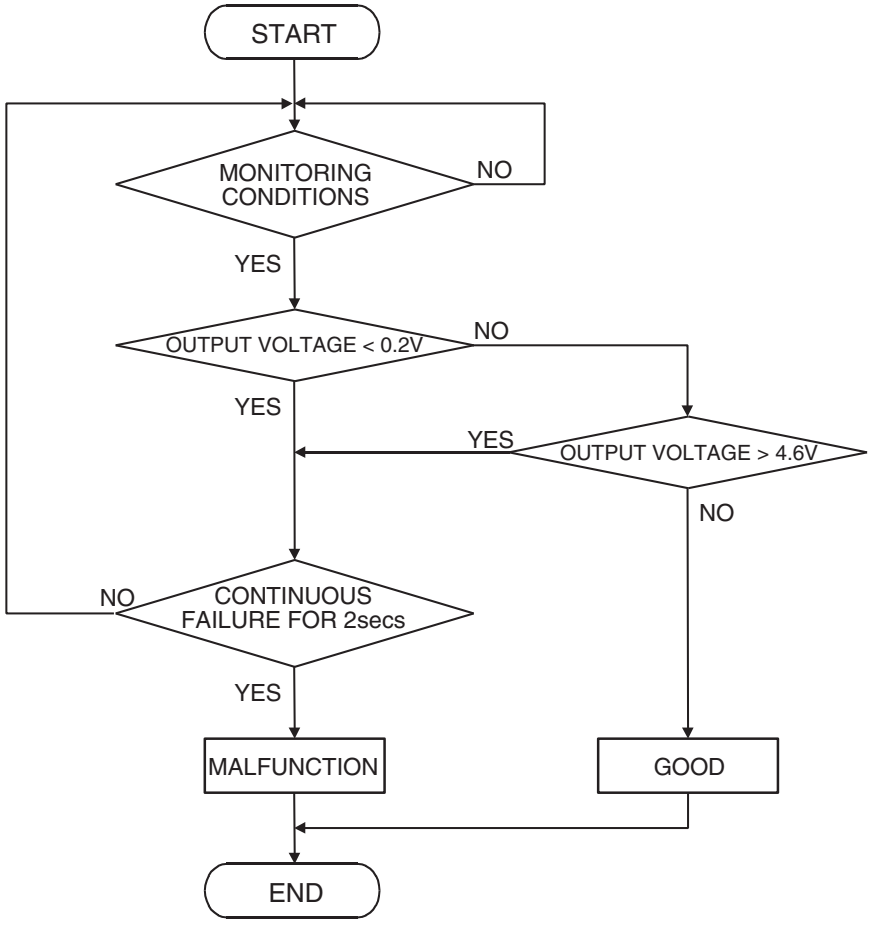
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302384

Check Condition

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

Judgement Criterion

- 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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Intake air temperature sensor failed.
- Shorted intake air temperature sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

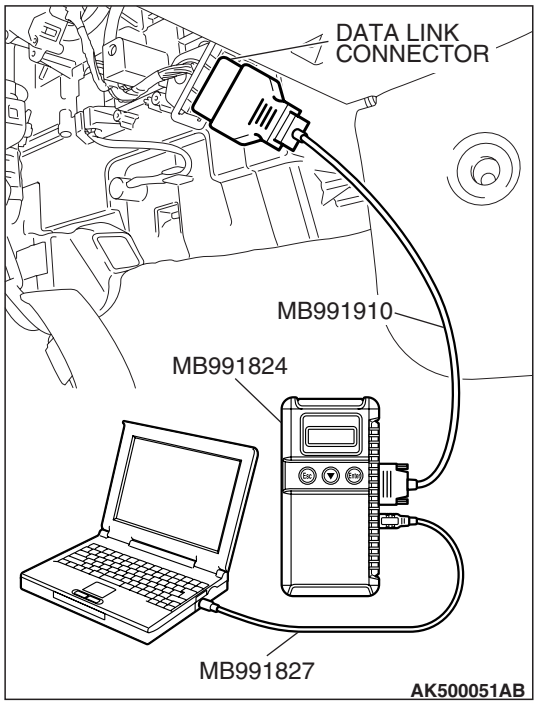
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, 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 –How to Cope with Intermittent Malfunctions P.00-14.

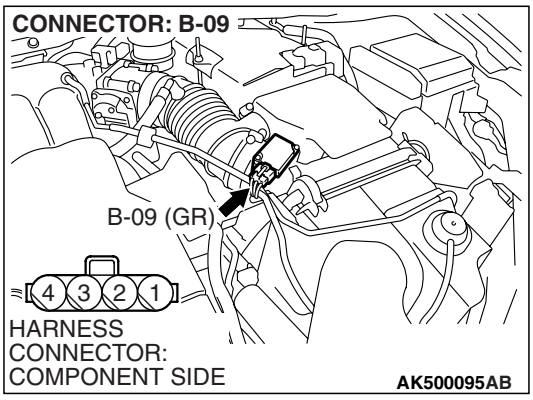
NO : Go to Step 2.

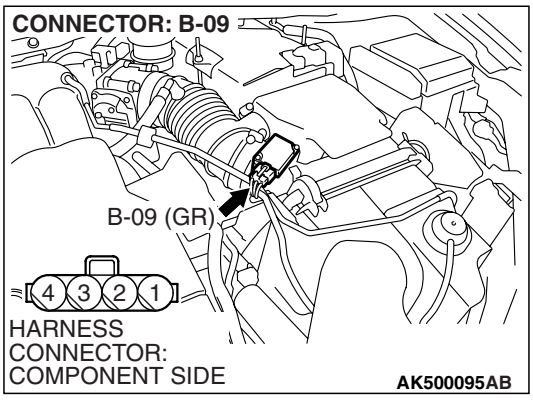
STEP 2. Check harness connector B-09 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

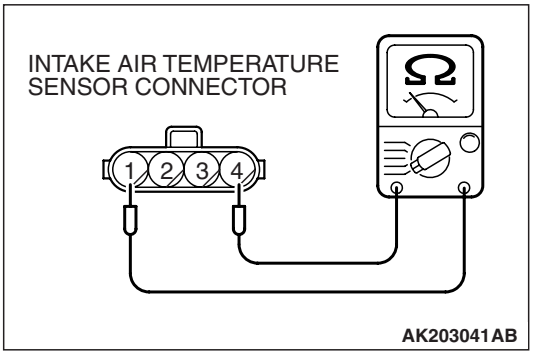
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.





STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-09.



(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.30 –20 kΩ)

Q: Is the measured resistance between 0.30 and 20 kΩ?

YES : Go to Step 4.

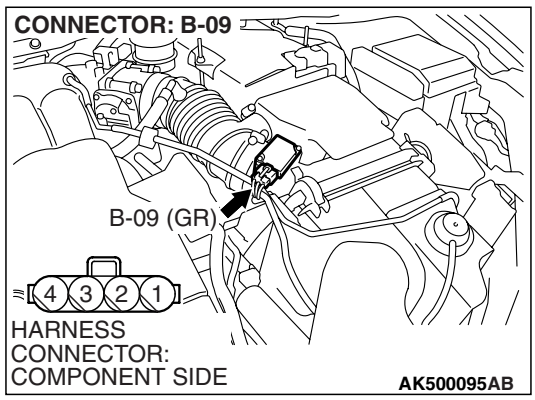
NO : Replace the mass airflow sensor. Then go to Step 6.

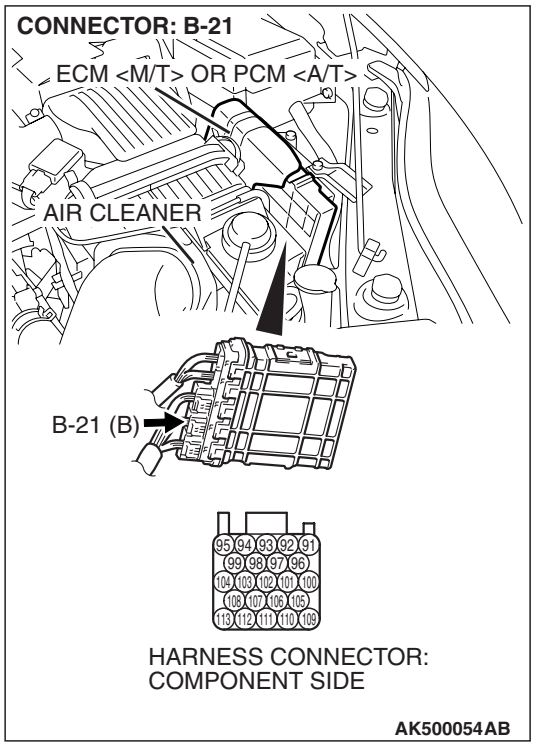
STEP 4. Check for short circuit to ground between intake air temperature sensor connector B-09 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 107).

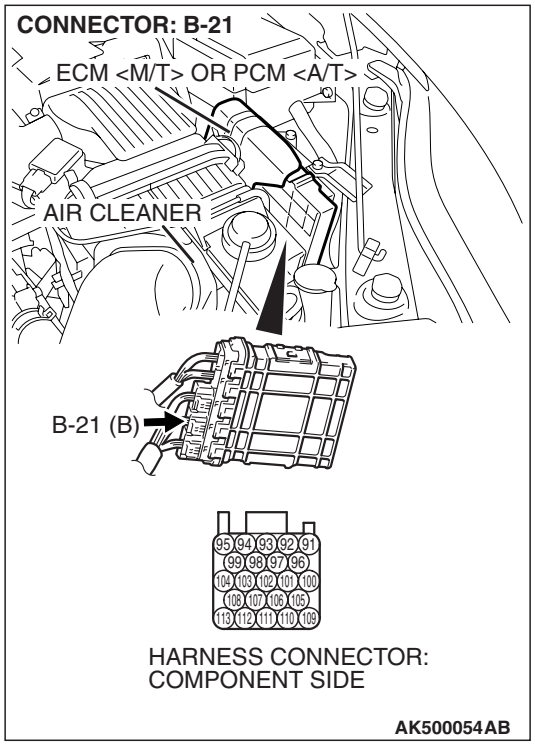
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.







STEP 5. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

Q: Is DTC P0112 set?

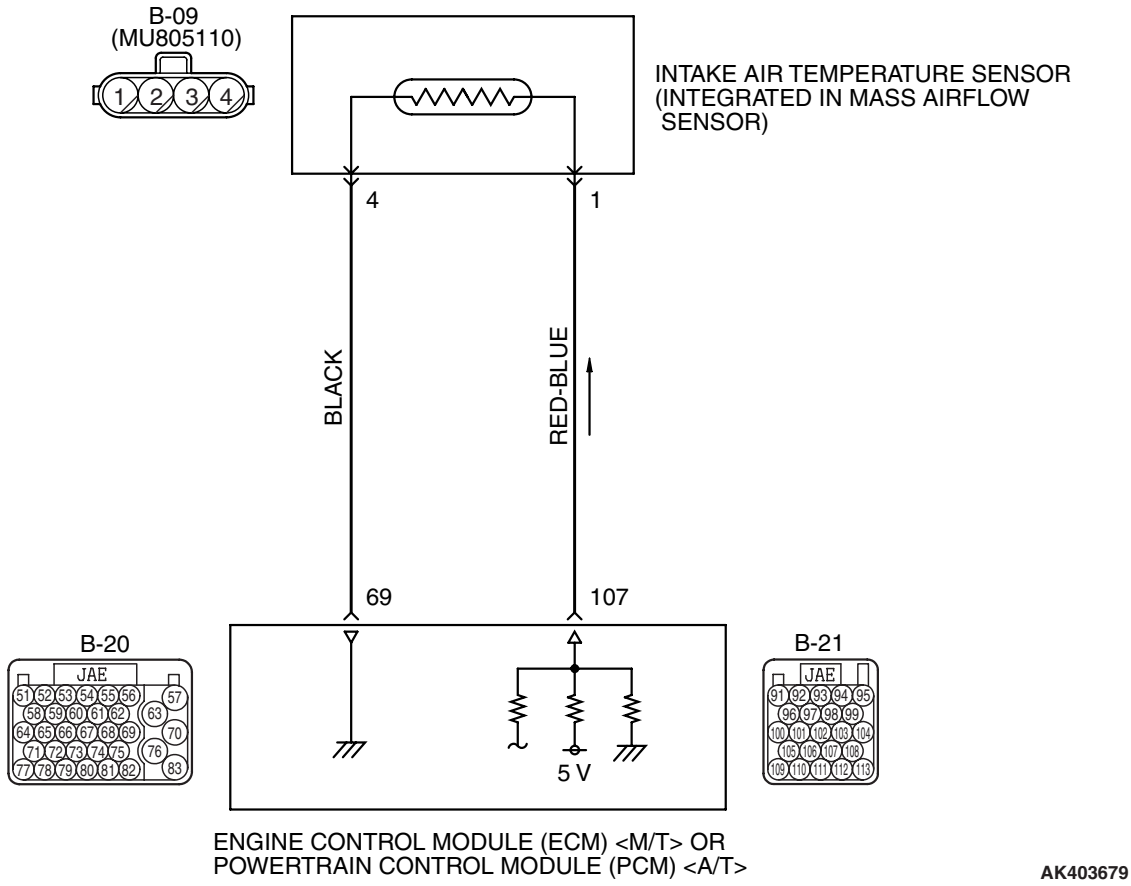
YES : Retry the troubleshooting.

NO : The inspection is complete.

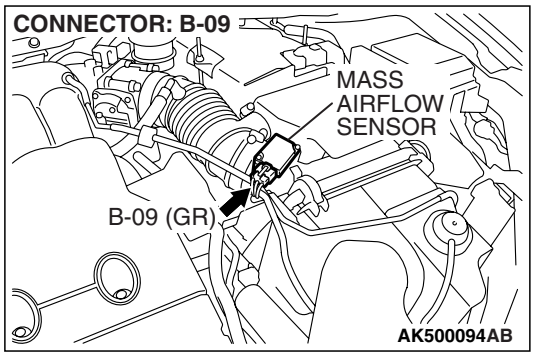
DTC P0113: Intake Air Temperature Circuit High Input

⚠ CAUTION
If DTC P0113 has been set, TCL related DTC U1120 is also set. After P0113 has been diagnosed, don't forget to erase DTC U1120.

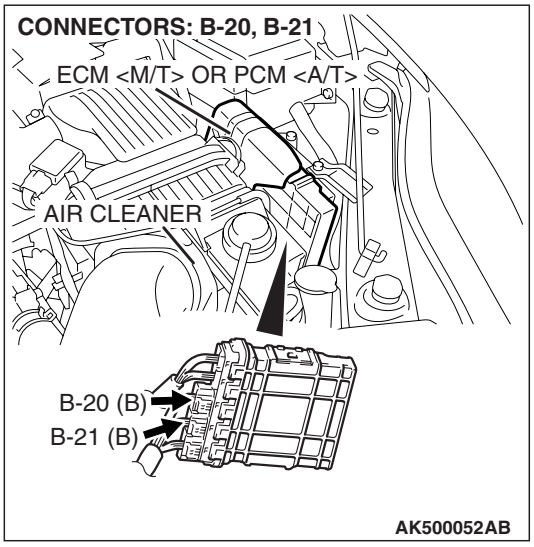
Intake Air Temperature Sensor Circuit



AK403679



AK500094AB



AK500052AB

TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 107) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 4) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

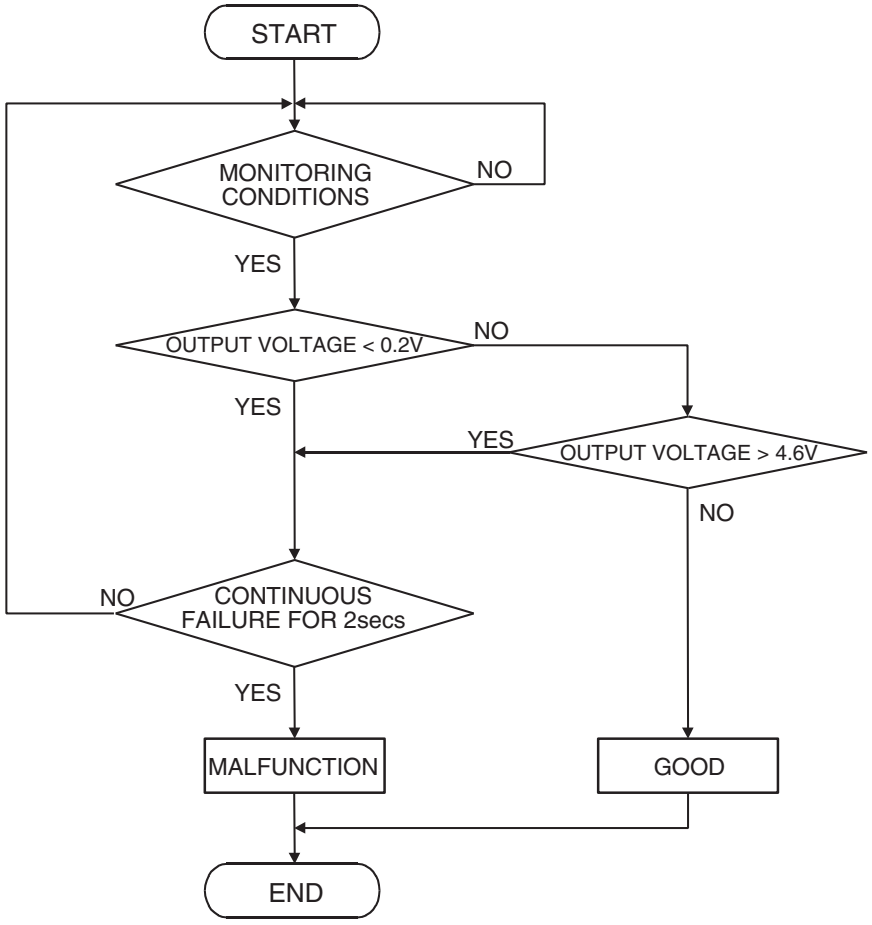
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302384

Check Condition

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

Judgement Criterion

- 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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Intake air temperature sensor failed.
- Open intake air temperature sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

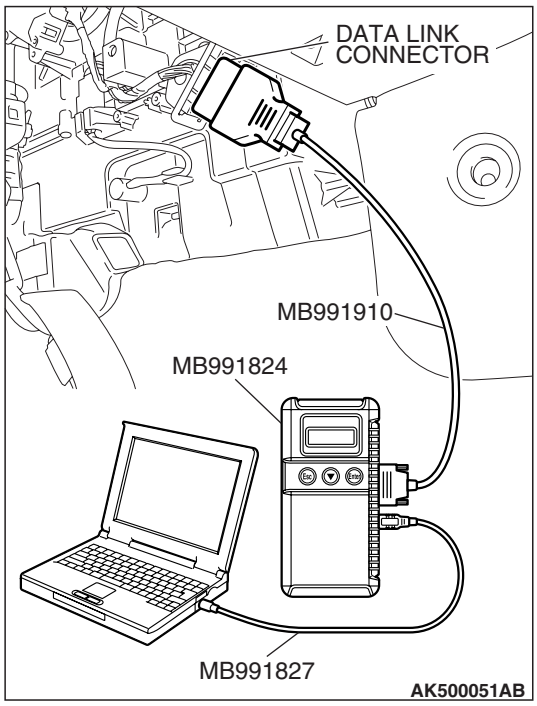
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

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



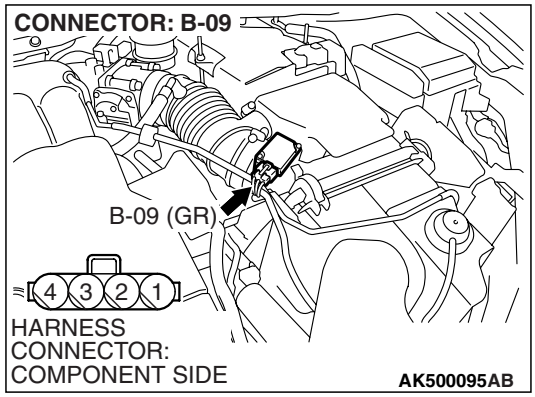
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Check harness connector B-09 at the intake air temperature sensor for damage.

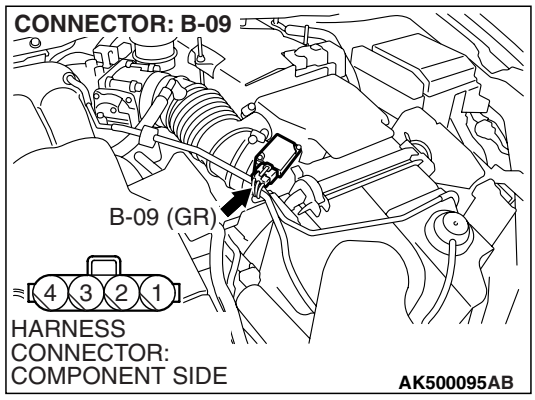


Q: Is the harness connector in good condition?

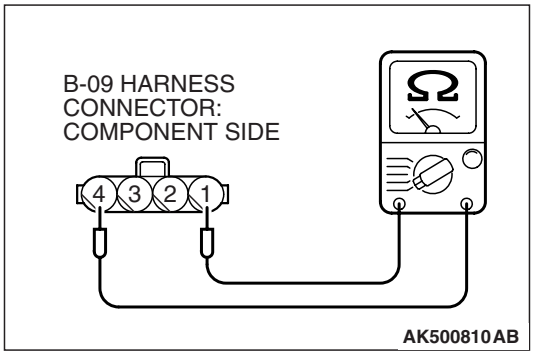
YES : Go to Step 3.

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

STEP 3. Check the intake air temperature sensor.



(1) Disconnect the intake air temperature sensor connector B-09.

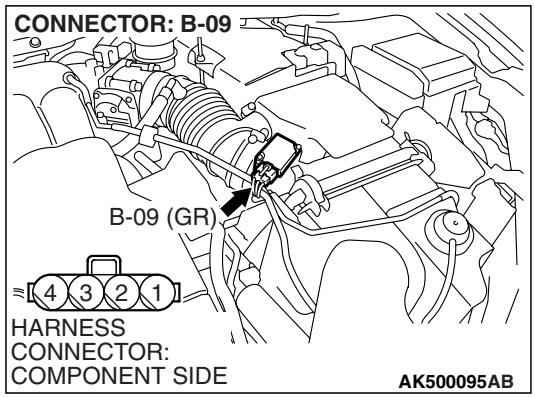


(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.30 – 20 kΩ)

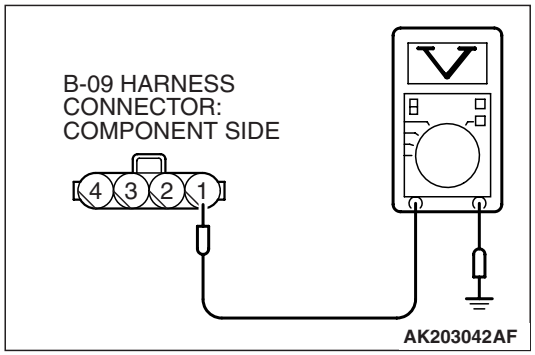
Q: Is the measured resistance between 0.30 and 20 kΩ?

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

STEP 4. Measure the sensor supply voltage at intake air temperature sensor harness side connector B-09.



(1) Disconnect the connector B-09 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

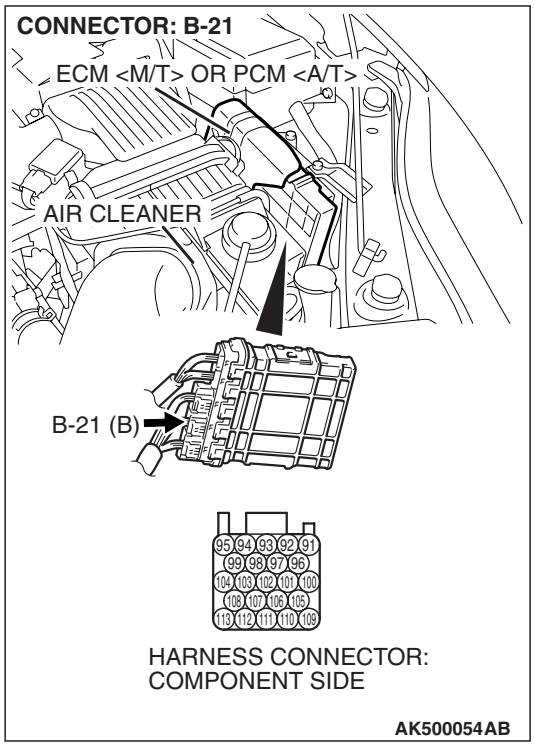


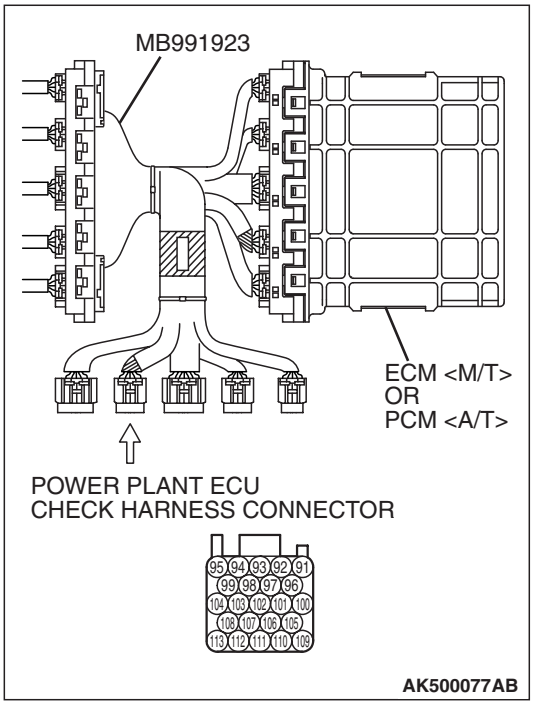
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

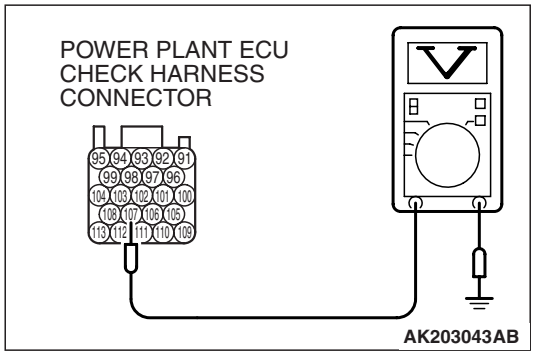
YES : Go to Step 8.
NO : Go to Step 5.





STEP 5. Measure the sensor supply voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the intake air temperature sensor connector B-09.
(3) Turn the ignition switch to the "ON" position.



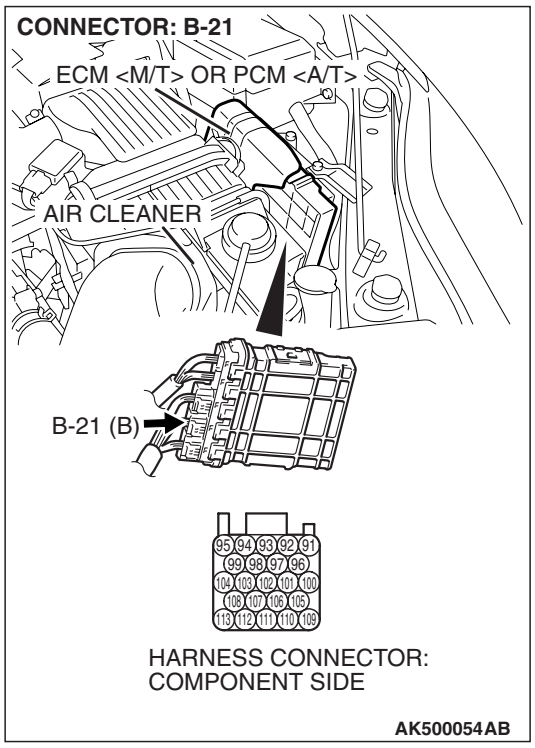
(4) Measure the voltage between terminal No. 107 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

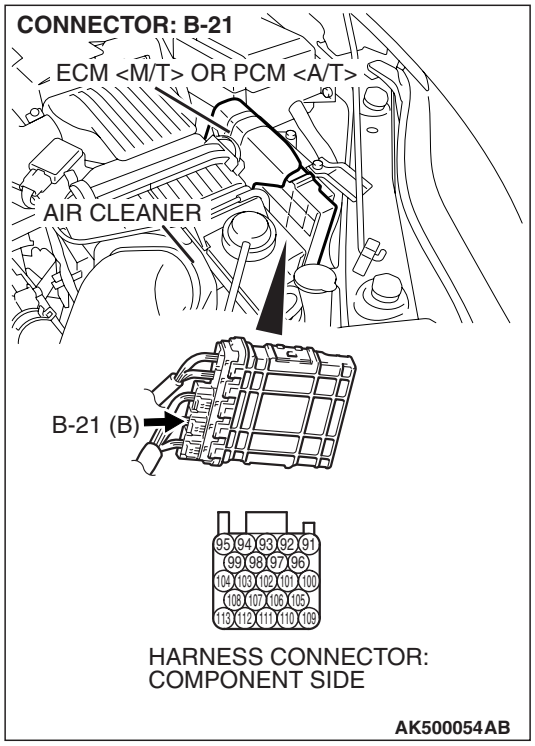
YES : Go to Step 6.
NO : Go to Step 7.

STEP 6. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.



Q: Is the harness connector in good condition?

YES : Repair harness wire between intake air temperature sensor connector B-09 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 107) because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

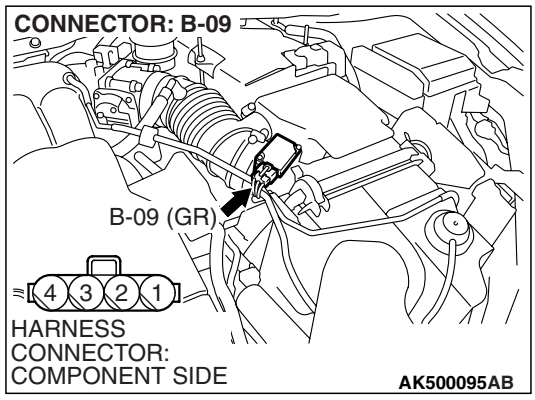


STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

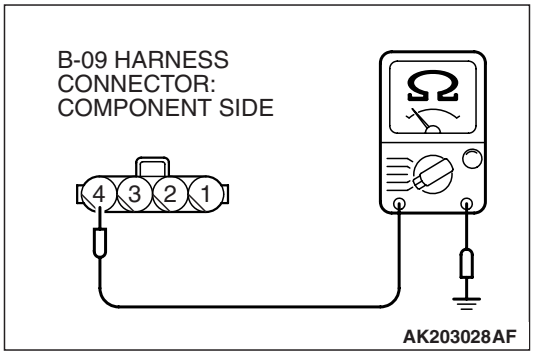
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

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-09.

(1) Disconnect the connector B-09 and measure at the harness side.

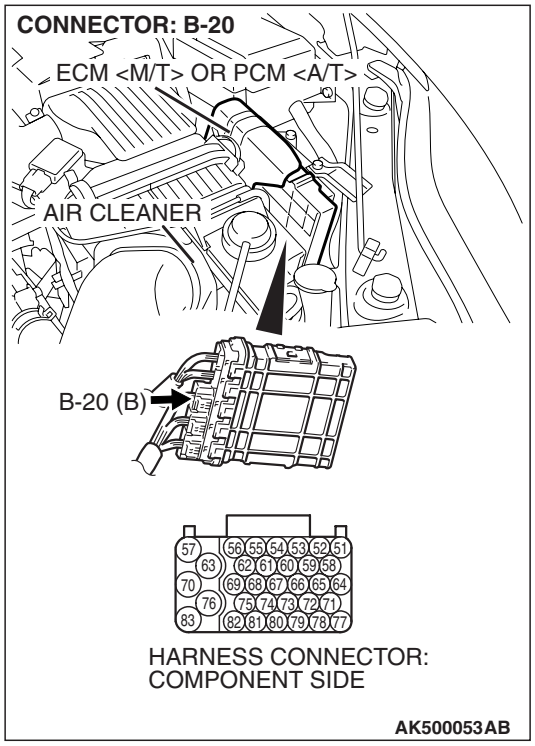


(2) Check for the continuity between terminal No. 4 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

NO : Go to Step 9.

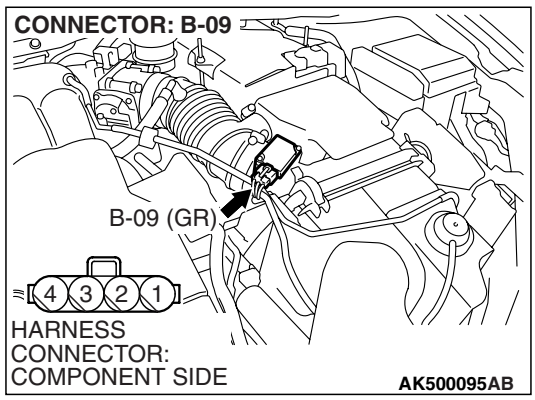


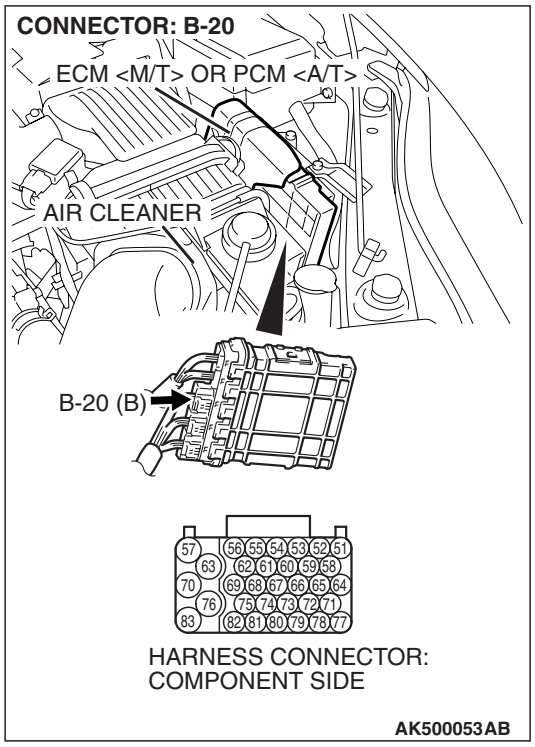
STEP 9. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check for open circuit between intake air temperature sensor connector B-09 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the ECM or 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

Q: Is DTC P0113 set?

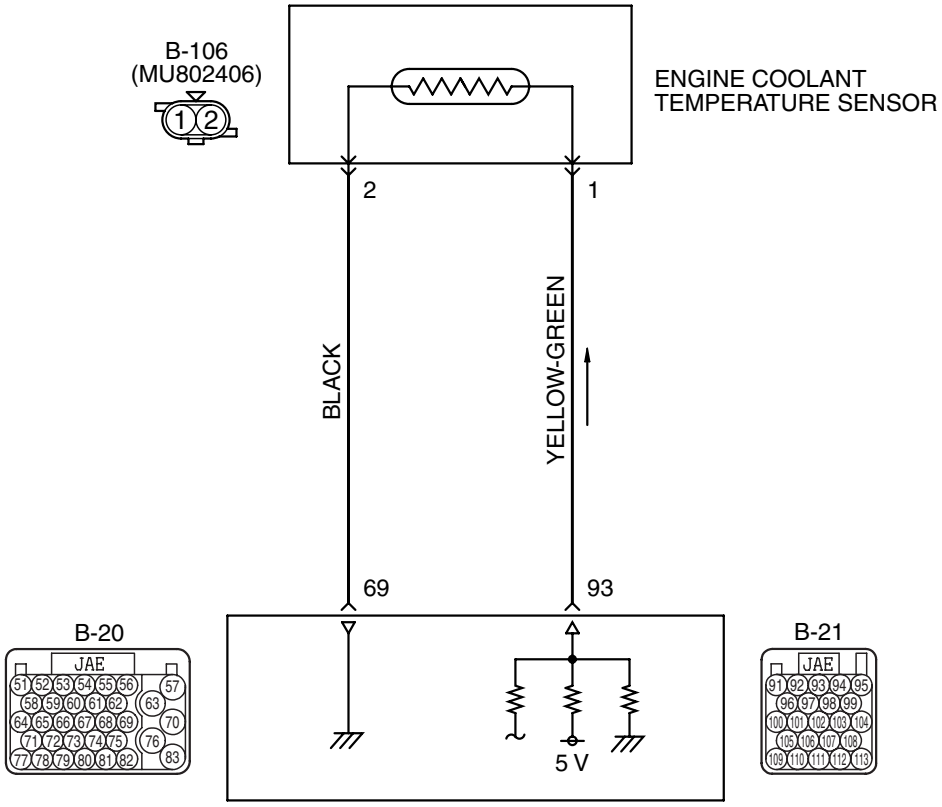
YES : Retry the troubleshooting.

NO : The inspection is complete.

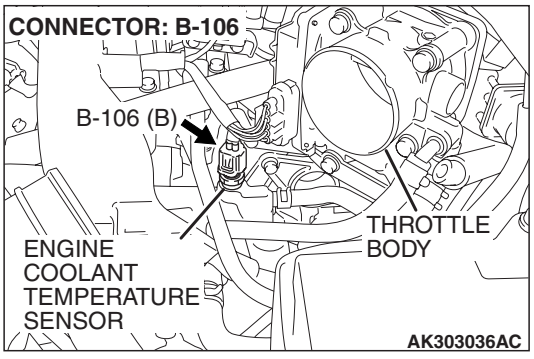
DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

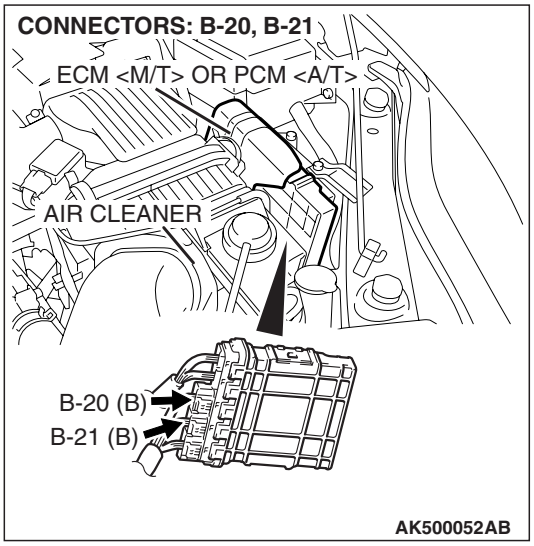
⚠ CAUTION
If DTC P0116 has been set, TCL related DTC U1120 is also set. After P0116 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



AK403680





TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 93) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage does not change for specified period when engine coolant temperature sensor output voltage at engine start is over 7° C (45° F).

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

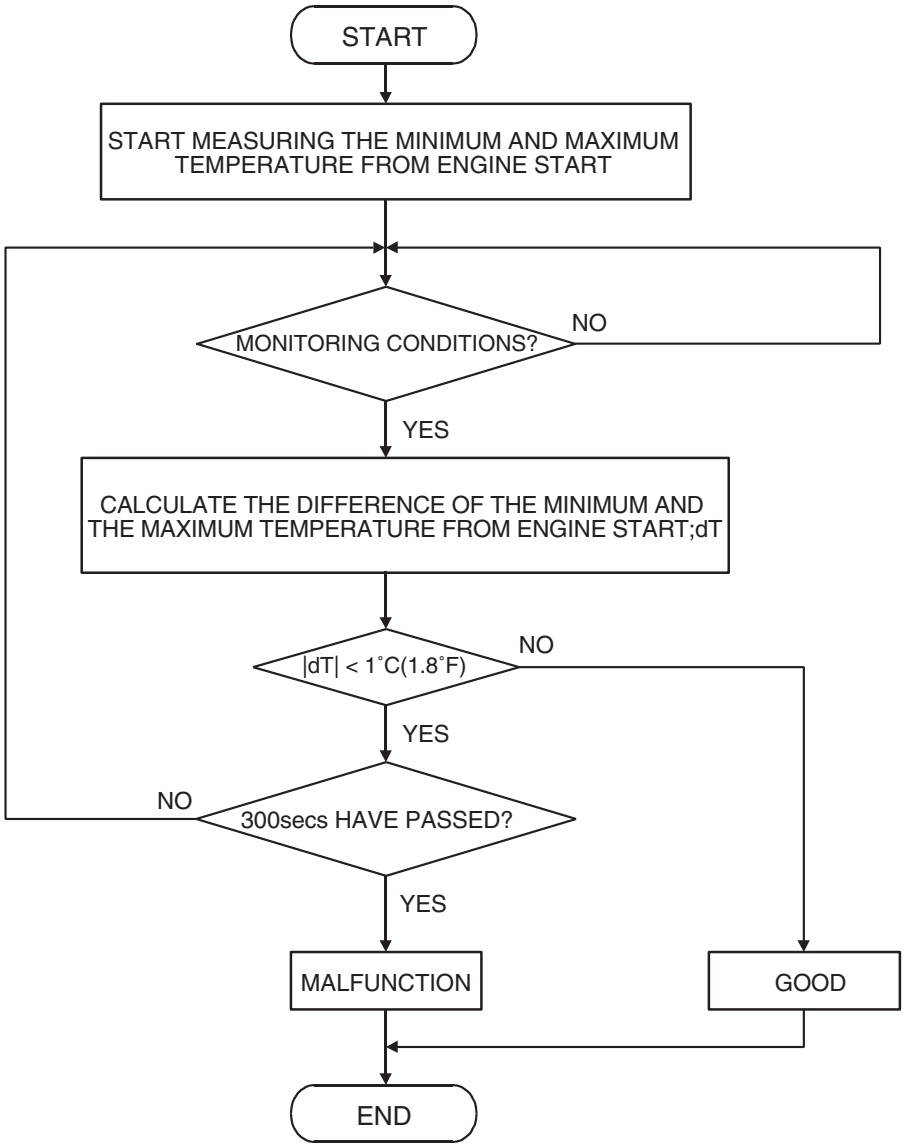
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500793

Check Conditions

- Engine coolant temperature was 7° C (45° F) or more when the engine started.

Judgement Criterion

- 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. During fuel shut-off operation.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern – 9 P.13B-6.

TSB Revision

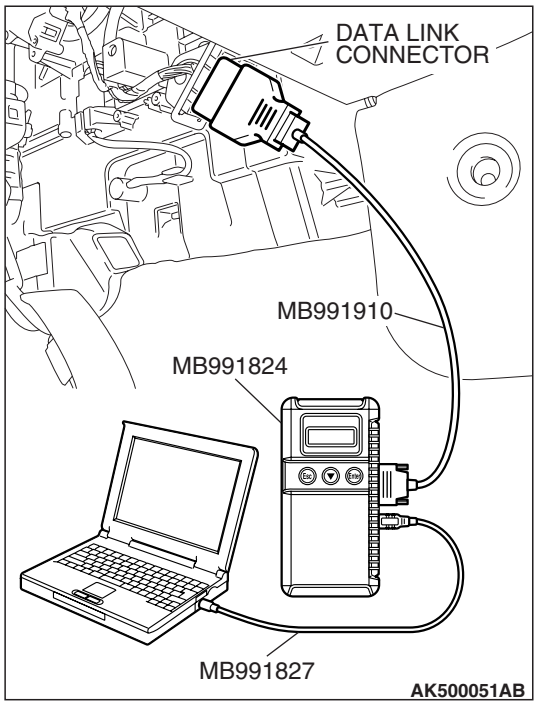
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Harness damage or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

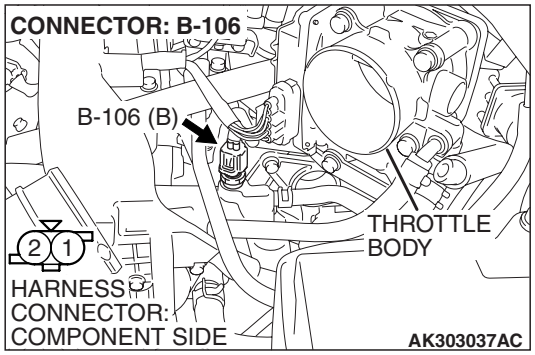
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, 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?

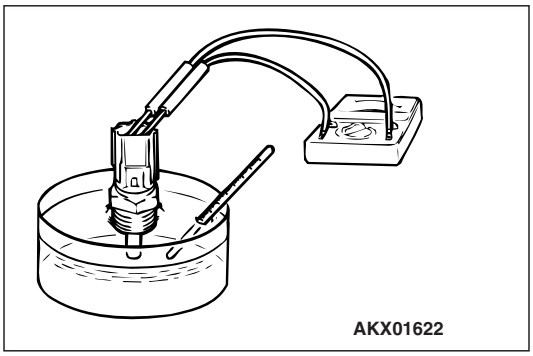
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



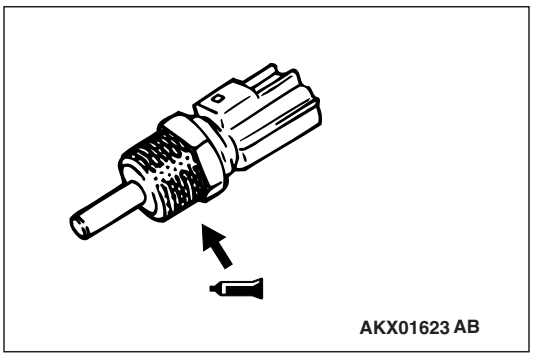
STEP 2. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-106.
(2) Remove the engine coolant temperature sensor.



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

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



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

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

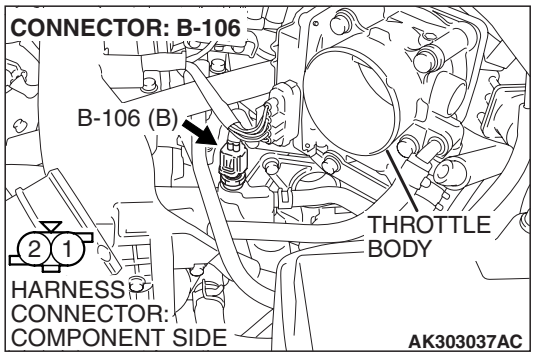
Q: Is the measured resistance normal?

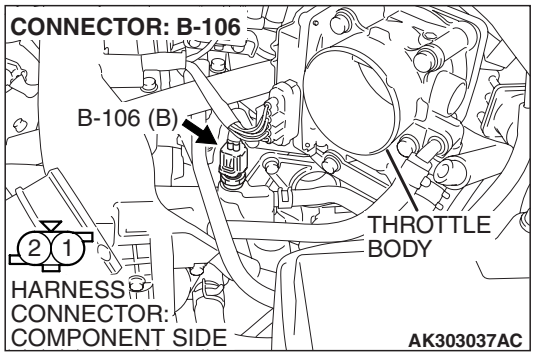
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-106 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

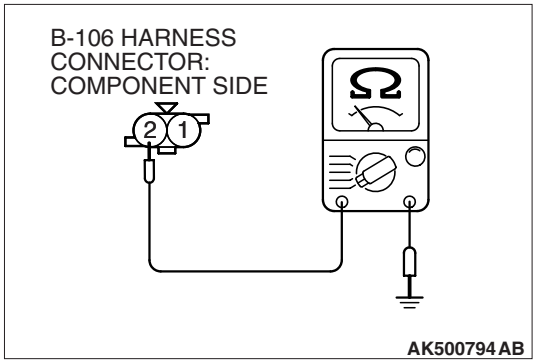
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 4. Check for continuity at engine coolant temperature sensor harness side connector B-106.

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



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

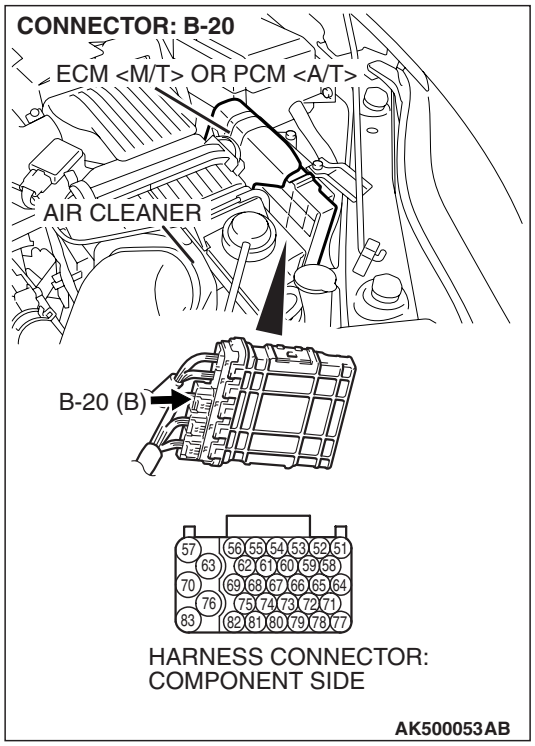
Q: Does continuity exist?

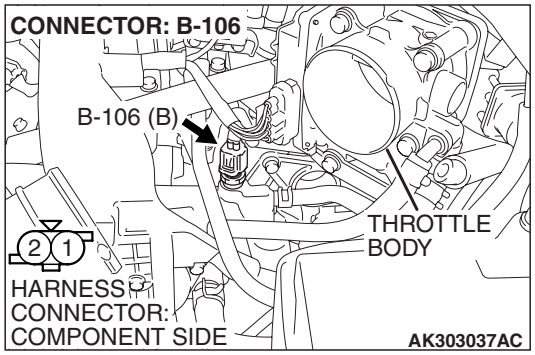
YES : Go to Step 7.
NO : Go to Step 6.

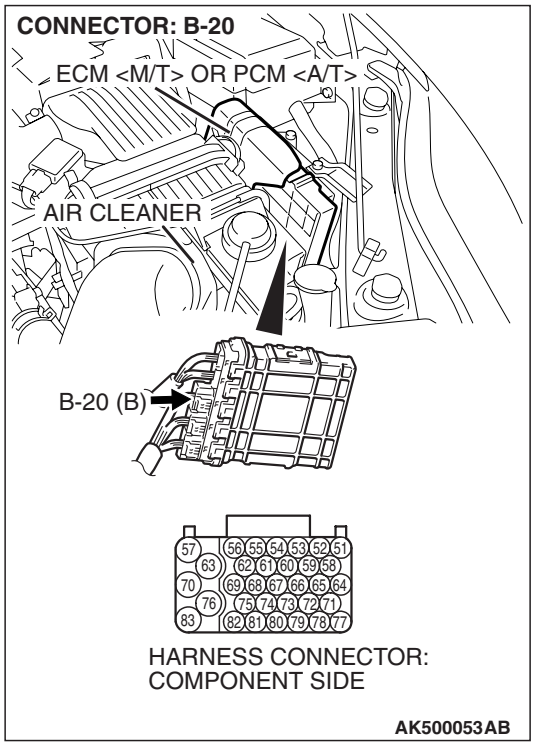
STEP 5. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 9.
NO : Repair it. Then go to Step 9.





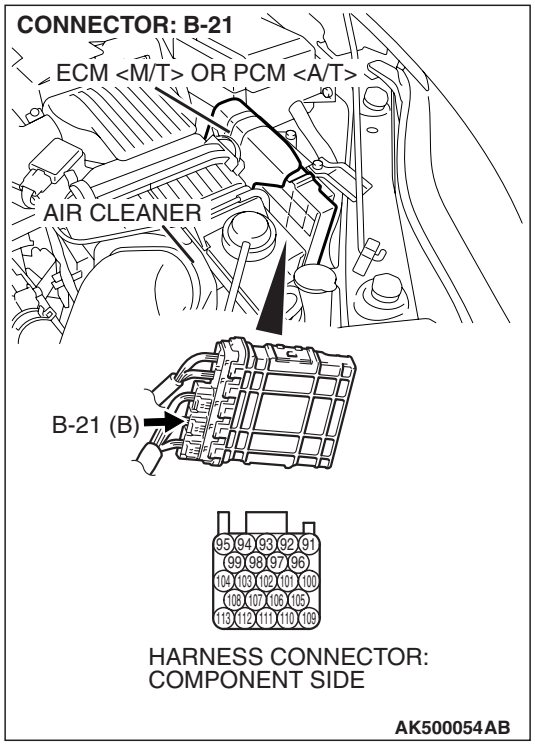


STEP 6. Check for harness damage between engine coolant temperature sensor connector B-106 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 9.

NO : Repair it. Then go to Step 9.

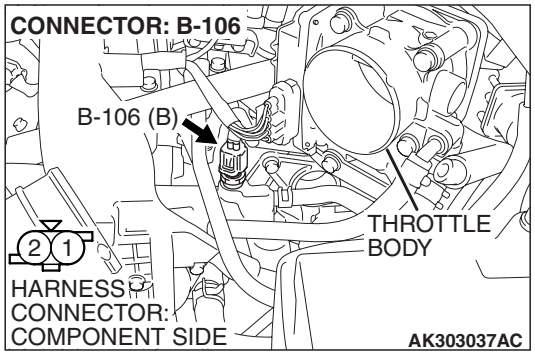


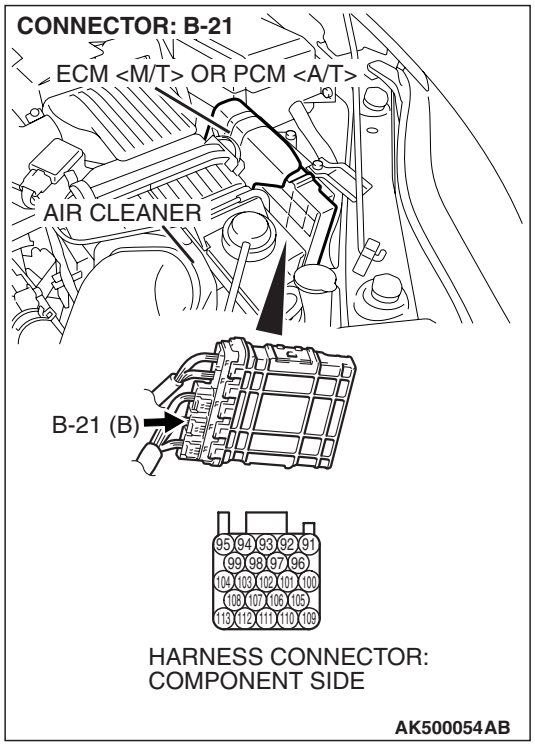
STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 9.





STEP 8. Check for harness damage between engine coolant temperature sensor connector B-106 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 9 P.13B-6.

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

Q: Is DTC P0116 set?

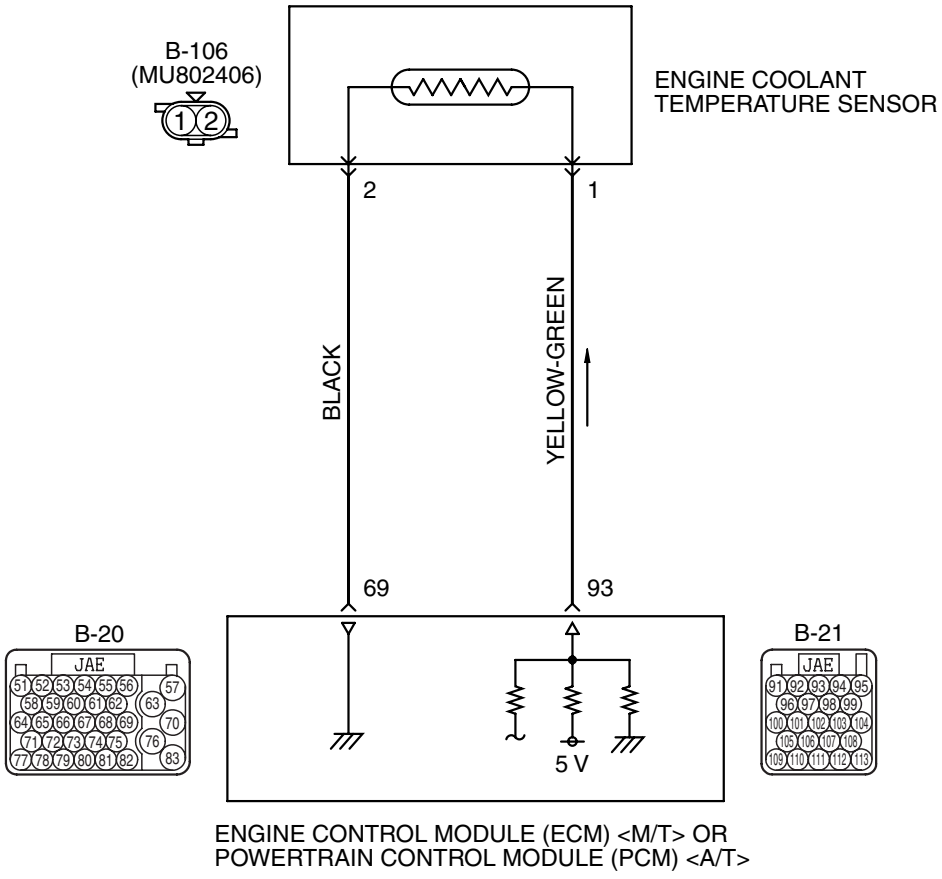
YES : Retry the troubleshooting.

NO : The inspection is complete.

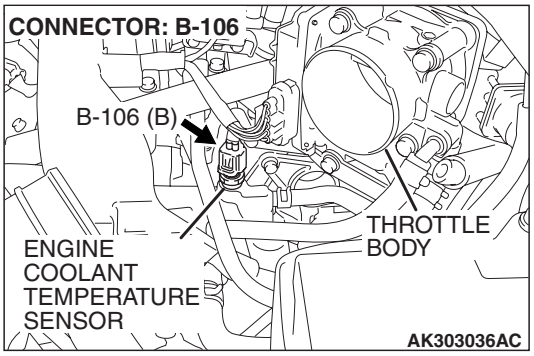
DTC P0117: Engine Coolant Temperature Circuit Low Input

⚠ CAUTION
If DTC P0117 has been set, TCL and air conditioner related DTC U1120 is also set. After P0117 has been diagnosed, don't forget to erase DTC U1120.

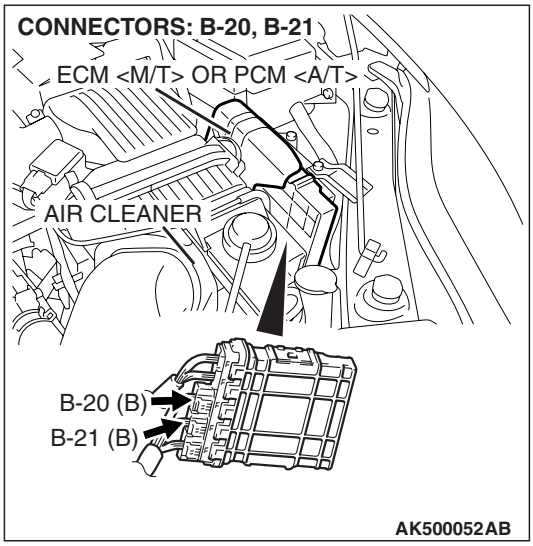
Engine Coolant Temperature Sensor Circuit



AK403680



TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 93) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

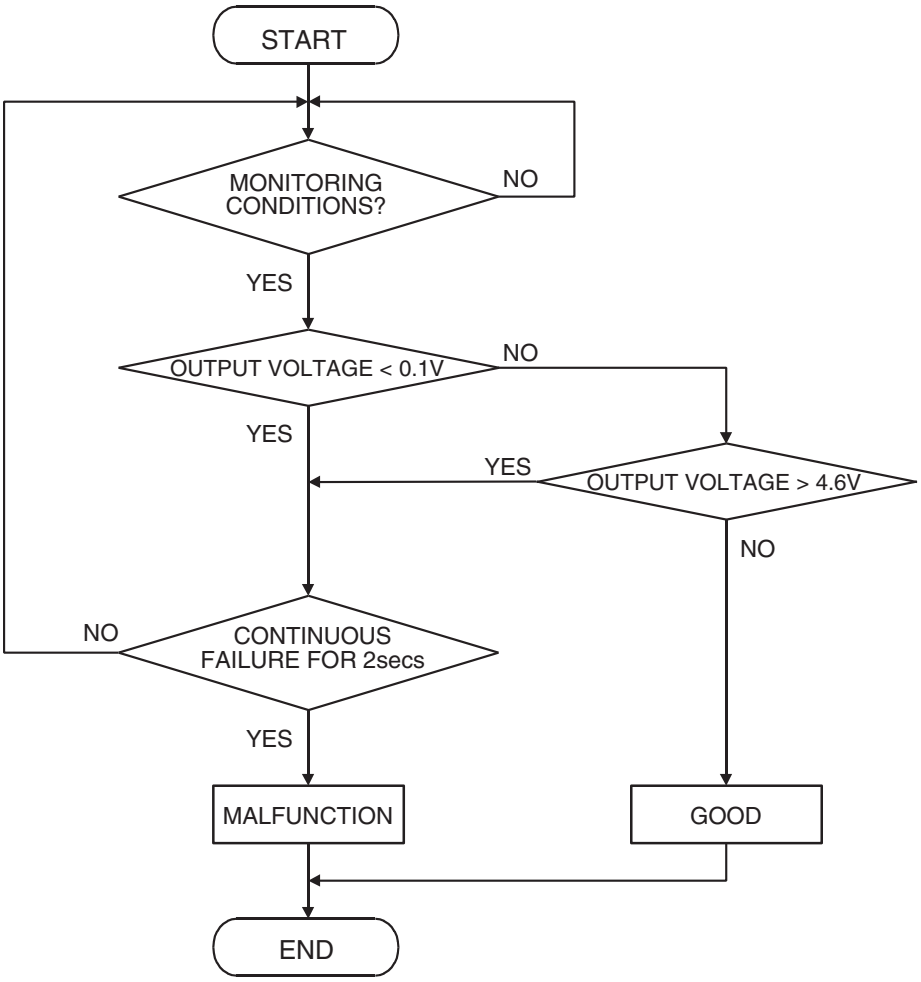
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302388

Check Condition

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

Judgement Criterion

- 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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Engine coolant temperature sensor failed.
- Shorted engine coolant temperature sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

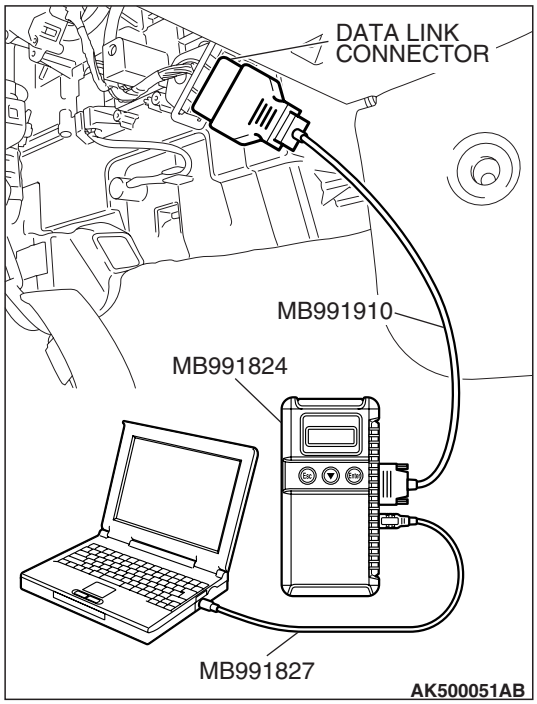
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, 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.



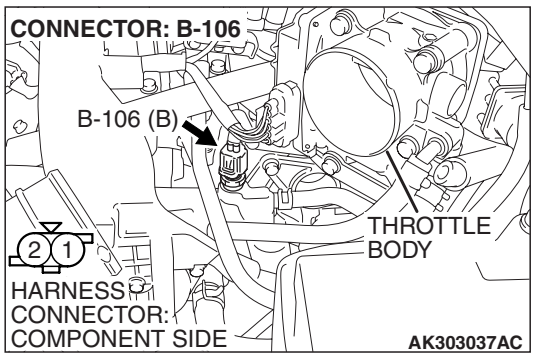
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

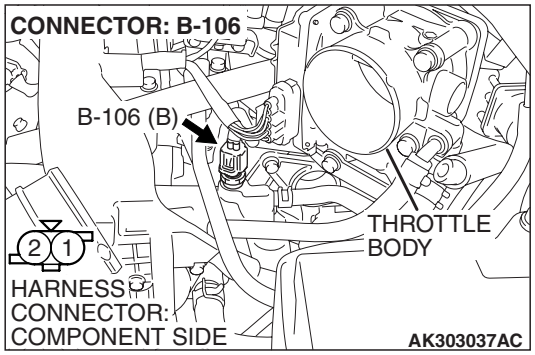
STEP 2. Check harness connector B-106 at the engine coolant temperature sensor for damage.

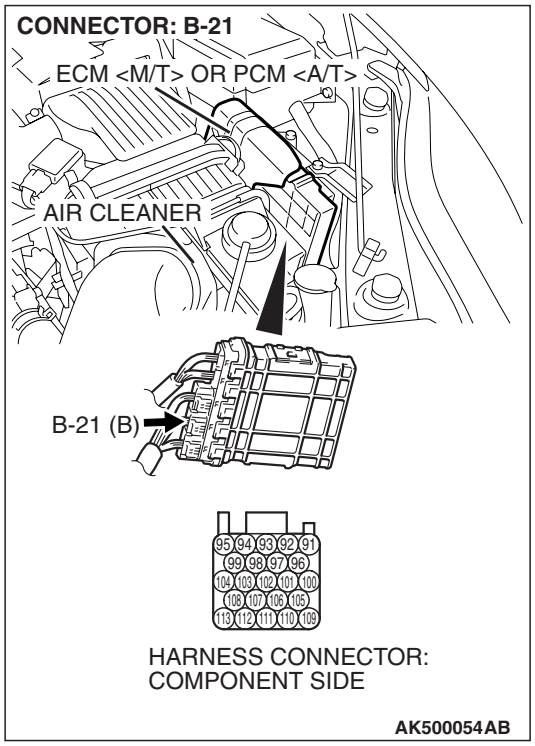
Q: Is the harness connector in good condition?



YES : Go to Step 3.

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



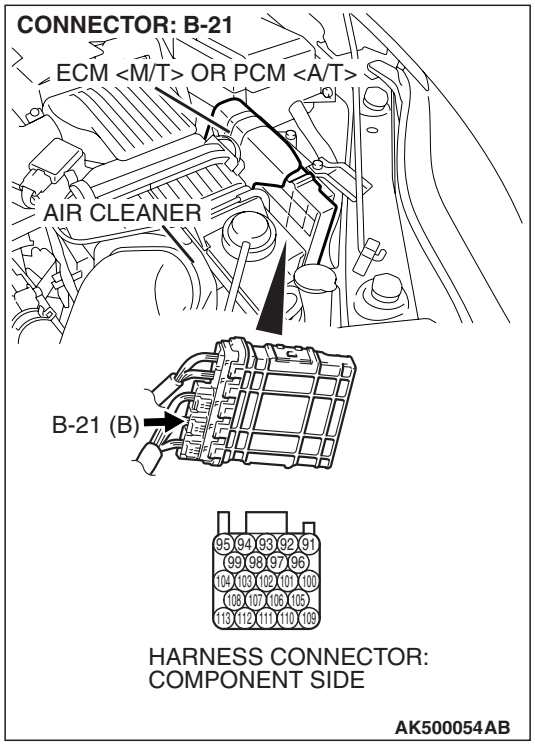


STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-106 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 6.

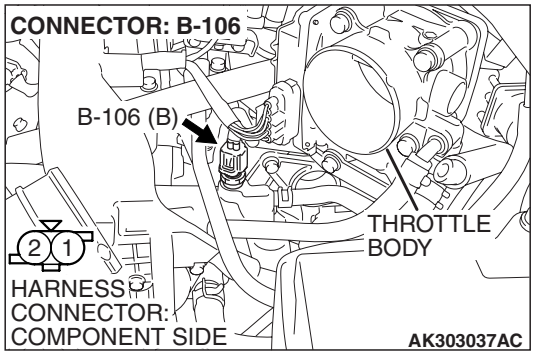


STEP 4. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

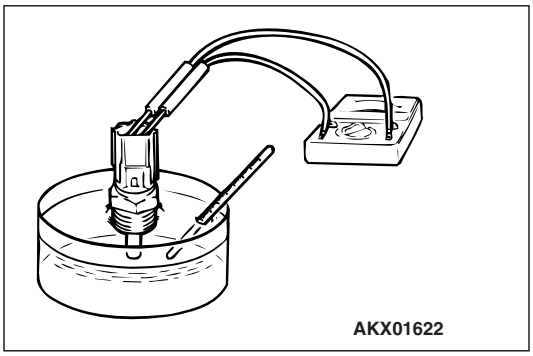
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-106.

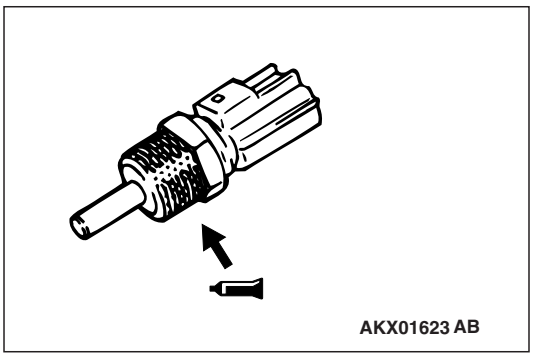
(2) Remove the engine coolant temperature sensor.



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

Standard value:

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



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

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

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

Q: Is the measured resistance at the standard value?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

Q: Is DTC P0117 set?

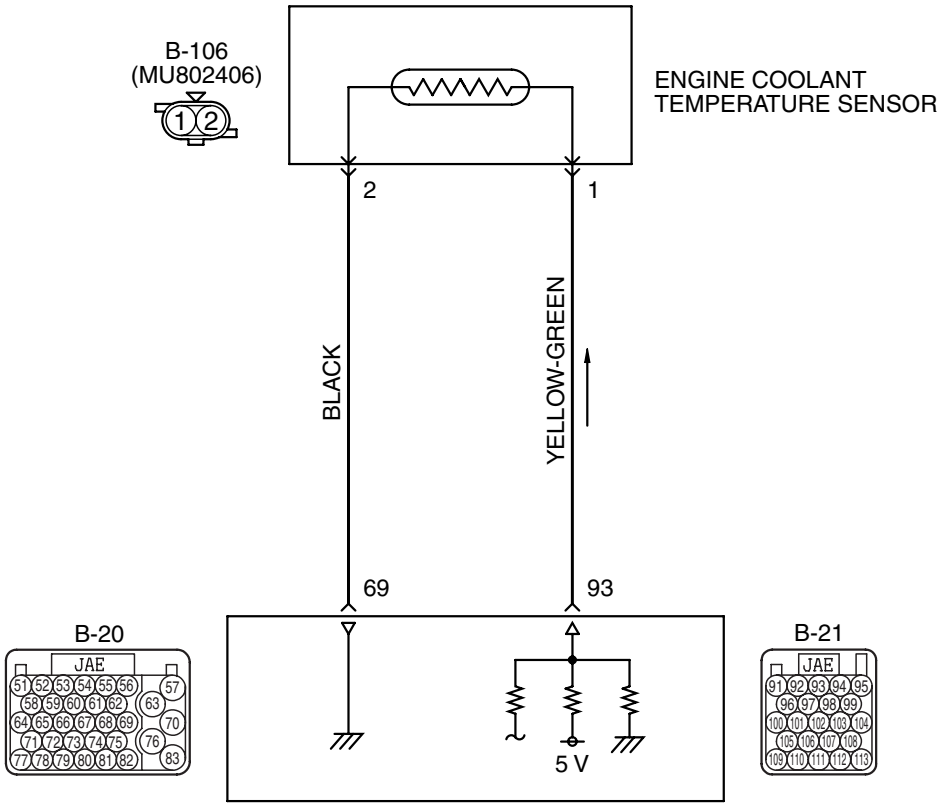
YES : Retry the troubleshooting.

NO : The inspection is complete.

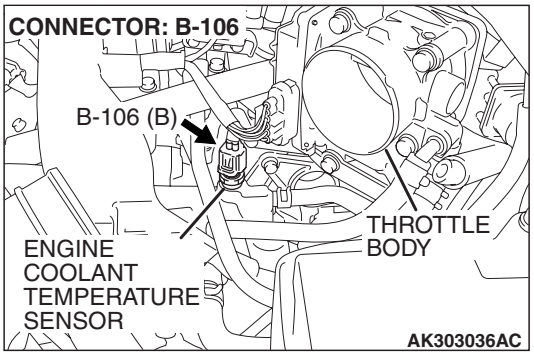
DTC P0118: Engine Coolant Temperature Circuit High Input

⚠ CAUTION
If DTC P0118 has been set, TCL and air conditioner related DTC U1120 is also set. After P0118 has been diagnosed, don't forget to erase DTC U1120.

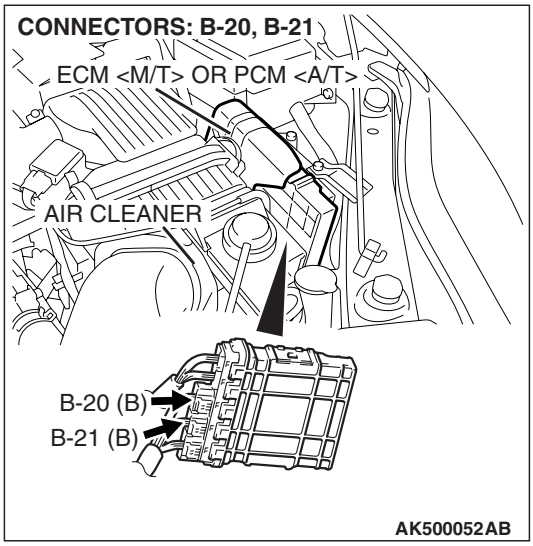
Engine Coolant Temperature Sensor Circuit



AK403680



TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 93) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

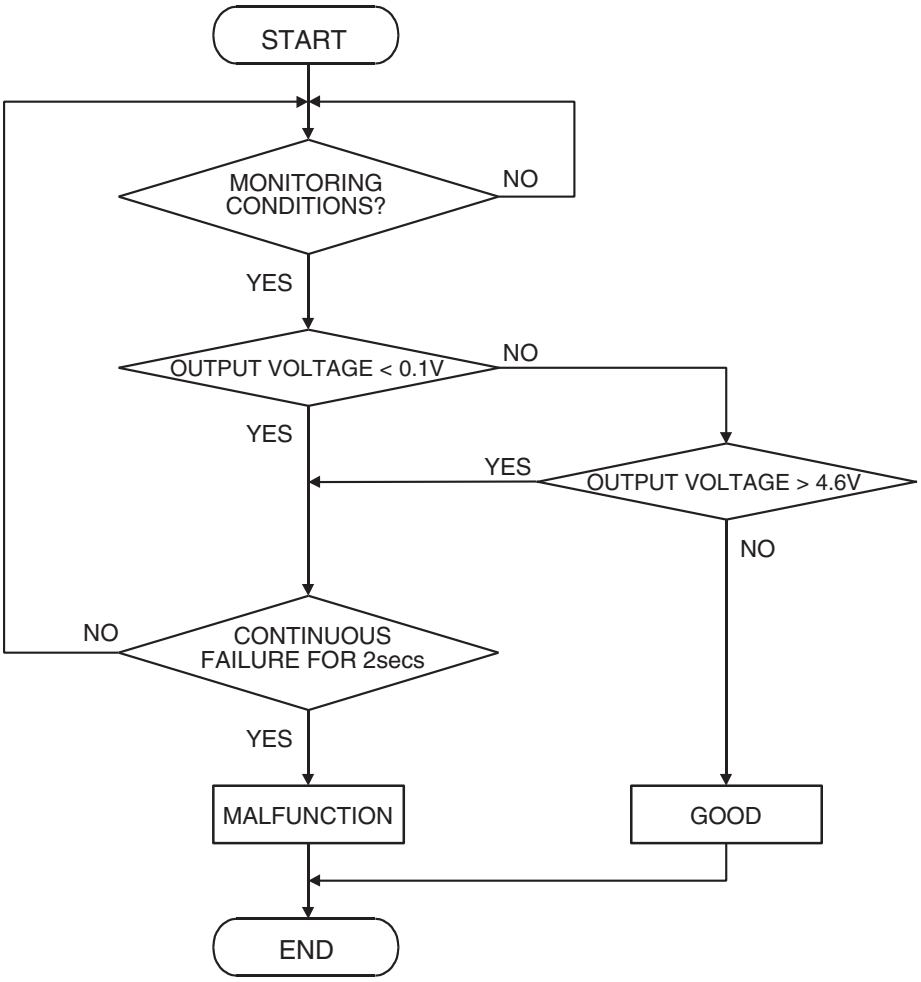
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302388

Check Condition

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

Judgement Criterion

- 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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function–OBD-II Drive Cycle–Pattern 22 P.13B-6.

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

- Engine coolant temperature sensor failed.
- Open engine coolant temperature sensor circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

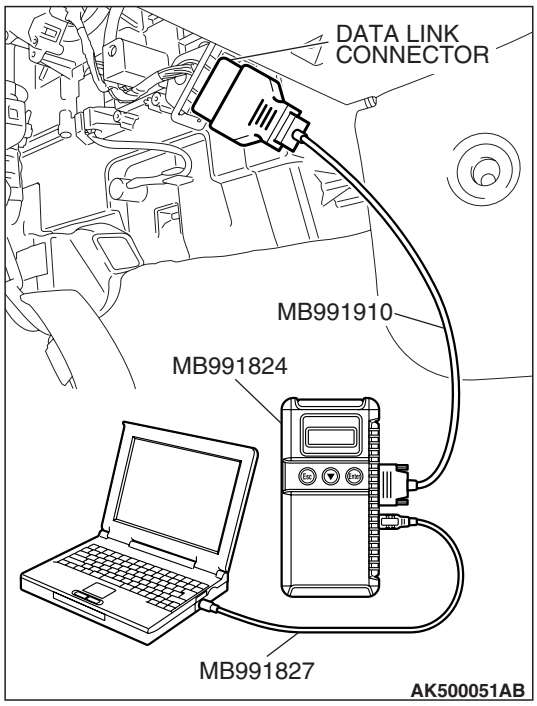
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

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



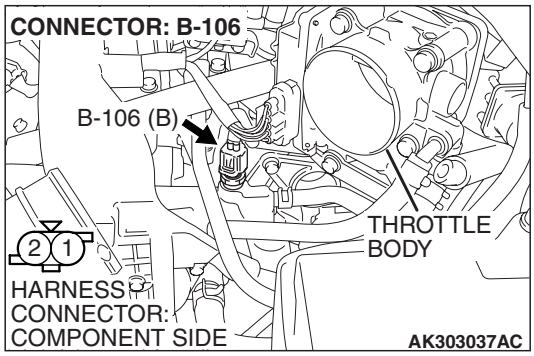
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately 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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

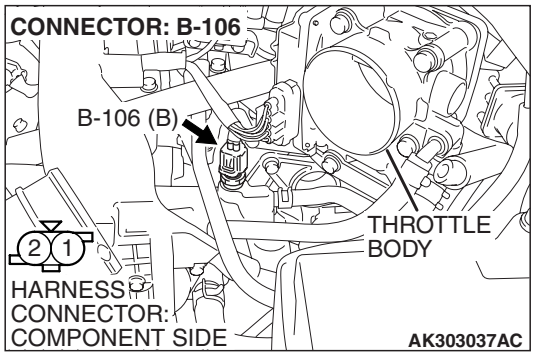
STEP 2. Check harness connector B-106 at the engine coolant temperature sensor for damage.



Q: Is the harness connector in good condition?

YES : Go to Step 3.

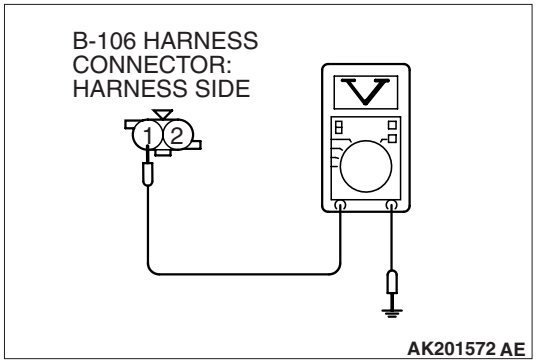
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-106.

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

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



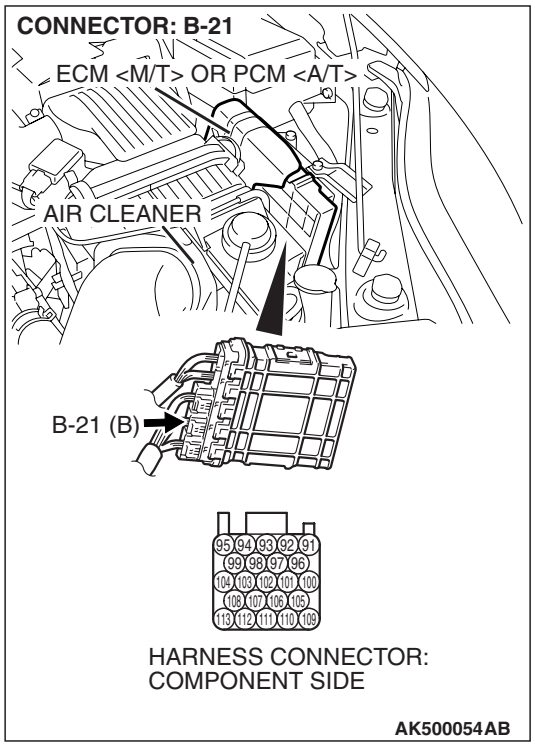
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

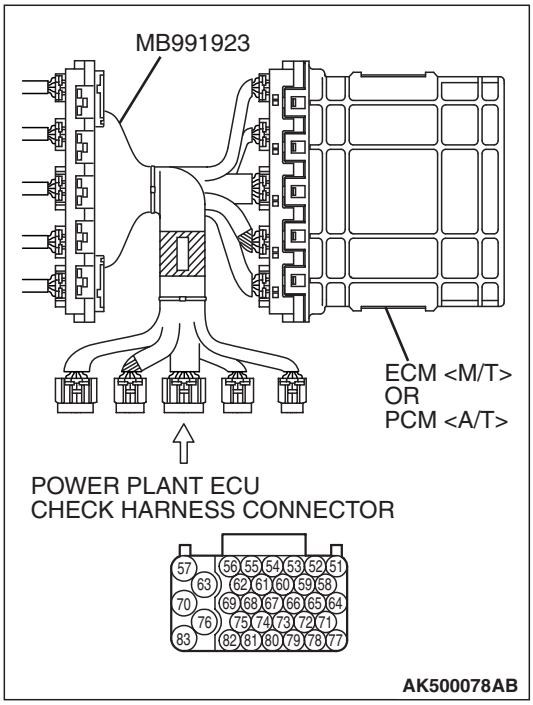
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 7.

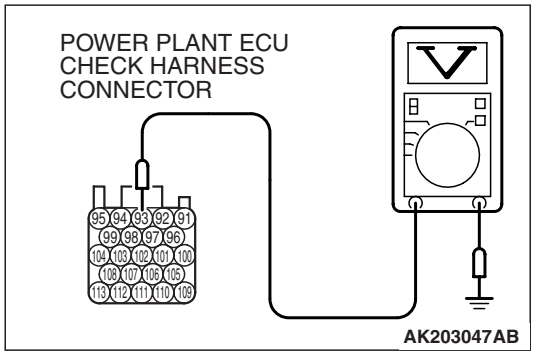
NO : Go to Step 4.





STEP 4. Measure the sensor supply voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the engine coolant temperature sensor connector B-106.
(3) Turn the ignition switch to the "ON" position.

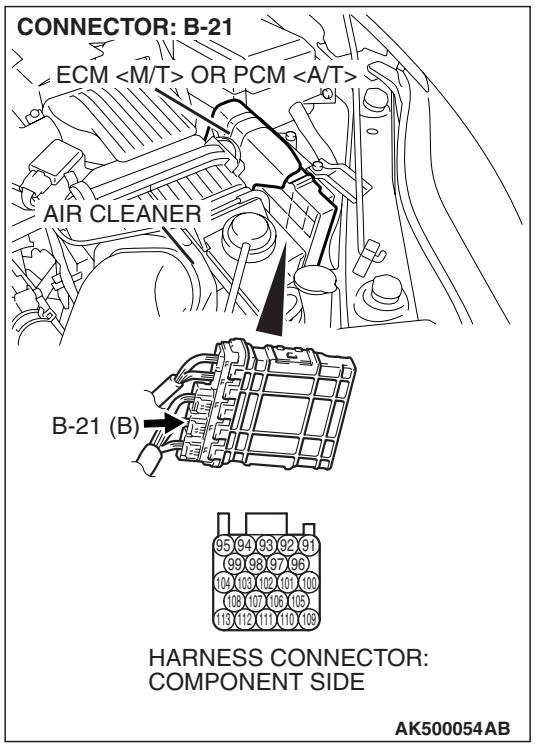


(4) Measure the voltage between terminal No. 93 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

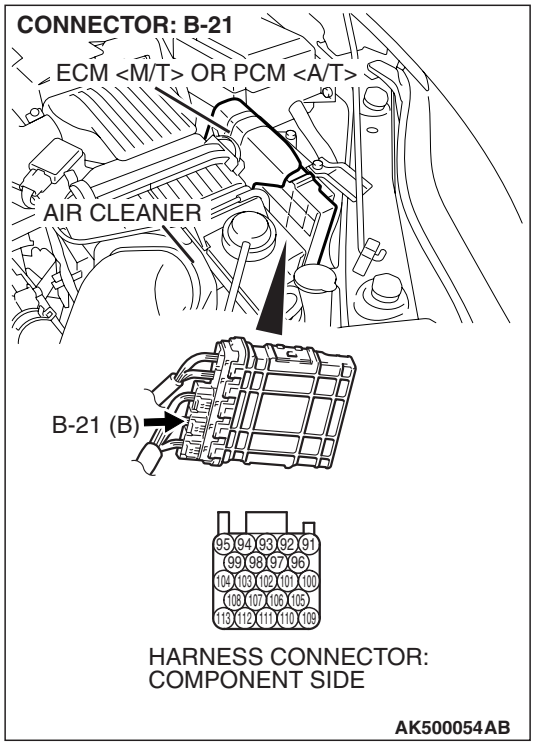
YES : Go to Step 5.
NO : Go to Step 6.



STEP 5. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between engine coolant temperature sensor connector B-106 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 93) 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.

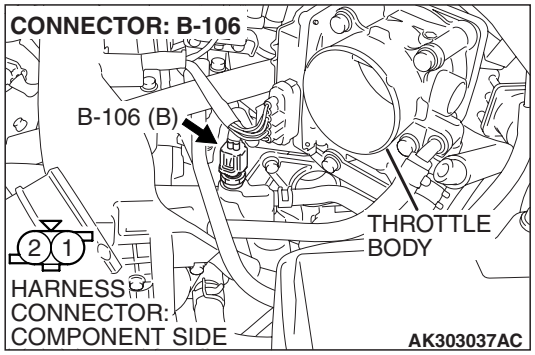


STEP 6. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

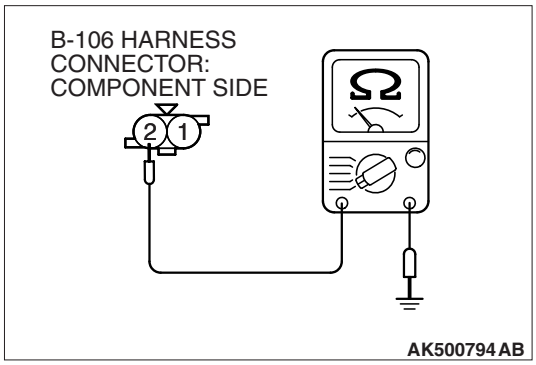
YES : Replace the ECM or the PCM. Then go to Step 11.

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-106.

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

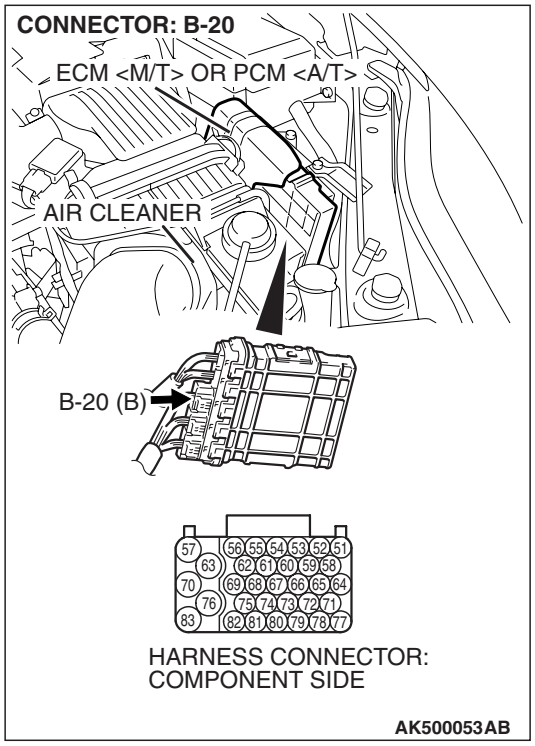


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 10.

NO : Go to Step 8.

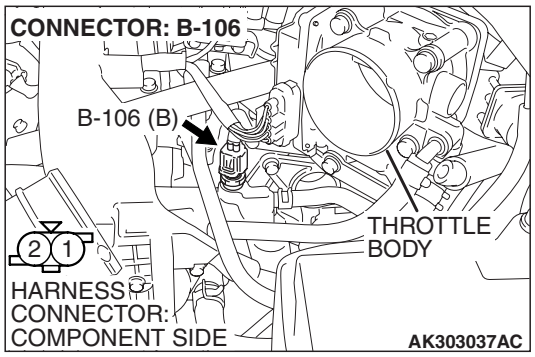


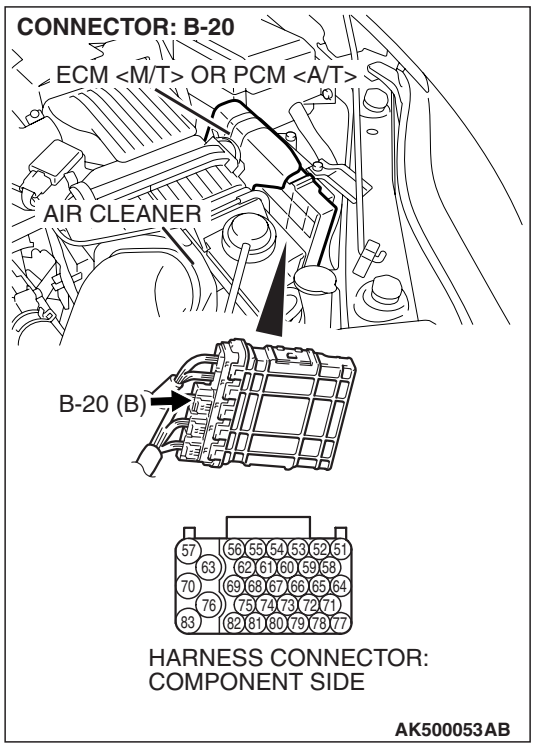
STEP 8. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

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 11.



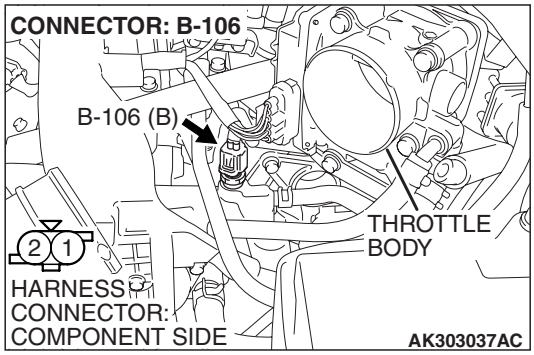


STEP 9. Check for open circuit between engine coolant sensor connector B-106 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

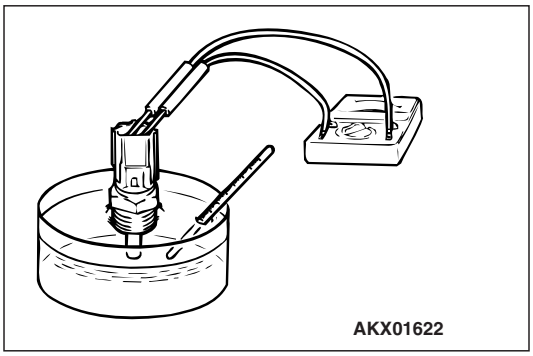
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

NO : Repair it. Then go to Step 11.



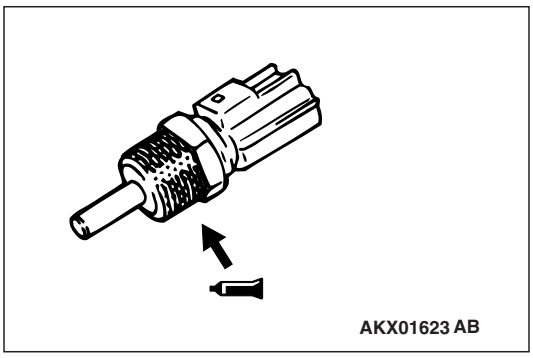
STEP 10. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-106.
(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 kΩ [at – 20° C (– 4° F)]
5.1 – 6.5 kΩ [at 0° C (32° F)]
2.1 – 2.7 kΩ [at 20° C (68° F)]
0.9 – 1.3 kΩ [at 40° C (104° F)]
0.48 – 0.68 kΩ [at 60° C (140° F)]
0.26 – 0.36 kΩ [at 80° C (176° F)]



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

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

Q: Is the measured resistance at the standard value?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

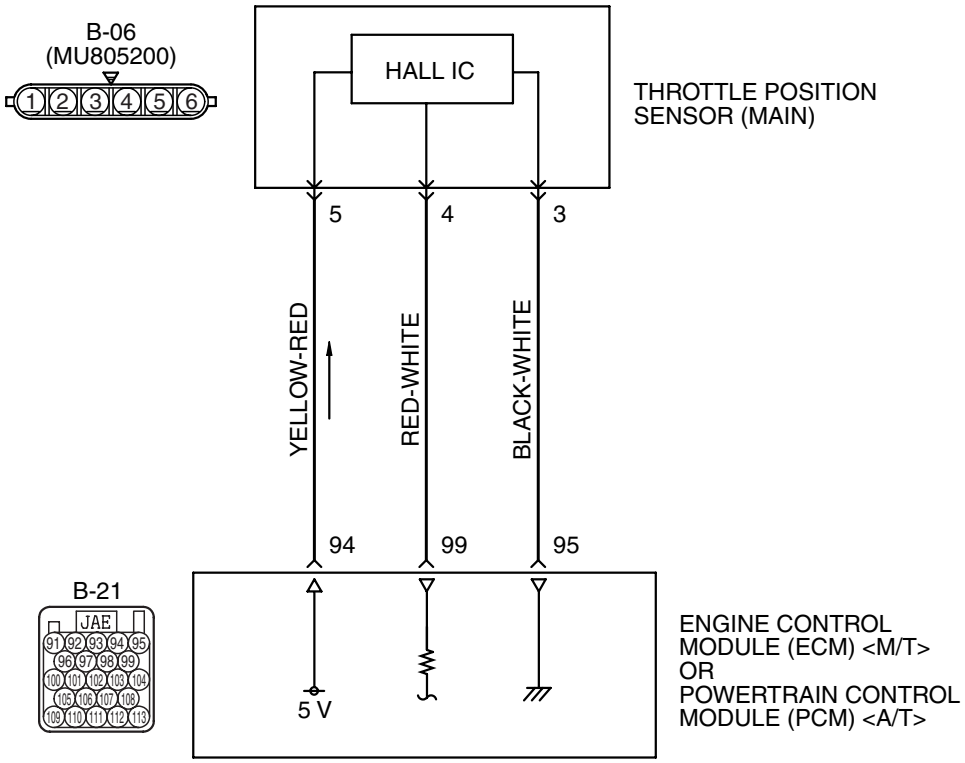
Q: Is DTC P0118 set?

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

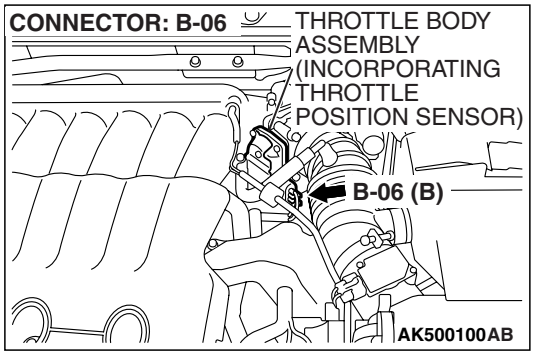
DTC P0122: Throttle Position Sensor (Main) Circuit Low Input

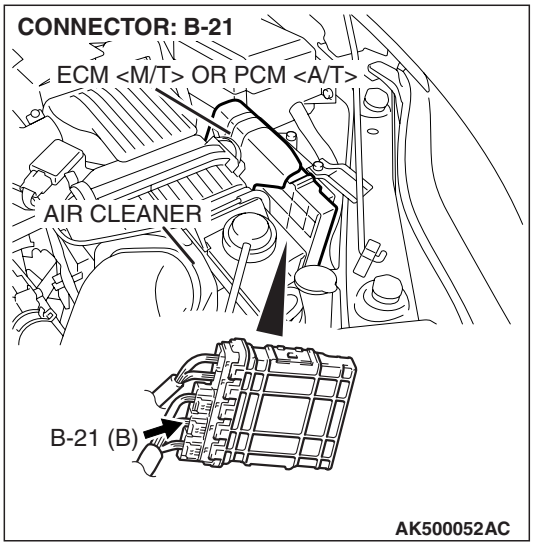
⚠ CAUTION
If DTC P0122 has been set, TCL related DTC U1120 is also set. After P0122 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (main) Circuit



AK403681





TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM <M/T> or the PCM <A/T> (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

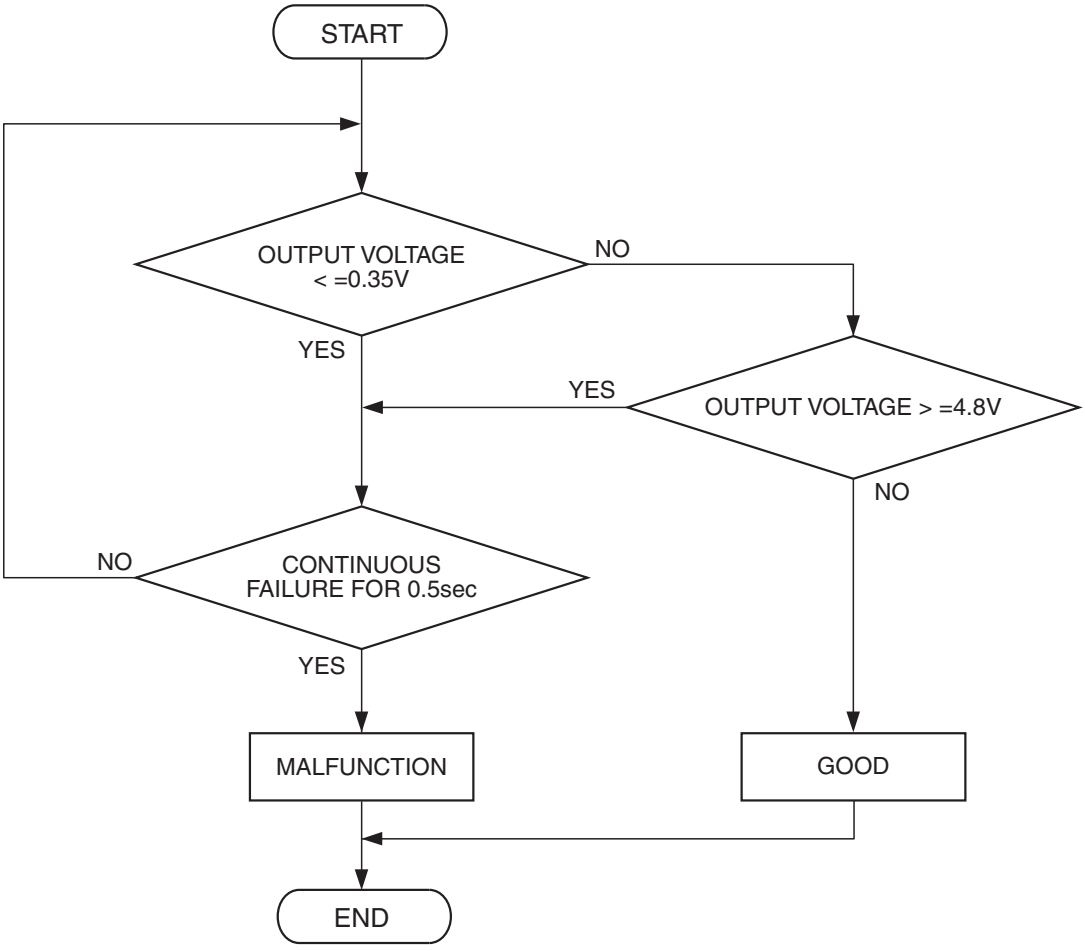
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302389

Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- Throttle position sensor (main) output voltage should be 0.35 volt or less for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Open or shorted throttle position sensor (main) circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

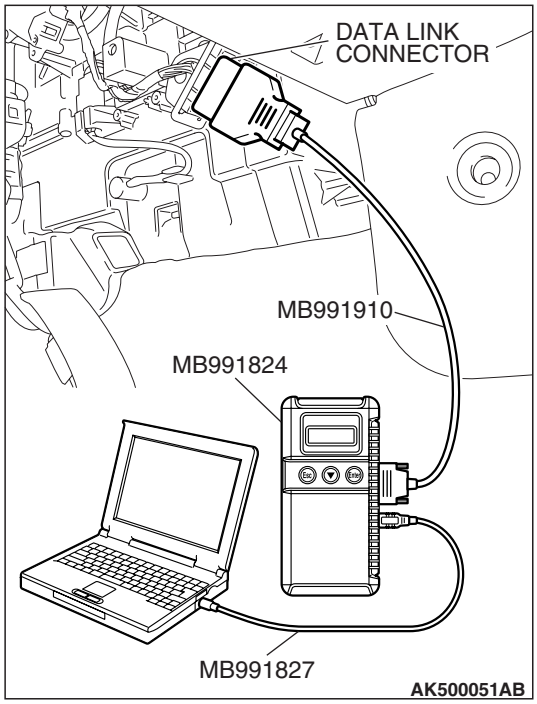
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).



⚠ CAUTION

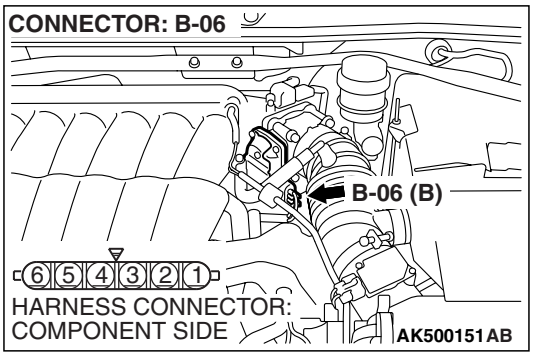
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 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 (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
  - Output voltage should be between 4.0 volts or more 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?

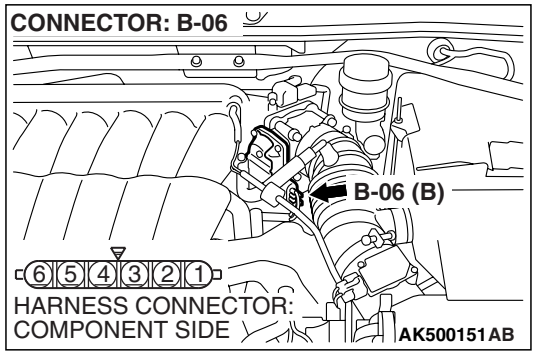
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.
NO : Go to Step 2.

STEP 2. Check harness connector B-06 at throttle position sensor for damage.



Q: Is the harness connector in good condition?

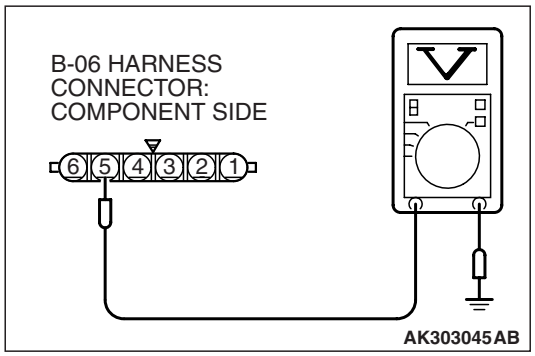
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at throttle position sensor 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. 5 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

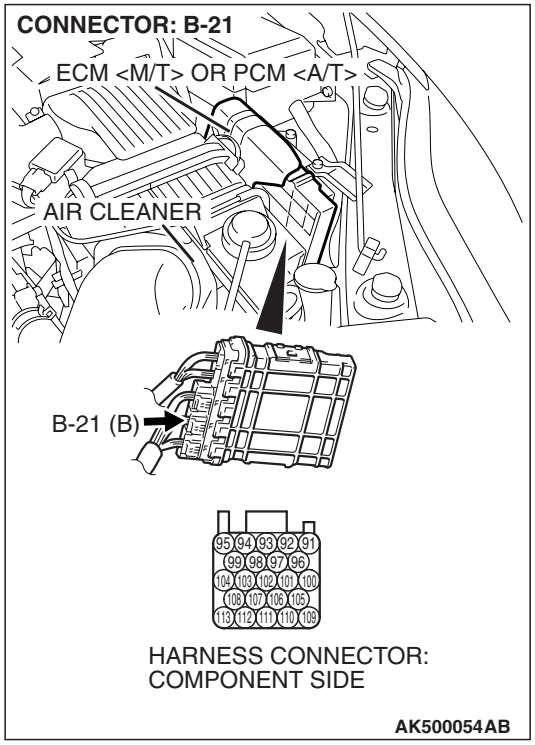
Q: Is the measured voltage between 4.9 and 5.1 volts?

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

STEP 4. Check harness connector B-21 at ECM <M/T> or PCM <A/T> 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 11.

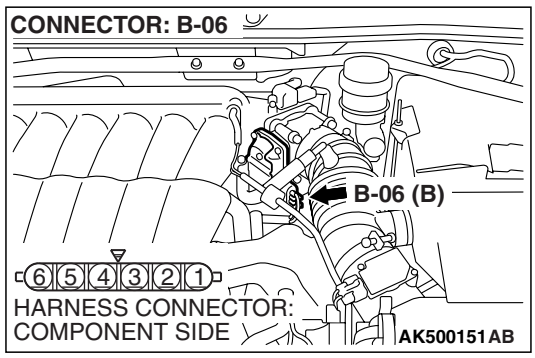


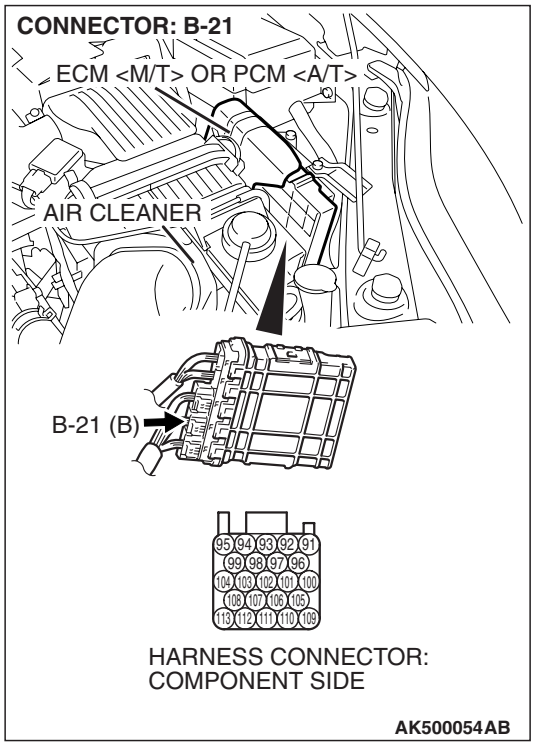
STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 94).

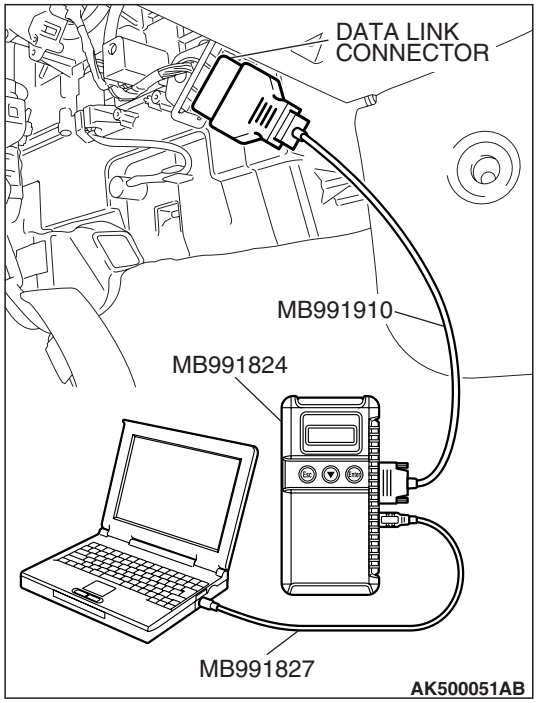
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 11.







STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

⚠ CAUTION

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

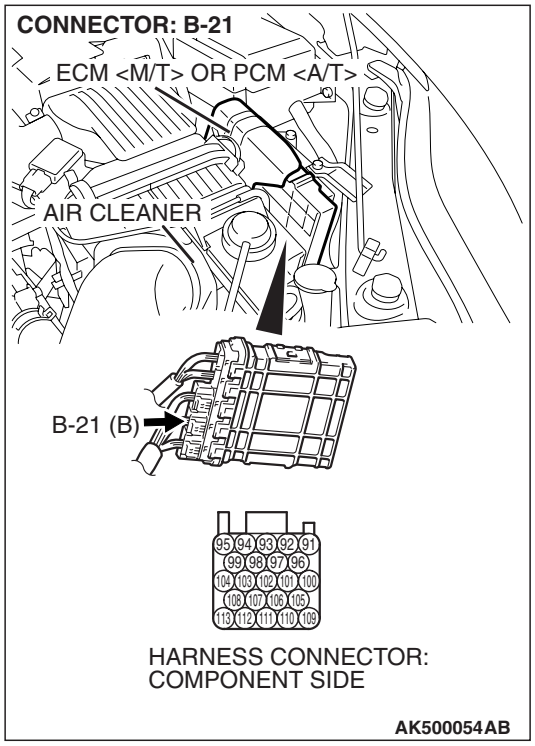
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more 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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

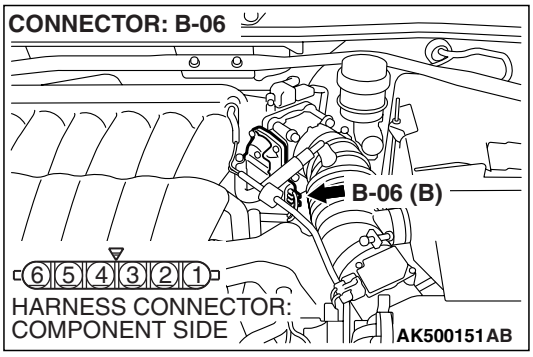


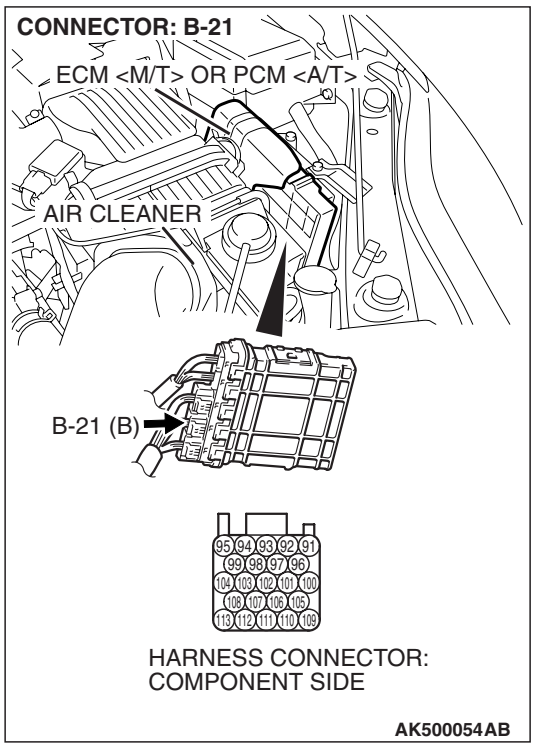
STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 11.





STEP 8. Check for harness damage between throttle position sensor connector B-06 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

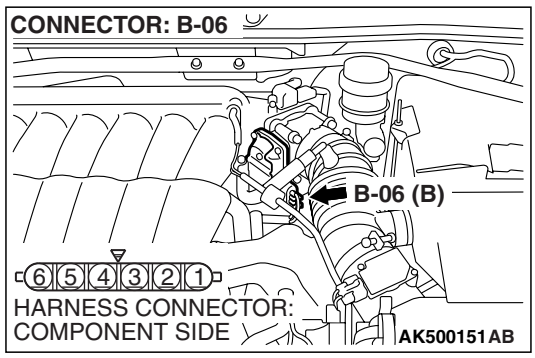
NO : Repair it. Then go to Step 11.

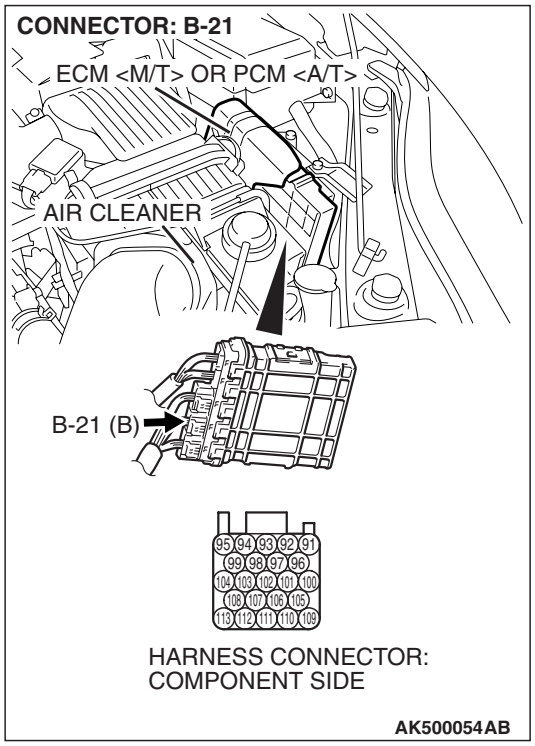
STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





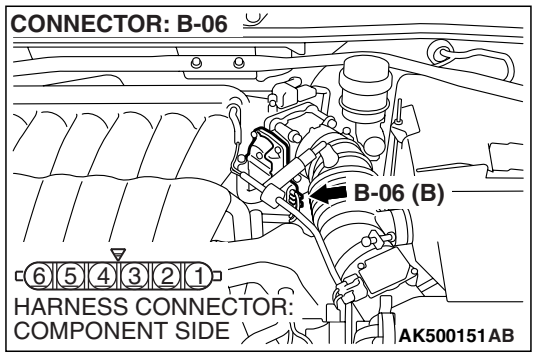
STEP 10. Replace the throttle body assembly.

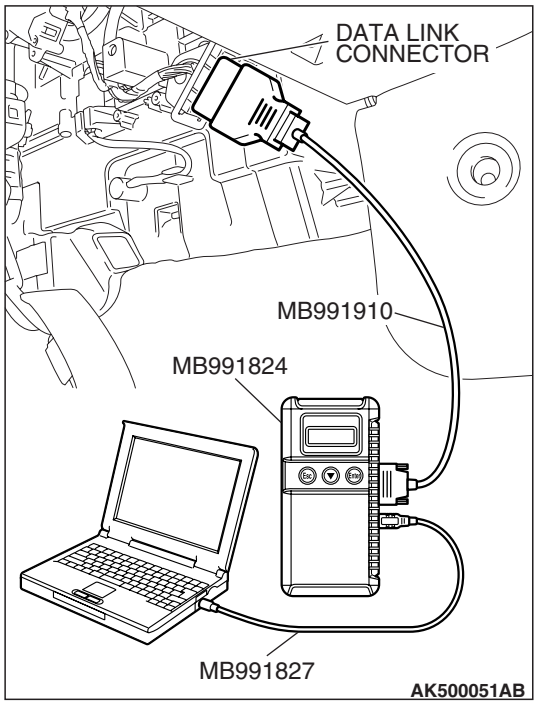
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0122 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

NO : The inspection is complete.





STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

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

(1) Connect scan tool MB991958 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?

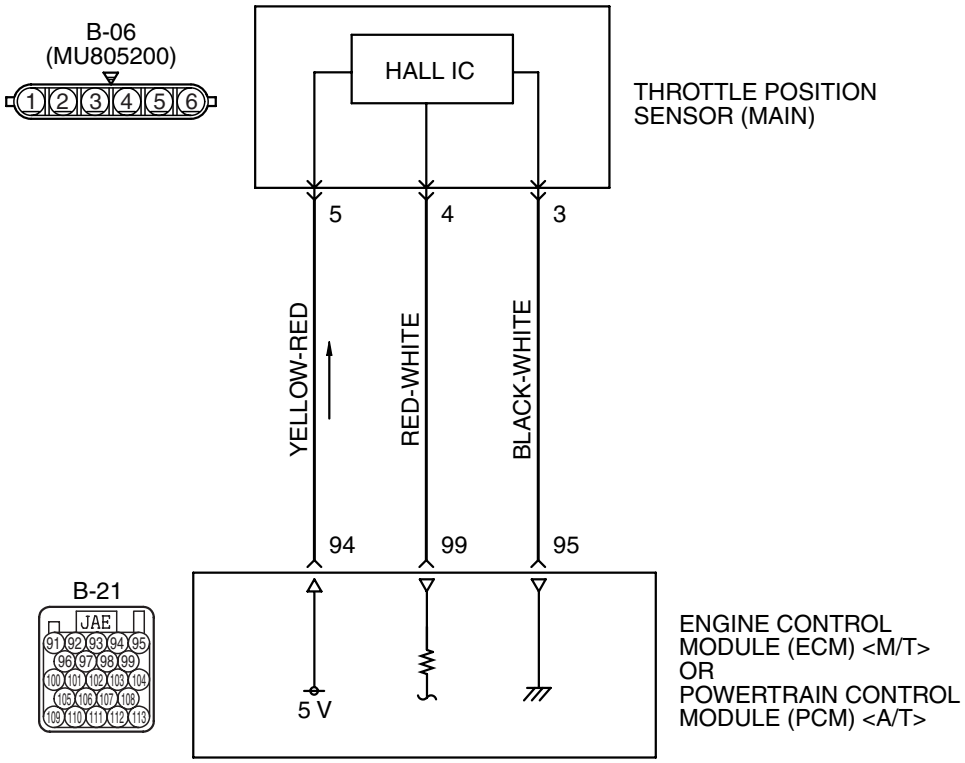
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0123: Throttle Position Sensor (main) Circuit High Input

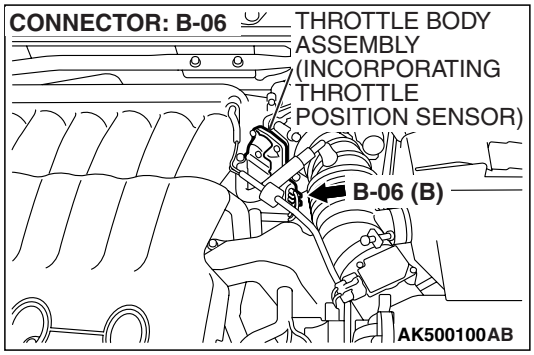
⚠ CAUTION

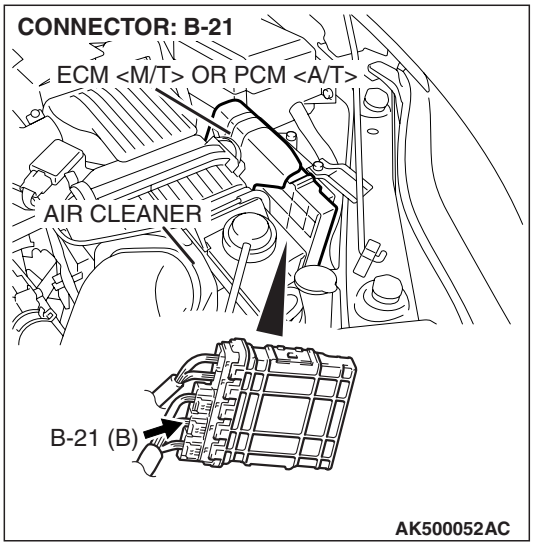
If DTC P0123 has been set, TCL related DTC U1120 is also set. After P0123 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (main) Circuit



AK403681





TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM <M/T> or the PCM <A/T> (terminal No. 94).
  The ground terminal (terminal No. 3) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

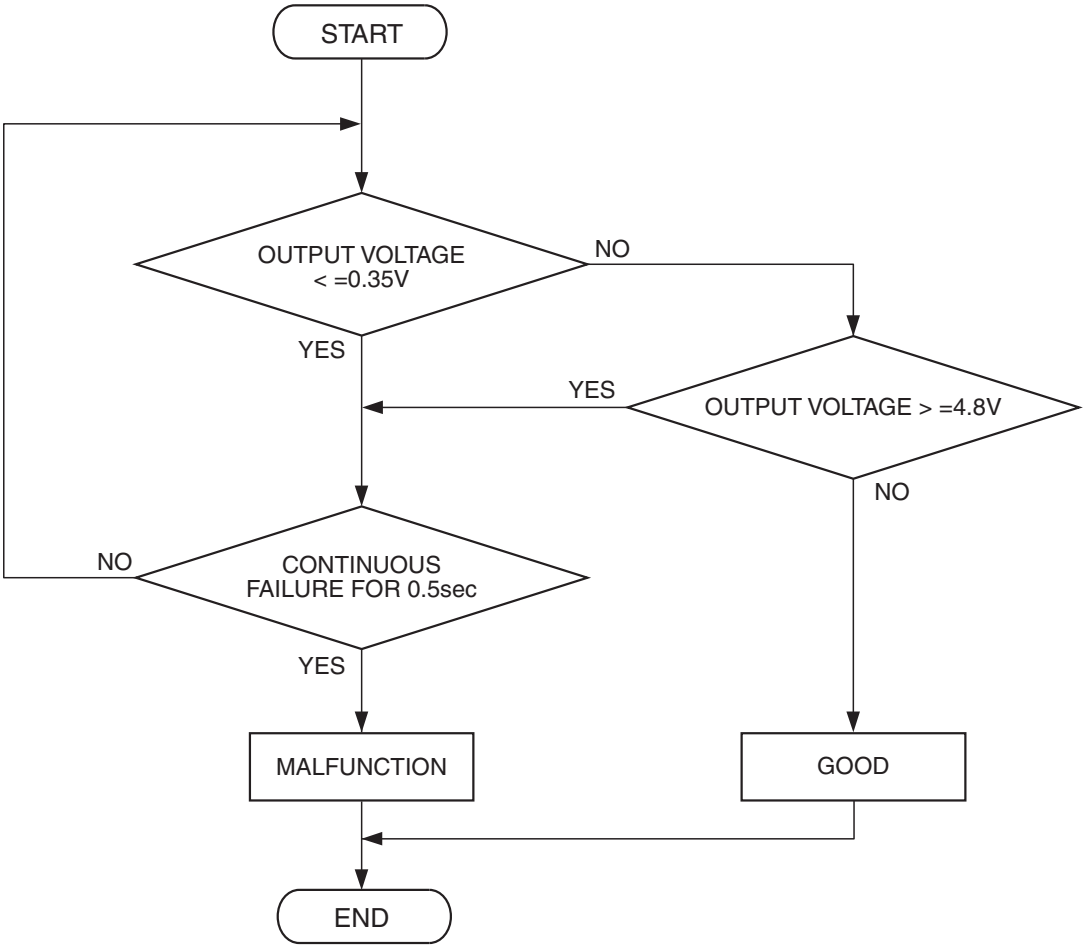
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302389

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (main) output voltage should be 4.8 volts or more for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Open throttle position sensor (main) circuit, or harness damage or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

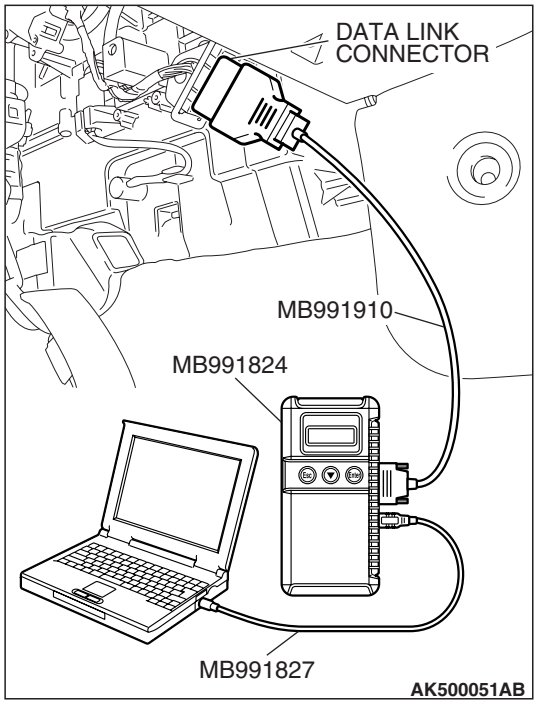
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).



⚠ CAUTION

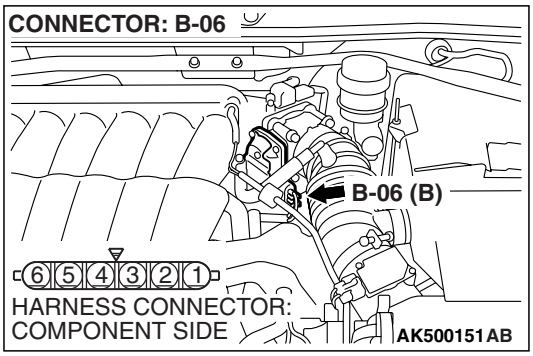
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 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 (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
  - Output voltage should be 4.0 volts or more 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?

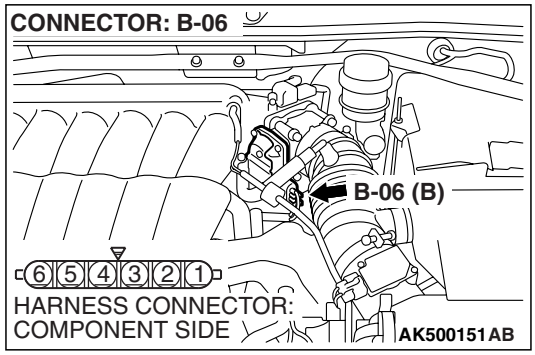
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.
NO : Go to Step 2.

STEP 2. Check harness connector B-06 at throttle position sensor for damage.



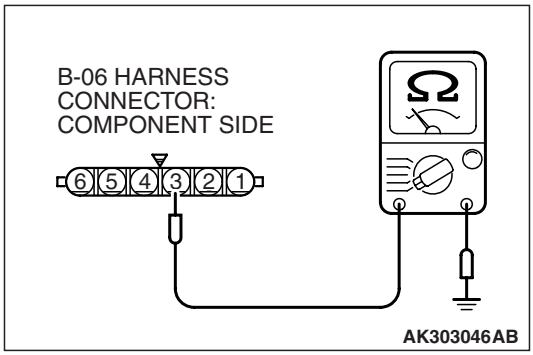
Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.



(2) Measure the continuity between terminal No. 3 and ground
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.

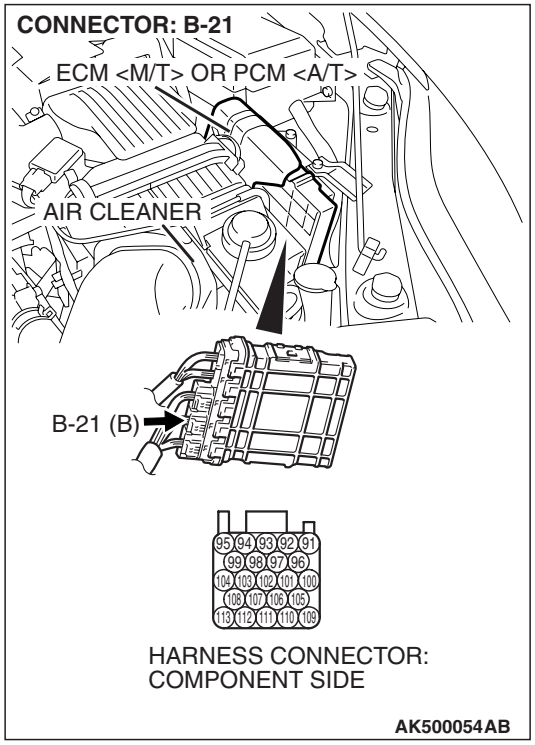
NO : Go to Step 4.

STEP 4. Check harness connector B-21 at ECM <M/T> or PCM <A/T> 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 8.

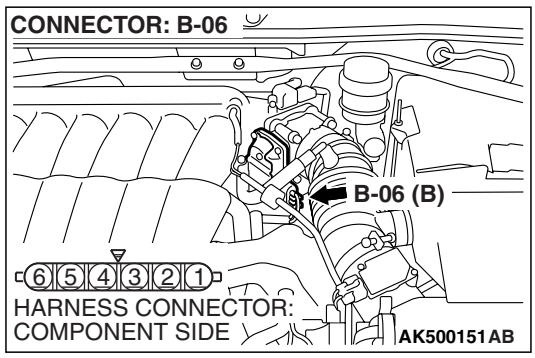


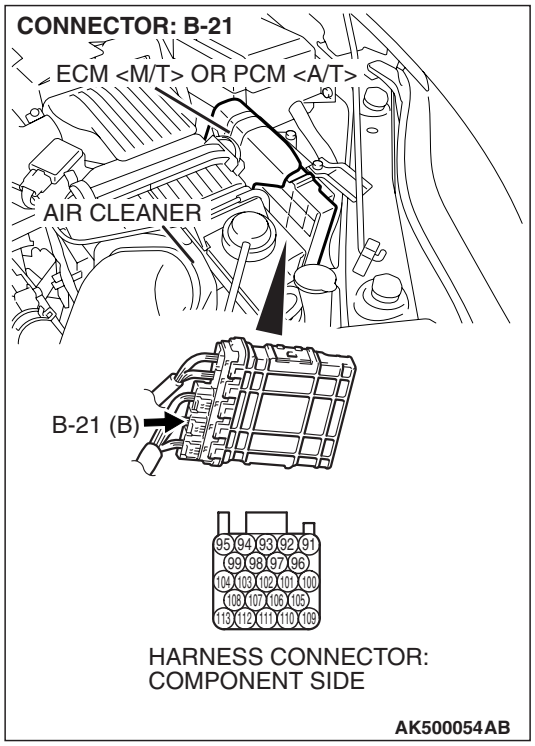
STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 95).

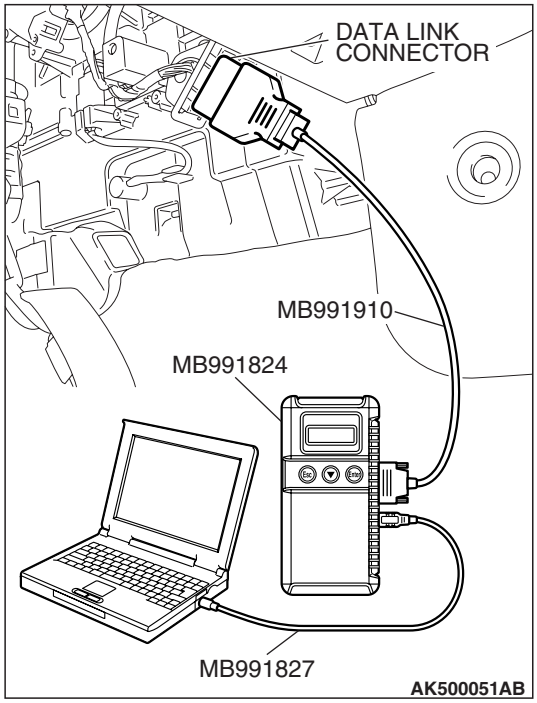
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.







STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

⚠ CAUTION

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

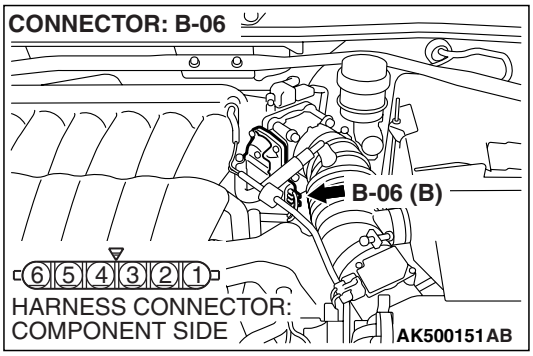
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more 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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 8.



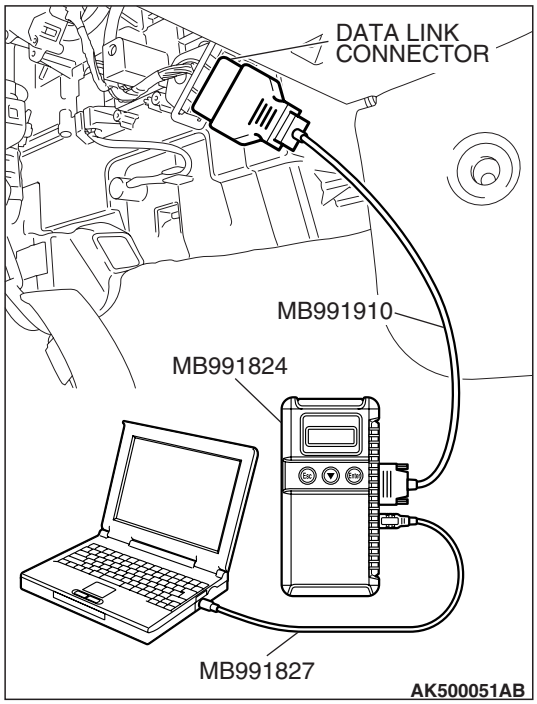
STEP 7. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(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 : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 8.

NO : The procedure is complete.



STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

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

(1) Connect scan tool MB991958 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.

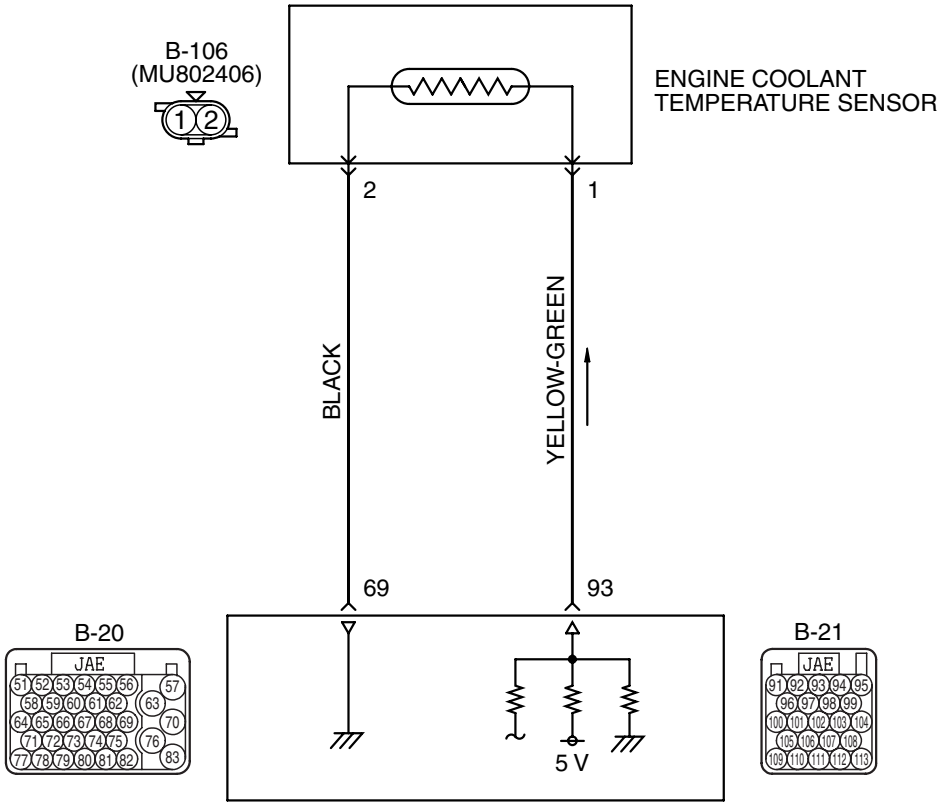
Q: Is DTC P0123 set?

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

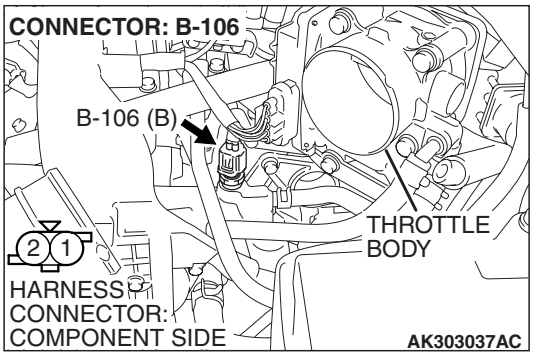
DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

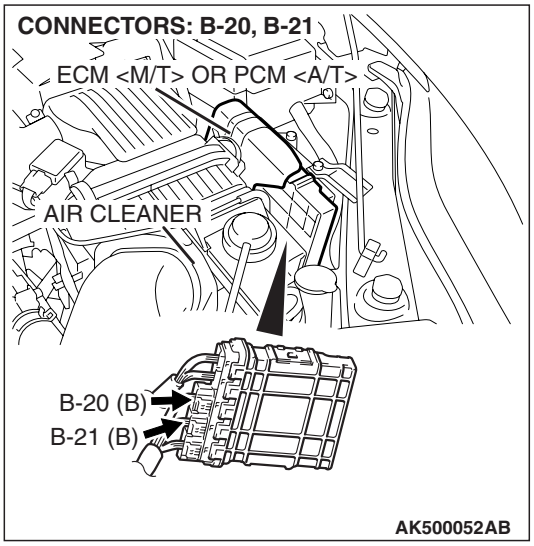
⚠ CAUTION
If DTC P0125 has been set, TCL related DTC U1120 is also set. After P0125 has been diagnosed, don't forget to erase DTC U1120.

Engine Coolant Temperature Sensor Circuit



AK403680





TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 93) via the resistor in the ECM <M/T> or the PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM <M/T> or PCM <A/T> (terminal No. 69).
- 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 resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM <M/T> or the PCM <A/T> checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

- Engine coolant temperature sensor output voltage drops from over 40° C (104° F) to under 40° C (104° F) and keeps under 40° C (104° F) for 5 minutes.
- Engine coolant temperature sensor output voltage does not reach close loop enable temperature within specified period when engine coolant temperature sensor output voltage at engine start is under 7° C (45° F).

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

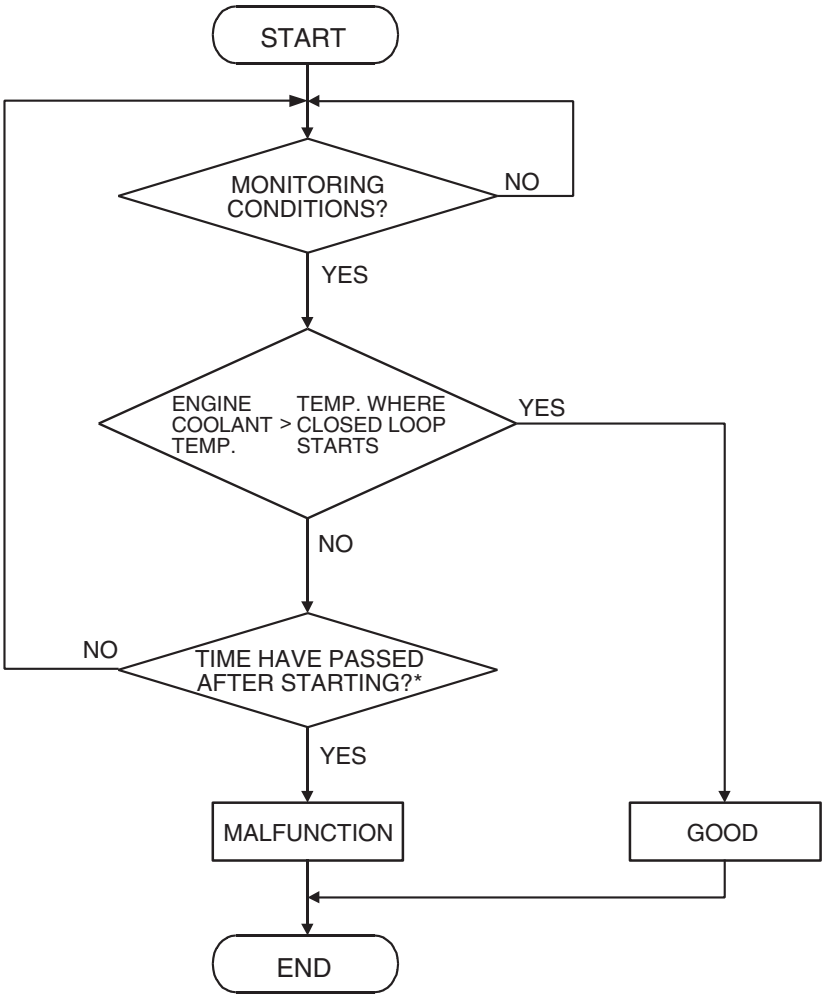
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS <Range/Performance problem - low input (time to reach closed loop temperature)>

Logic Flow Chart



*: SEE DTC SET CONDITIONS-SET CONDITIONS, JUDGMENT CRITERIA

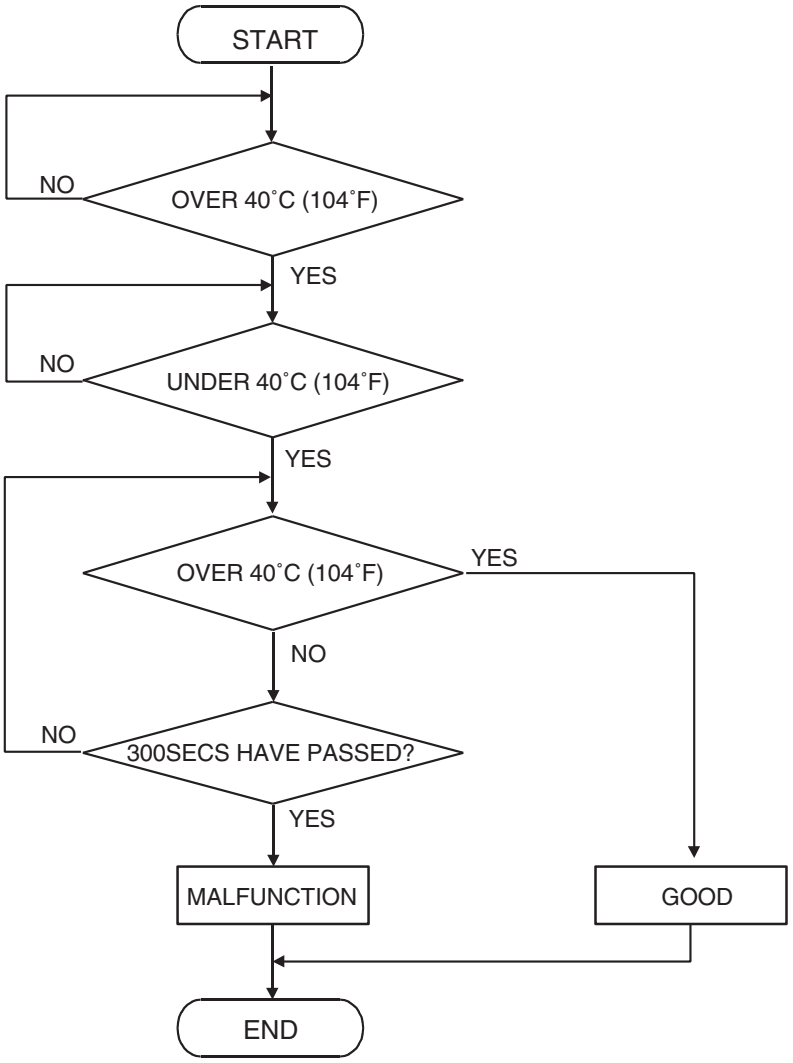
AK302385

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.

DTC SET CONDITIONS <Range/Performance problem - drift>

Logic Flow Chart



AK500795

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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 9 P.13B-6.

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

- Engine coolant temperature sensor failed.
- Harness damage in engine coolant temperature sensor circuit or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

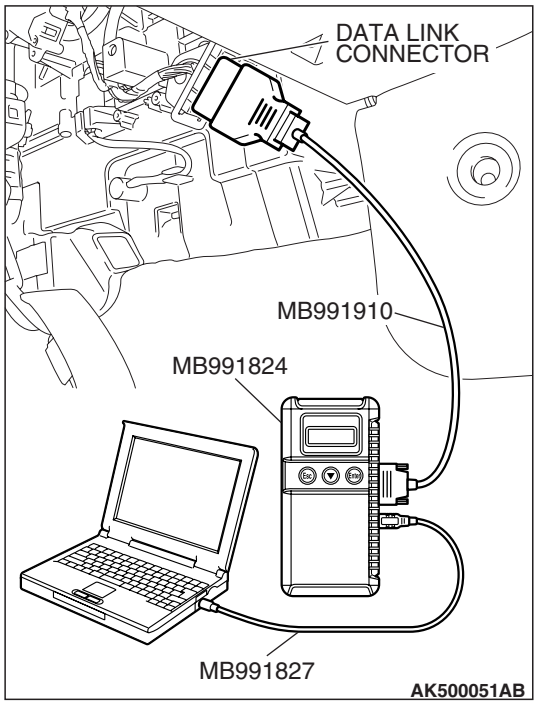
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.



⚠ CAUTION

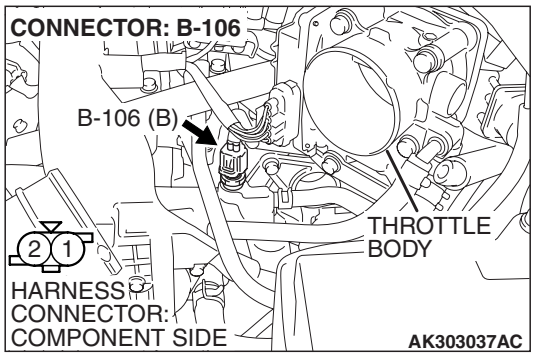
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, 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?

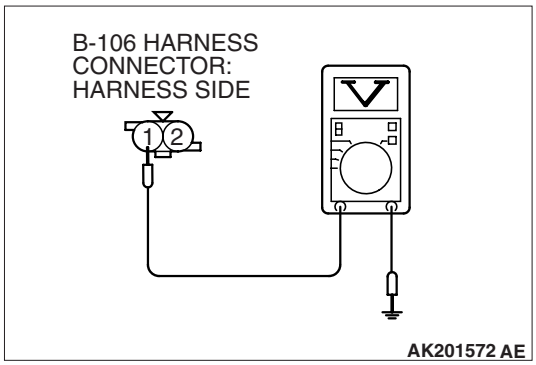
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-106 by backprobing.

(1) Do not disconnect the connector B-106.
(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 between 3.9 and 4.5 volts.
- When engine coolant temperature is 0° C (32° F), voltage should be between 3.2 and 3.8 volts.
- When engine coolant temperature is 20° C (68° F), voltage should be between 2.3 and 2.9 volts.
- When engine coolant temperature is 40° C (104° F), voltage should be between 1.3 and 1.9 volts.
- When engine coolant temperature is 60° C (140° F), voltage should be between 0.7 and 1.3 volts.
- When engine coolant temperature is 80° C (176° F), voltage should be between 0.3 and 0.9 volt.

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

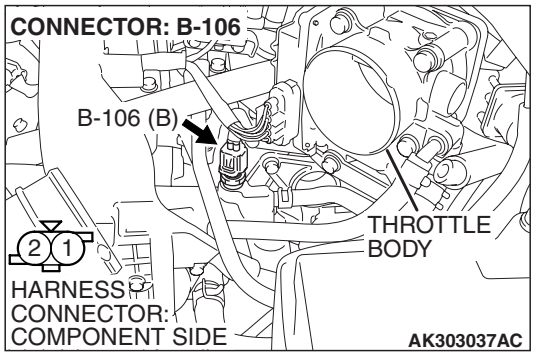
Q: Is the measured voltage within the specified range?

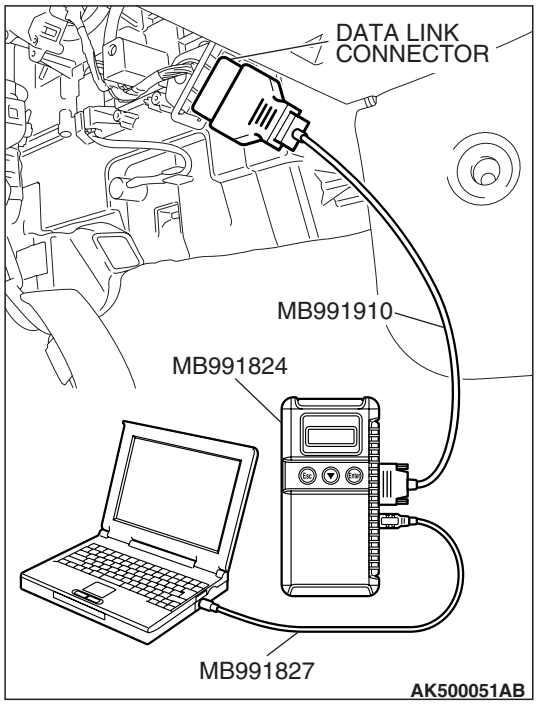
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-106 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

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





STEP 4. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

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

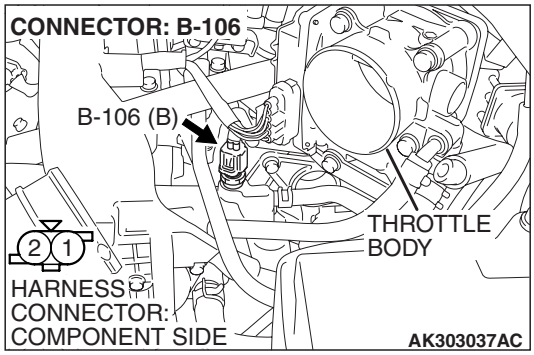
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately 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 –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 14.

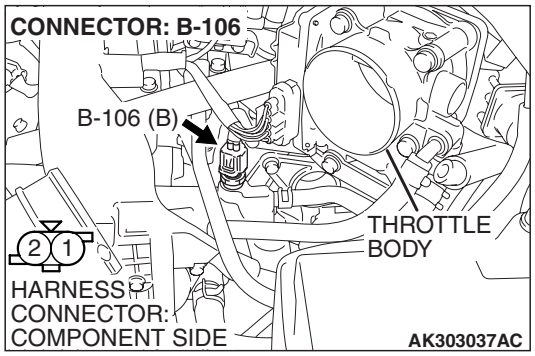


STEP 5. Check harness connector B-106 at engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

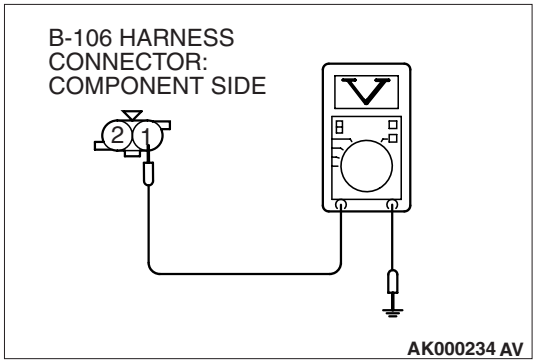
YES : Go to Step 6.

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



STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-106.

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



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

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

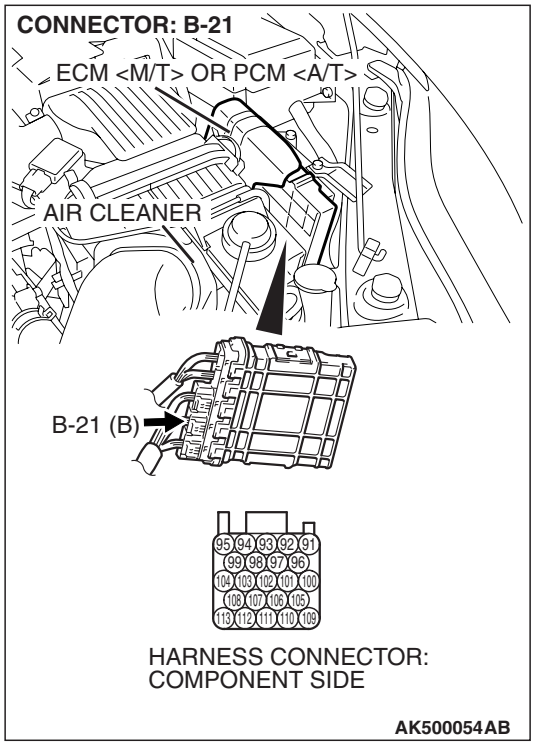
Q: Is the measured voltage between 4.5 and 4.9 volts?

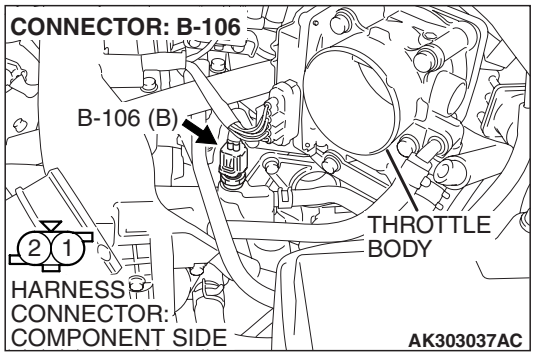
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

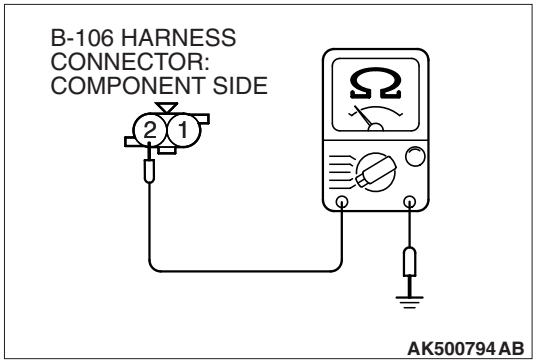
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-106.

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



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

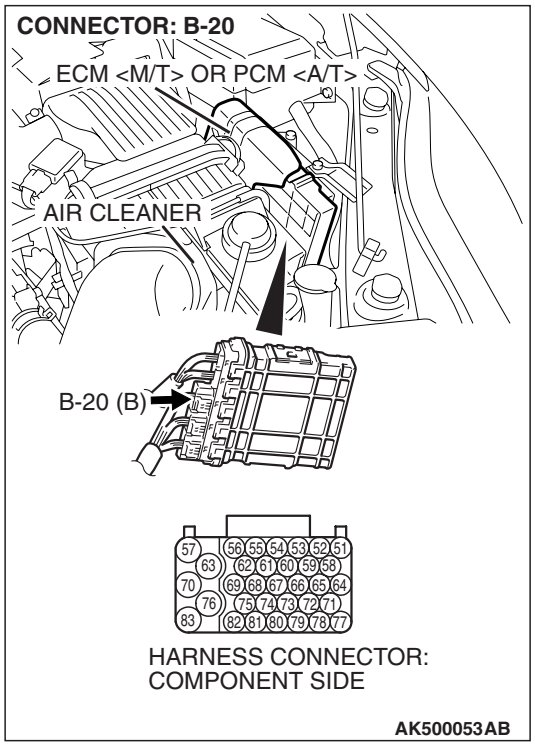
Q: Does continuity exist?

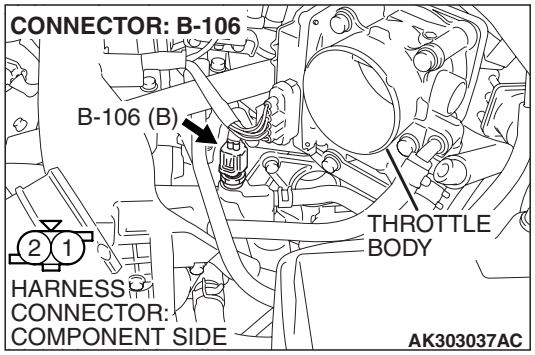
YES : Go to Step 11.
NO : Go to Step 9.

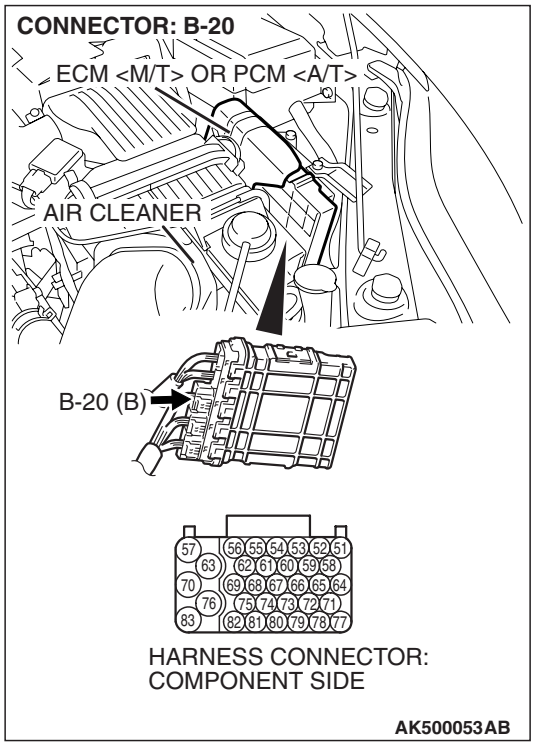
STEP 9. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

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.





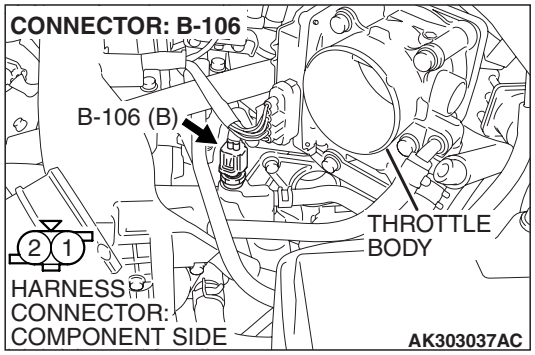


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-106 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 69).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 14.

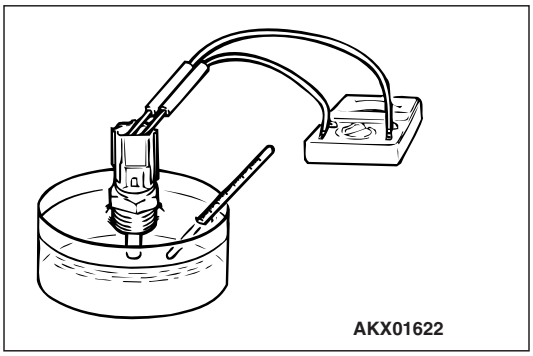
NO : Repair it. Then go to Step 14.



STEP 11. Check the engine coolant temperature sensor.

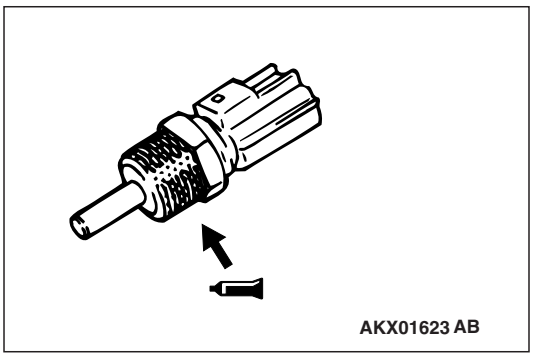
(1) Disconnect the engine coolant temperature sensor connector B-106.

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



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

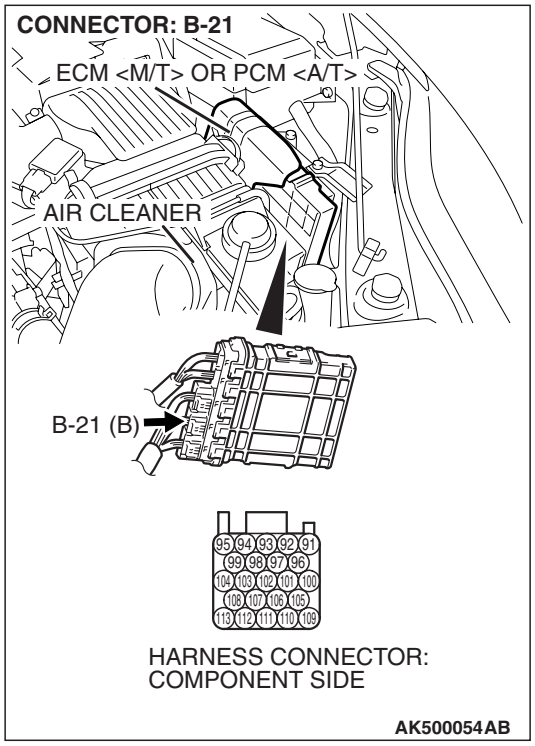
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

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

Q: Is the measured resistance at the standard value?

YES : Go to Step 12.

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

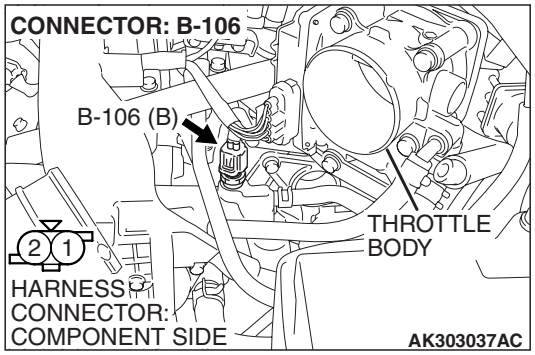


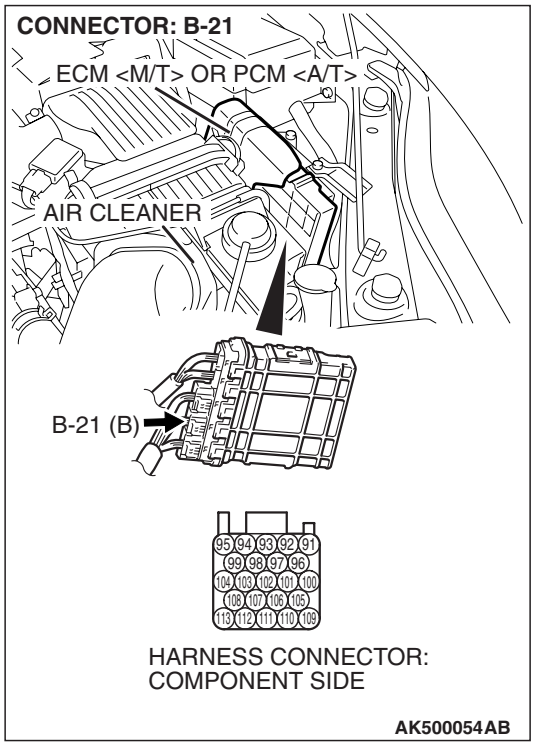
STEP 12. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 engine coolant temperature sensor connector B-106 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 93).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 9 P.13B-6.

(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 ECM <M/T> or the PCM <A/T> checks the time for the cooling water temperature to reach the judgment temperature.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature does not reach 77°C (171°F) within specified period after cold start.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

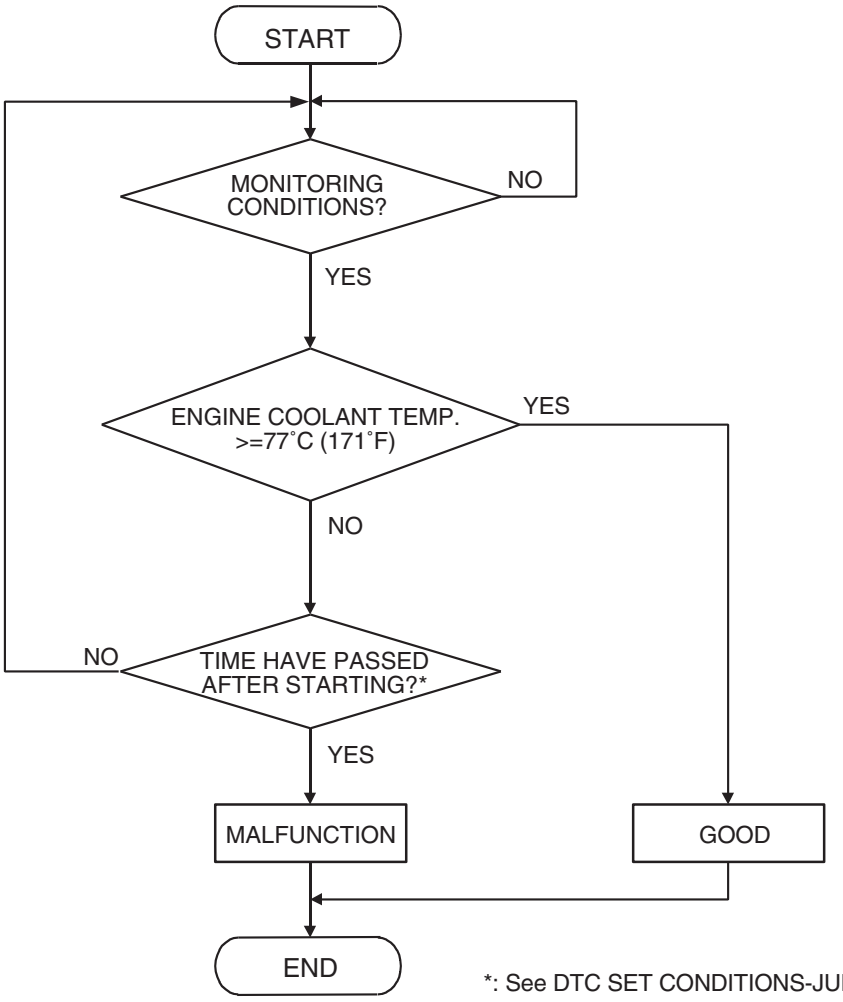
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



*: See DTC SET CONDITIONS-JUDGMENT CRITERIA

AK204044

TSB Revision

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 total time of the mass airflow sensor output whose state is below 15g/sec within 300 seconds.

Judgement Criteria

- The time for the engine coolant temperature to rise to 77° C (171° F) takes longer than approximately 4.5 to 28 minutes.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 10 P.13B-6.

TROUBLESHOOTING HINTS

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

- The thermostat is faulty.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

STEP 1. Check the cooling system.

Refer to Engine Cooling Diagnosis P.14-4.

Q: Is the cooling system normal?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 2.

NO : Repair it. Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

1. Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 10 P.13B-6.
2. Check the diagnostic trouble code (DTC).

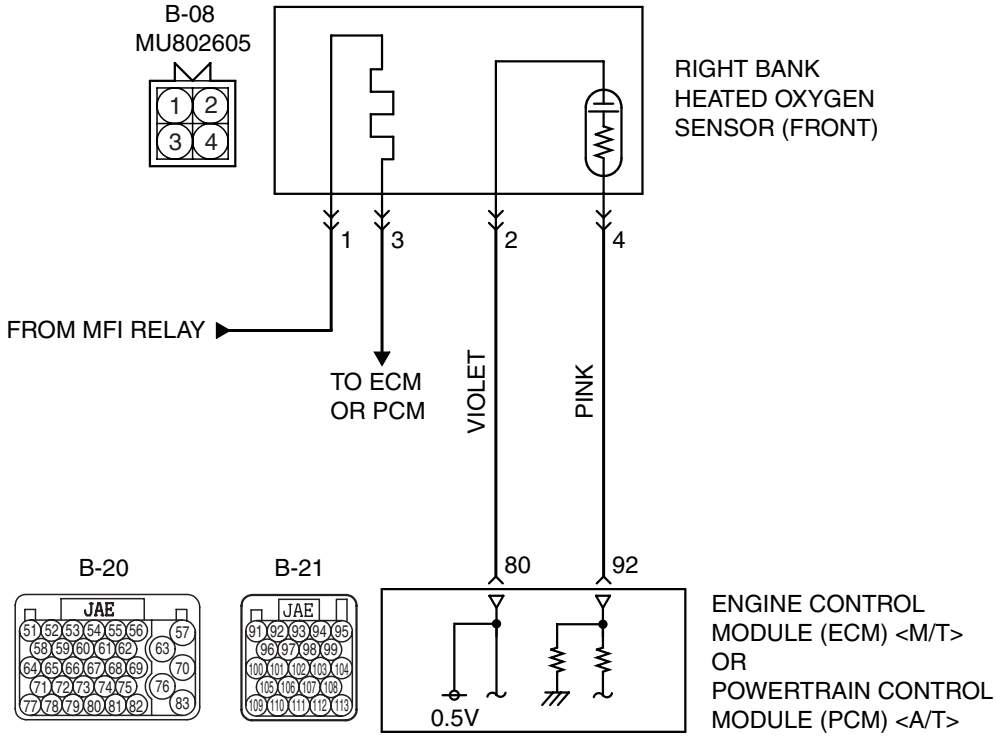
Q: Is DTC P0128 set?

YES : Retry the troubleshooting.

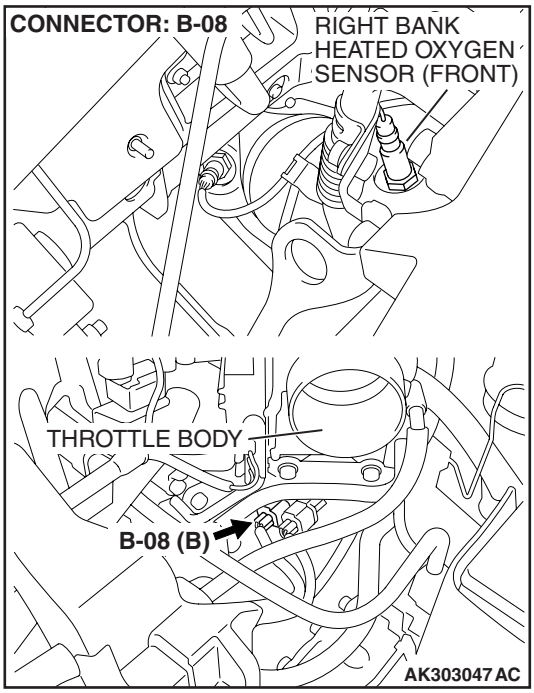
NO : The inspection is complete.

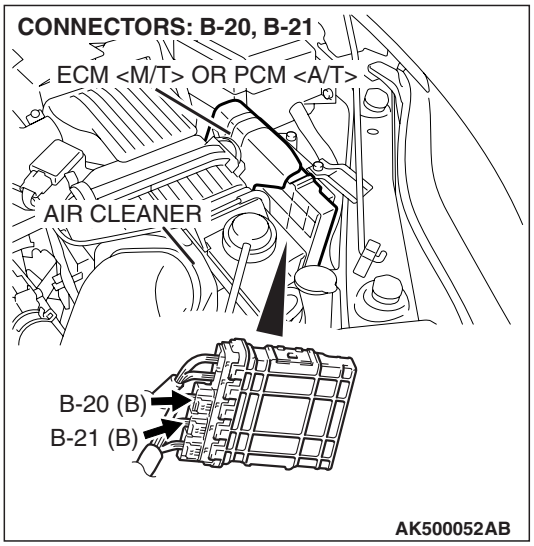
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



AK403970





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 92) 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 ECM <M/T> or PCM <A/T> (terminal No. 80).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (front).

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 ECM <M/T> or the PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or the PCM <A/T> also checks for an open circuit in the right bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage is under specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

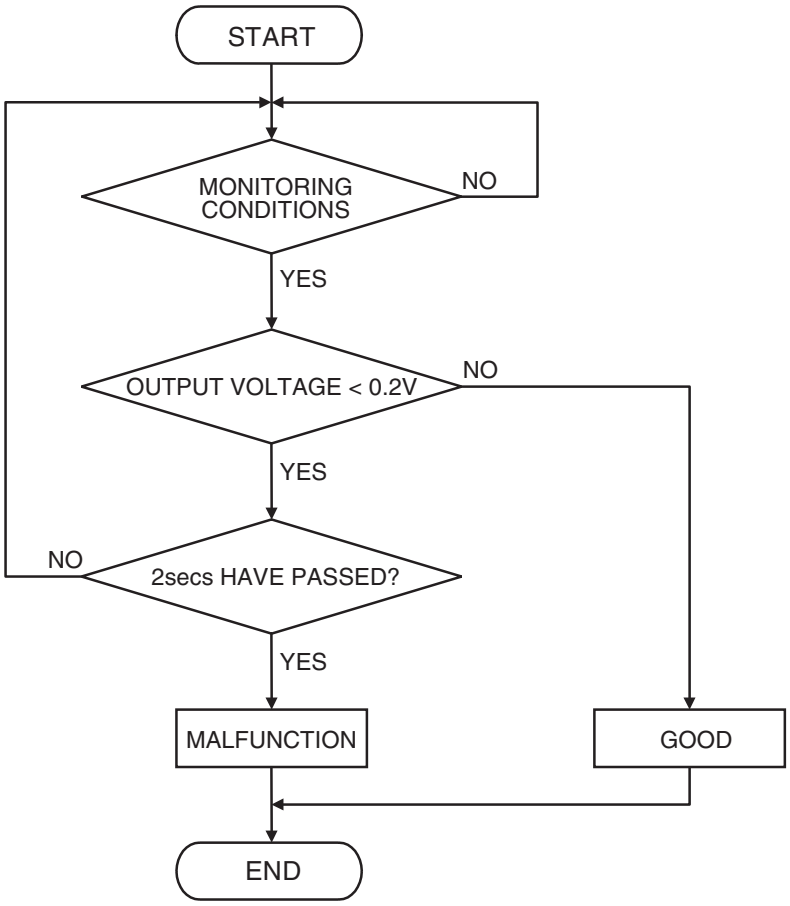
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500034

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 15 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Right bank heated oxygen sensor (front) output voltage is lower than 0.2 volt.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-6.

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

- Right bank heated oxygen sensor (front) failed.
- Open or shorted circuit in right bank heated oxygen sensor (front) output line, or harness damage.
- Open circuit in right bank heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

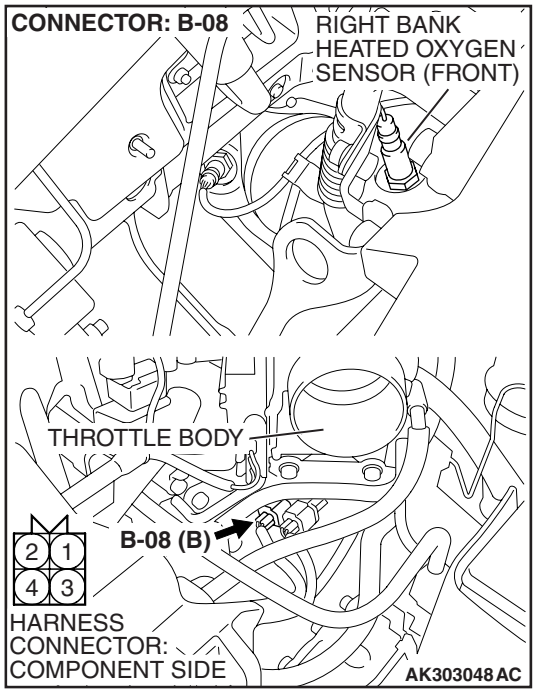
TSB Revision

DIAGNOSIS

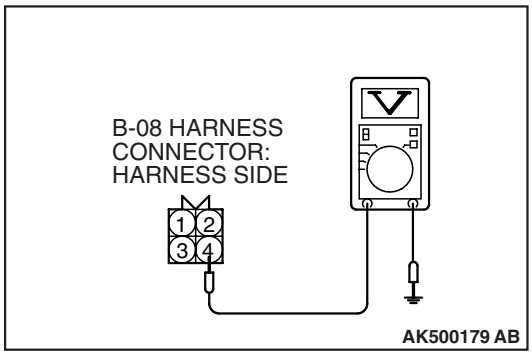
Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Measure the sensor output voltage at right bank heated oxygen sensor (front) connector B-08 by backprobing



(1) Do not disconnect the connector B-08.
(2) Start the engine and run at idle.

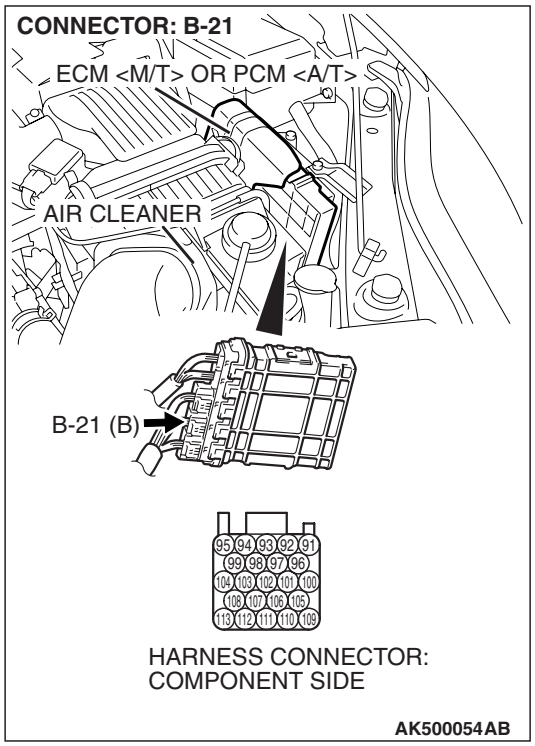


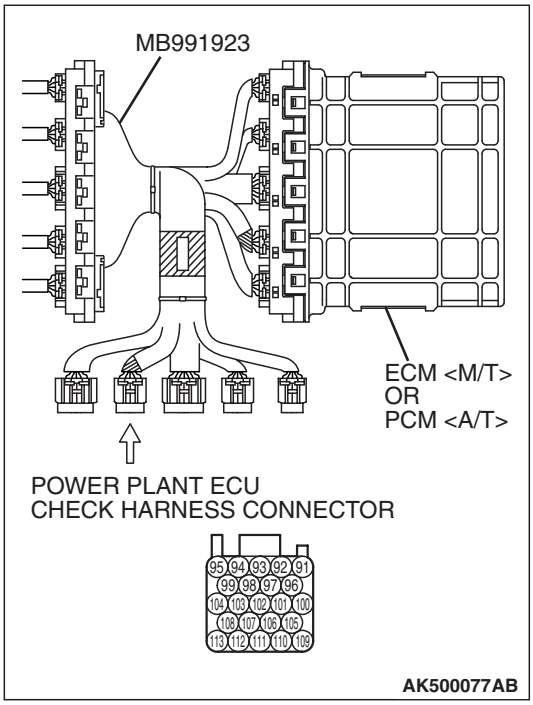
(3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

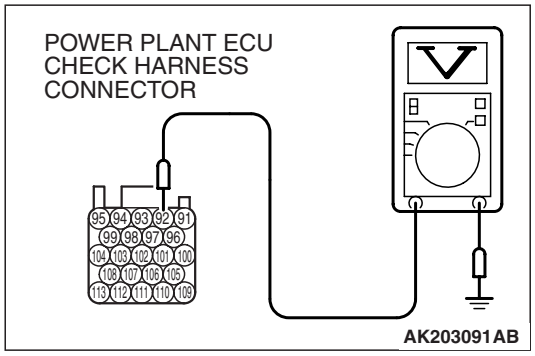
YES : Go to Step 2.
NO : Go to Step 6.





STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.

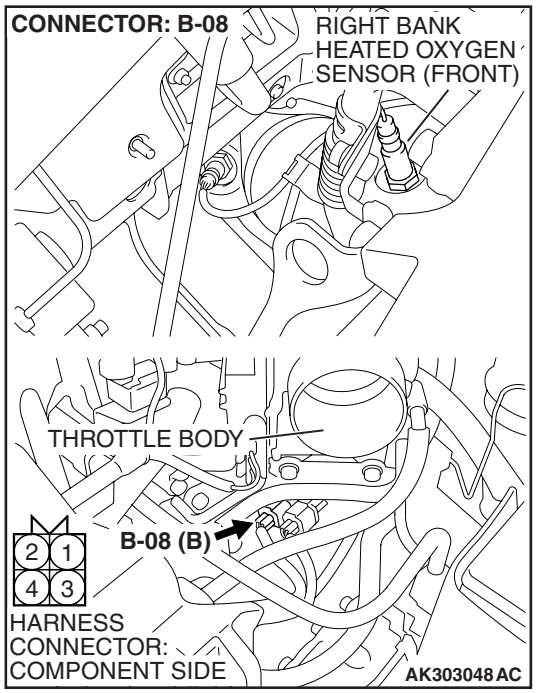


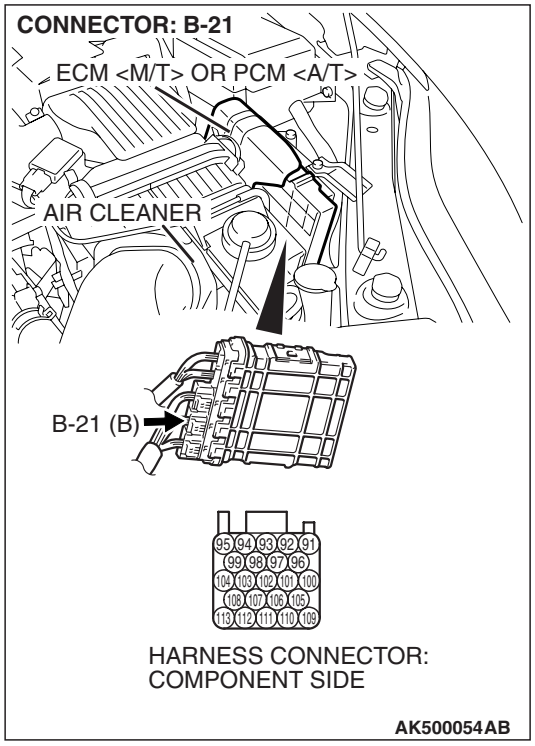
(3) Measure the voltage between terminal No. 92 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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





STEP 3. Check harness connector B-08 at right bank heated oxygen sensor (front) and harness connector B-21 at ECM <M/T> or PCM <A/T> 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 13.

STEP 4. Check the trouble symptoms.

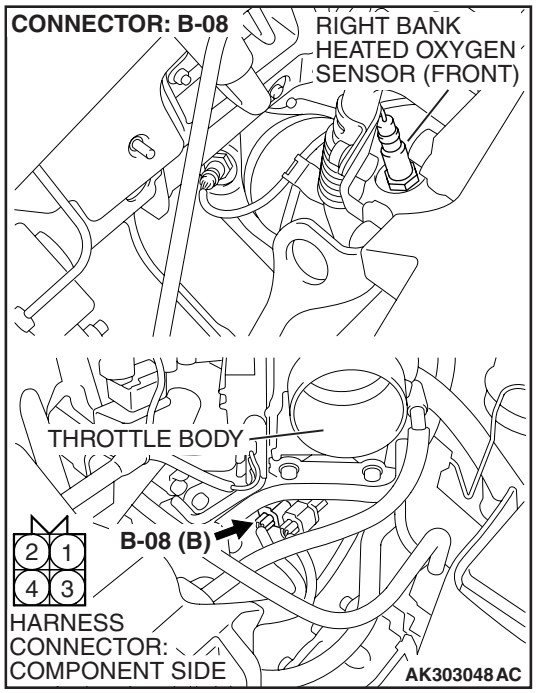
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

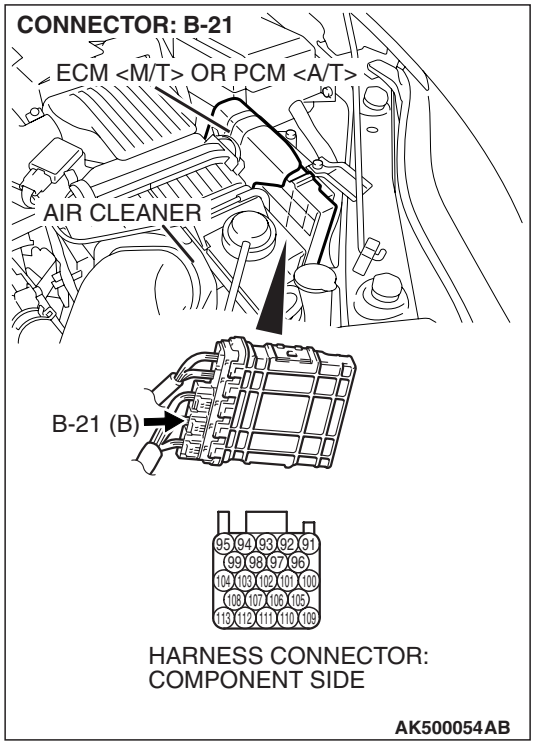
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0131 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.

NO : 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 Malfunctions P.00-14.



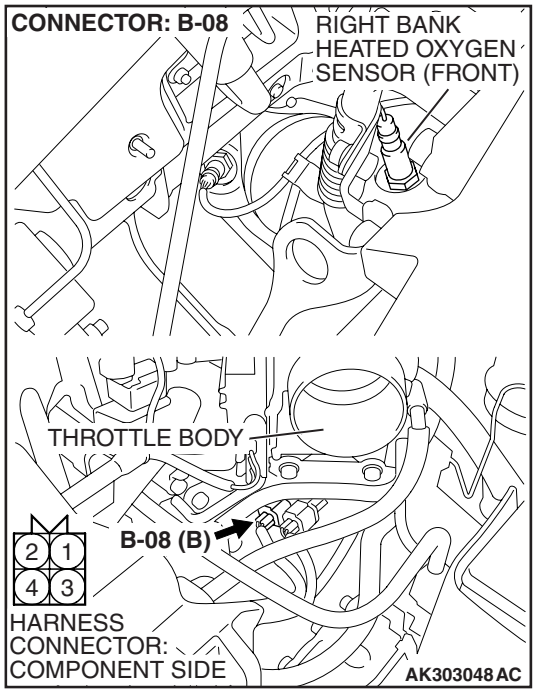


STEP 5. Check harness connector B-08 at right bank heated oxygen sensor (front) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-08 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 92) because of open circuit or 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.

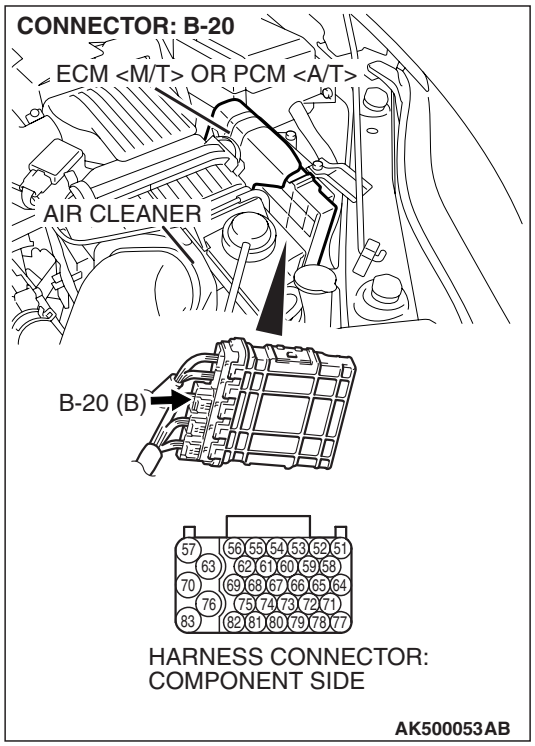


STEP 6. Check harness connector B-08 at right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

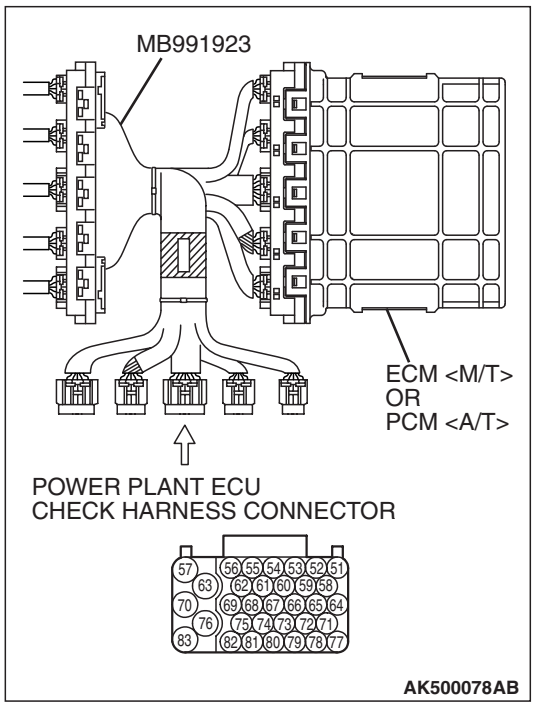
YES : Go to Step 7.

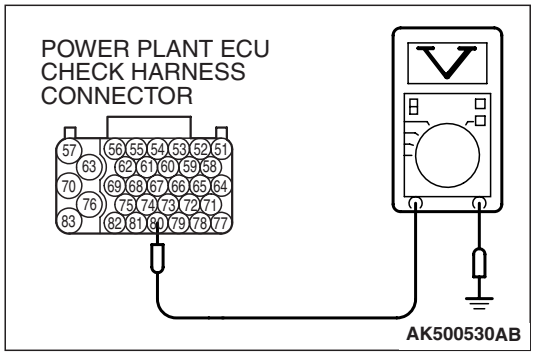
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 7. Measure the sensor offset voltage at ECM <M/T> or PCM <A/T> connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



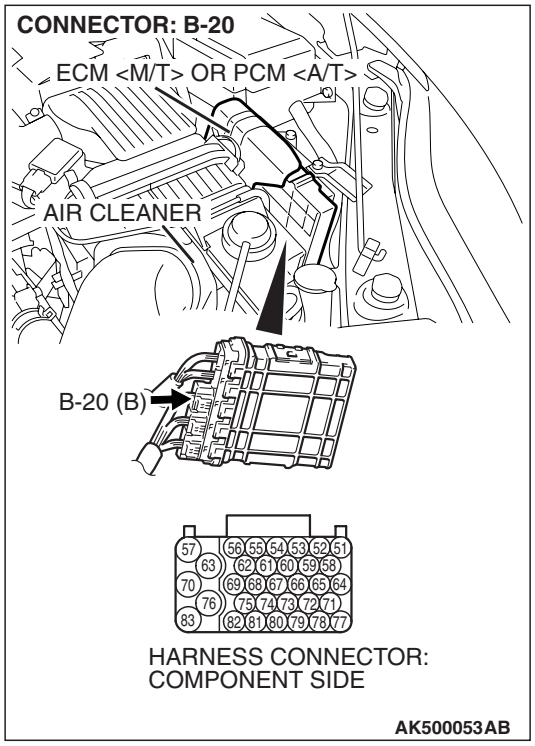


(3) Measure the voltage between terminal No. 80 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

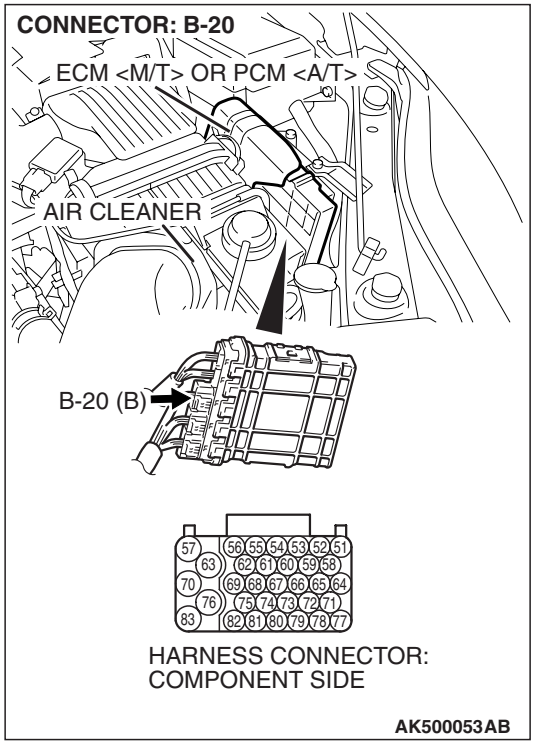


STEP 8. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-08 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 80) because of open circuit or 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 9. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

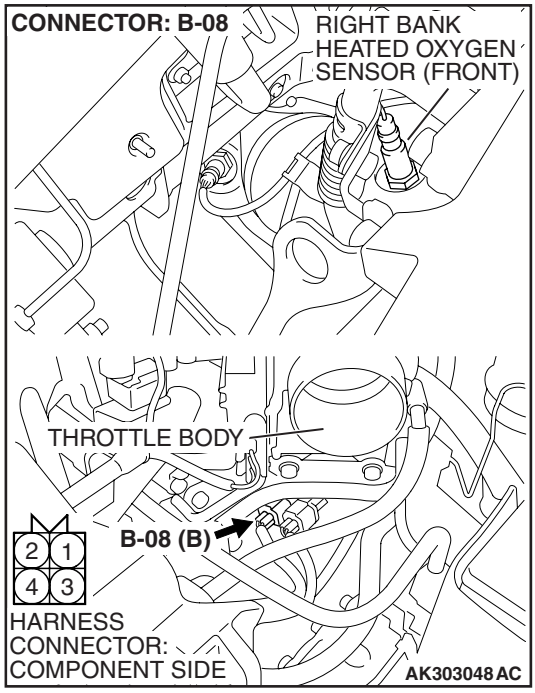
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

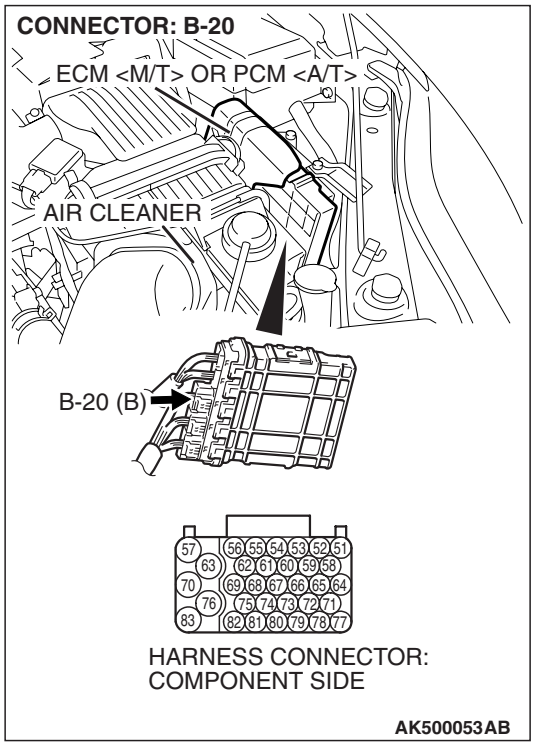
STEP 10. Check for harness damage between right bank heated oxygen sensor (front) connector B-08 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 80).

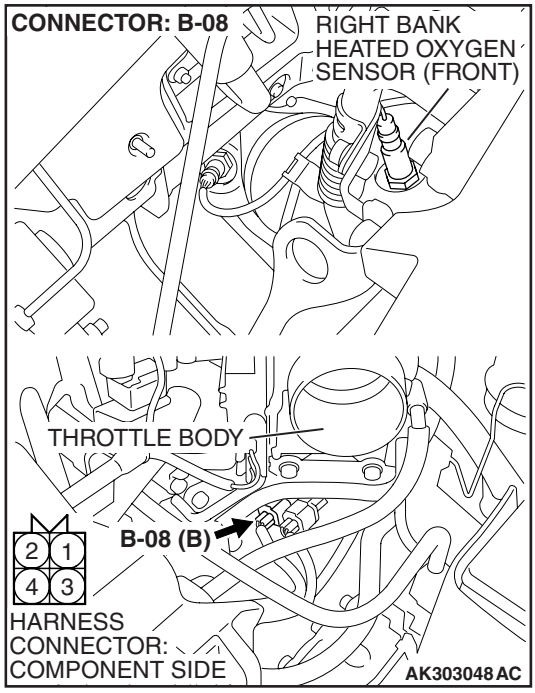
Q: Is the harness wire in good condition?

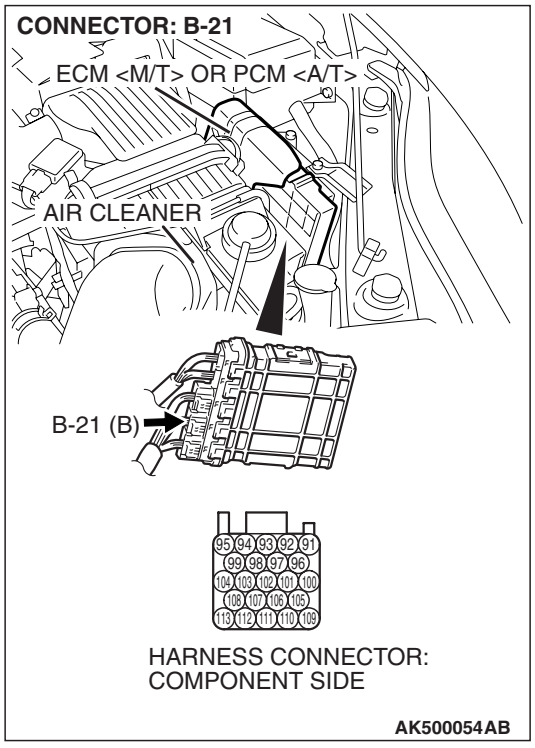
YES : Go to Step 11.

NO : Repair it. Then go to Step 13.







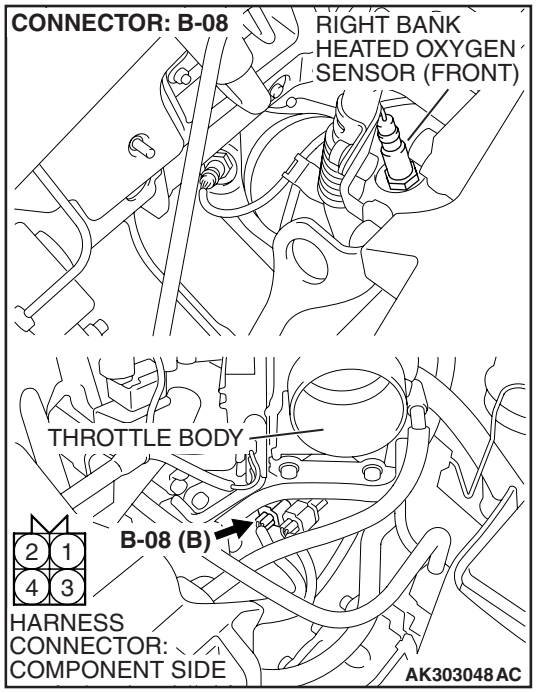


STEP 11. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (front) connector B-08 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 92).

Q: Is the harness wire in good condition?

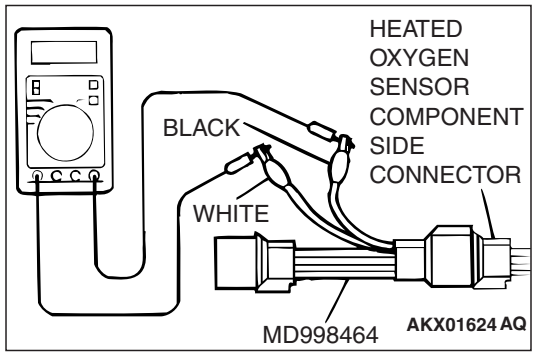
YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



STEP 12. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-08 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage 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 volts

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the voltage between 0.6 and 1.0 volts?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.
NO : Replace the right bank heated oxygen sensor (front). 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

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

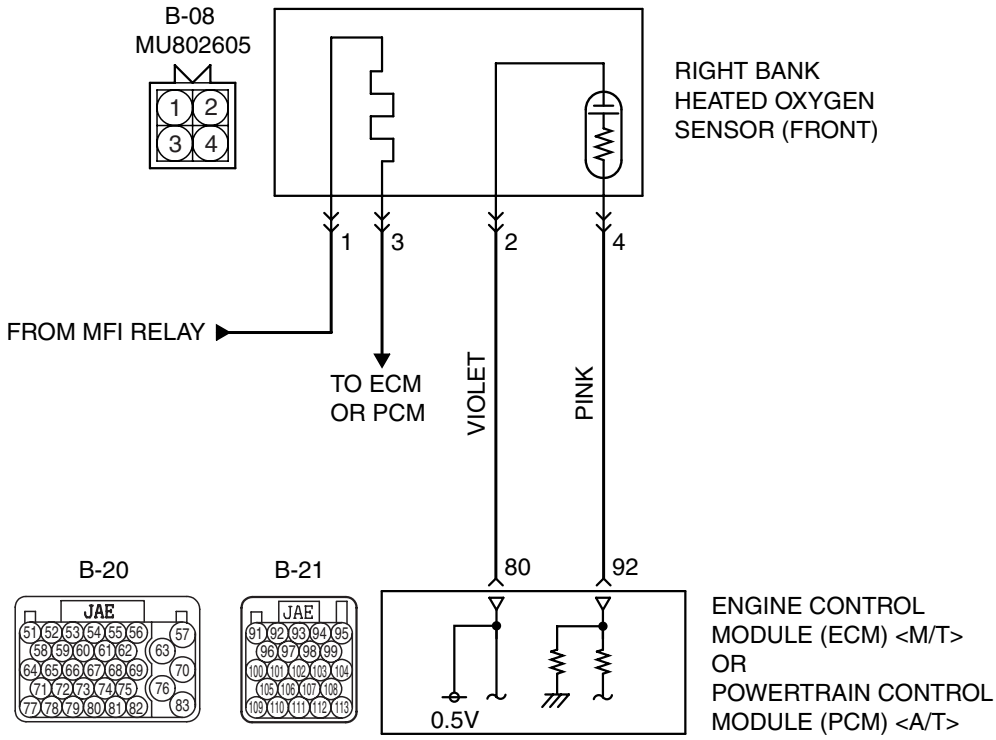
Q: Is DTC P0131 set?

YES : Retry the troubleshooting.

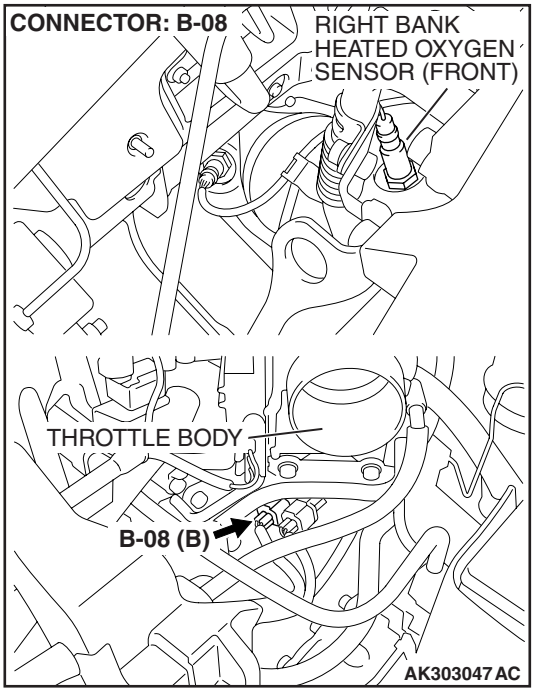
NO : The inspection is complete.

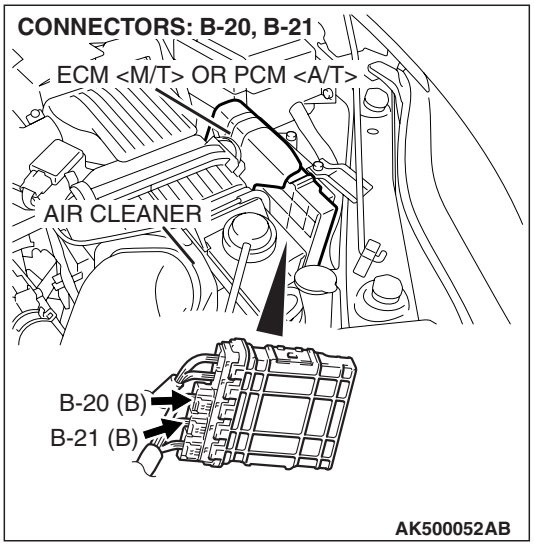
DTC P0132: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



AK403970





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 92) 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 ECM <M/T> or PCM <A/T> (terminal No. 80).
- The ECM <M/T> or the PCM <A/T> applies an off set voltage of 0.5 volt to terminal No. 2 the right bank heated oxygen sensor (front).

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 ECM <M/T> or the PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or the PCM <A/T> the right bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

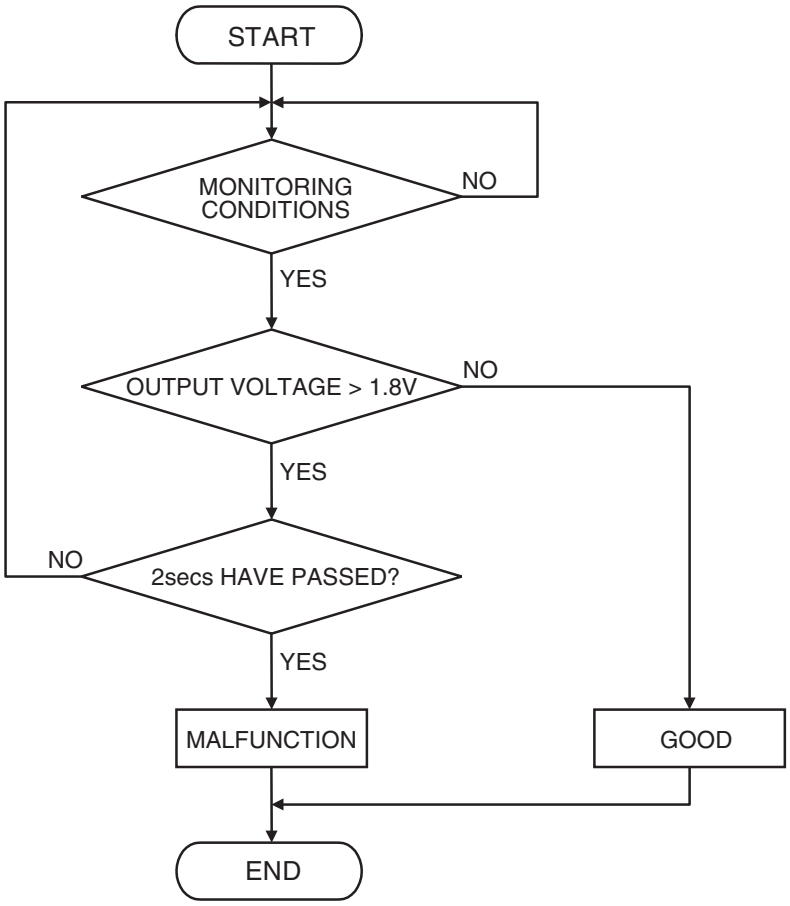
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500035

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Right bank heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

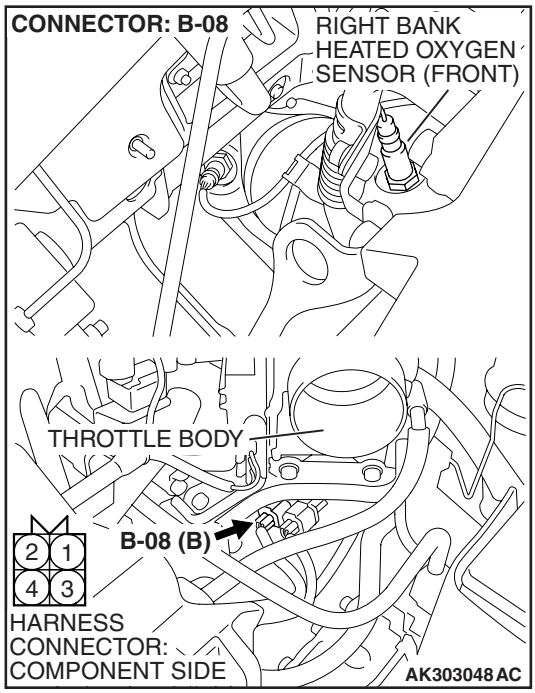
Refer to Diagnosis Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

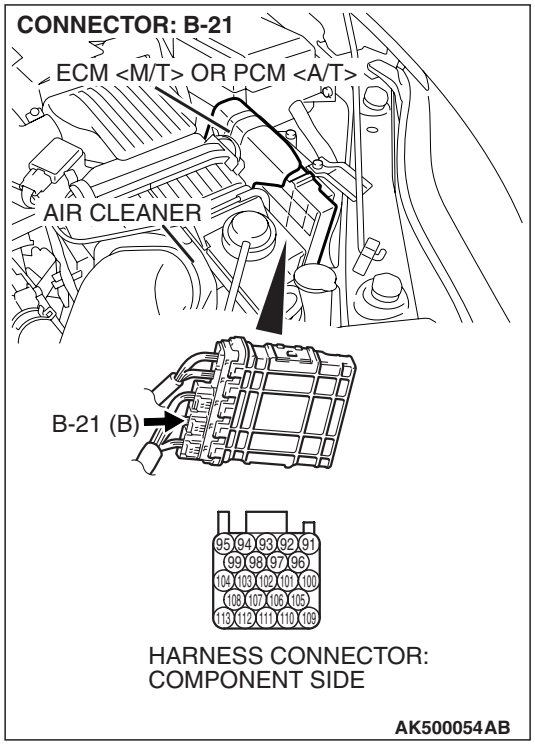
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in right bank heated oxygen sensor (front) output line.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS



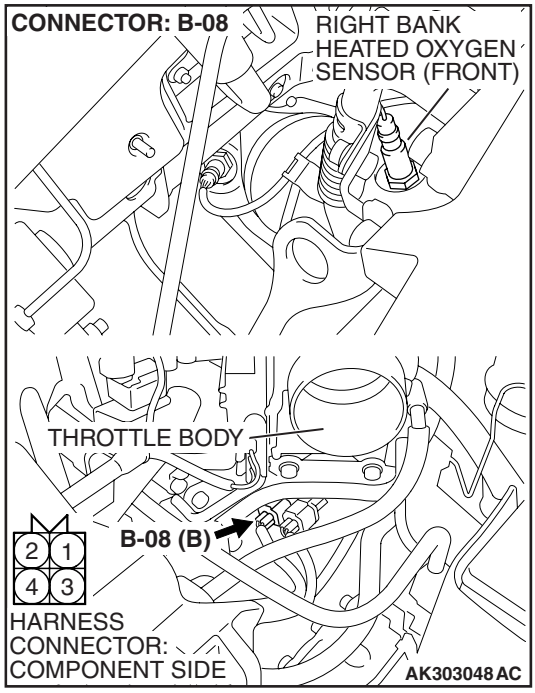


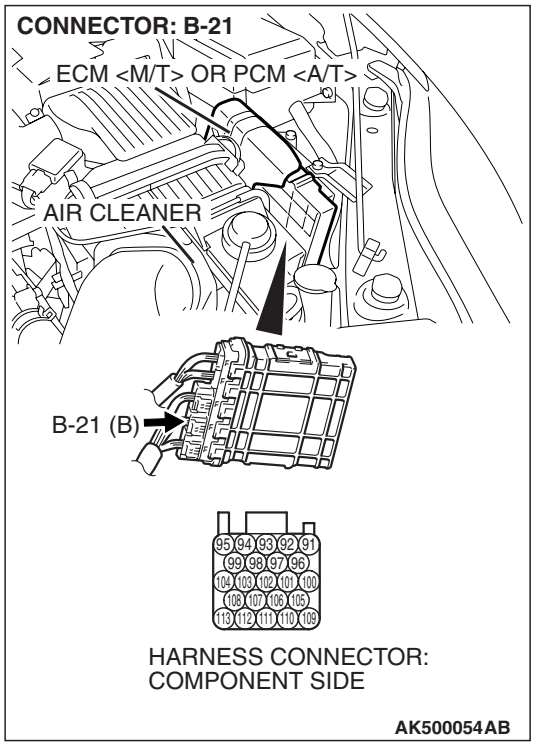
STEP 1. Check harness connector B-08 at right bank heated oxygen sensor (front) and harness connector B-21 at PCM for damage.

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 3.





STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-08 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 92).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

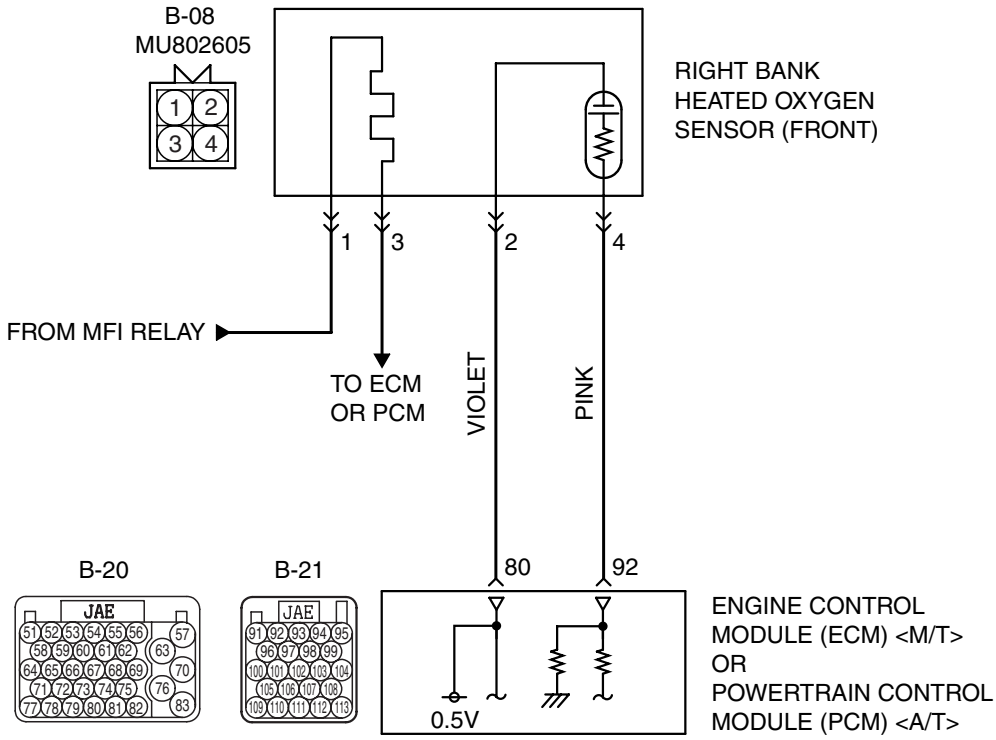
Q: Is DTC P0132 set?

YES : Retry the troubleshooting.

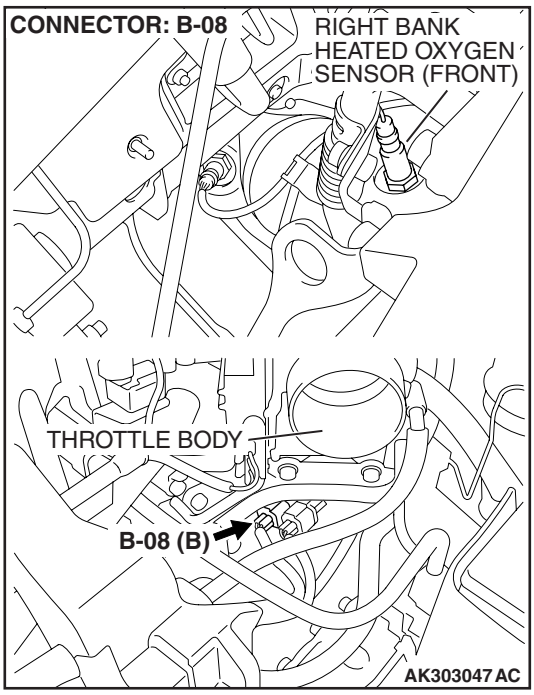
NO : The inspection is complete.

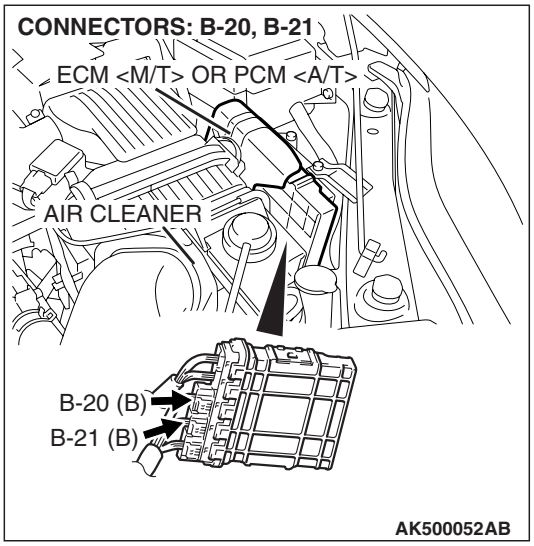
DTC P0133: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



AK403970





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 92) 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 ECM <M/T> or PCM <A/T> (terminal No. 80).
- The ECM <M/T> or the PCM <A/T> applies an off set voltage of 0.5 volt to terminal No. 2 of the right bank oxygen sensor (front).

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 ECM <M/T> or the PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or the PCM <A/T> also checks for the right bank heated oxygen sensor (front) rich learn switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

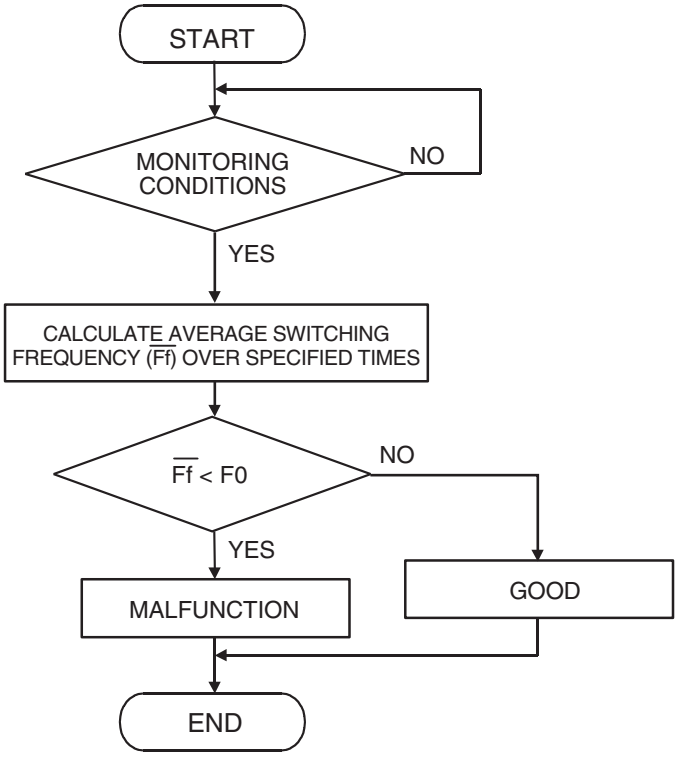
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



F0: THRESHOLD VALUE FOR AVERAGE SWITDHING FREQUENCY

AK302395

Check Conditions

- Engine coolant temperature is higher than 50° C (122° F).
- Engine speed is between 1,500 and 3,000 r/min <M/T> or 1,300 and 3,000 r/min <A/T>.
- Volumetric efficiency is between 12 and 60 <M/T> or 20 and 60 <A/T> percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is open.
- Short-term fuel trim is between –30 and +25 percent.
- More than 2 seconds have elapsed after the abovementioned conditions have been met.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 7 cycles <M/T> or 5 cycles <A/T> of 12 seconds each during the drive cycle.

Judgement Criterion

- The average of the right bank heated oxygen sensor (front) rich/lean switching frequency is less than 7 times <M/T> or 10 times <A/T> per 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the MUT-III OBD-II test Mode – HO2S 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 second.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 1 P.13B-6.

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

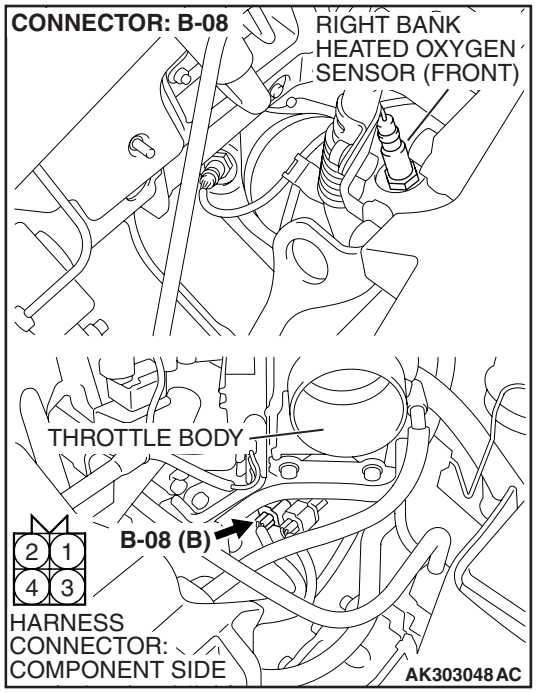
- Right bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

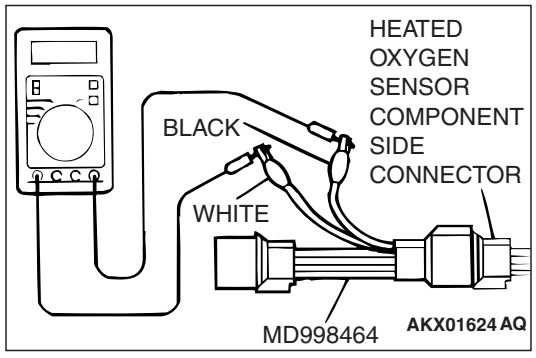
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness

STEP 1. Check the right bank heated oxygen sensor (front).



(1) Disconnect the right bank heated oxygen sensor (front) connector B-08 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



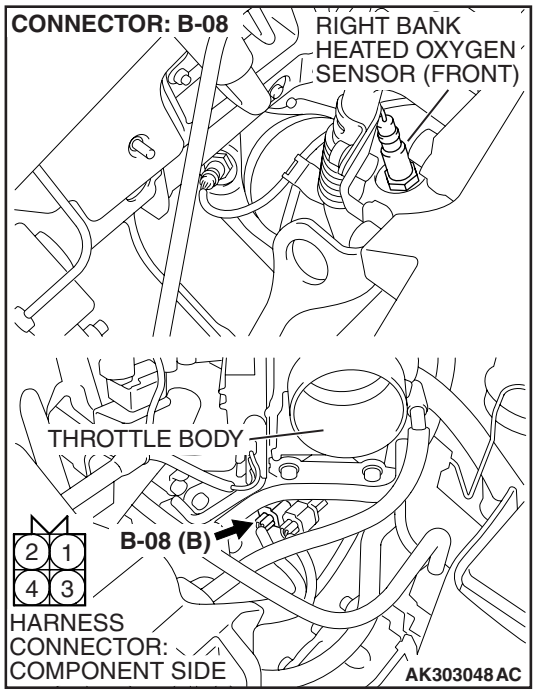
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Warn up the engine, 2,500 r/min.
- Output voltage repeats 0 – 0.4 volt and 0.6 – 1.0 volts 7 times <M/T> or 10 times <A/T> or more within 10 seconds.

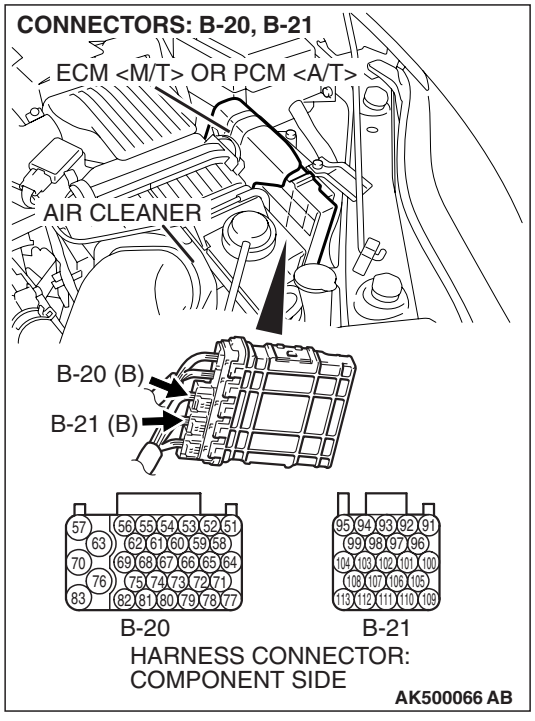
⚠ CAUTION
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 3.





STEP 2. Check harness connector B-08 at right bank heated oxygen sensor (front) and harness connector B-20, B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

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

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 1 P.13B-6.

(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)

⚠ CAUTION

If DTC P0134 has been set, TCL related DTC U1120 is also set. After P0134 has been diagnosed, don't forget to erase DTC U1120.

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

- Refer to, DTC P0131 –Right Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13B-282.
- Refer to, DTC P0201P.13B-474, P0203P.13B-497, P0205P.13B-520 –Injector Circuit.

CIRCUIT OPERATION

- Refer to, DTC P0131 –Right Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13B-282.
- Refer to, DTC P0201P.13B-474, P0203P.13B-497, P0205P.13B-520 –Injector Circuit.

TECHNICAL DESCRIPTION

- The ECM <M/T> or the PCM <A/T> 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.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage does not exceed 0.5 volt within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

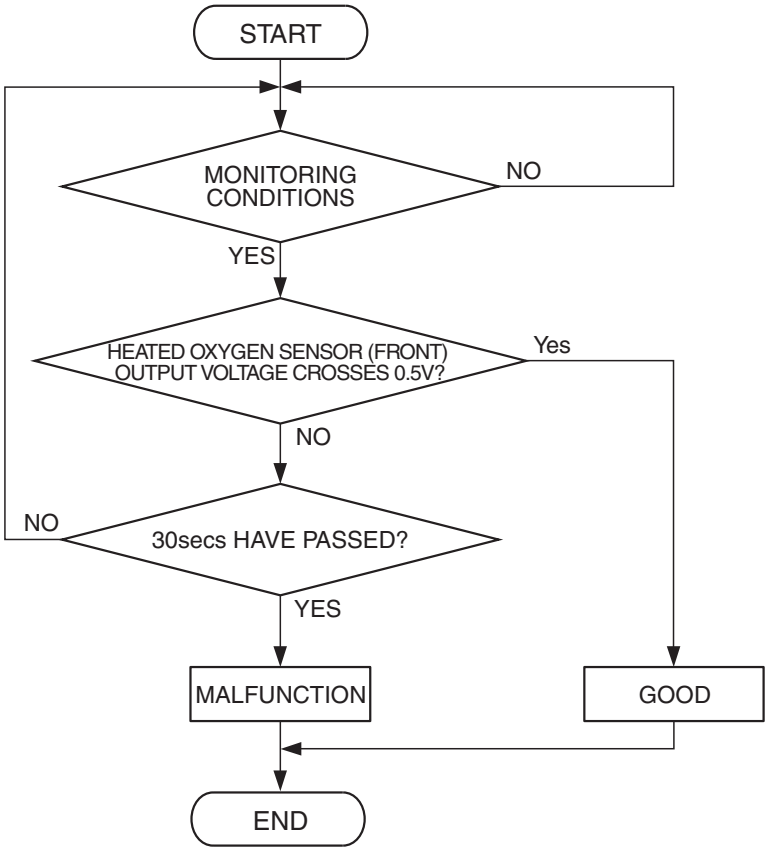
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK203999

Check Conditions

- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7° C (45° F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13B-6.

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

- Right bank heated oxygen sensor (front) deteriorated.
- Harness damage in right bank heated oxygen sensor (front) output 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).

TSB Revision

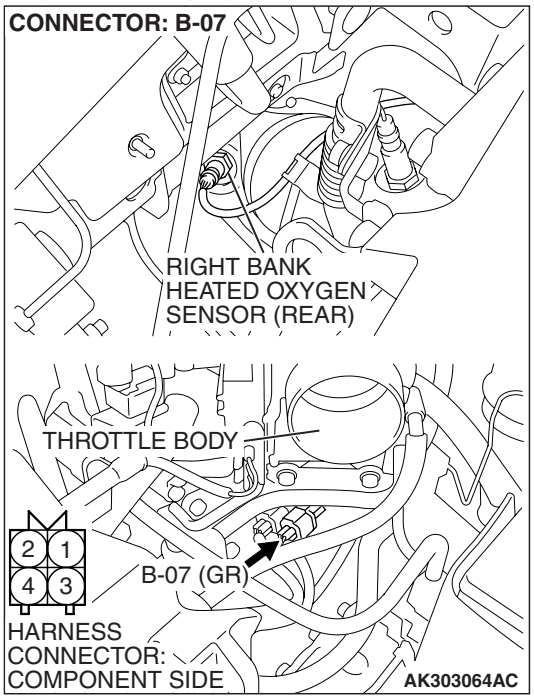
If the right bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the right bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the right bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.

- Open circuit in right bank injector.
- Harness damage in right bank injector circuit.
- Connector damage.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness



STEP 1. Measure the sensor output voltage at right bank heated oxygen sensor (rear) 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 under the following driving.
  a. Transaxle: 2nd speed (A/T: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 2.
NO : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-319, DTC P0138 –Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-335, DTC P0139 –Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13B-340, DTC P0140 –Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2) P.13B-344.

STEP 2. Check for exhaust leaks.

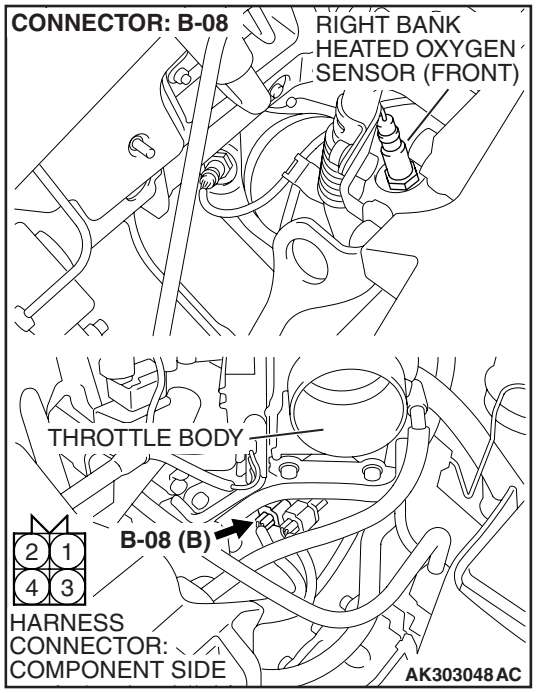
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 4.



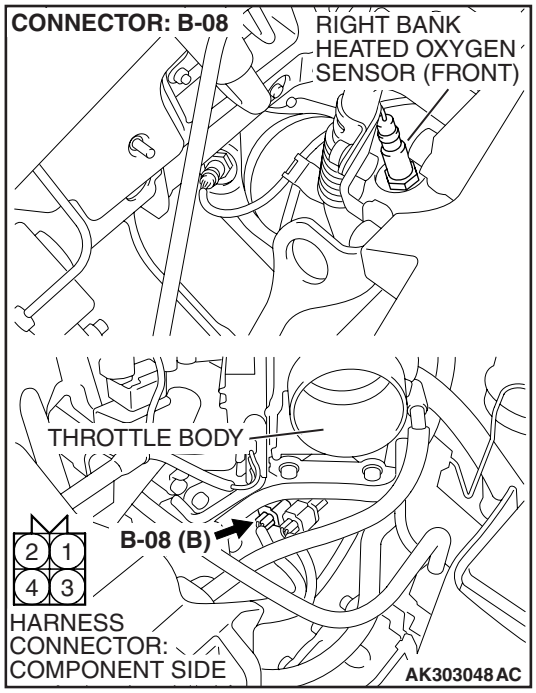
STEP 4. Check harness connector B-08 at the right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

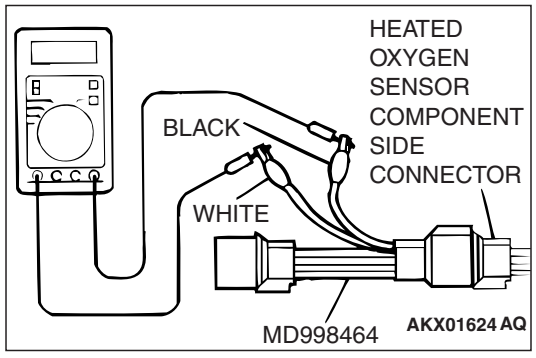
YES : Go to Step 5.

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

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



(1) Disconnect the right bank heated oxygen sensor (front) connector B-08 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage 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 volts

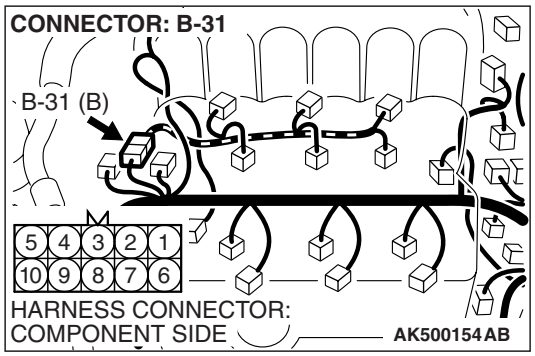
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the voltage between 0.6 and 1.0 volts?

YES : Go to Step 6.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 14.

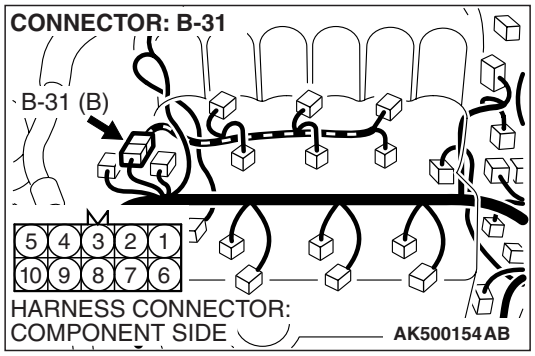


STEP 6. Check harness connector B-31 at intermediate connector for damage.

Q: Is the harness connector in good condition?

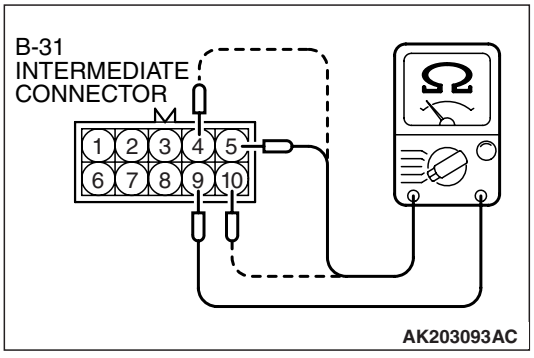
YES : Go to Step 7.

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



STEP 7. Measure the right bank injector resistance at intermediate connector B-31.

(1) Disconnect the intermediate connector B-31.



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

a. Measure the resistance between terminal No. 5 and No. 9 when measuring No. 1 cylinder.

b. Measure the resistance between terminal No. 10 and No. 9 when measuring No. 3 cylinder.

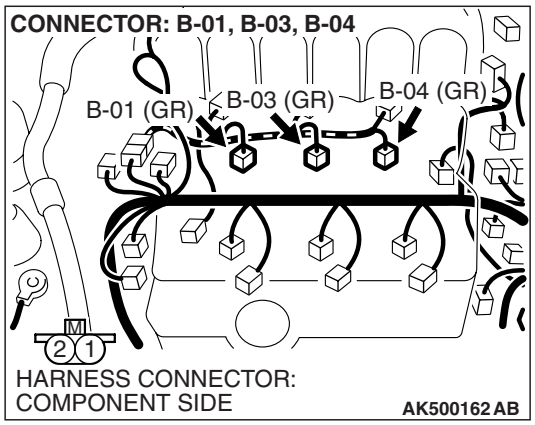
c. Measure the resistance between terminal No. 4 and No. 9 when measuring No. 5 cylinder.

- Resistance should be between 10.5 and 13.5 ohms [at 20° C (68° F)].

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 10.

NO : Go to Step 8.



STEP 8. Check harness connector B-03, B-04, B-01 at right bank injector for damage.

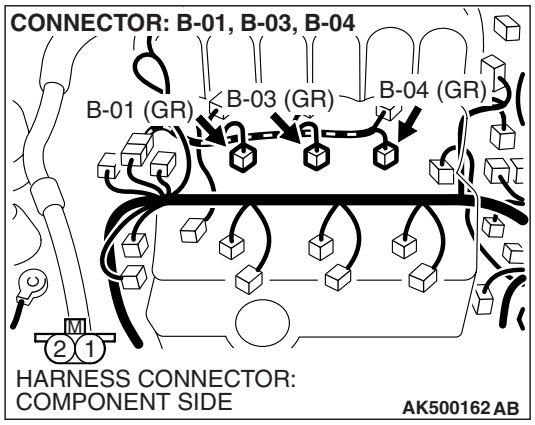
(1) Remove the intake manifold.

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

Q: Is the harness connector in good condition?

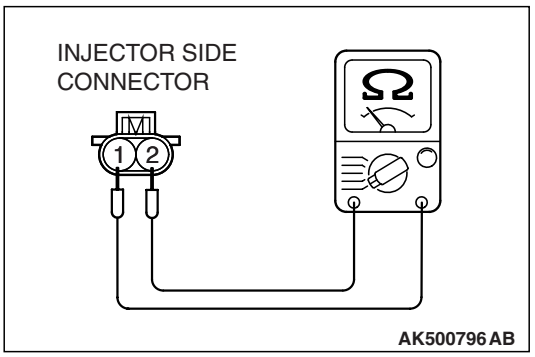
YES : Go to Step 9.

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



STEP 9. Check the right bank injector.

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



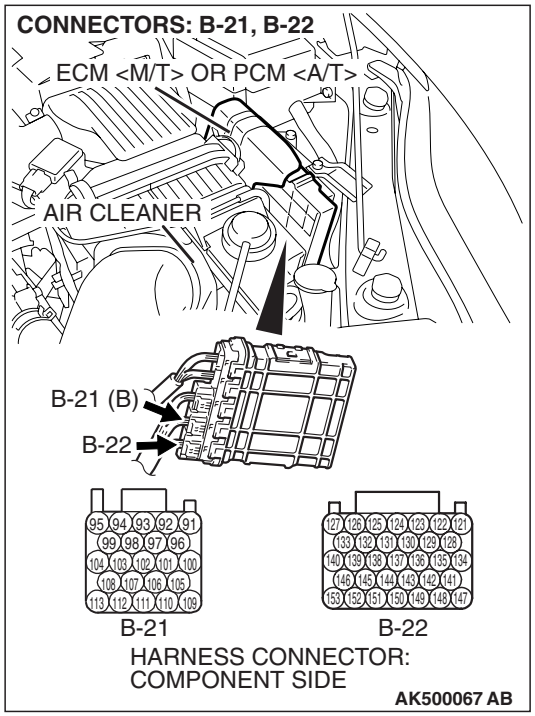
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 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 14.

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



STEP 10. Check harness connector B-21, B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

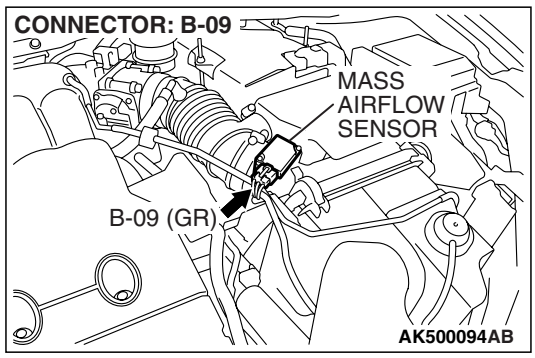
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

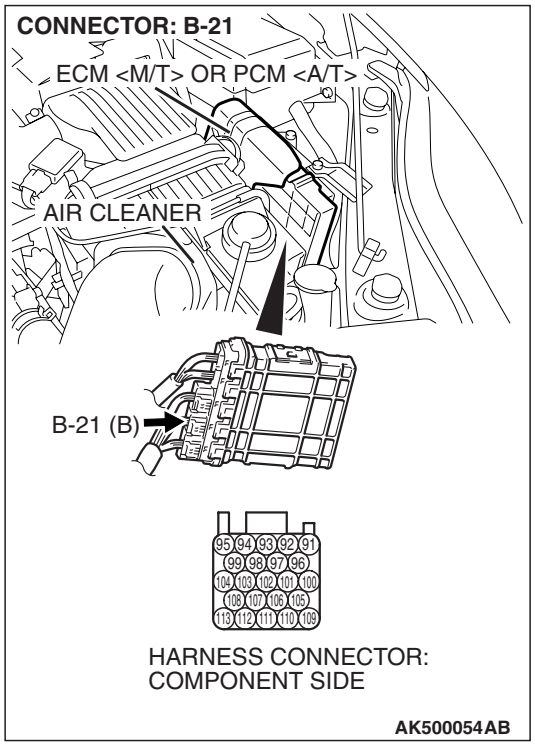
STEP 11. Check for harness damage between right bank heated oxygen sensor (front) connector B-08 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 92).

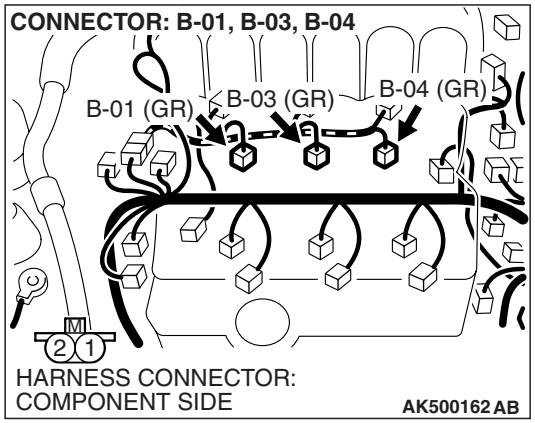
Q: Is the harness wire in good condition?

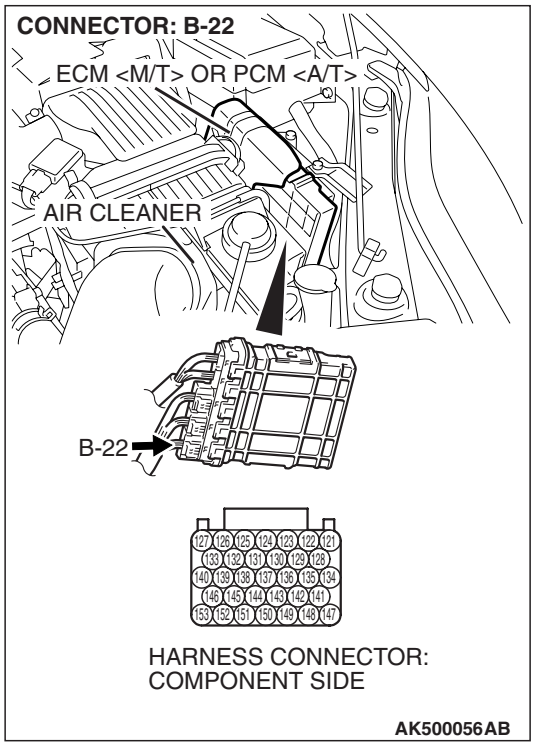
YES : Go to Step 12.

NO : Repair it. Then go to Step 14.









STEP 12. Check for harness damage between right bank injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between right bank injector connector B-01 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 153) when checking No. 1 cylinder.
b. Check the harness wire between right bank injector connector B-03 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 140) when checking No. 3 cylinder.
c. Check the harness wire between right bank injector connector B-04 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 133) 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 On-vehicle Service –Fuel Pressure Test P.13B-1280.

Q: Is the fuel pressure normal?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 12 P.13B-6.

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

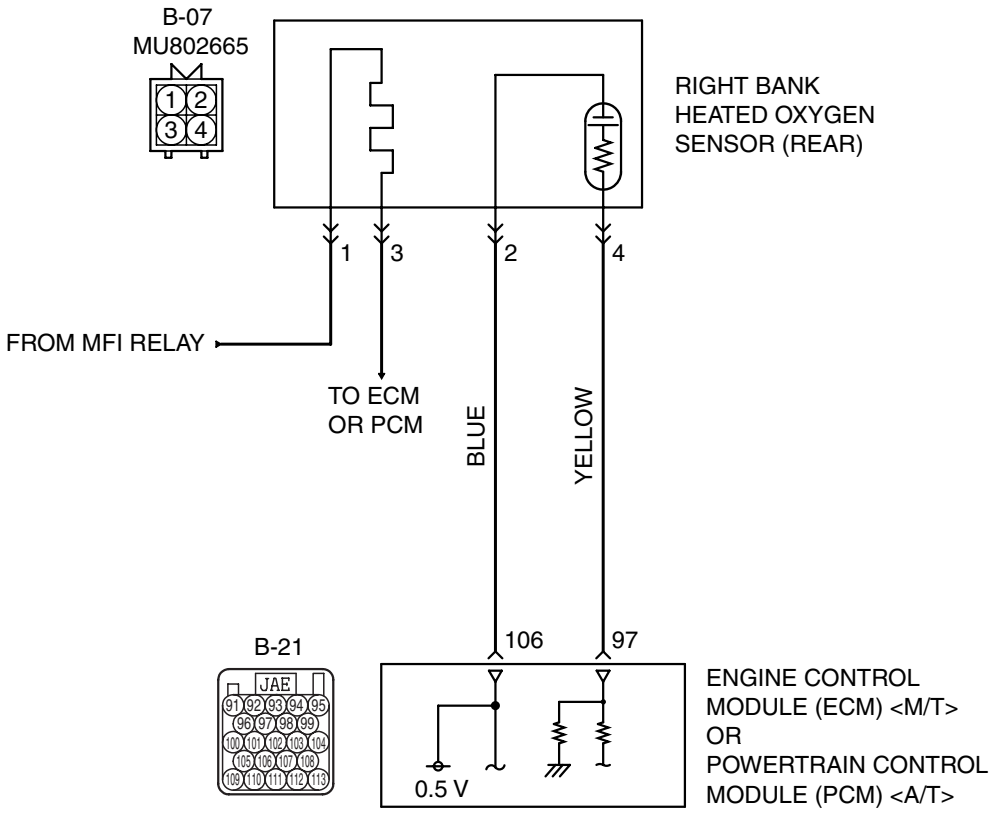
Q: Is DTC P0134 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

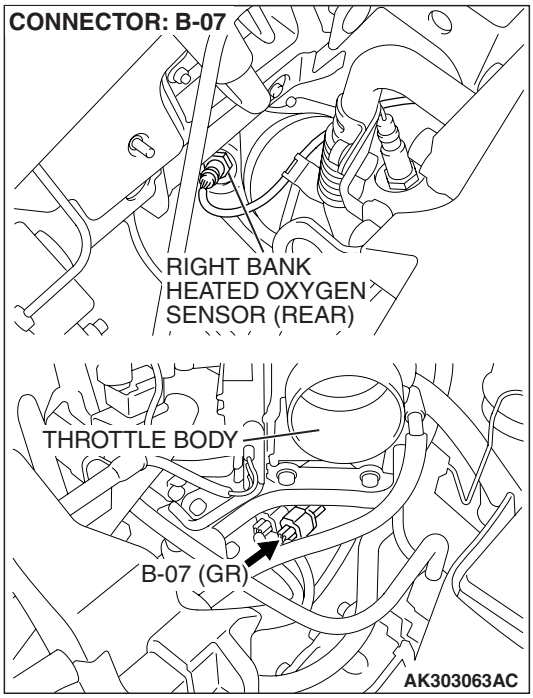
DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2)

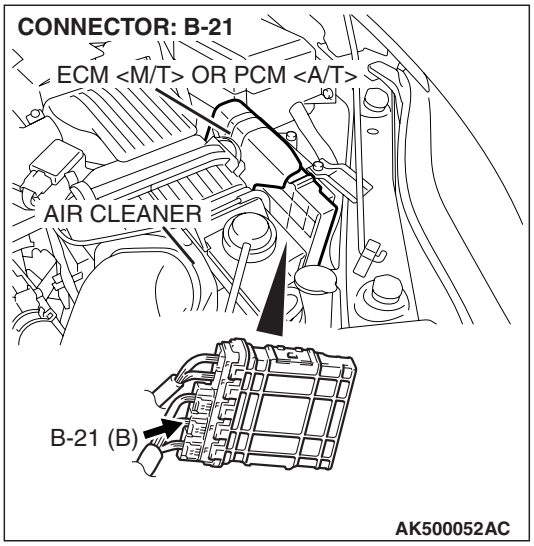
Right Bank Heated Oxygen Sensor (rear) Circuit



AK403971

TSB Revision





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 97) 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 ECM <M/T> or PCM <A/T> (terminal No. 106).
- The ECM <M/T> or the PCM <A/T> applies an off set voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

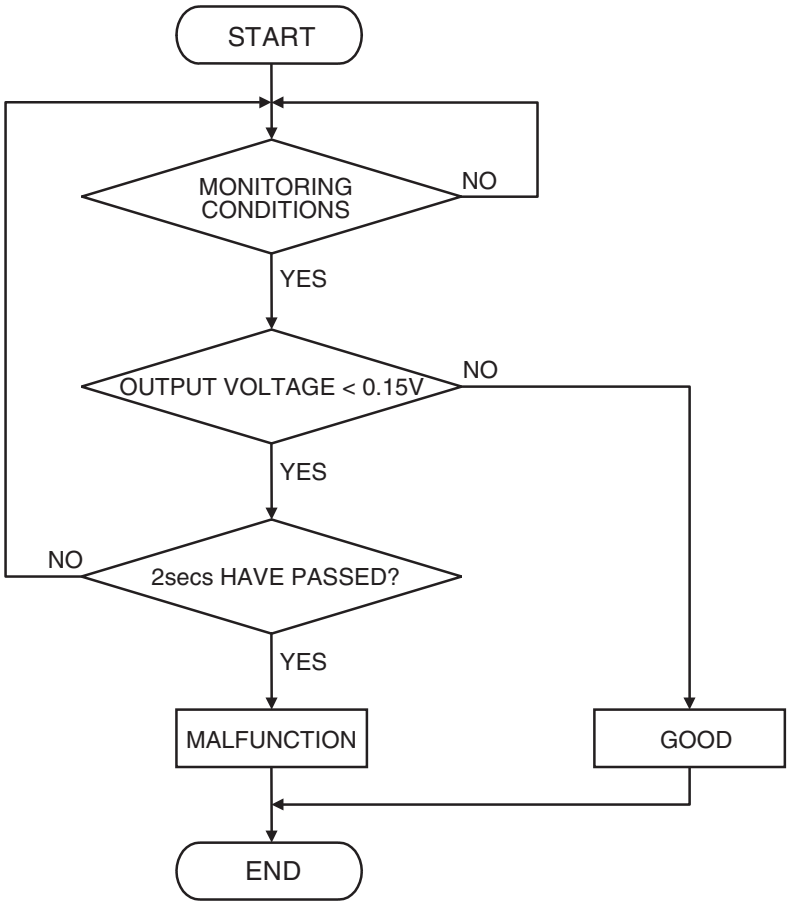
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500036

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Right bank heated oxygen sensor output voltage is lower than 0.15 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-6.

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

- Right bank heated oxygen sensor (rear) failed.
- Open or shorted circuit in right bank heated oxygen sensor (rear) output line or harness damage.
- Open circuit in right bank heated oxygen sensor (rear) ground line or harness damage.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

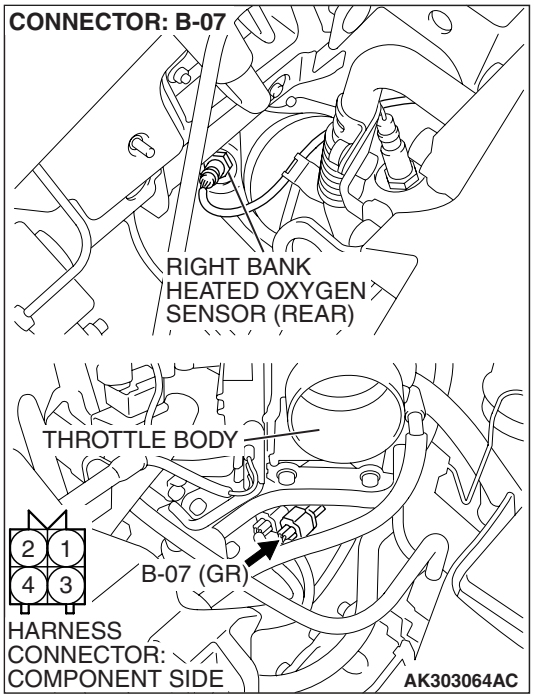
DIAGNOSIS

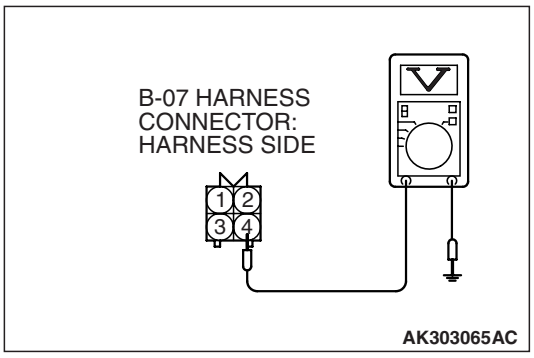
Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991316: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Measure the sensor output voltage at right bank heated oxygen sensor (rear) connector B-07 by backprobing

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





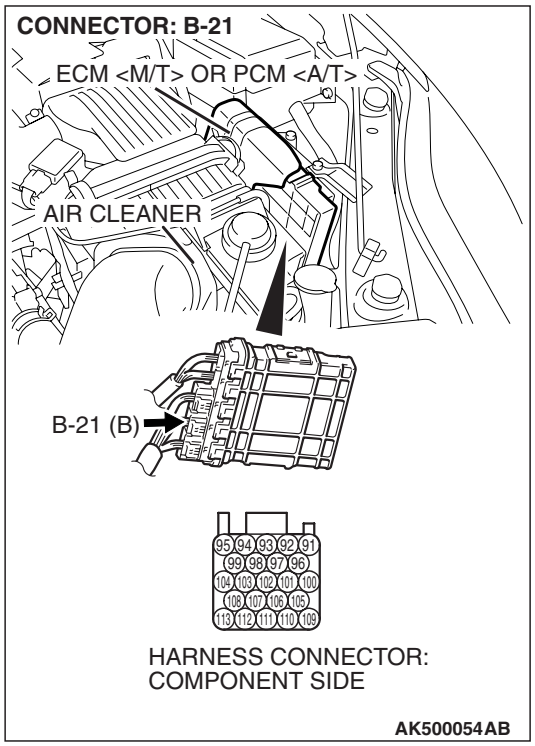
(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (A/T: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

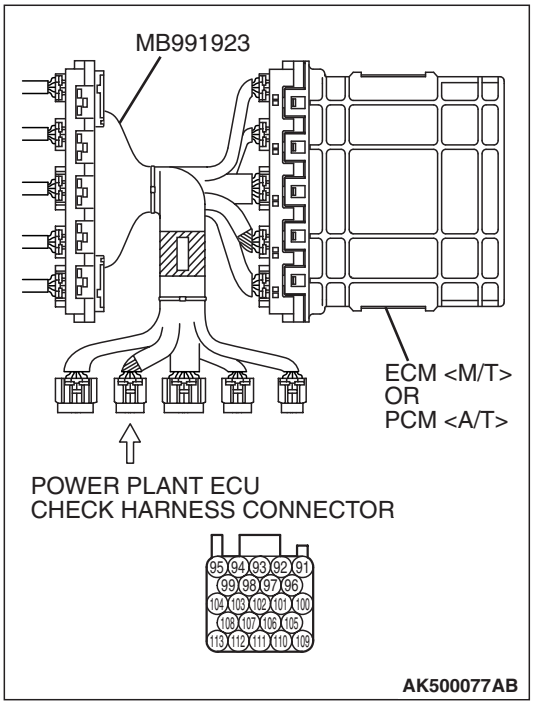
Q: Is the measured voltage between 1.0 and 1.5 volts?

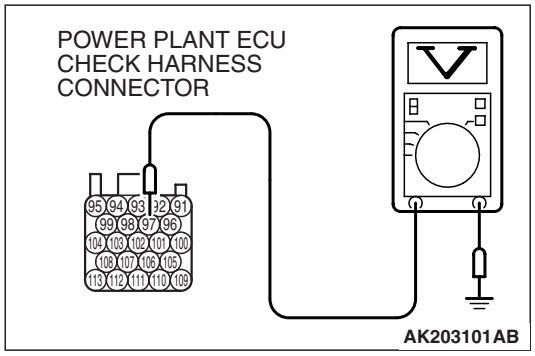
YES : Go to Step 2.
NO : Go to Step 6.

STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors and Connect power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.





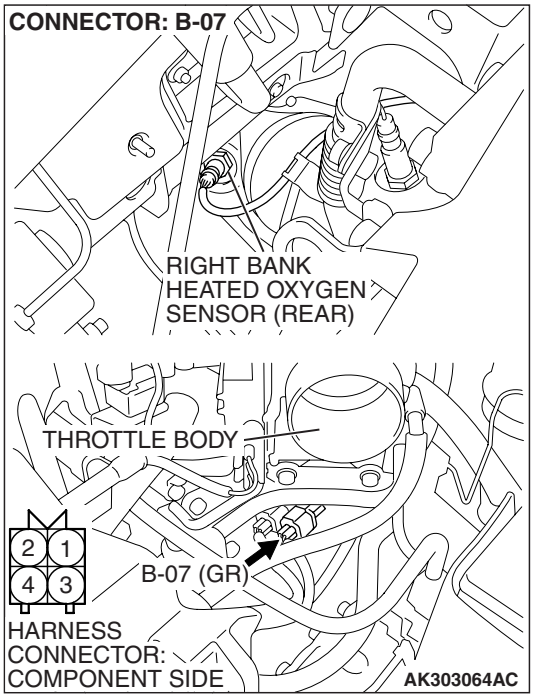


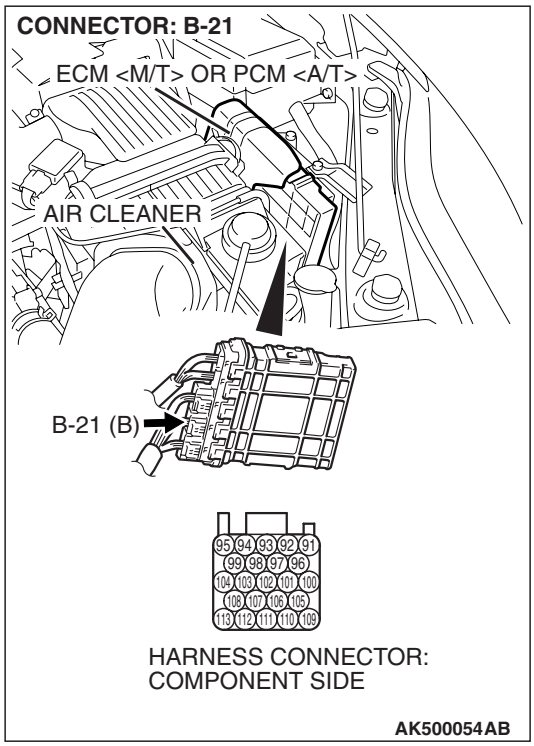
(3) Measure the voltage between terminal No. 97 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (A/T: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

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

Q: Is the measured voltage between 1.0 and 1.5 volts?

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





STEP 3. Check harness connector B-07 at right bank heated oxygen sensor (rear) and harness connector B-21 at ECM <M/T> or PCM <A/T> 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 13.

STEP 4. Check the trouble symptoms.

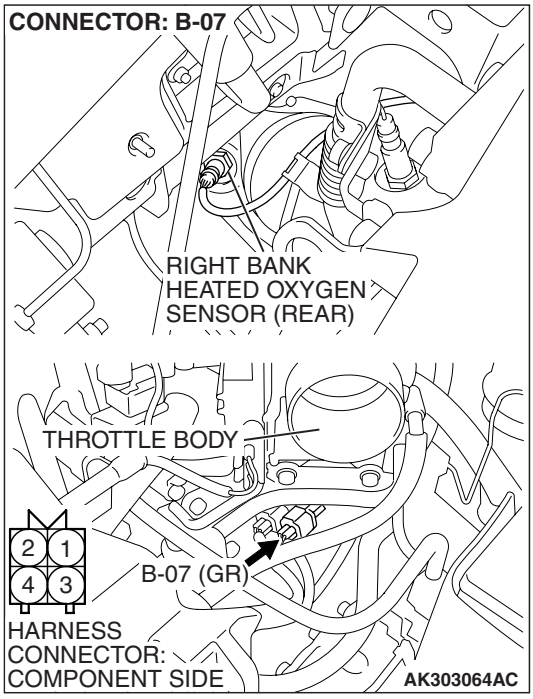
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

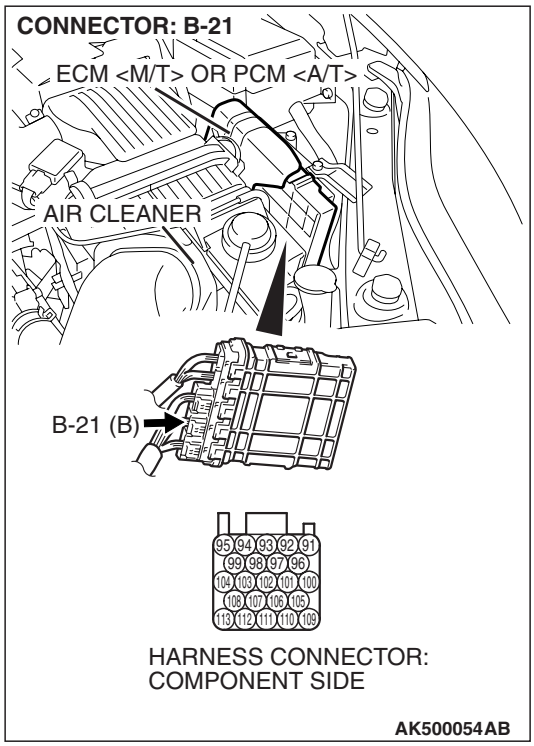
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0137 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.

NO : 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 Malfunctions P.00-14.



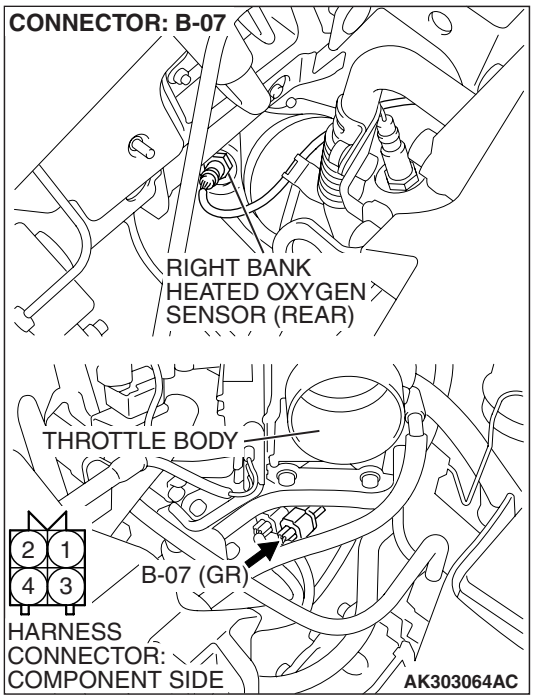


STEP 5. Check harness connector B-07 at right bank heated oxygen sensor (rear) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (rear) connector B-07 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 97) because of open circuit or 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.

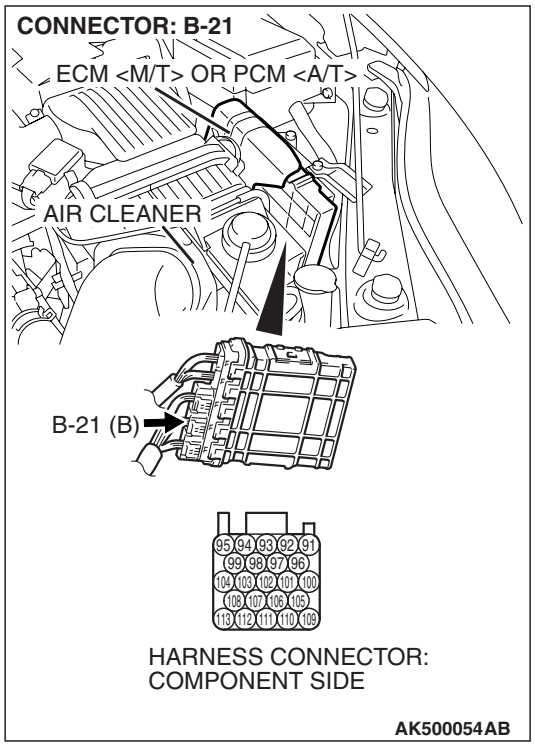


STEP 6. Check harness connector B-07 at right bank heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

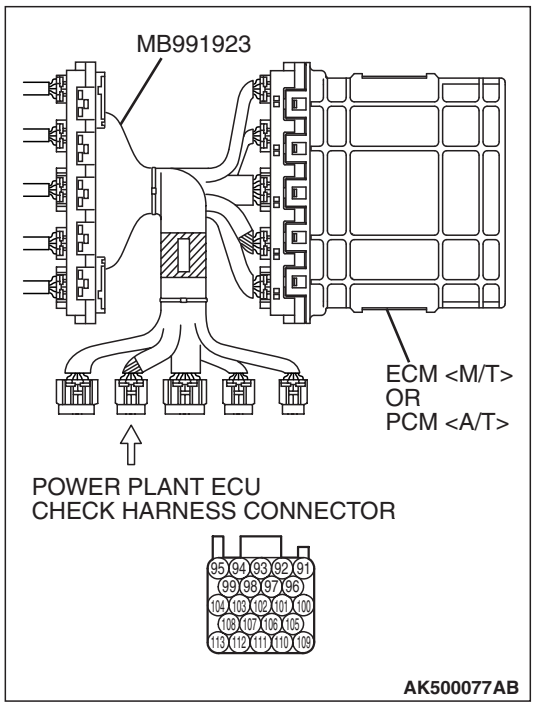
YES : Go to Step 7.

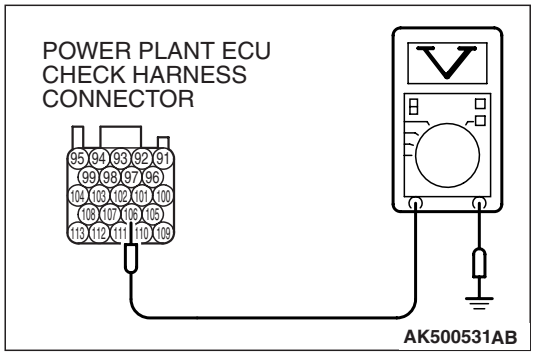
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 7. Measure the sensor offset voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



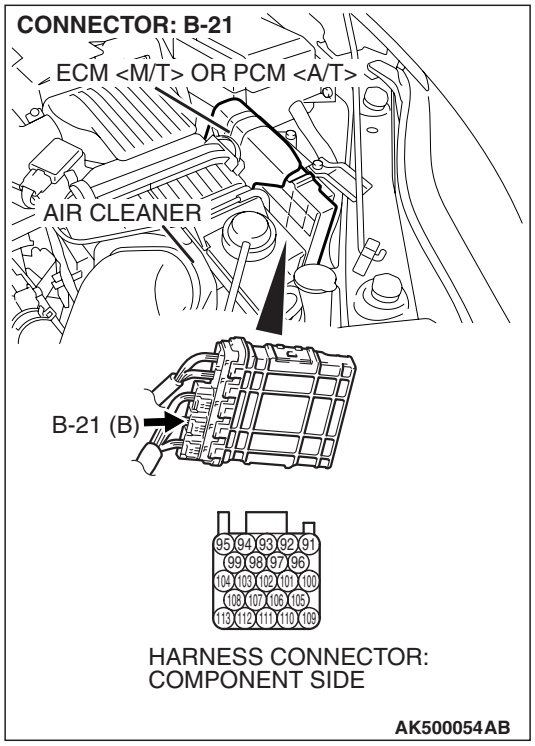


(3) Measure the voltage between terminal No. 106 and ground.
- Voltage should be between 0.4 and 0.6 volts.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

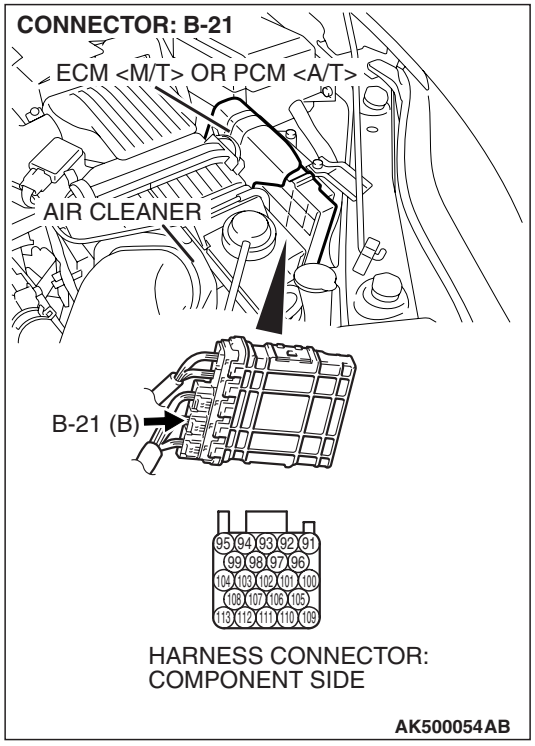


STEP 8. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (rear) connector B-07 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 106) because of open circuit or 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.

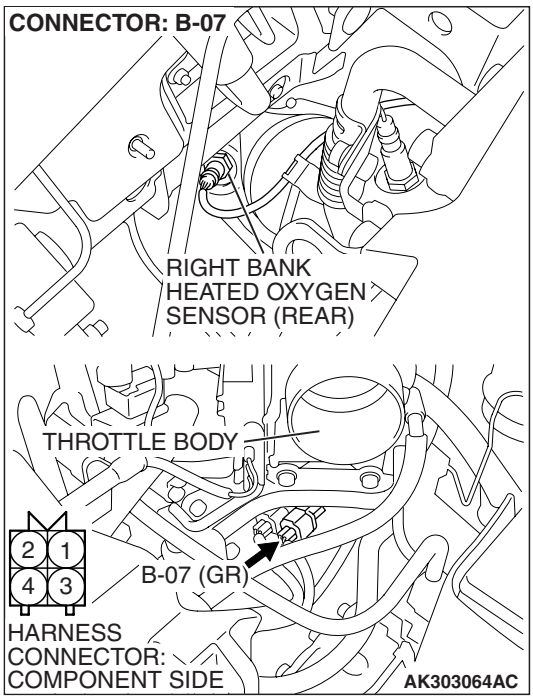


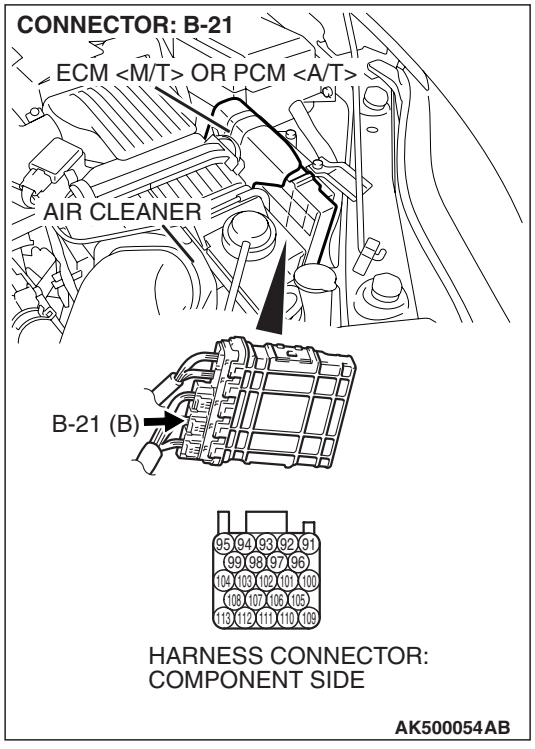
STEP 9. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.



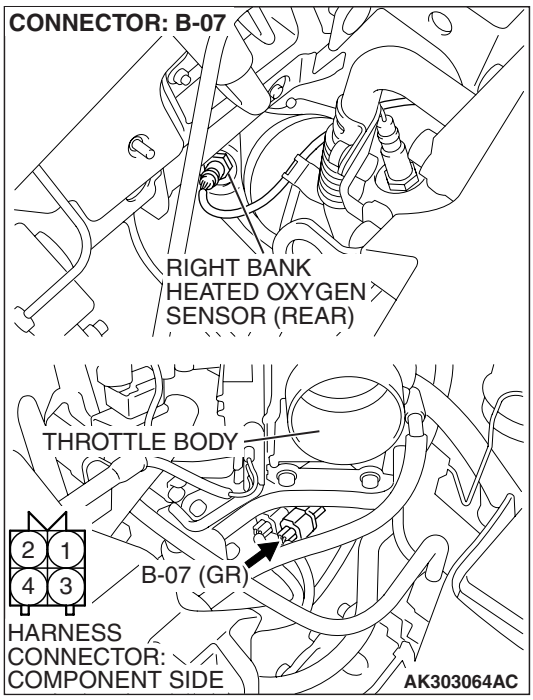


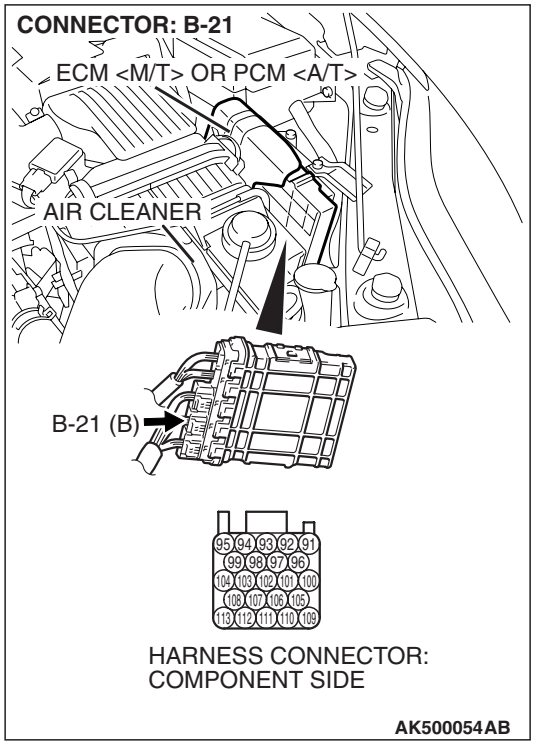
STEP 10. Check for harness damage between right bank heated oxygen sensor (rear) connector B-07 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 13.



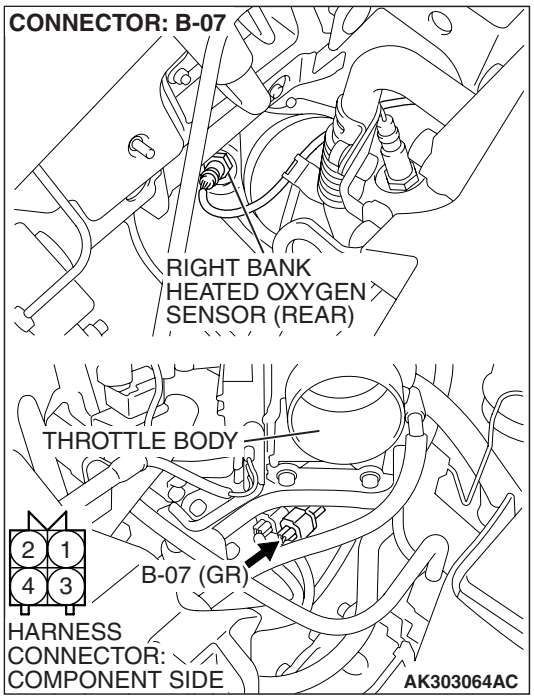


STEP 11. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (rear) connector B-07 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 97).

Q: Is the harness wire in good condition?

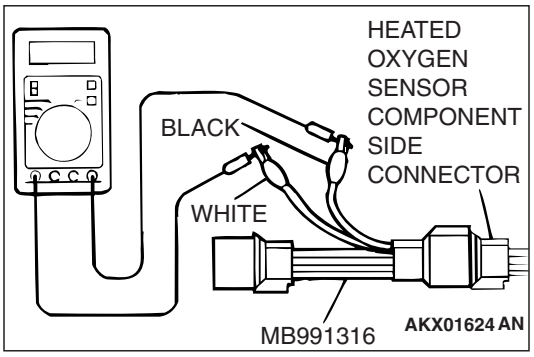
YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



STEP 12. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-07 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Drive at 50 km/h (31 mph) or more for 10 minutes.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
   a. Transaxle: 2nd speed (A/T: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more

   Standard value: 0.6 – 1.0 volts

NOTE: If the sufficiently high temperature [of approximate 400 °C (752 °F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

Q: Is the voltage between 0.6 and 1.0 volts?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.
NO : Replace the right bank heated oxygen sensor (rear). 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

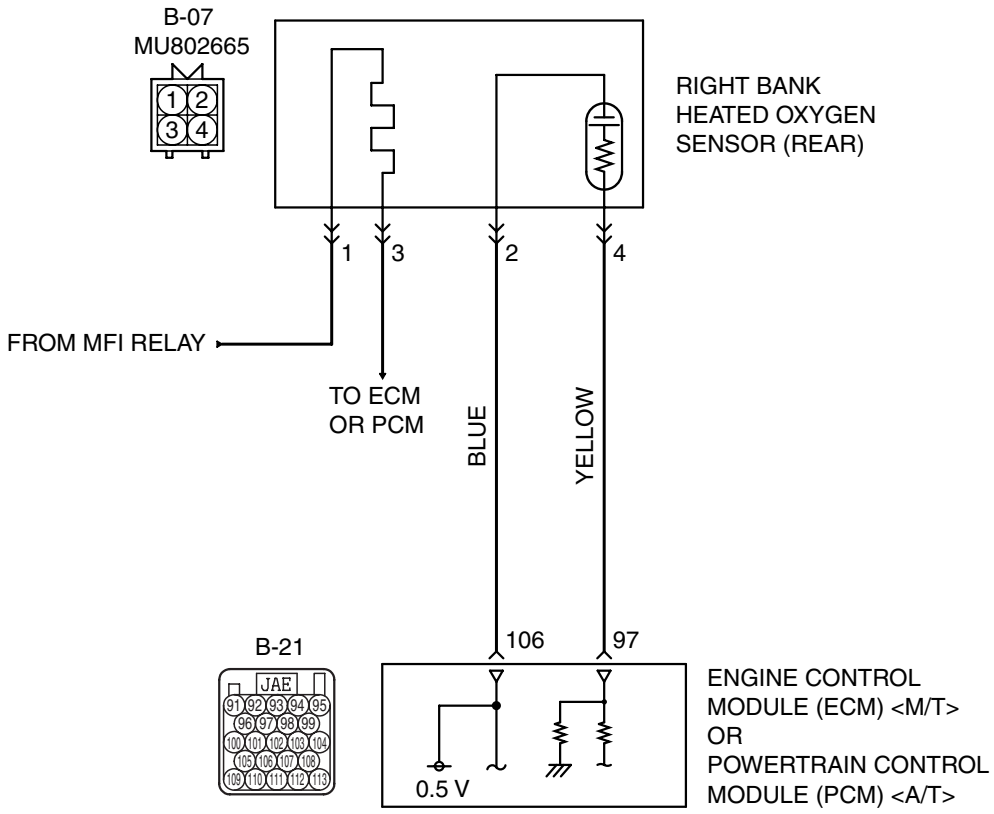
Q: Is DTC P0137 set?

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

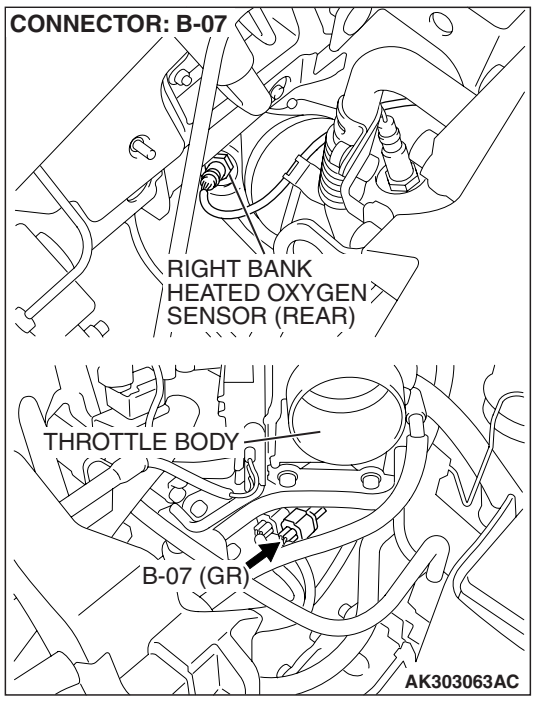
TSB Revision

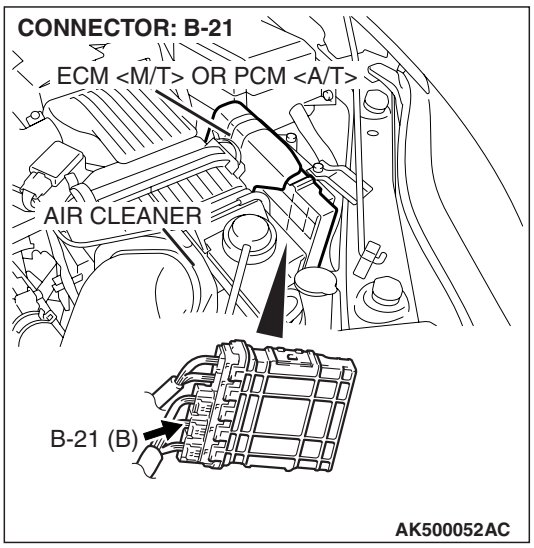
DTC P0138: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



AK403971





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 97) 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 ECM <M/T> or PCM <A/T> (terminal No. 106).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage is over the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

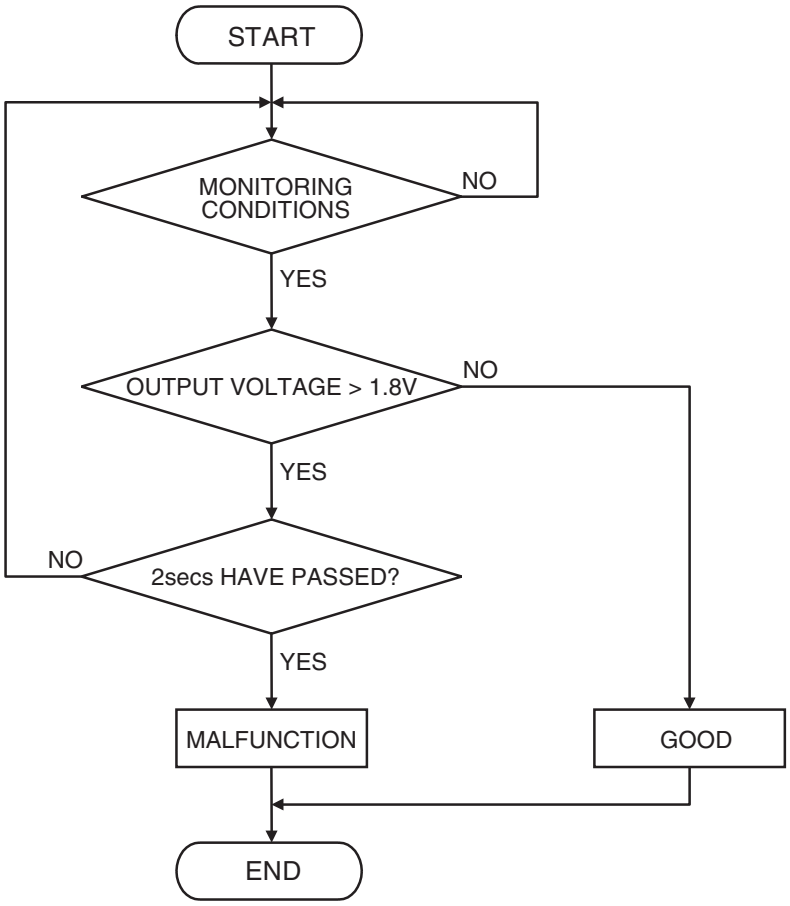
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500035

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Right bank heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Short circuit in right bank heated oxygen sensor (rear) output line.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

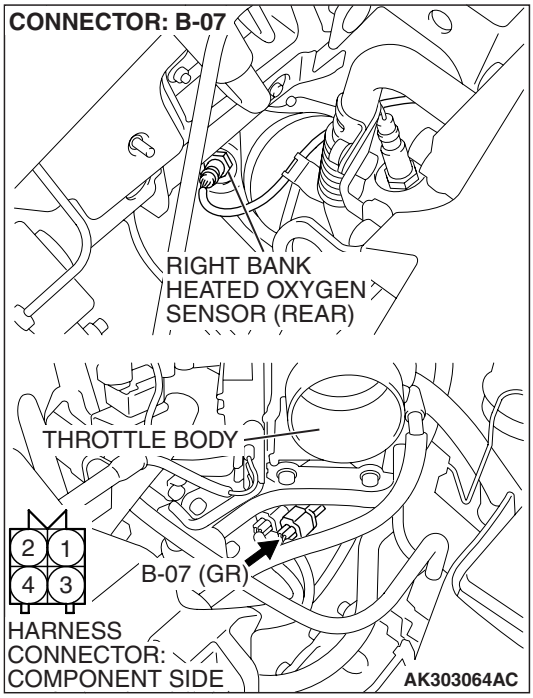
- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

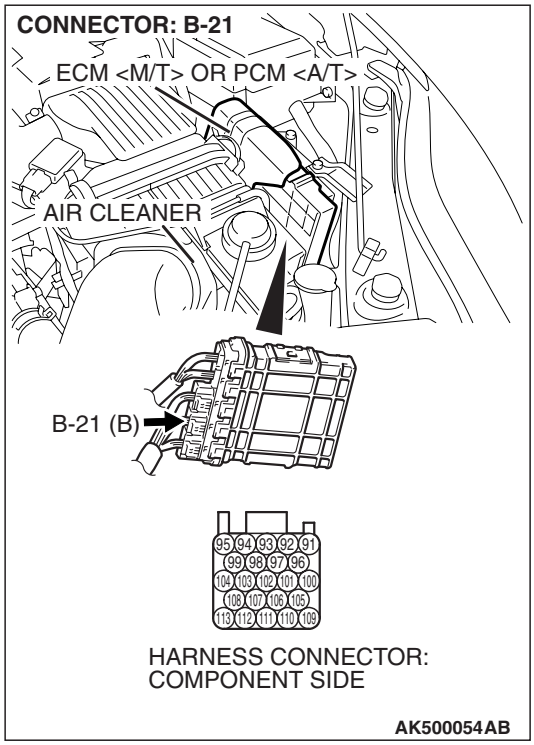
STEP 1. Check harness connector B-07 at right bank heated oxygen sensor (rear) and harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

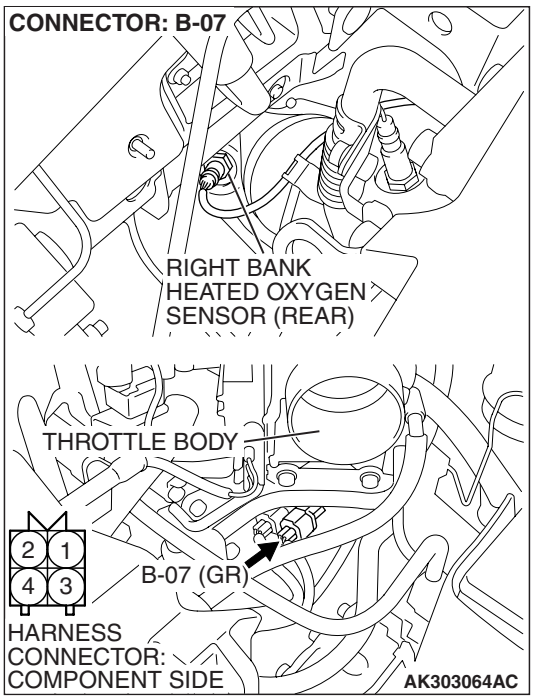
YES : Go to Step 2.

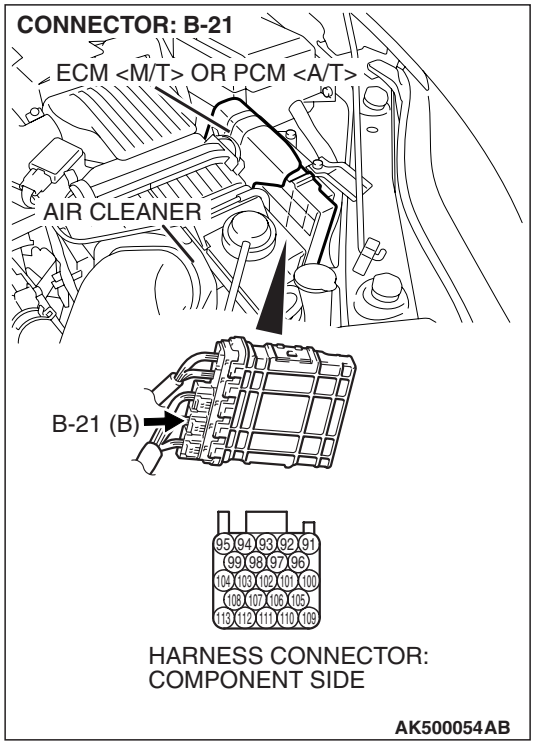
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.





TSB Revision





STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-07 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 97).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

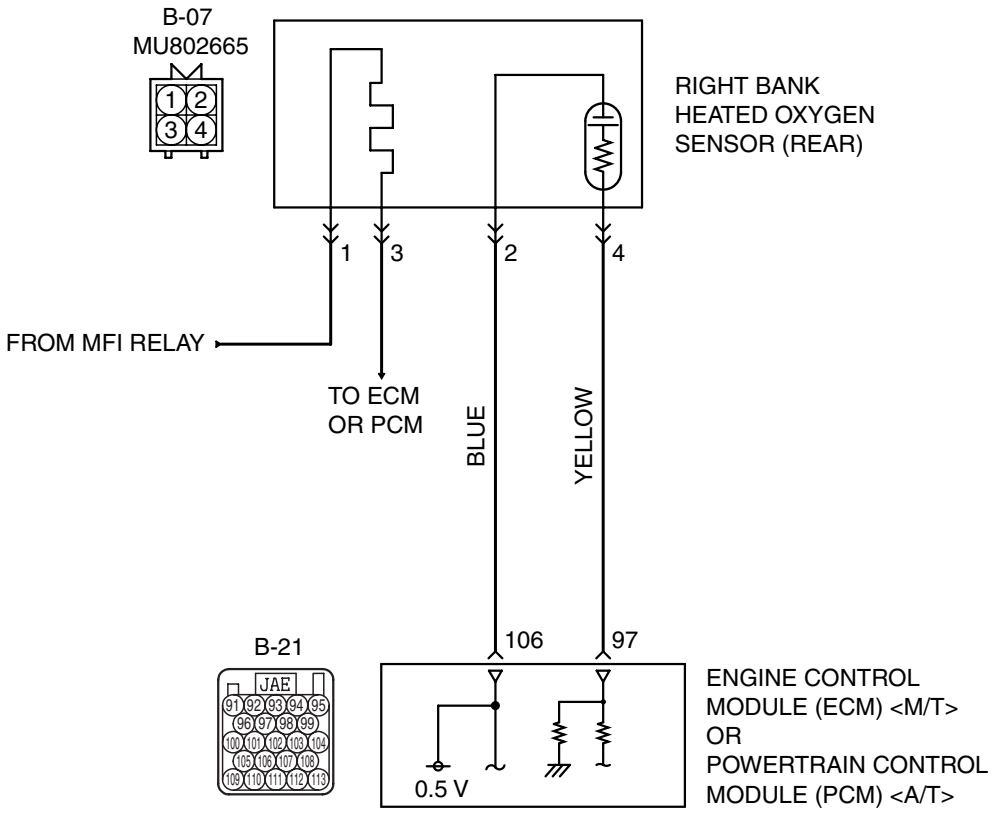
Q: Is DTC P0138 set?

YES : Retry the troubleshooting.

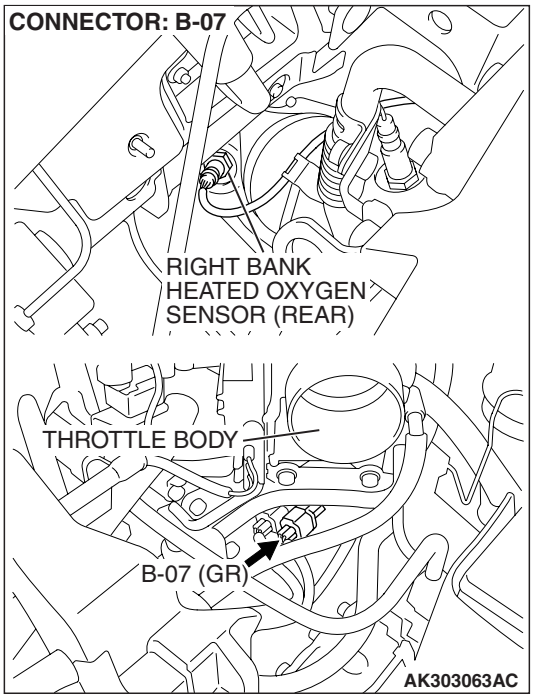
NO : The inspection is complete.

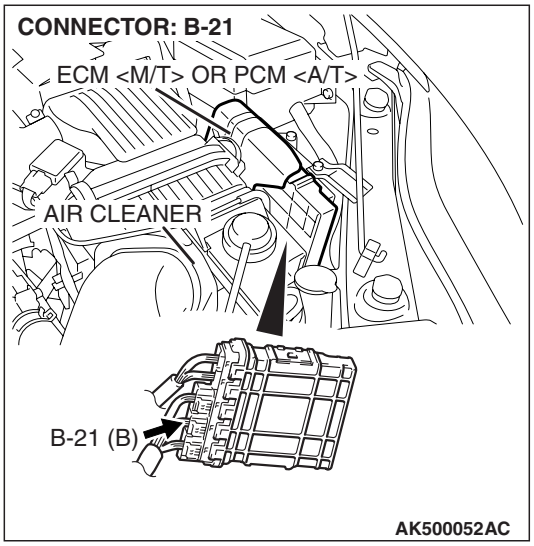
DTC P0139: Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



AK403971





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 97) 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 ECM <M/T> or PCM <A/T> (terminal No. 106).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank heated oxygen sensor (rear)

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 ECM <M/T> or the PCM <A/T> checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

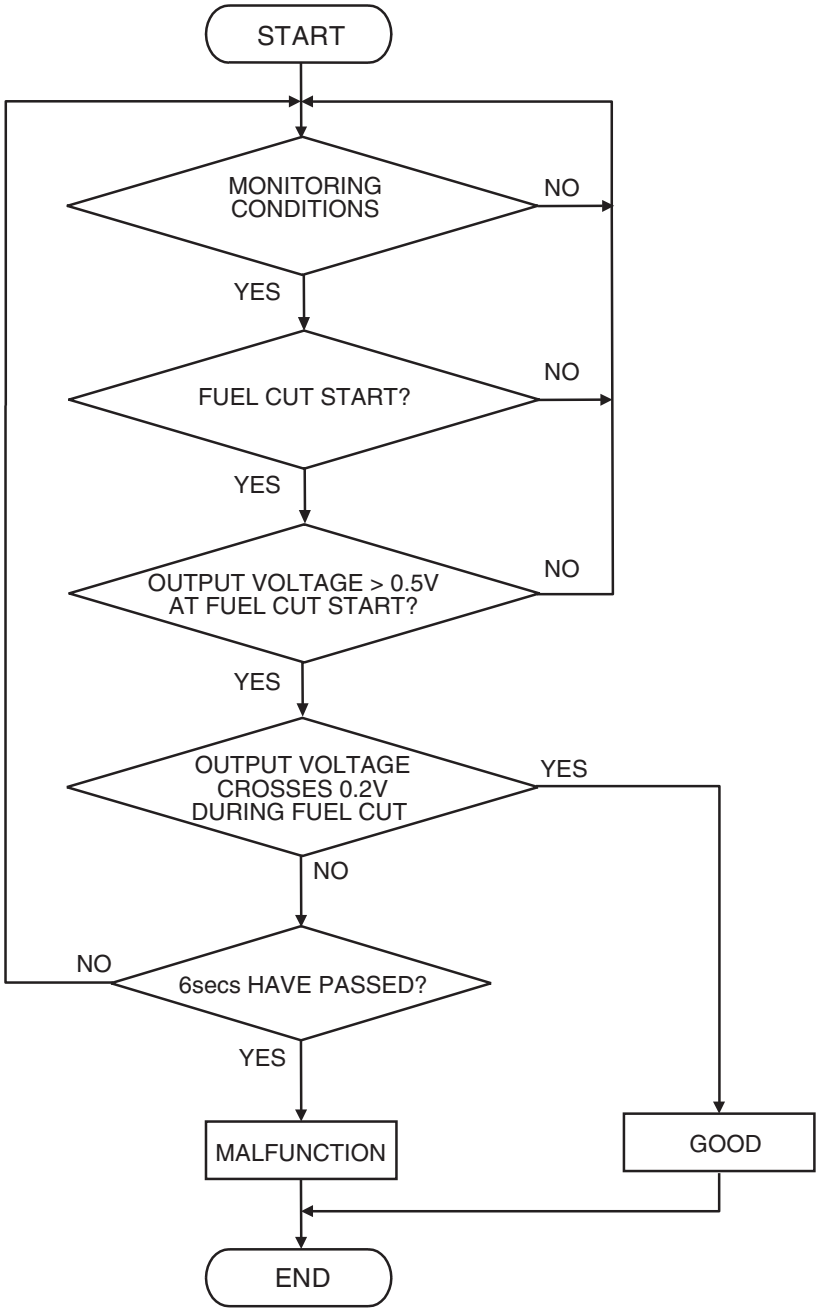
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500043

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The right bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1638 g.
- Fuel is being shut off.

Judgement Criterion

- Right bank oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13B-6.

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

- Right bank heated oxygen sensor (rear) failed.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Replace the right bank heated oxygen sensor (rear).

(1) Replace the right bank heated oxygen sensor (rear).
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

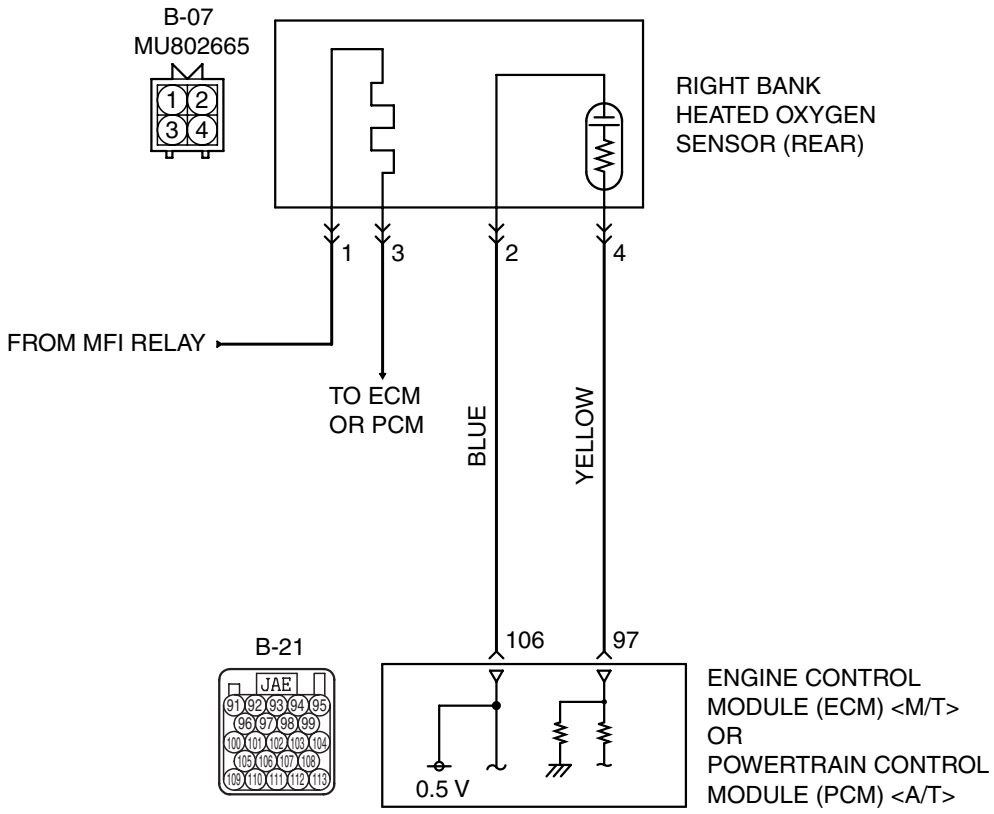
Q: Is DTC P0139 set?

YES : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-319, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-335.

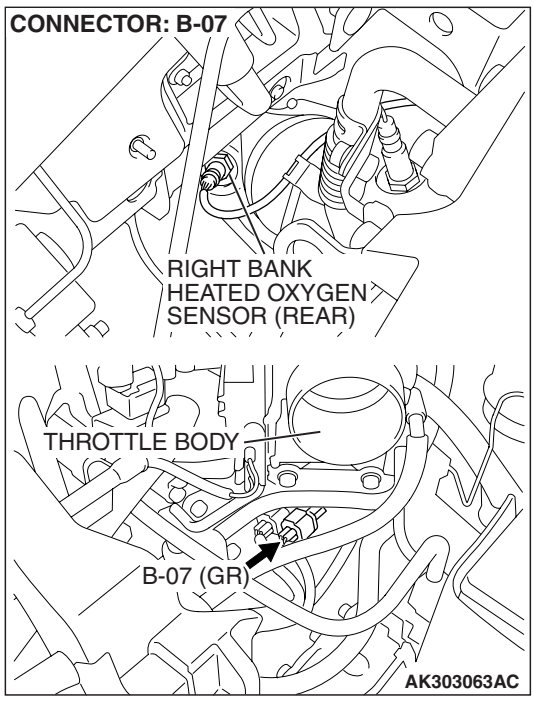
NO : The inspection is complete.

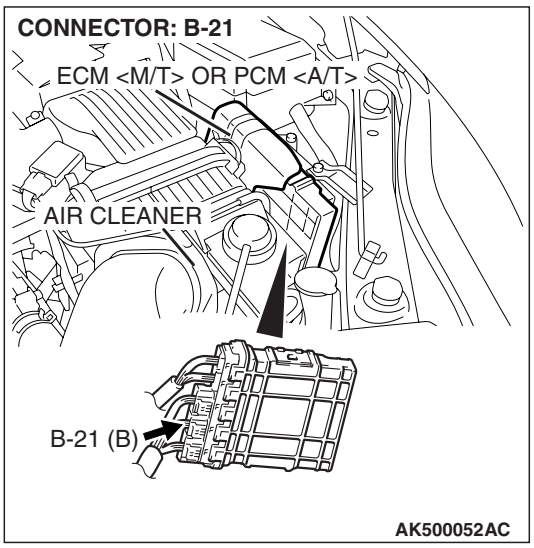
DTC P0140: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



AK403971





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 97) 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 ECM <M/T> or PCM <A/T> (terminal No. 106).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the right bank oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the right bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (rear) output voltage does not change during specified.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

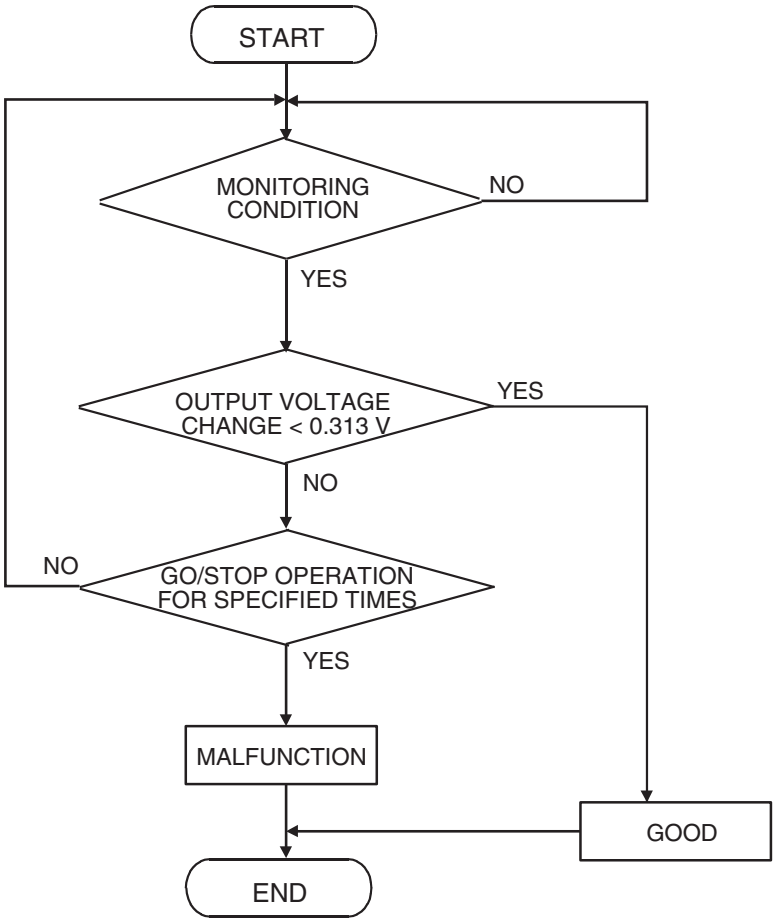
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302399

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The right bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1638 g.
- 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 (19 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 (1.0 mph).

Judgement Criterion

- 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 41 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13B-6.

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

- Right bank heated oxygen sensor (rear) failed.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Replace the right bank heated oxygen sensor (rear).

(1) Replace the right bank heated oxygen sensor (rear).
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

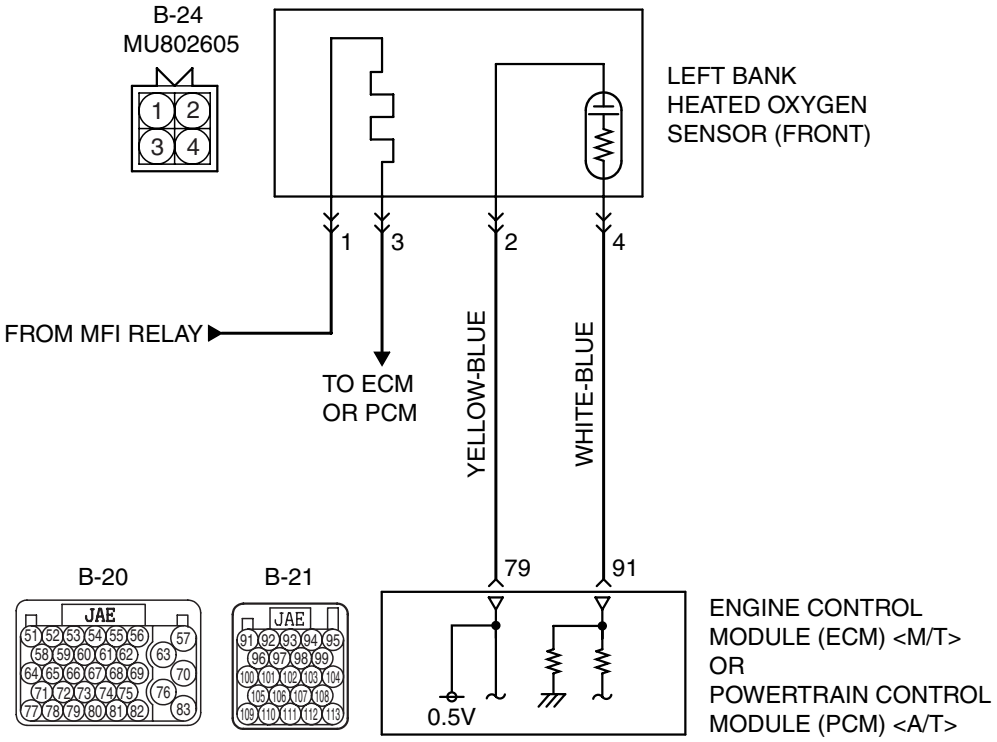
Q: Is DTC P0140 set?

YES : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-319, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-335.

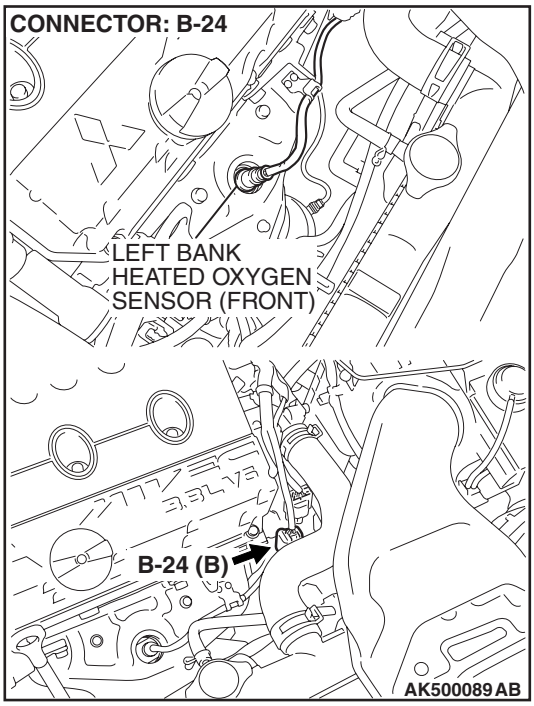
NO : The inspection is complete.

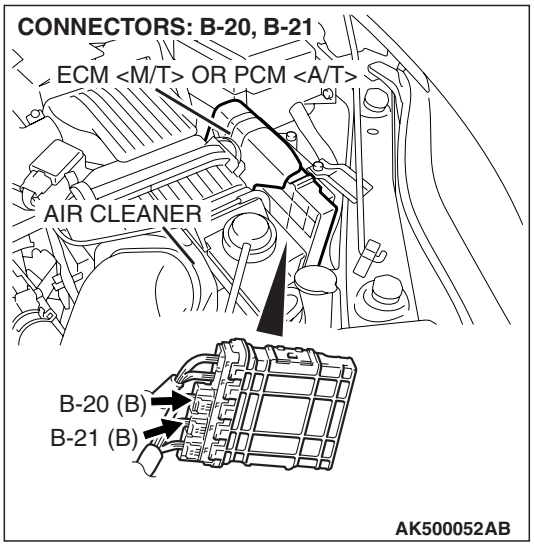
DTC P0151: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



AK403972





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 91) 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 ECM <M/T> or PCM <A/T> (terminal No. 79).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

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 ECM <M/T> or the PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM <M/T> or the PCM <A/T> also checks for the left bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

The left bank heated oxygen sensor (front) output voltage is under specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

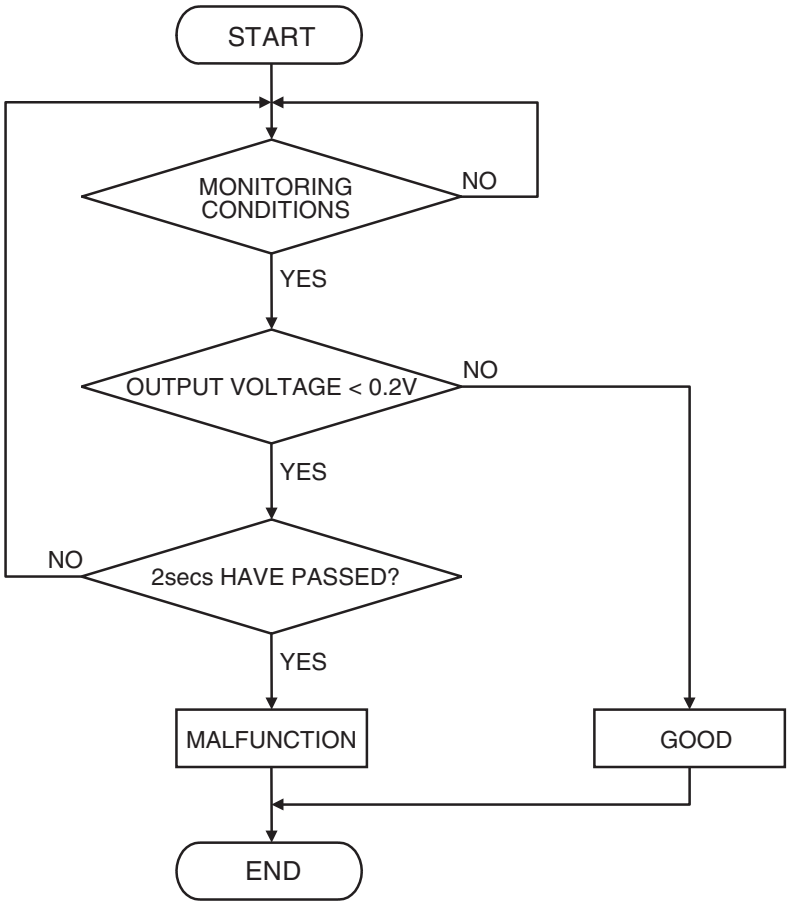
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500034

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 15 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Left bank heated oxygen sensor (front) output voltage is lower than 0.2 volts.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21. P.13B-6

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

- Left bank heated oxygen sensor (front) failed.
- Open or shorted circuit in left bank heated oxygen sensor (front) output line, or harness damage.
- Open circuit in left bank heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

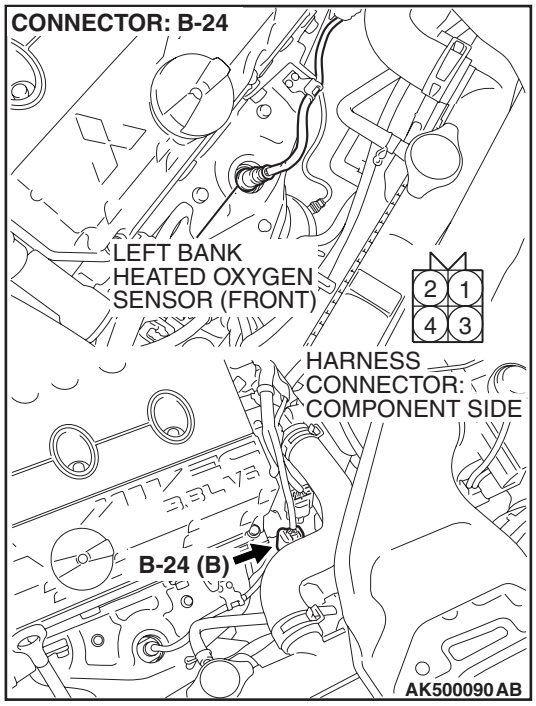
DIAGNOSIS

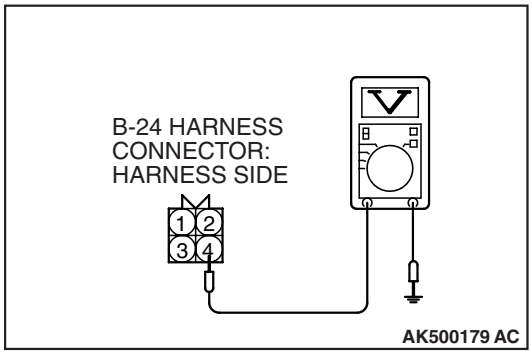
Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Measure the sensor output voltage at left bank heated oxygen sensor (front) connector B-24 by backprobing

(1) Do not disconnect the connector B-24.
(2) Start the engine and run at idle.

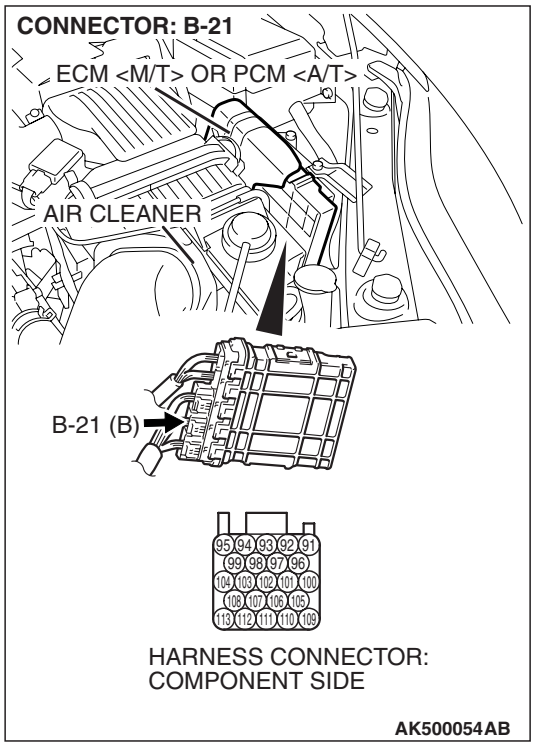


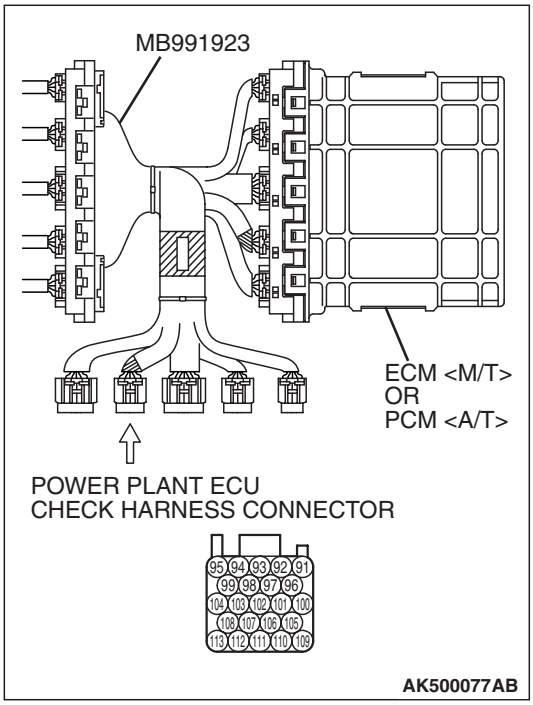


(3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

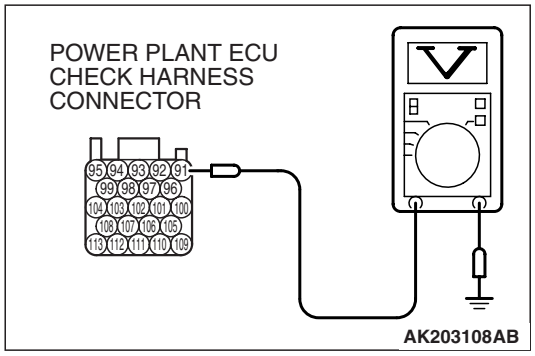
YES : Go to Step 2.
NO : Go to Step 6.





STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.

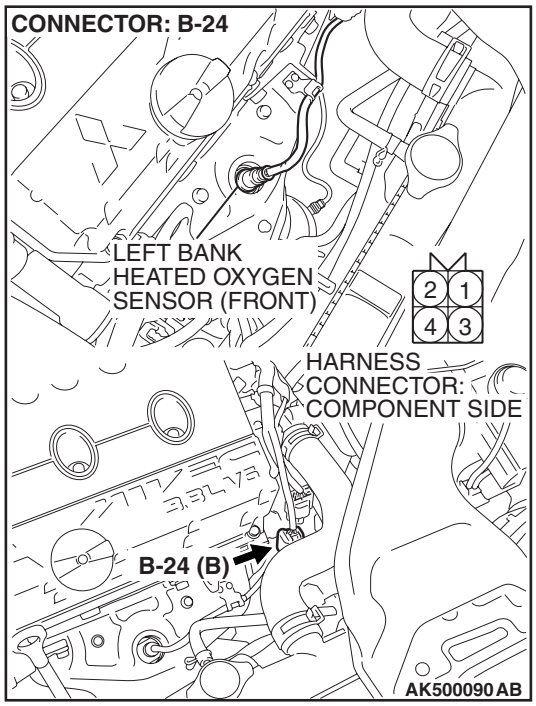


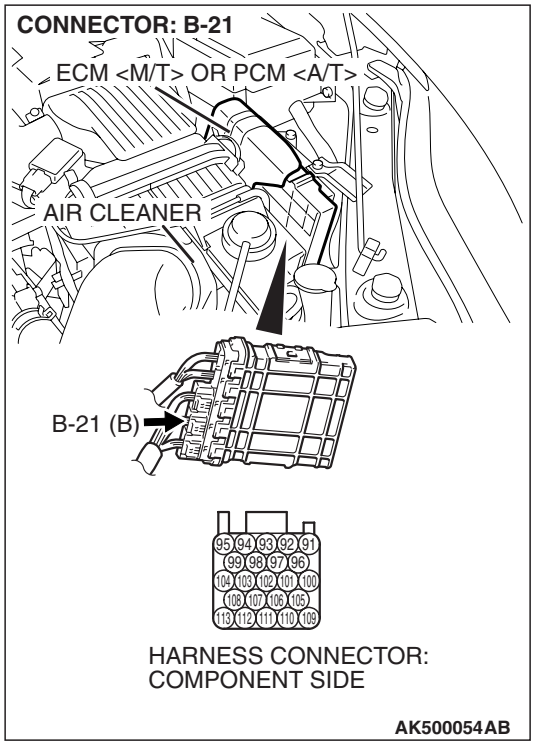
(3) Measure the voltage between terminal No. 91 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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





STEP 3. Check harness connector B-24 at left bank heated oxygen sensor (front) and harness connector B-21 at ECM <M/T> or PCM <A/T> 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 13.

STEP 4. Check the trouble symptoms.

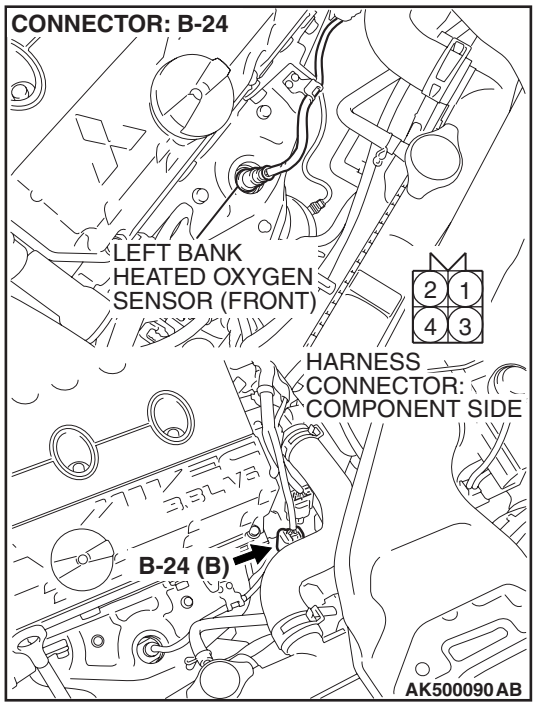
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

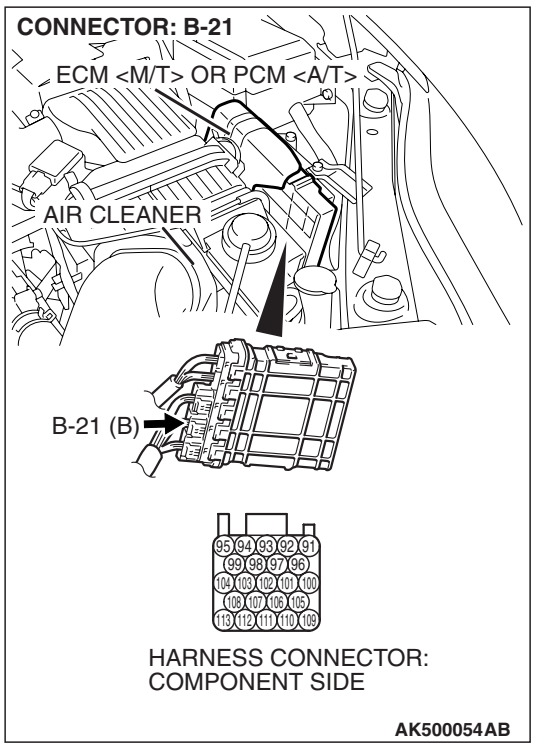
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0151 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.

NO : 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 Malfunctions P.00-14.



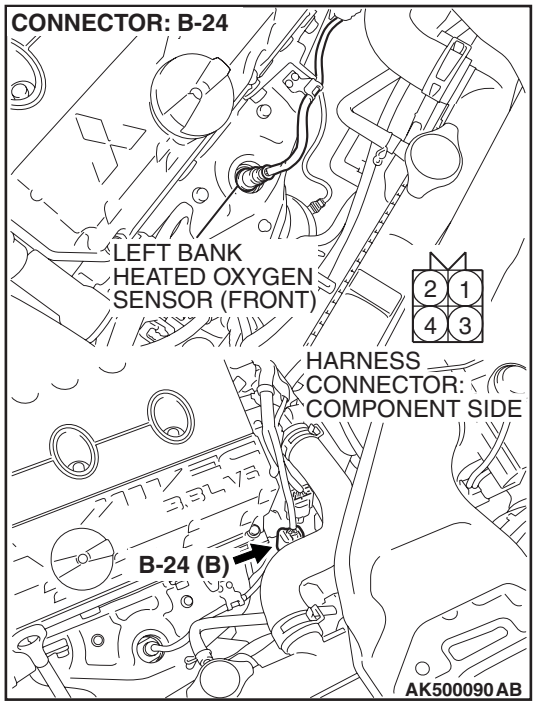


STEP 5. Check harness connector B-24 at left bank heated oxygen sensor (front) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-24 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 91) because of open circuit or 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.

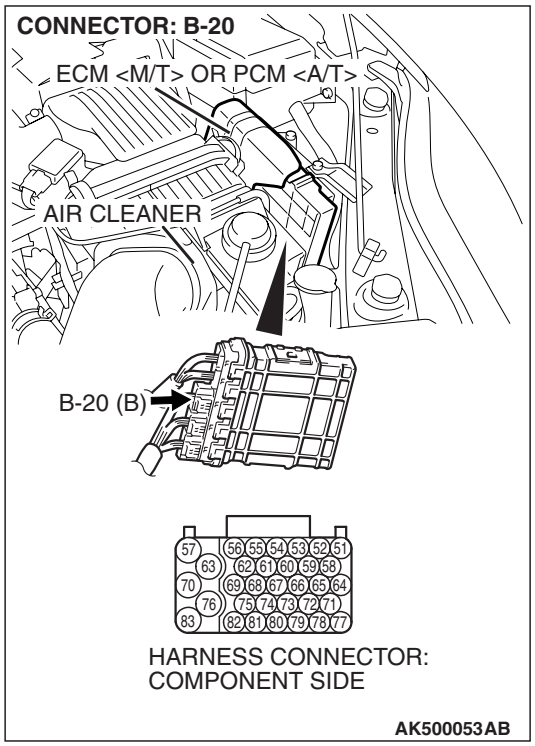


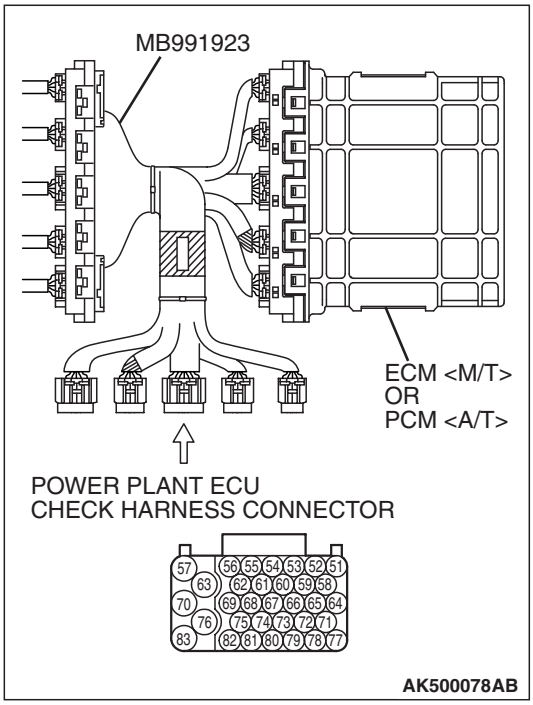
STEP 6. Check harness connector B-24 at left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

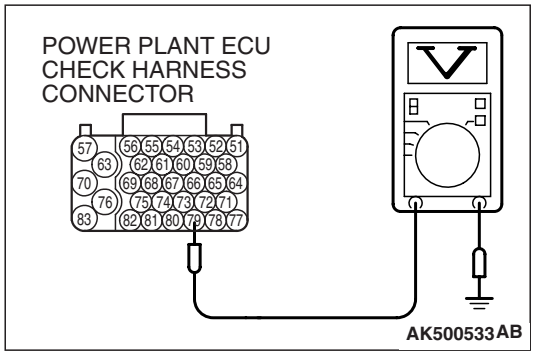
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





STEP 7. Measure the sensor offset voltage at ECM <M/T> or PCM <A/T> connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.

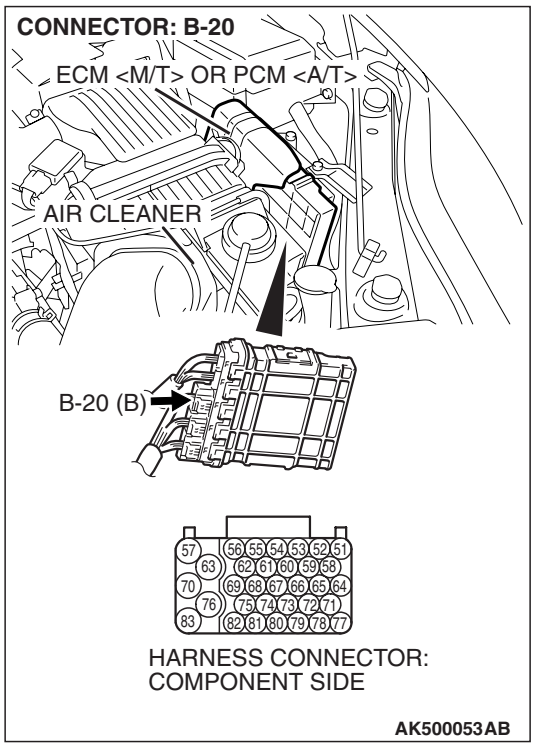


(3) Measure the voltage between terminal No. 79 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

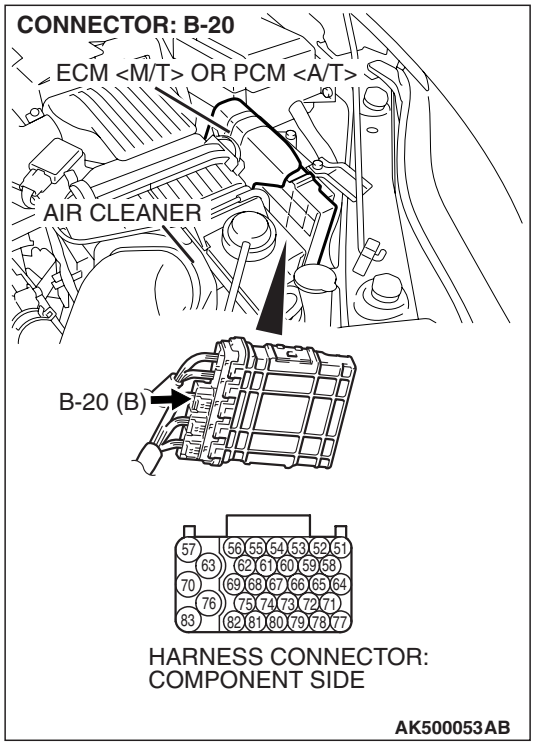
YES : Go to Step 9.
NO : Go to Step 8.



STEP 8. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-24 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 79) because of open circuit or 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 9. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

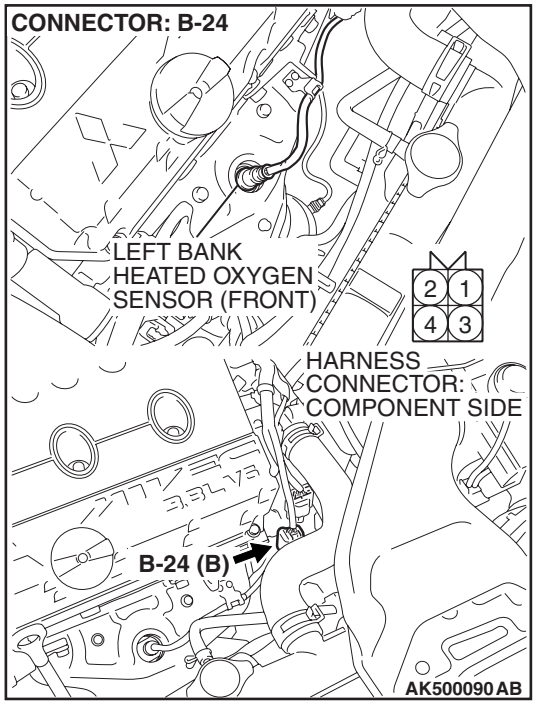
NO : Repair or replace it. Then go to Step 13.

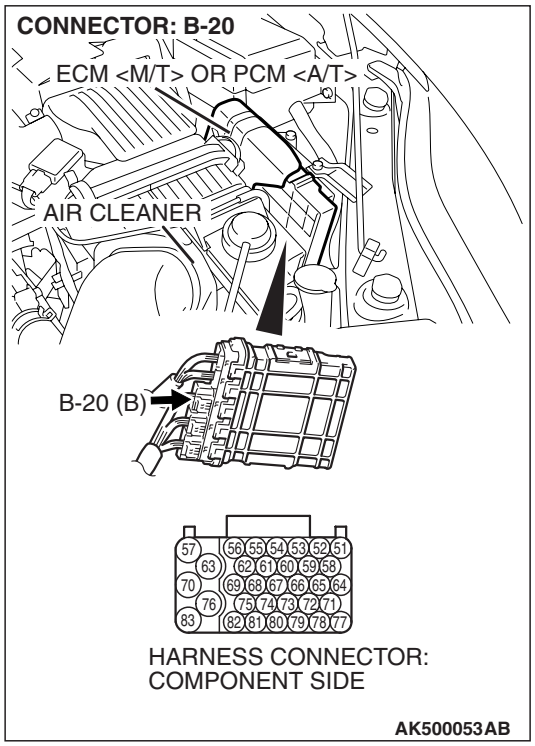
STEP 10. Check for harness damage between left bank heated oxygen sensor (front) connector B-24 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 79).

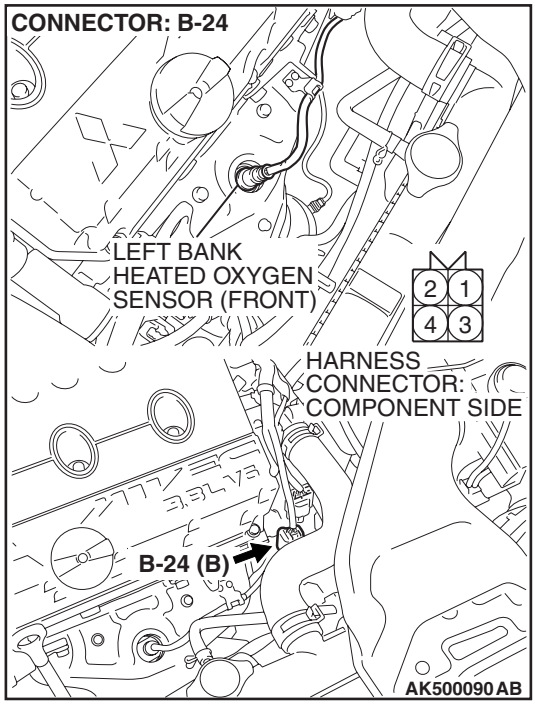
Q: Is the harness wire in good condition?

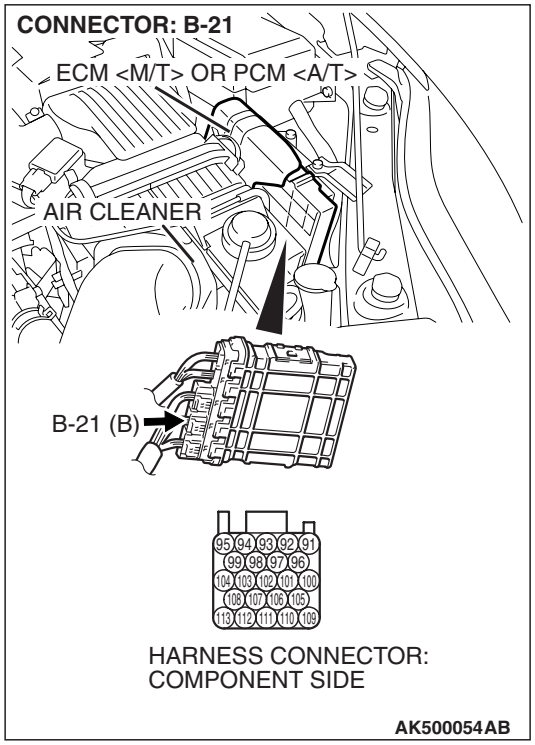
YES : Go to Step 11.

NO : Repair it. Then go to Step 13.







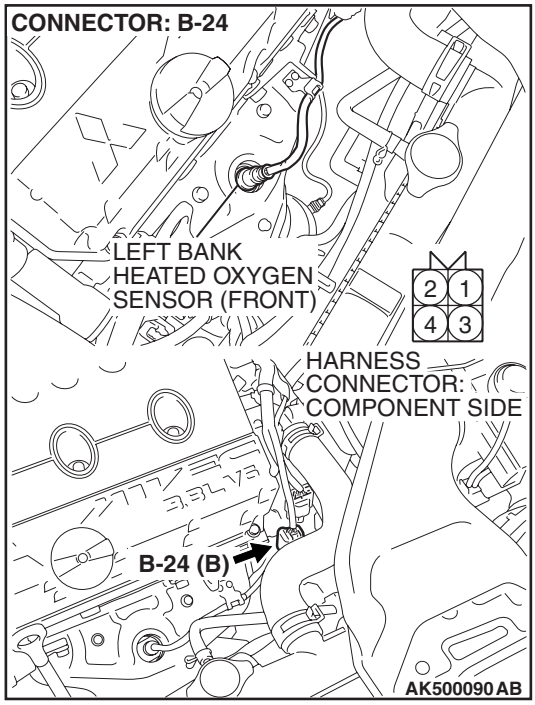


STEP 11. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (front) connector B-24 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 91).

Q: Is the harness wire in good condition?

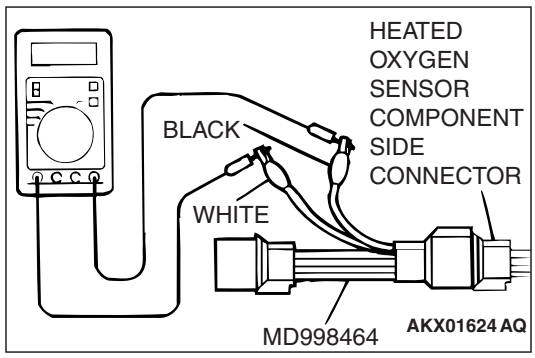
YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



STEP 12. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage 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 volts

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.
NO : Replace the left bank heated oxygen sensor (front). 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

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

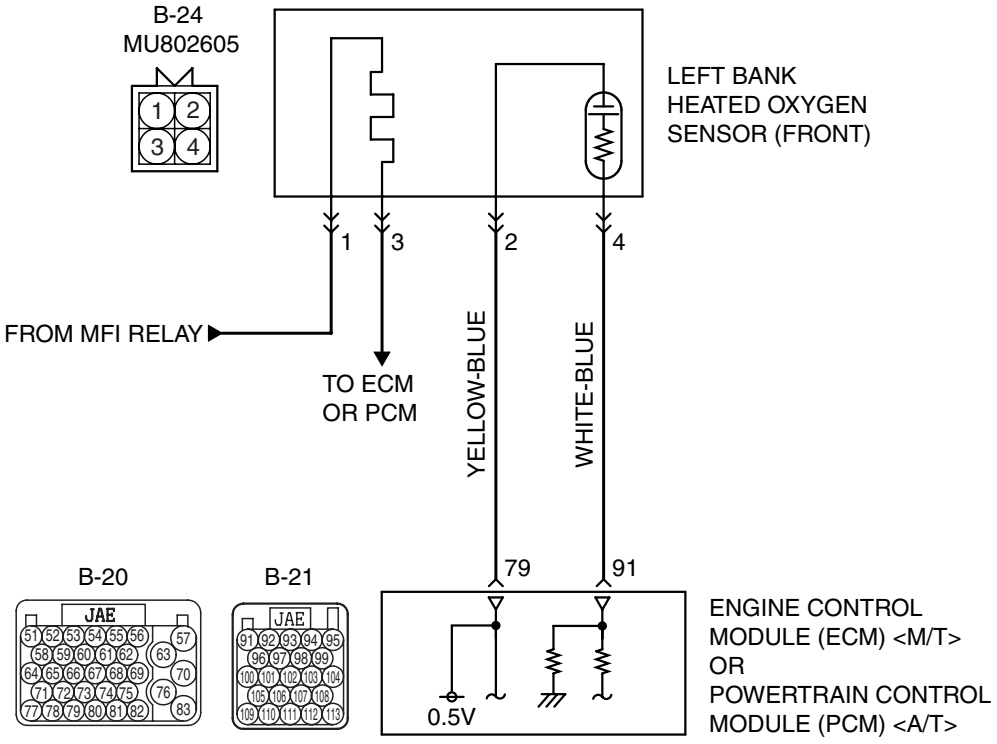
Q: Is DTC P0151 set?

YES : Retry the troubleshooting.

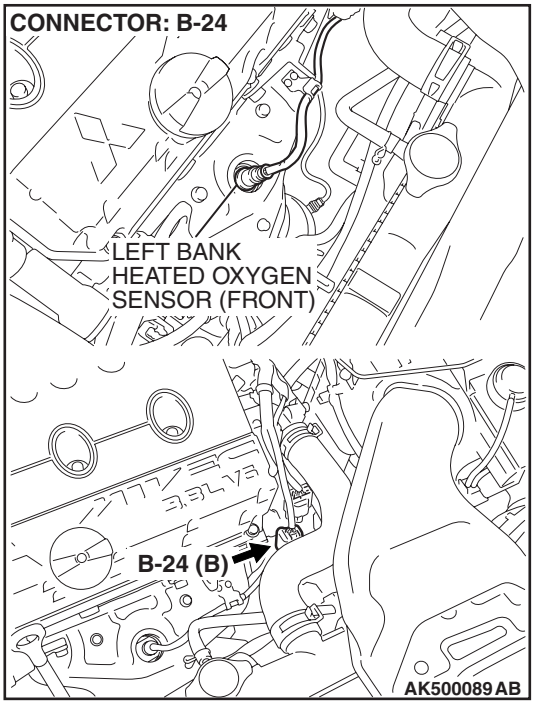
NO : The inspection is complete.

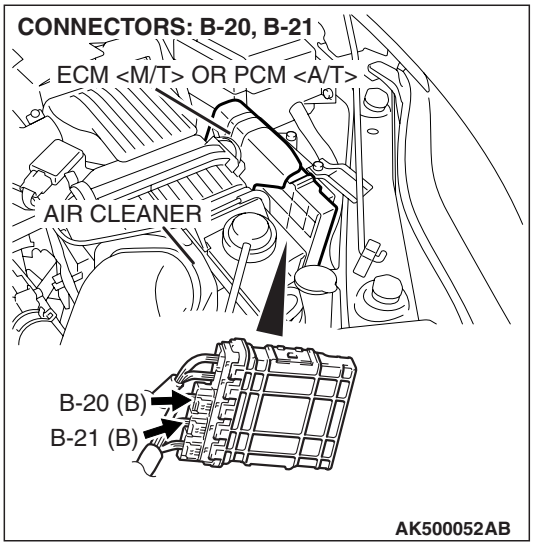
DTC P0152: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



AK403972





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 91) 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 ECM <M/T> or PCM <A/T> (terminal No. 79).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

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 input the resulting signals to the ECM <M/T> or the PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or the PCM <A/T> also checks for the left bank heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

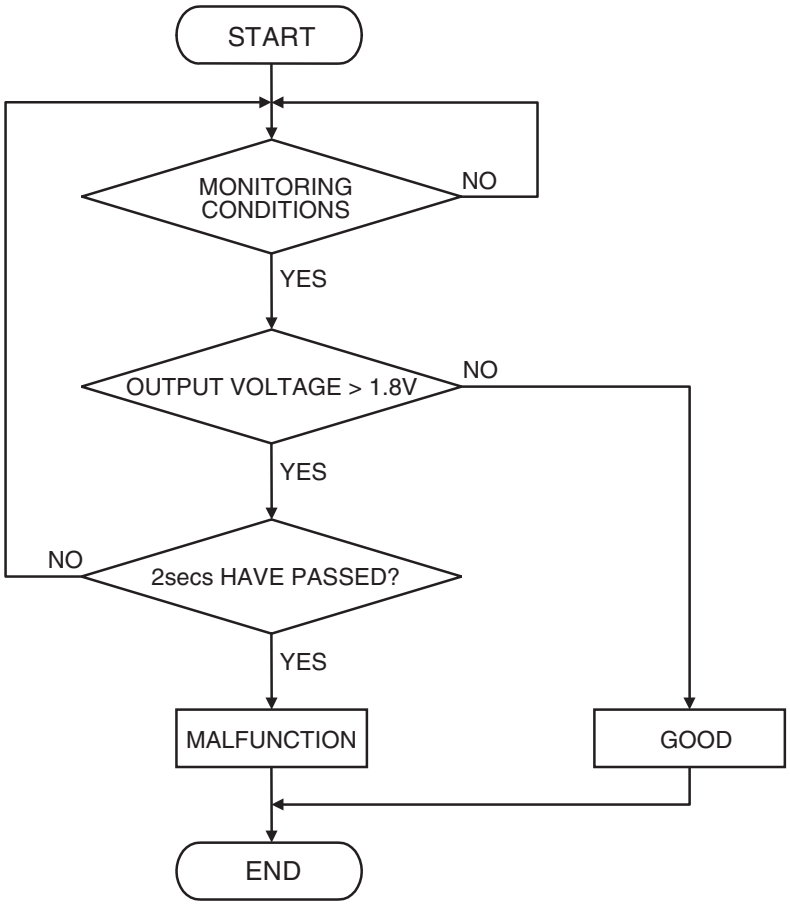
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500035

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgment Criterion

- Left bank heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Short circuit in left bank heated oxygen sensor (front) output line.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

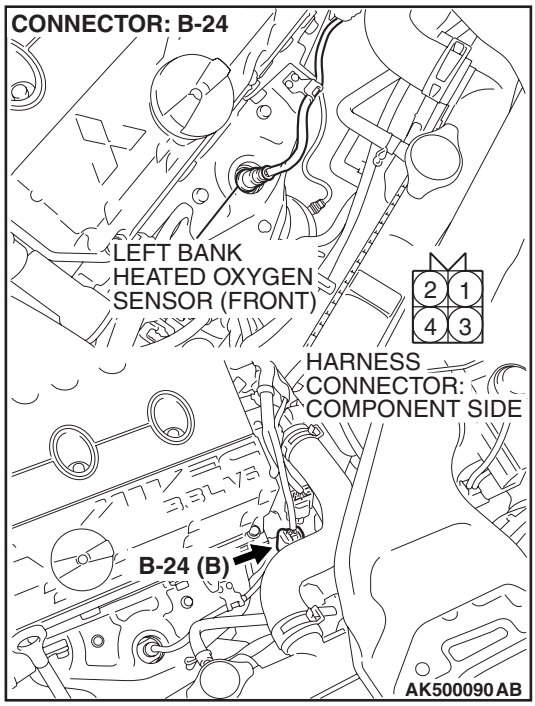
DIAGNOSIS

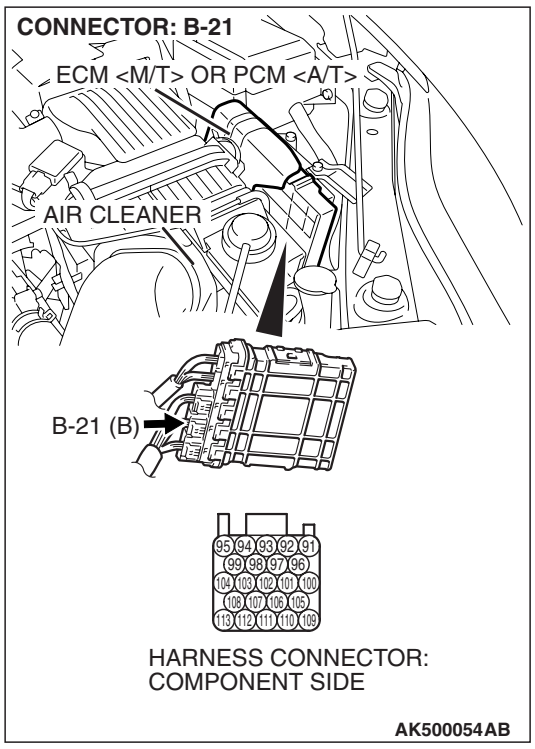
STEP 1. Check harness connector B-24 at left bank heated oxygen sensor (front) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

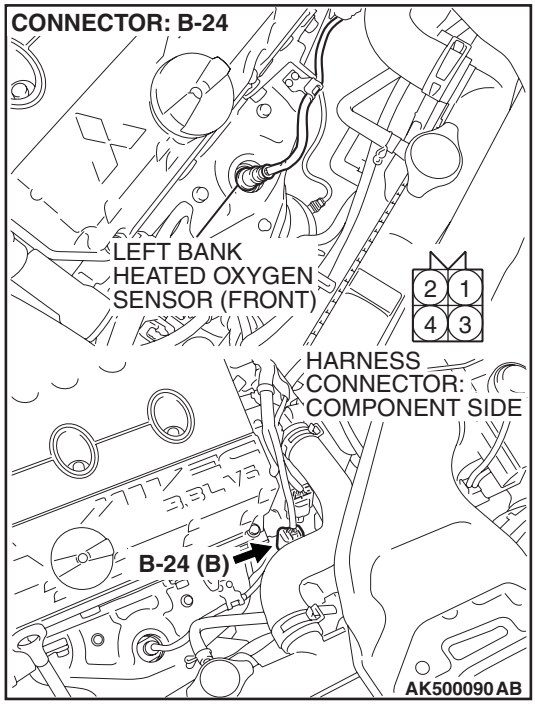
Q: Is the harness connector in good condition?

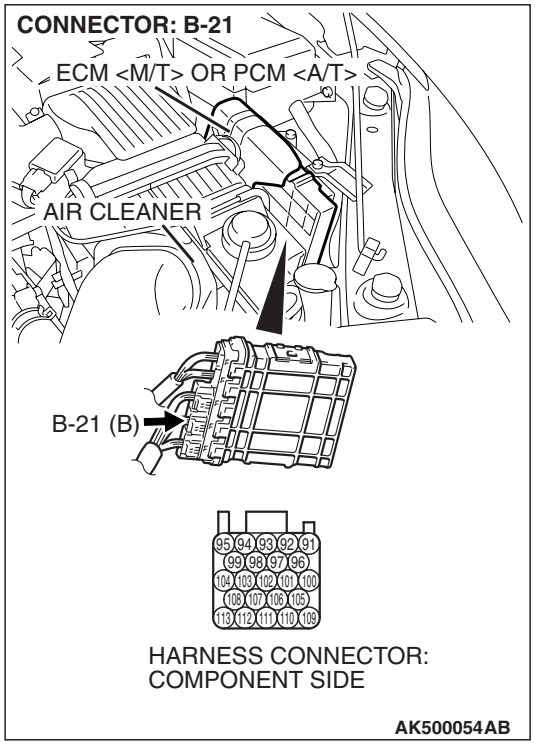
YES : Go to Step 2.

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









STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-24 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 91).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

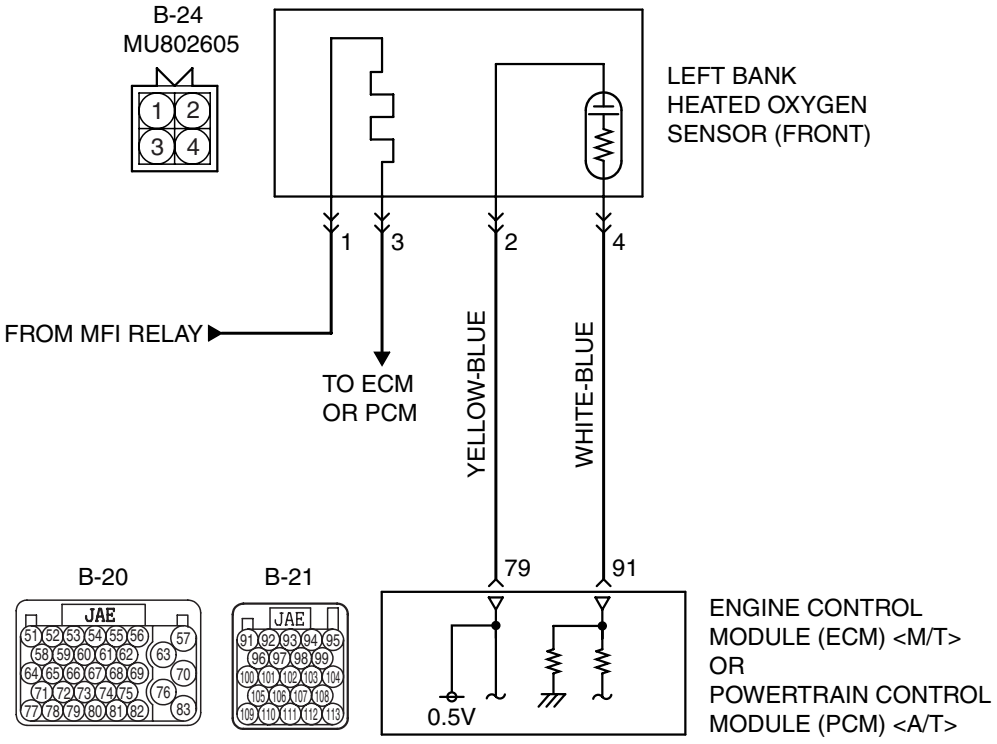
Q: Is DTC P0152 set?

YES : Retry the troubleshooting.

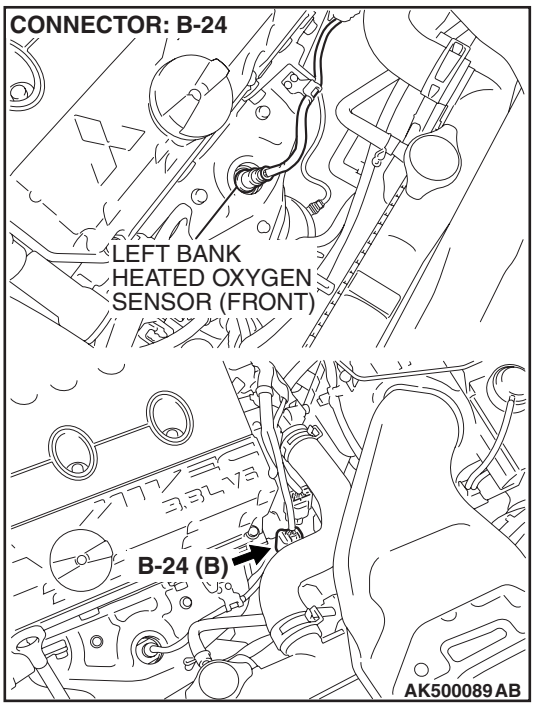
NO : The inspection is complete.

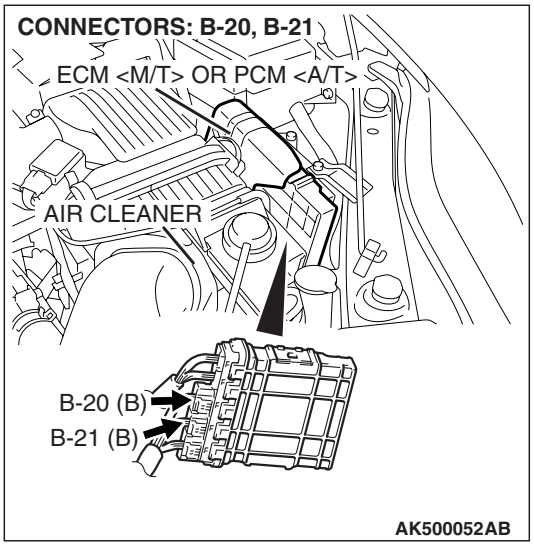
DTC P0153: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



AK403972





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 91) 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 ECM <M/T> or PCM <A/T> (terminal No. 79).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (front).

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 ECM <M/T> or the PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the left bank heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or the PCM <A/T> also checks for the left bank heated oxygen sensor (front) rich/lean switch frequency.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

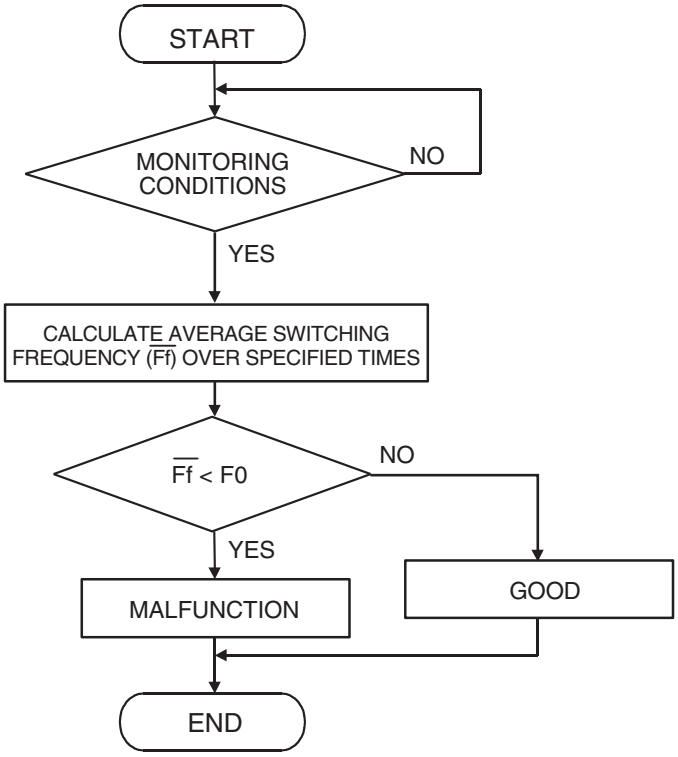
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



F0: THRESHOLD VALUE FOR AVERAGE SWITDHING FREQUENCY

AK302395

Check Conditions

- Engine coolant temperature is higher than 50° C (122° F).
- Engine speed is between 1,500 and 3,000 r/min <M/T> or 1,300 and 3,000 r/min <A/T>.
- Volumetric efficiency is between 12 and 60 <M/T> or 20 and 60 <A/T> percent.
- Under the closed loop air/fuel control.
- The accelerator pedal open.
- Short-term fuel trim is at between –30 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 7 cycles <M/T> or 5 cycles <A/T> of 12 seconds each during the drive cycle.

Judgement Criterion

- The average of the left bank heated oxygen sensor (front) rich/lean switching frequency is less than 7 times <M/T> or 10 times <A/T> per 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the MUT-III OBD-II test Mode – HO2S 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.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 1 P.13B-6.

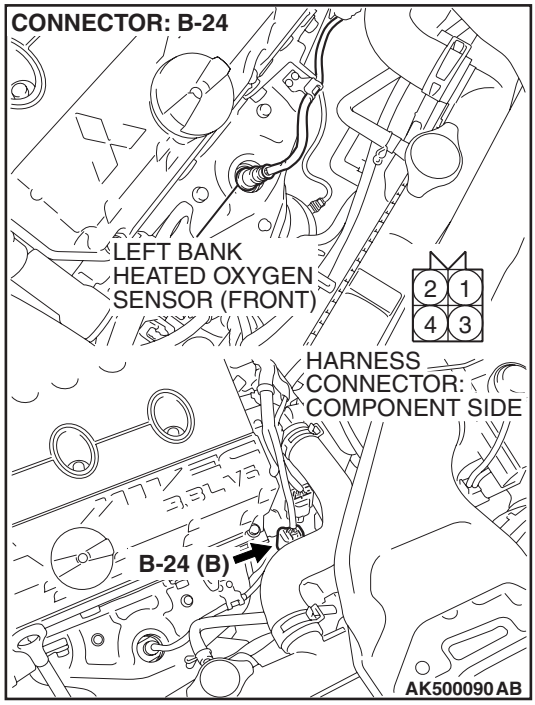
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

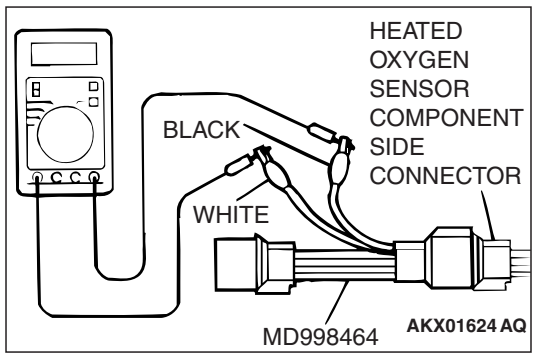
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness



STEP 1. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Warm up engine, 2,500 r/min.
- Output voltage repears 0 – 0.4 volt and 0.6 – 1.0 volts 7 times <M/T> or 10 times <A/T> or more within 10 seconds.

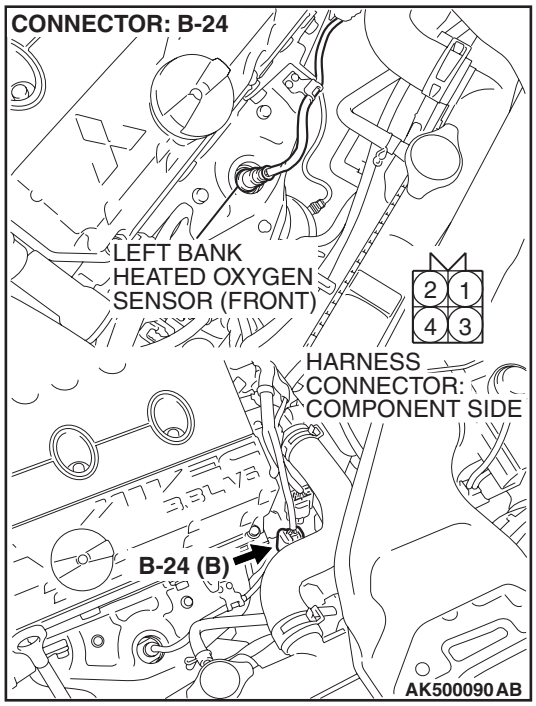
⚠ CAUTION

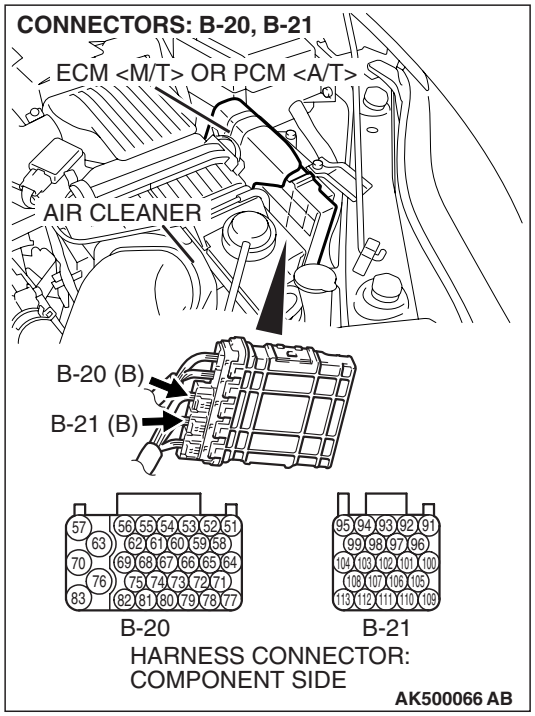
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752° F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 3.





STEP 2. Check harness connector B-24 at left bank heated oxygen sensor (front) and harness connector B-20, B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

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

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 1 P.13B-6.

(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)

⚠ CAUTION

If DTC P0154 has been set, TCL related DTC U1120 is also set. After P0154 has been diagnosed, don't forget to erase DTC U1120.

Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1) Circuit

- Refer to, DTC P0151 –Left Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13B-348.
- Refer to, DTC P0202P.13B-486, P0204P.13B-509, P0206P.13B-532 –Injector Circuit.

CIRCUIT OPERATION

- Refer to, DTC P0151 –Left Bank Heated Oxygen Sensor (Front) Circuit Low Voltage P.13B-348.
- Refer to, DTC P0202P.13B-486, P0204P.13B-509, P0206P.13B-532 –Injector Circuit.

TECHNICAL DESCRIPTION

- The ECM <M/T> or the PCM <A/T> 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.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (front) output voltage does not exceed 0.5 volt within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

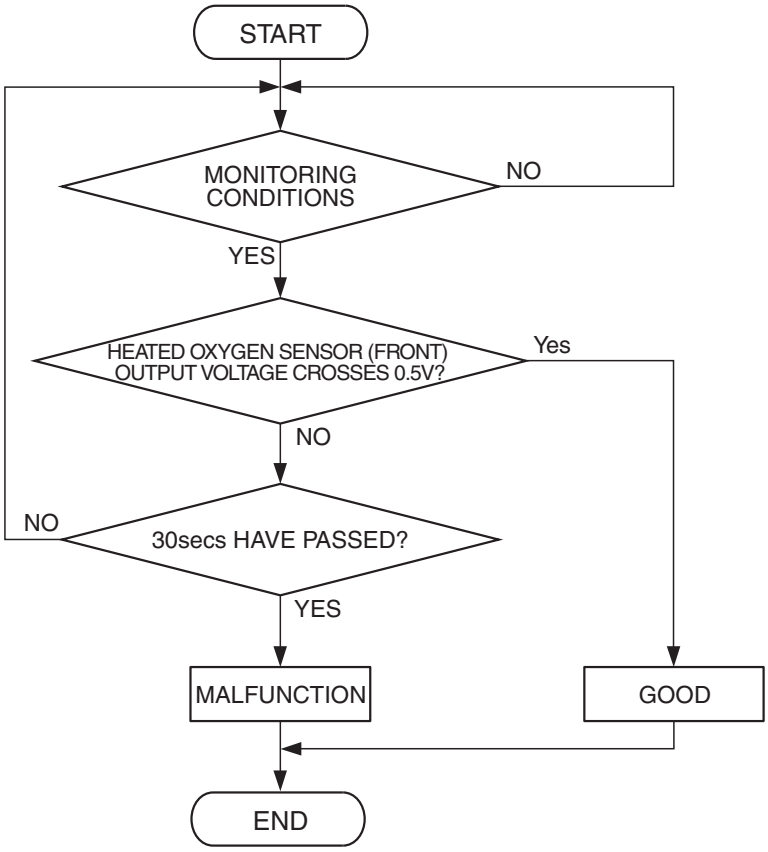
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK203999

Check Conditions

- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7°C (45°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13B-6.

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

- Left bank heated oxygen sensor (front) deteriorated.
- Harness damage in left bank heated oxygen sensor (front) output line.
- Left bank heated oxygen sensor (rear) deteriorated.

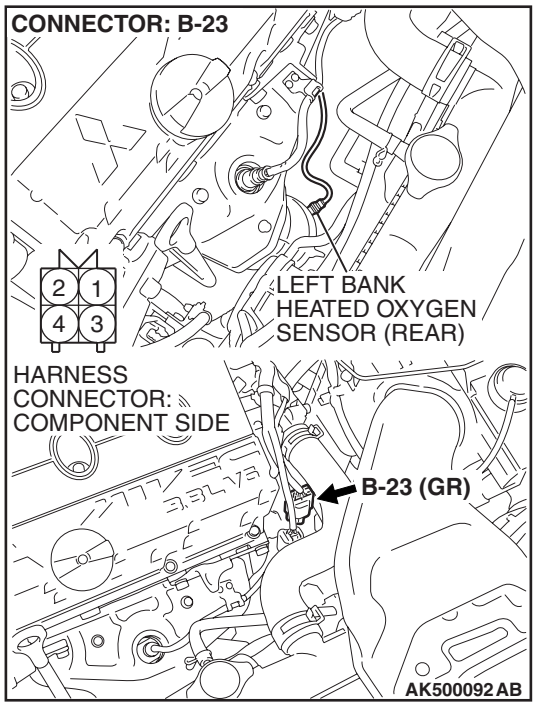
  NOTE: When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the left bank heated oxygen sensor (rear).

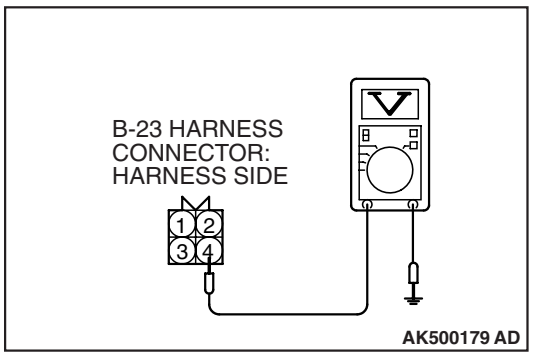
  If the left bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the left bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the left bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0154 becoming registered.
- Open circuit in left bank injector.
- Harness damage in left bank injector circuit.
- Connector damage.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness





STEP 1. Measure the sensor output voltage at left bank heated oxygen sensor (rear) connector B-23 by backprobing

(1) Do not disconnect the connector B-23.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (A/T: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 2.
NO : Refer to, DTC P0157 –Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-385, DTC P0158-Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-401, DTC P0159 –Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13B-406, DTC P0160–Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2) P.13B-410.

STEP 2. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

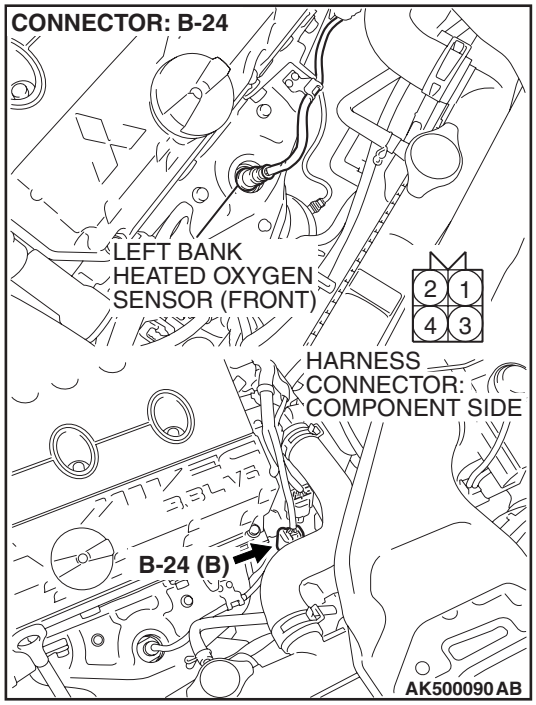
Q: Are there any abnormalities?

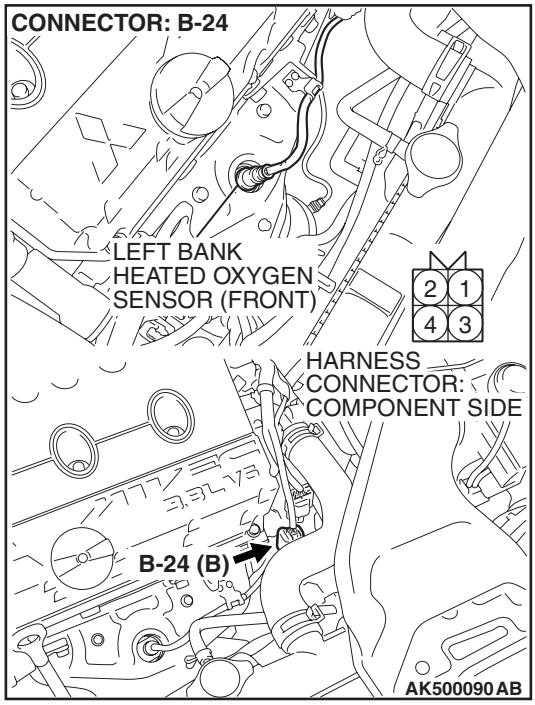
YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

STEP 4. Check harness connector B-24 at the left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

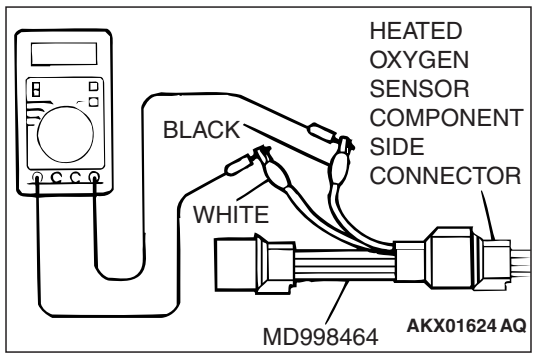
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





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

(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 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 temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.



(4) Connect a digital voltage 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 volts

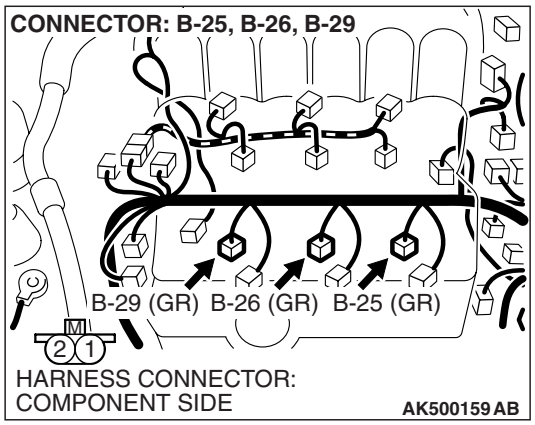
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged it voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No.1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the voltage between 0.6 and 1.0 volts?

YES : Go to Step 6.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 12.



STEP 6. Check harness connector B-25, B-26, B-29 at left bank injector for damage.

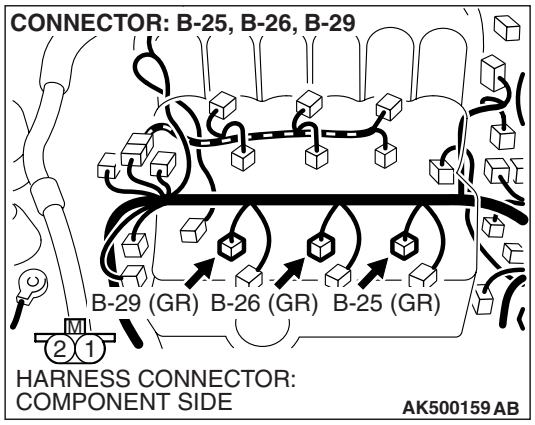
(1) Remove the intake manifold.

(2) Check the left bank injector connector for damage.

Q: Is the harness connector in good condition?

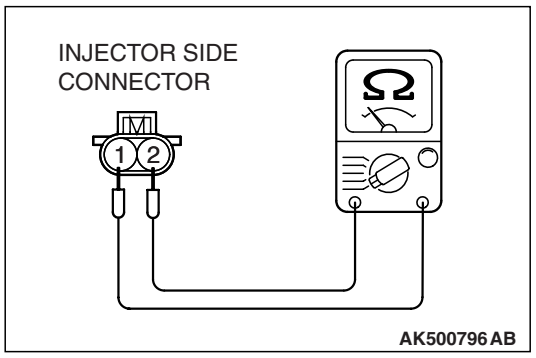
YES : Go to Step 7.

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



STEP 7. Check the left bank injector.

(1) Disconnect each left bank injector connector.



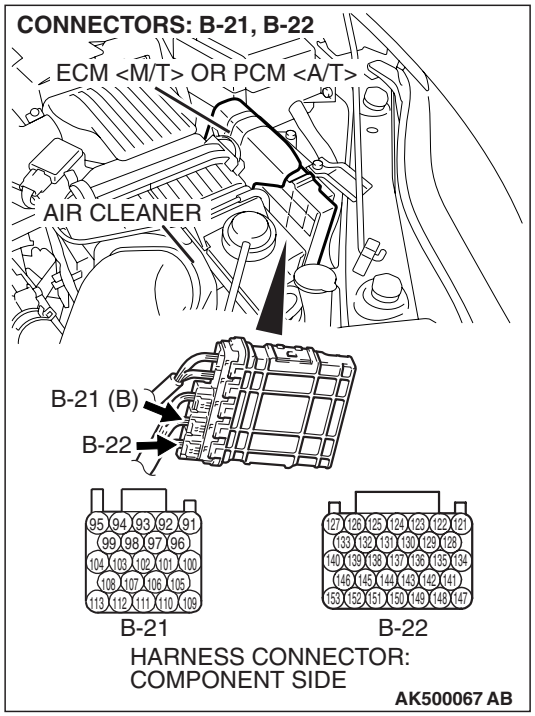
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 8.

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



STEP 8. Check harness connector B-21, B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

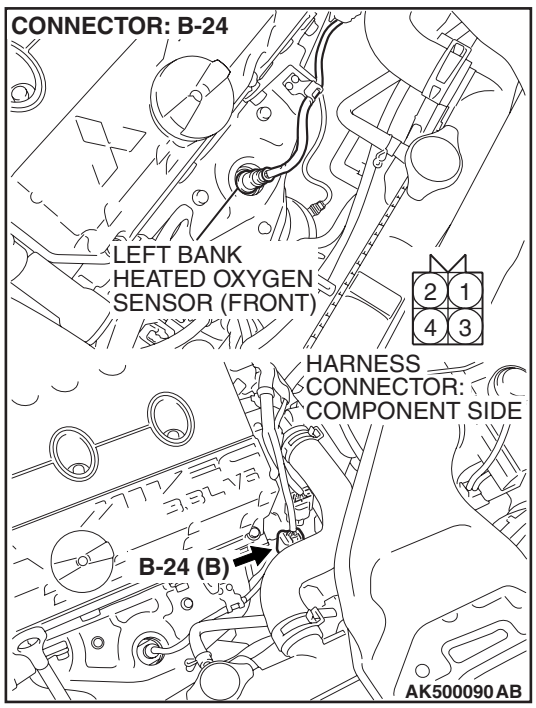
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

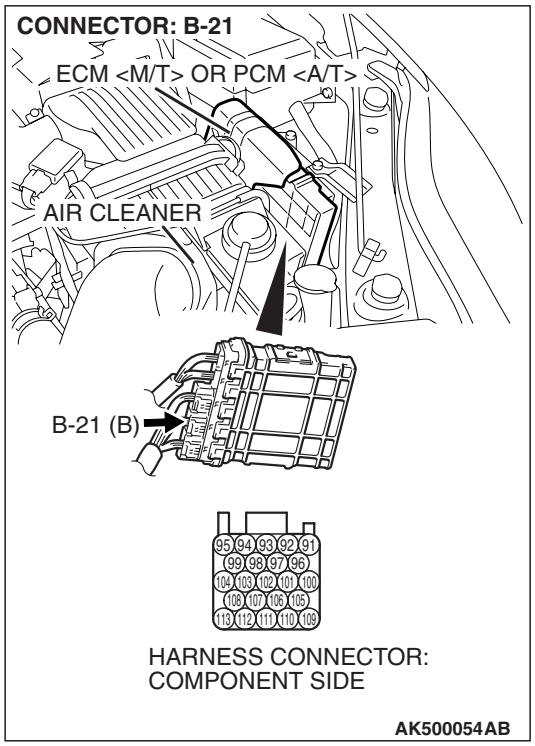
STEP 9. Check for harness damage between left bank heated oxygen sensor (front) connector B-24 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 91).

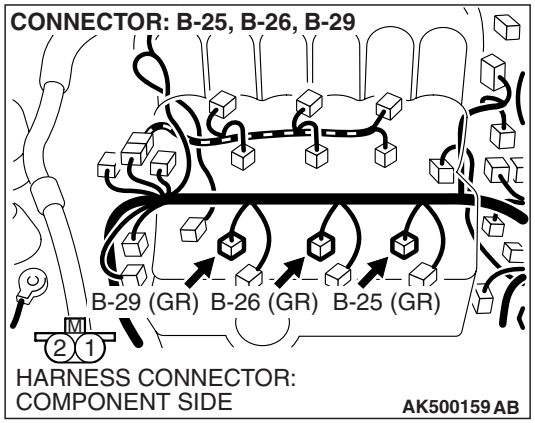
Q: Is the harness wire in good condition?

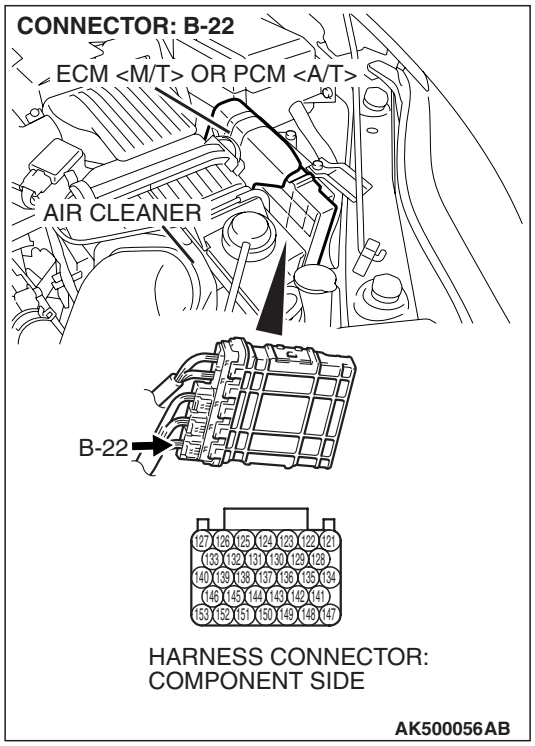
YES : Go to Step 10.

NO : Repair it. Then go to Step 12.









STEP 10. Check for harness damage between left bank injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between left bank injector connector B-29 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 146) at No. 2 cylinder.
b. Check the harness wire between left bank injector connector B-26 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 139) at No. 4 cylinder.
c. Check the harness wire between left bank injector connector B-25 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 127) at No. 6 cylinder.

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 fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1280.

Q: Is the fuel pressure normal?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 12 P.13B-6.

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

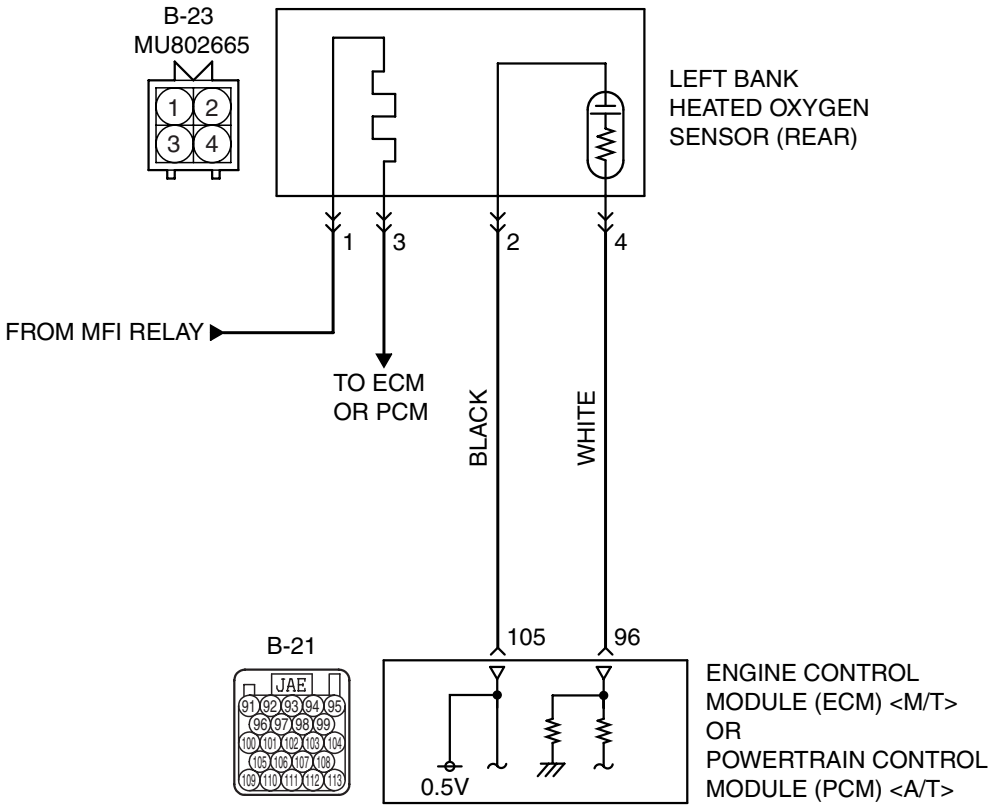
Q: Is DTC P0154 set?

YES : Retry the troubleshooting.

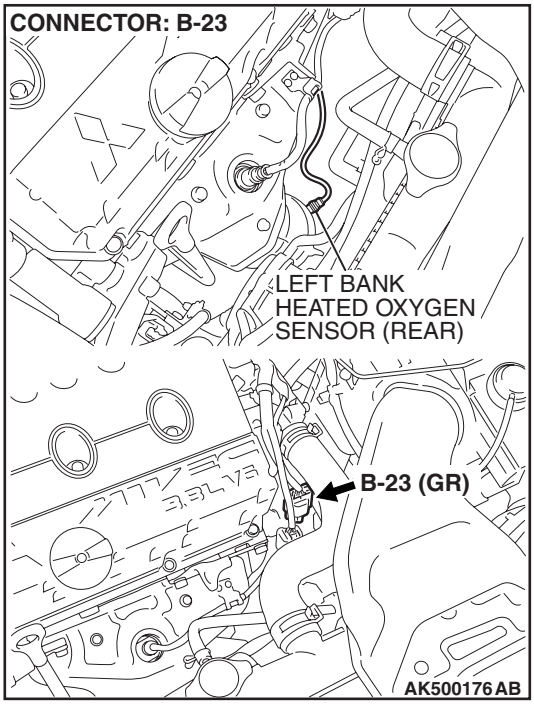
NO : The inspection is complete.

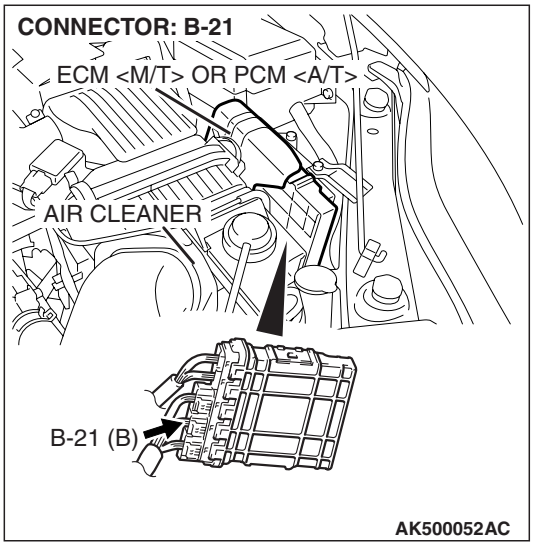
DTC P0157: Heated Oxygen Sensor Circuit Low Voltag (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



AK403973





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 96) 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 ECM <M/T> or PCM <A/T> (terminal No. 105).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> check for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) out put voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

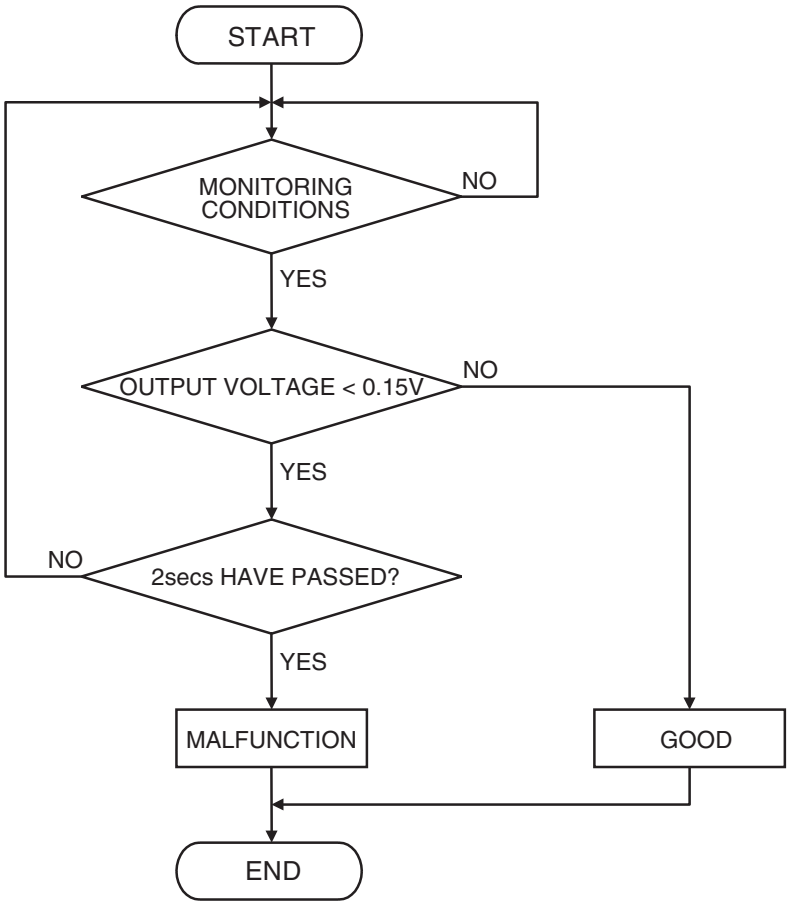
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500036

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Left bank heated oxygen sensor output voltage is lower than 0.15 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-6.

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

- Left bank heated oxygen sensor (rear) failed.
- Open or shorted circuit in left bank heated oxygen sensor (rear) output line, or harness damage.
- Open circuit in left bank heated oxygen sensor (rear) ground line, or harness damage.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

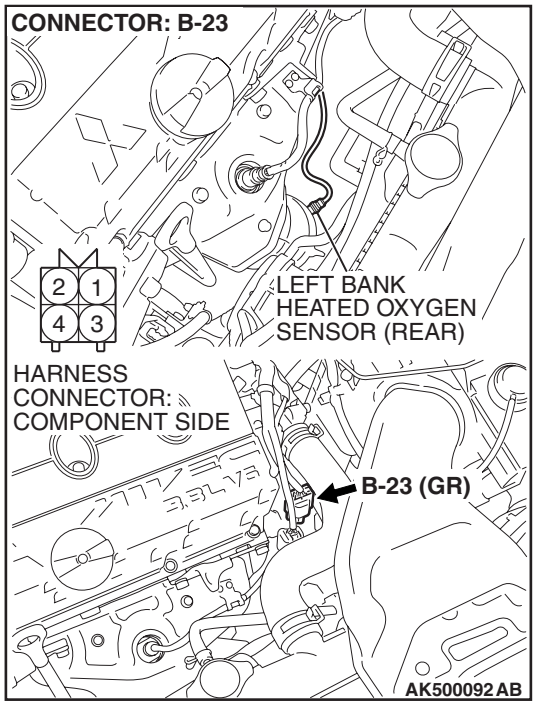
DIAGNOSIS

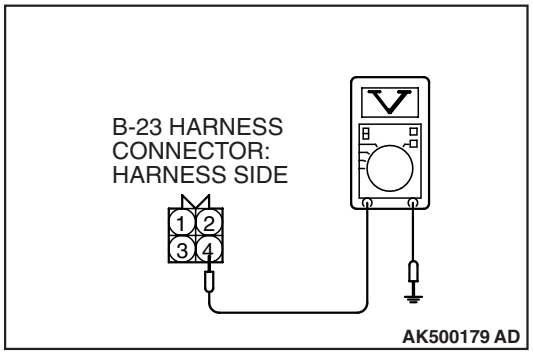
Required Special Tools:

- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991316: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Measure the sensor output voltage at left bank heated oxygen sensor (rear) connector B-23 by backprobing.

(1) Do not disconnect the connector B-23.
(2) Start the engine and run at idle.

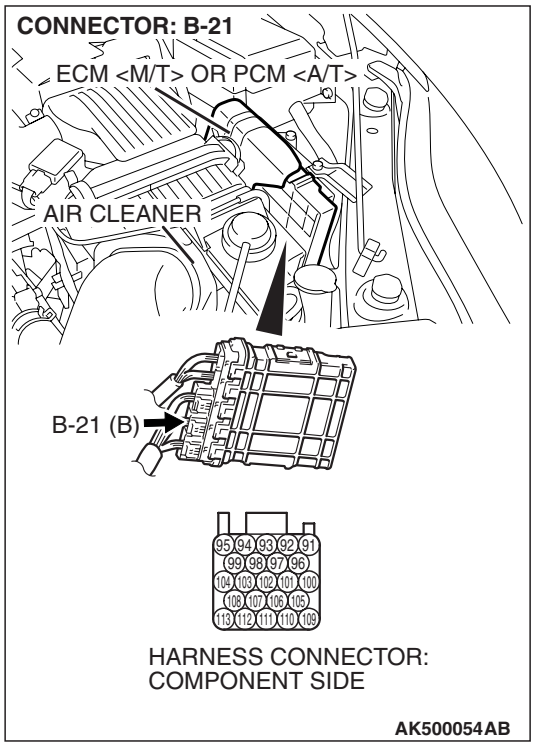


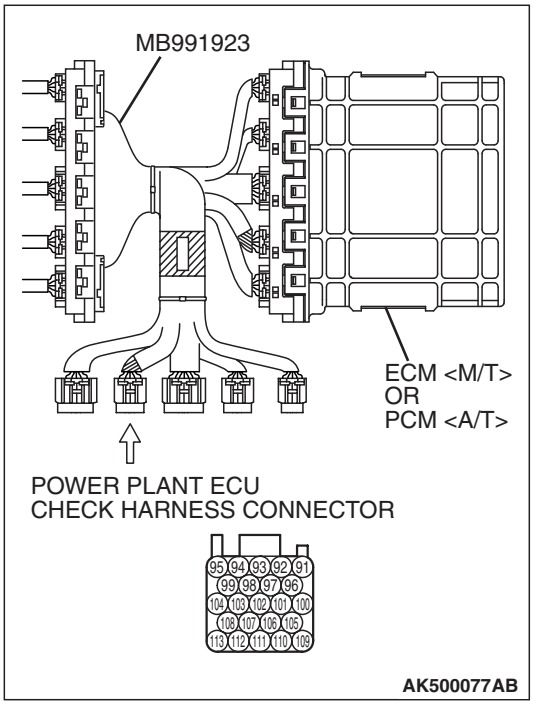


(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (A/T: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

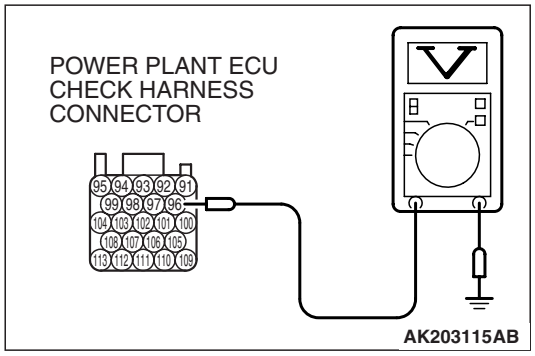
YES : Go to Step 2.
NO : Go to Step 6.





STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.

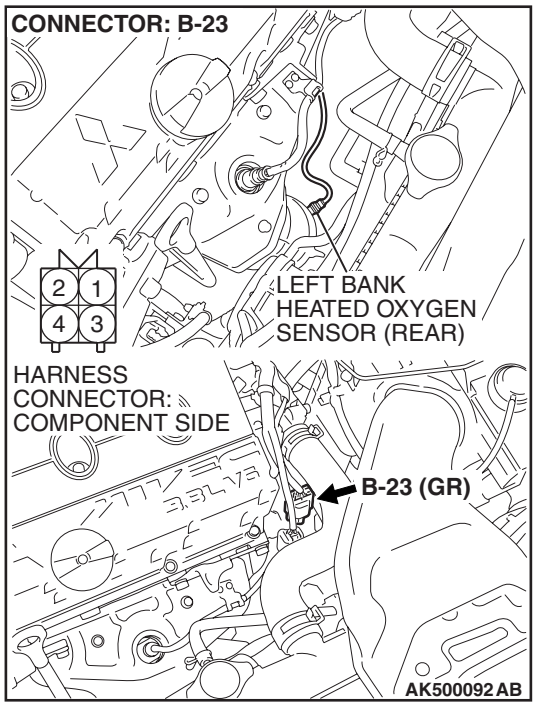


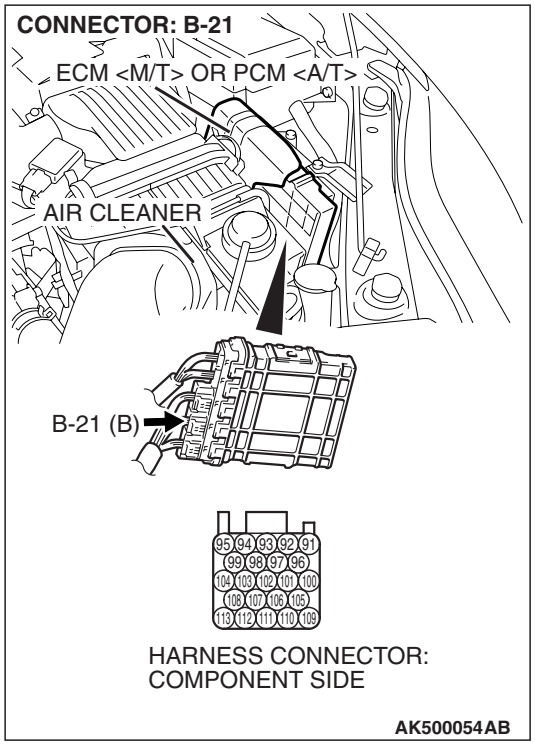
(3) Measure the voltage between terminal No. 96 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (A/T: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

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

Q: Is the measured voltage between 1.0 and 1.5 volts?

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





STEP 3. Check harness connector B-23 at left bank heated oxygen sensor (rear) and harness connector B-21 at ECM <M/T> or PCM <A/T> 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 13.

STEP 4. Check the trouble symptoms.

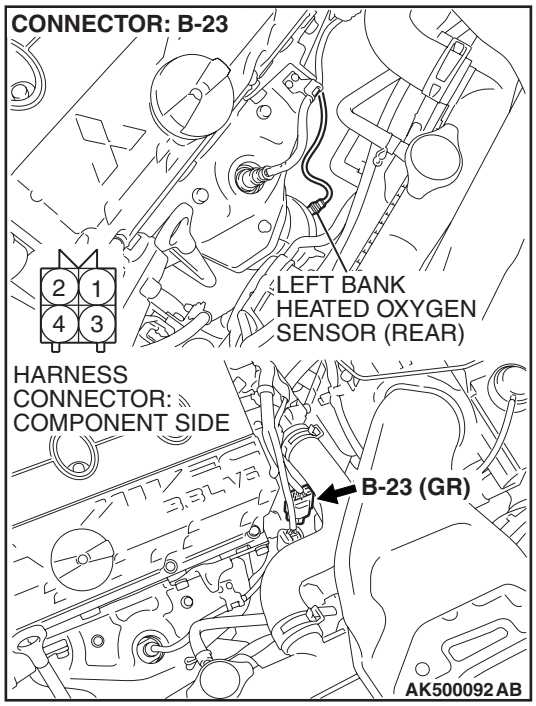
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.

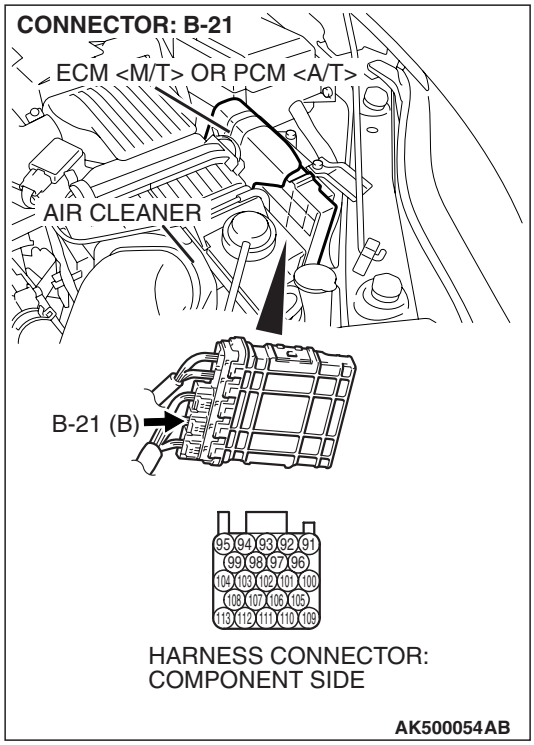
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0157 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.

NO : 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 Malfunctions P.00-14.



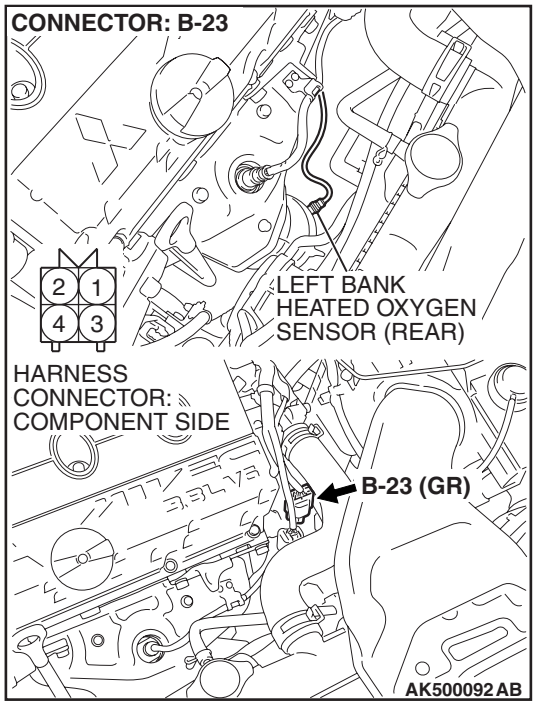


STEP 5. Check harness connector B-23 at left bank heated oxygen sensor (rear) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (rear) connector B-23 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 96) because of open circuit or 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 6. Check harness connector B-23 at left bank heated oxygen sensor (rear) for damage.

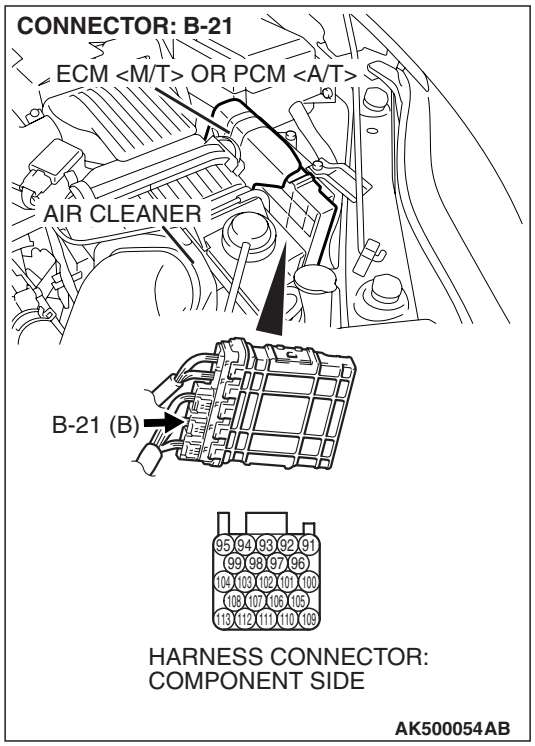
Q: Is the harness connector in good condition?

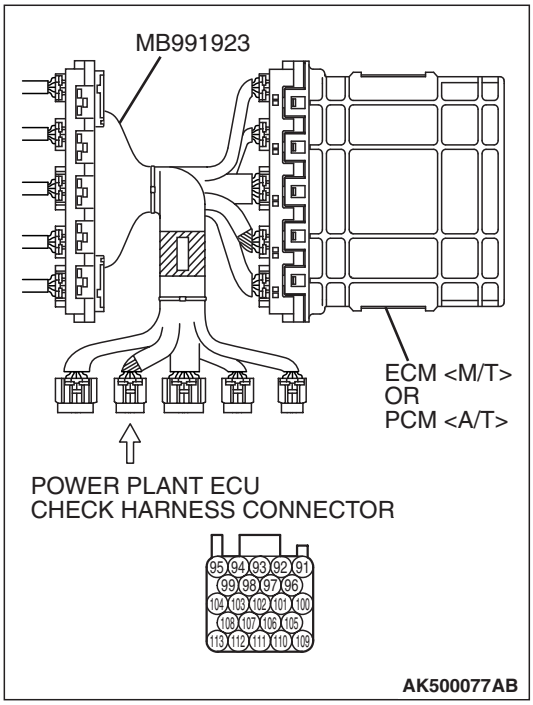
YES : Go to Step 7.

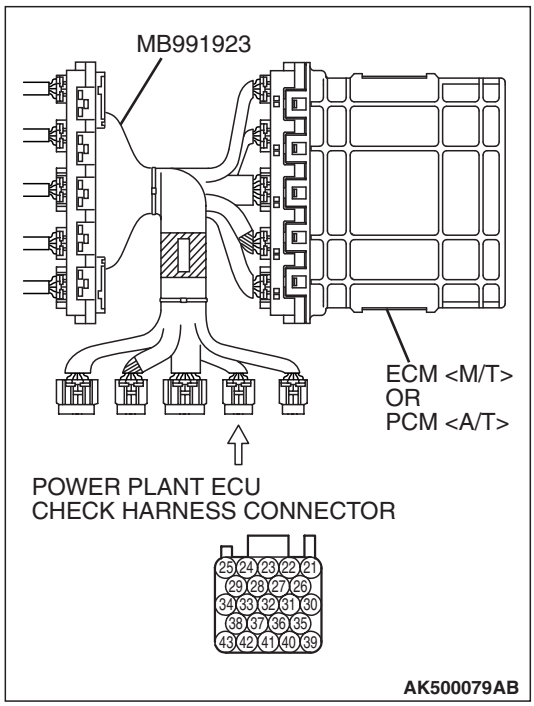
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

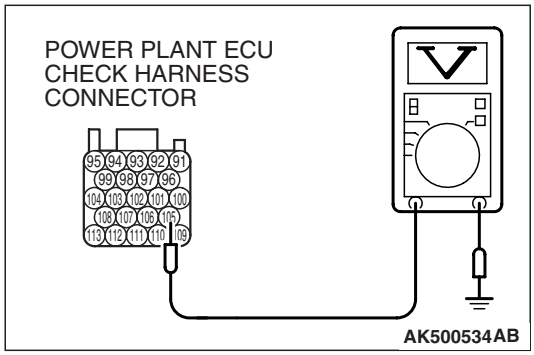
STEP 7. Measure the sensor offset voltage at ECM <M/T> or PCM <A/T> connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.







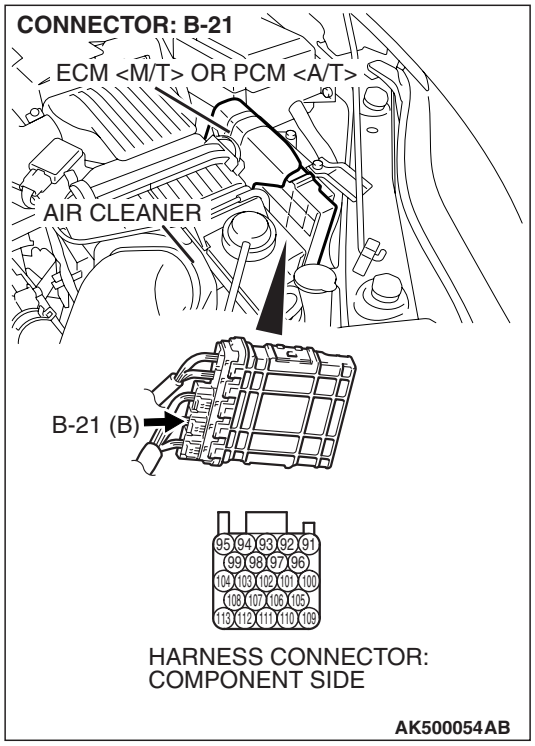


(3) Measure the voltage between terminal No. 105 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

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

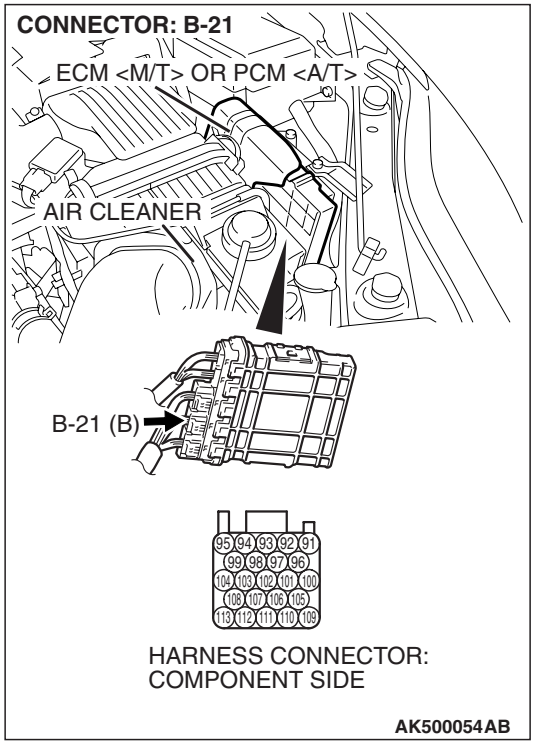


STEP 8. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 105) because of open circuit or 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.

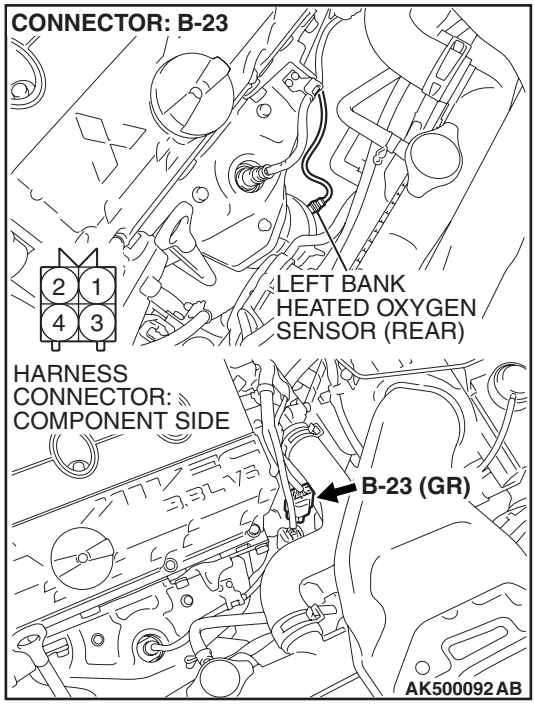


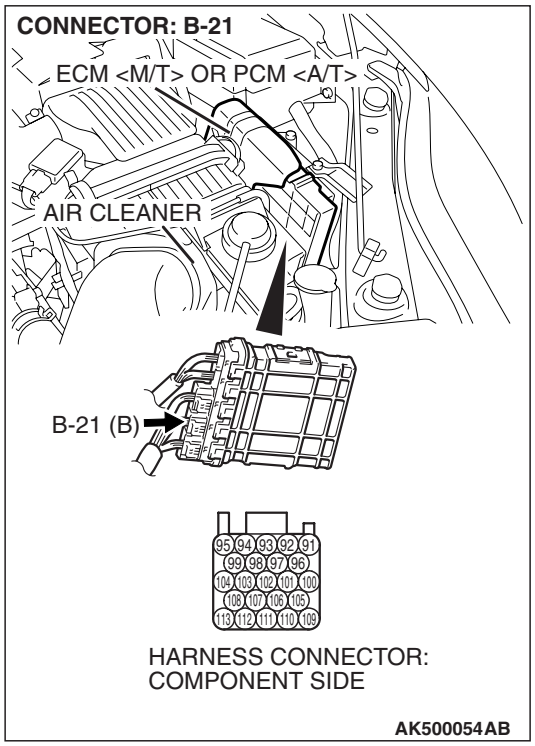
STEP 9. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 left bank heated oxygen sensor (rear) connector B-23 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 105).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

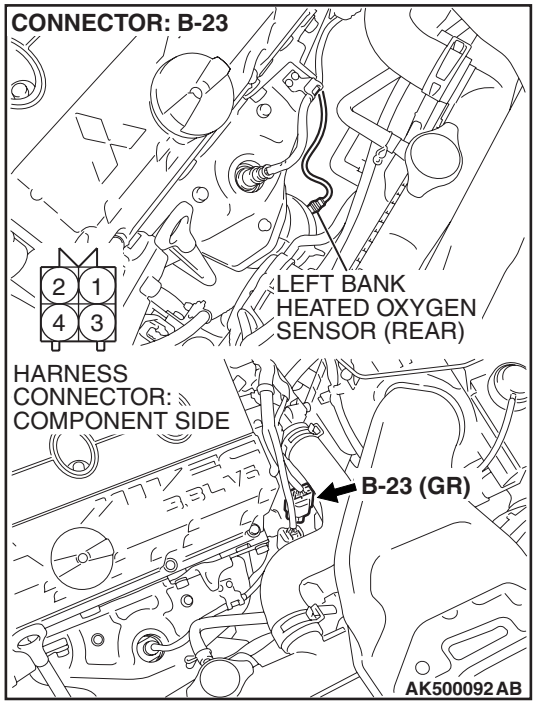
NO : Repair it. Then go to Step 13.

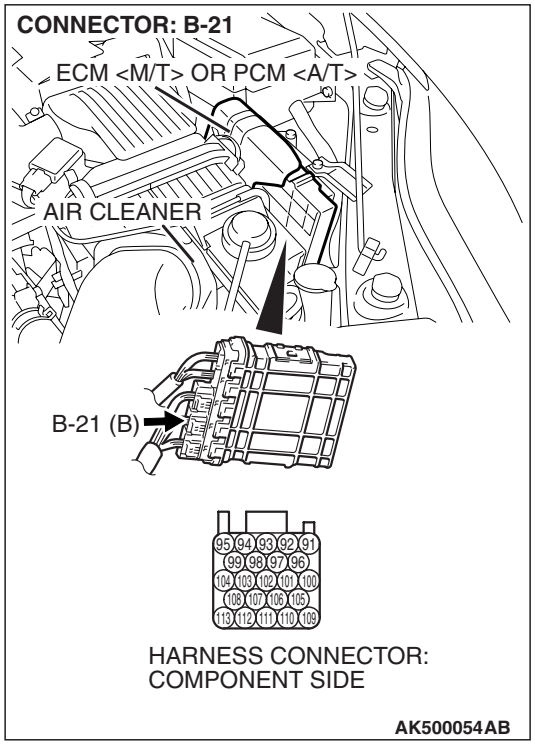
STEP 11. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (rear) connector B-23 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 96).

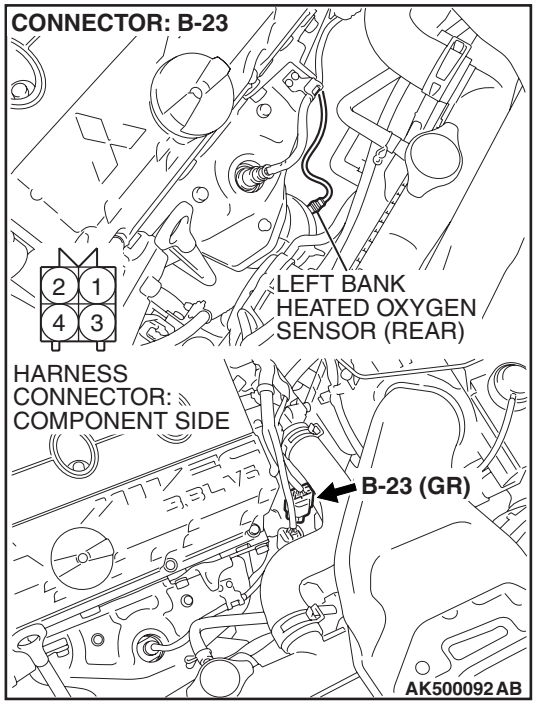
Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 13.

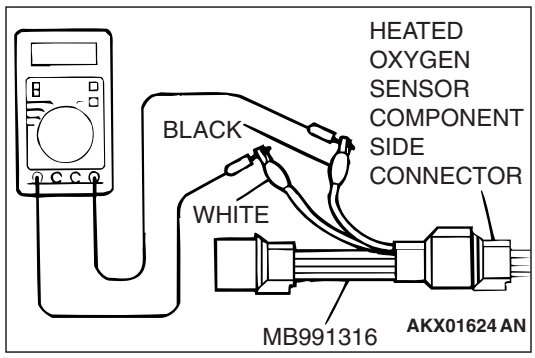






STEP 12. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-23 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Drive at 50 km/h (31 mph) or more for 10 minutes.



(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
   a. Transaxle: 2nd speed (A/T: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more

   Standard value: 0.6 – 1.0 volts

NOTE: If the sufficiently high temperature [of approximate 400 °C (752 °F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

Q: Is the voltage between 0.6 and 1.0 volts?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 13.
NO : Replace the left bank heated oxygen sensor (rear). 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 Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

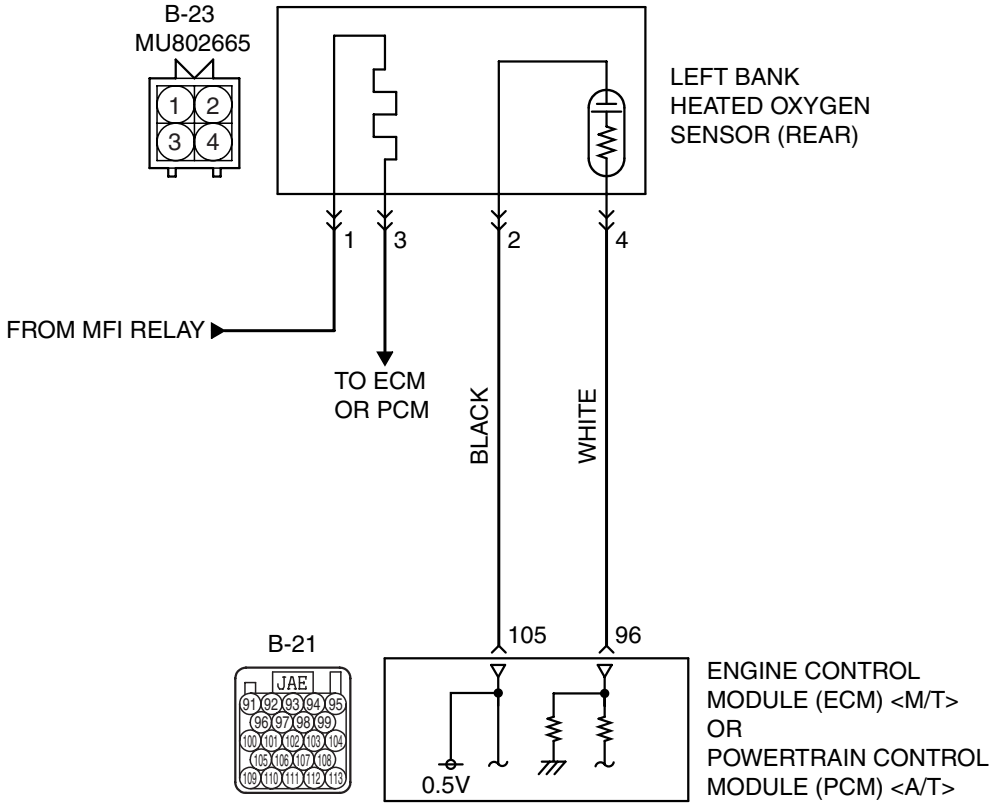
Q: Is DTC P0157 set?

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

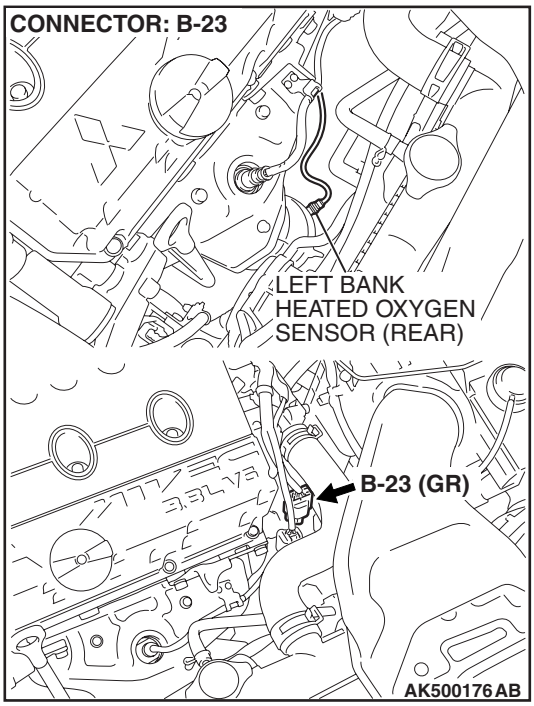
TSB Revision

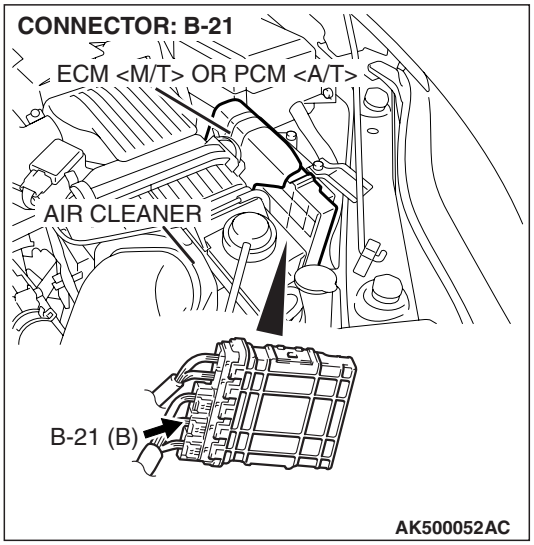
DTC P0158: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



AK403973





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 96) 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 ECM <M/T> or PCM <A/T> (terminal No. 105).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) output voltage is over the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

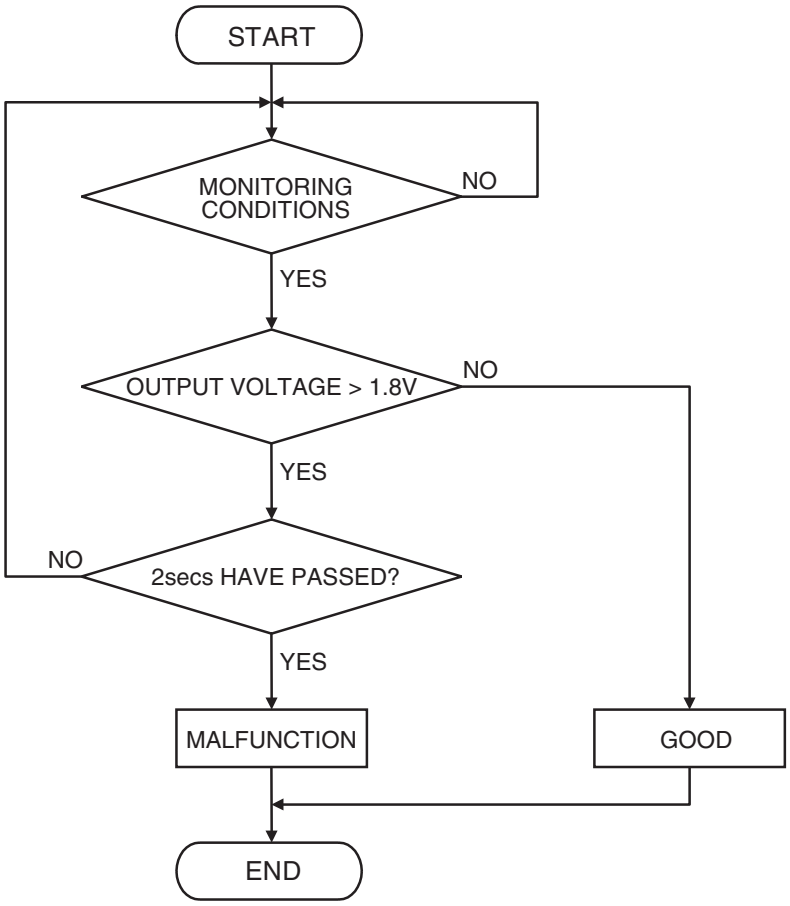
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500035

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor off set voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Left bank heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

- Short circuit in left bank heated oxygen sensor (rear) output line.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:

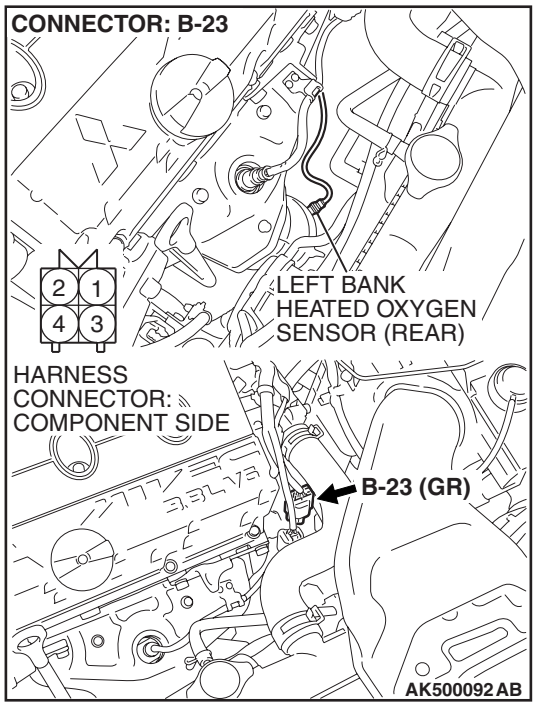
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

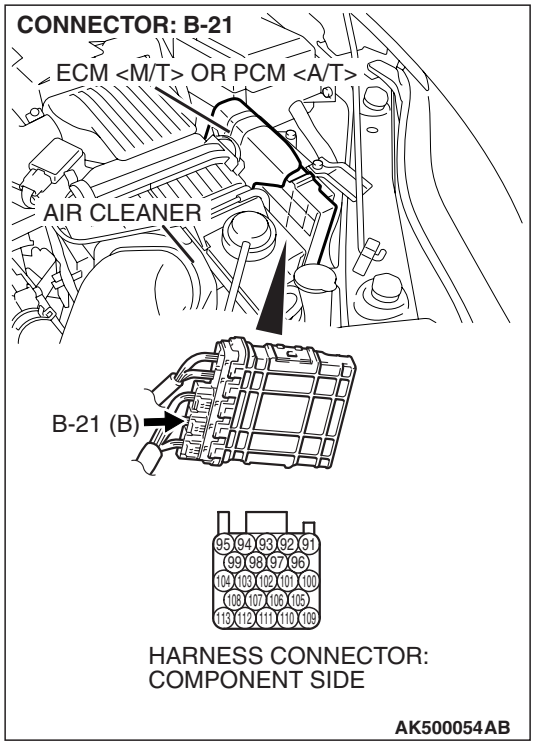
STEP 1. Check harness connector B-23 at left bank heated oxygen sensor (rear) and harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

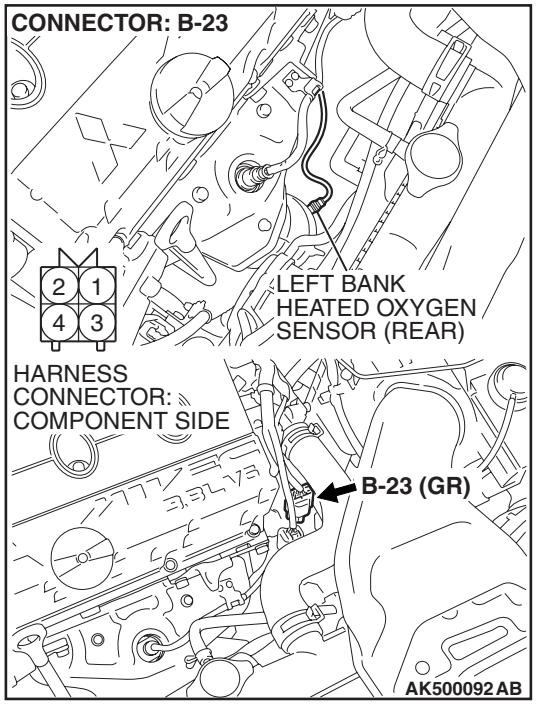
YES : Go to Step 2.

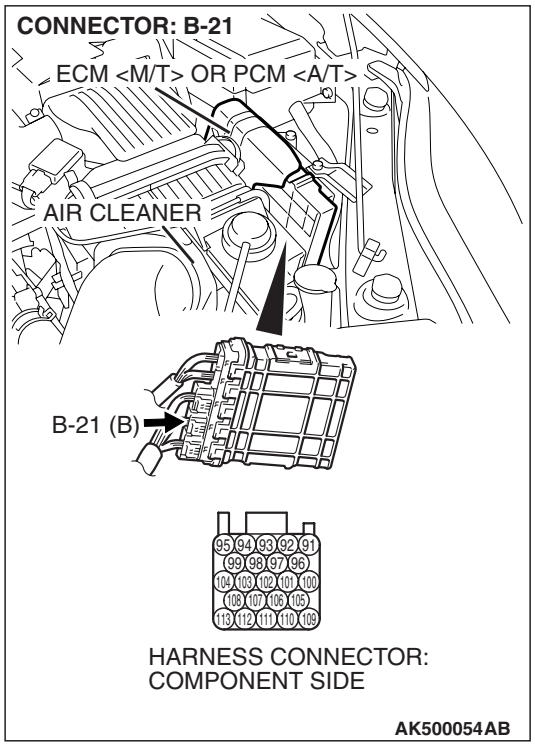
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.





TSB Revision





STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (rear) connector B-23 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 96).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

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

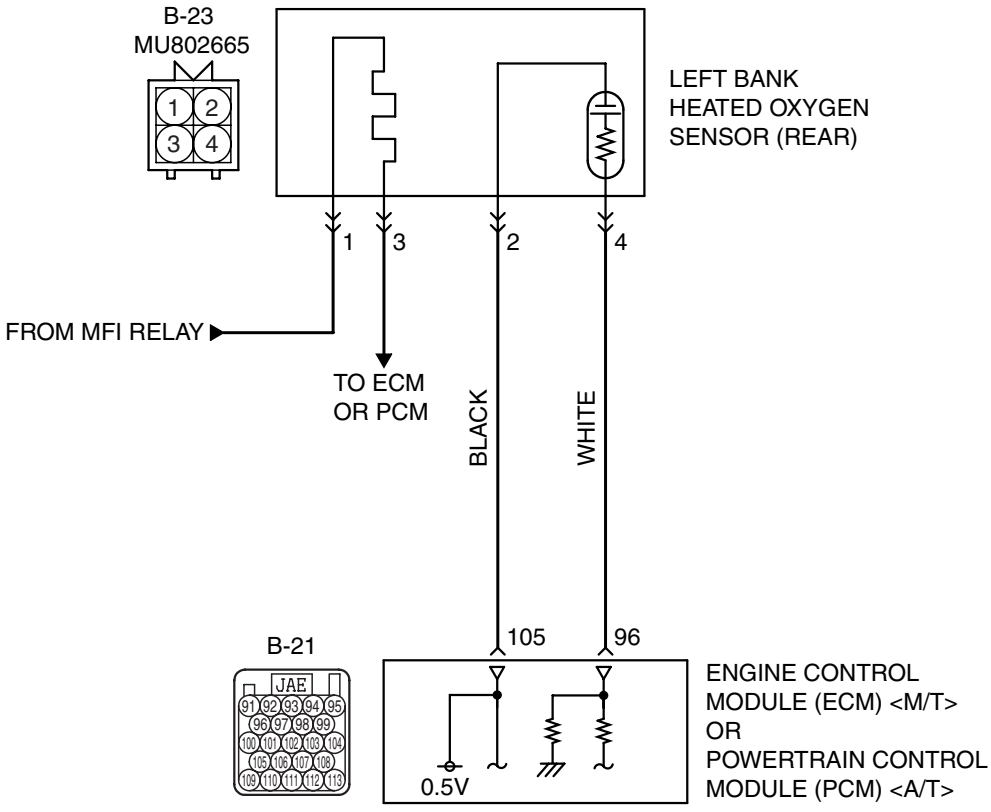
Q: Is DTC P0158 set?

YES : Retry the troubleshooting.

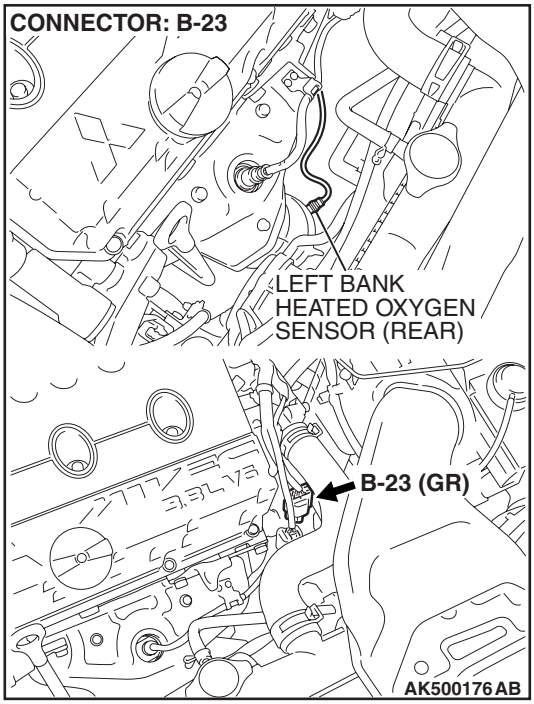
NO : The inspection is complete.

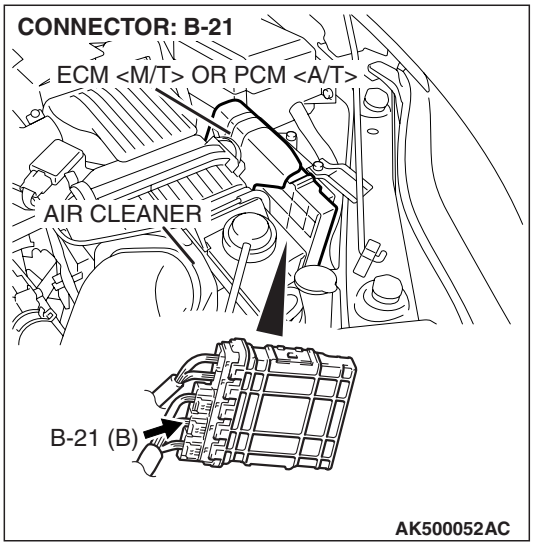
DTC P0159: Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



AK403973





CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 96) 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 ECM <M/T> or PCM <A/T> (terminal No. 105).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the left bank heated oxygen sensor (rear) output line.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

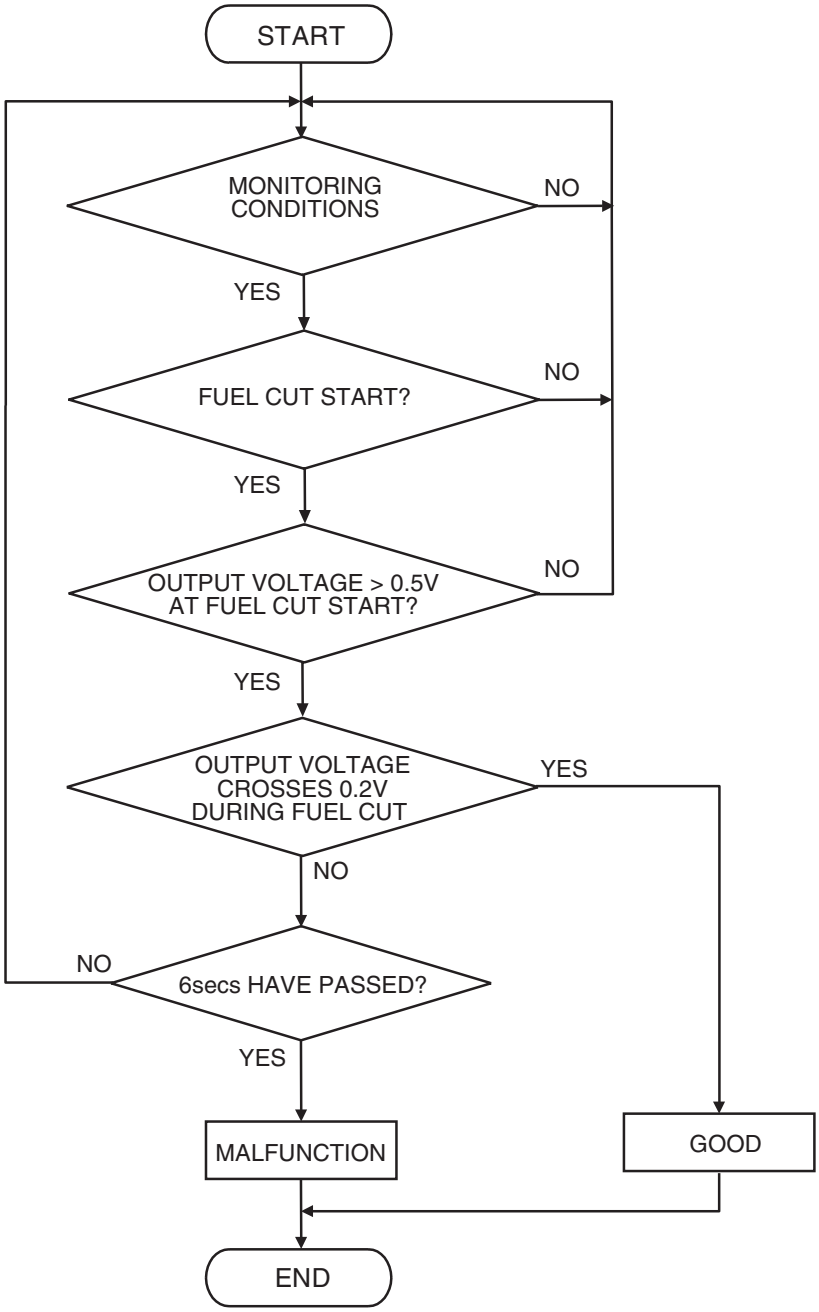
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK500043

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The left bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.

Judgement Criterion

- Left bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13B-6.

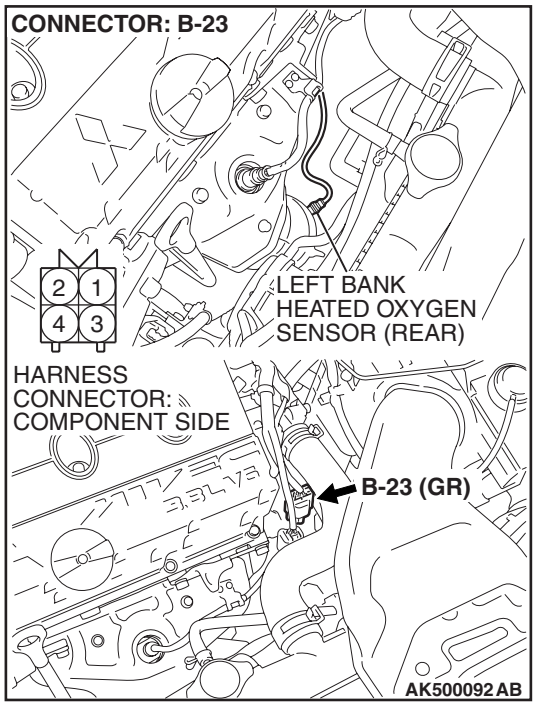
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Replace the left bank heated oxygen sensor (rear).

(1) Replace the left bank heated oxygen sensor (rear).
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

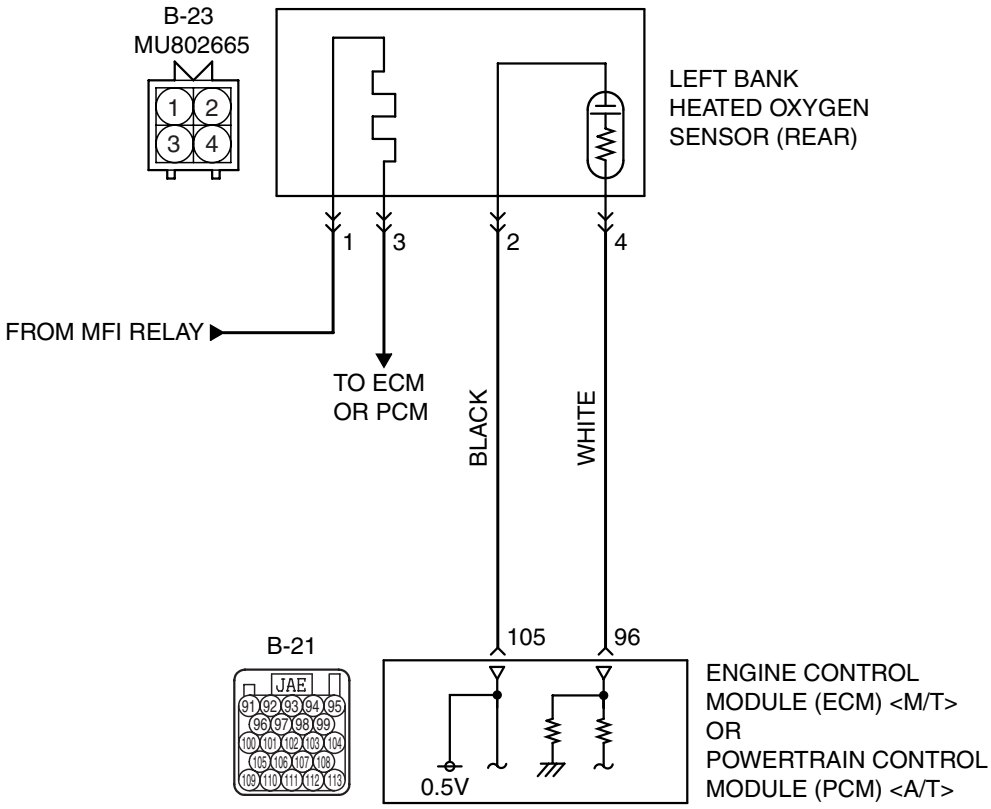
Q: Is DTC P0159 set?

YES : Refer to, P0157 –Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-385, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-401.

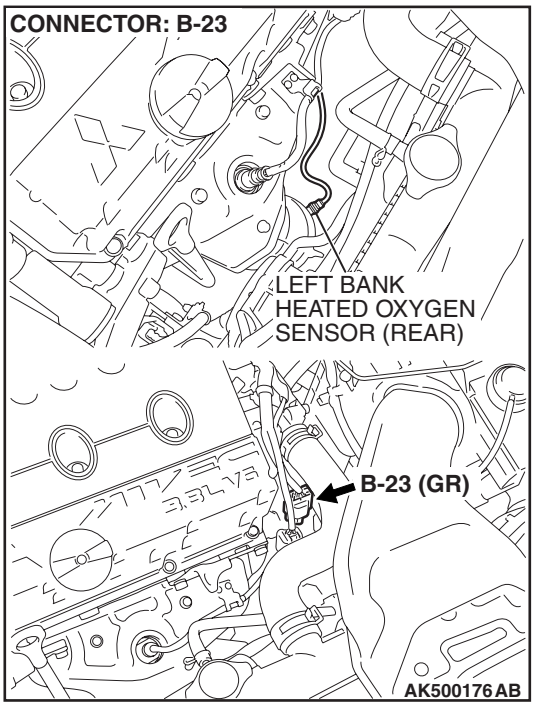
NO : The inspection is complete.

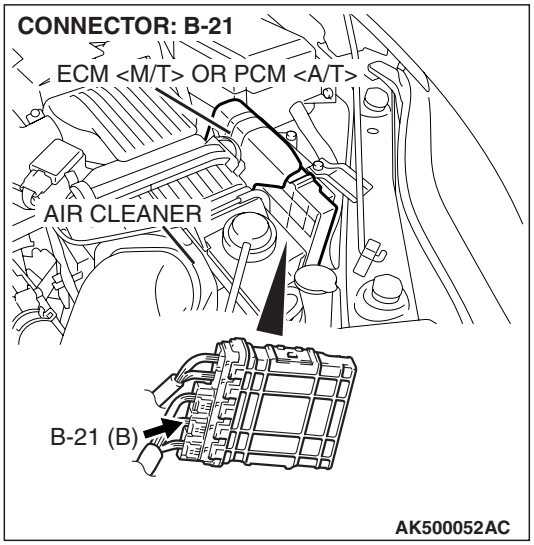
DTC P0160: Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



AK403973





TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM <M/T> or the PCM <A/T> (terminal No. 96) 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 ECM <M/T> or PCM <A/T> (terminal No. 105).
- The ECM <M/T> or the PCM <A/T> applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

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 ECM <M/T> or the PCM <A/T> checks for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (rear) output voltage does not change during specified.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

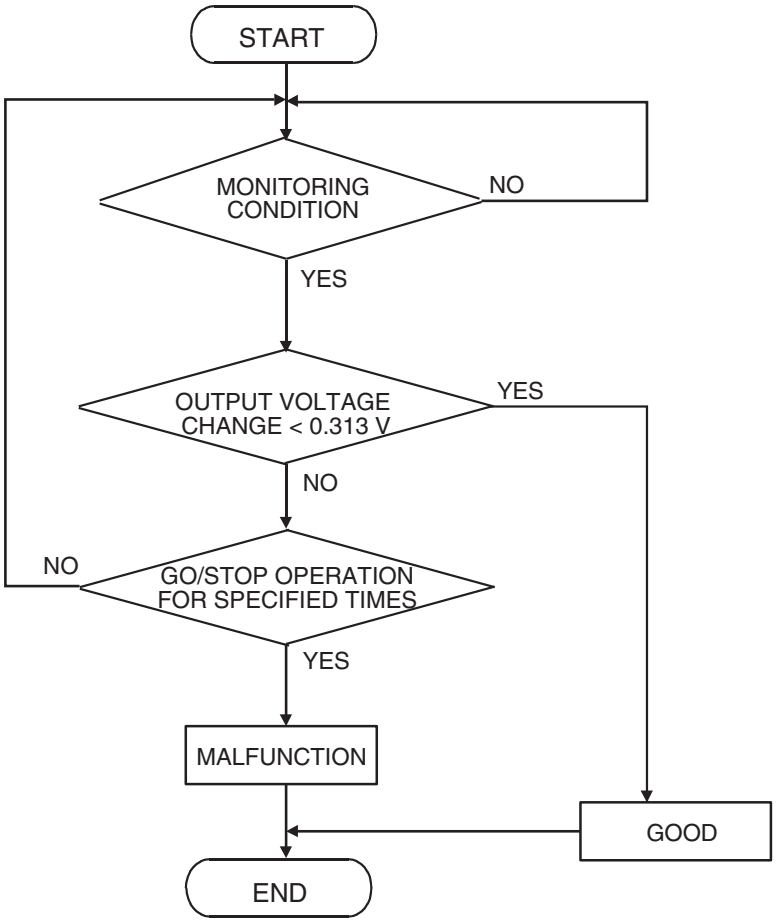
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302399

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The left bank heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- 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 (19 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 (1.0 mph).

Judgement Criterion

- 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 41 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13B-6.

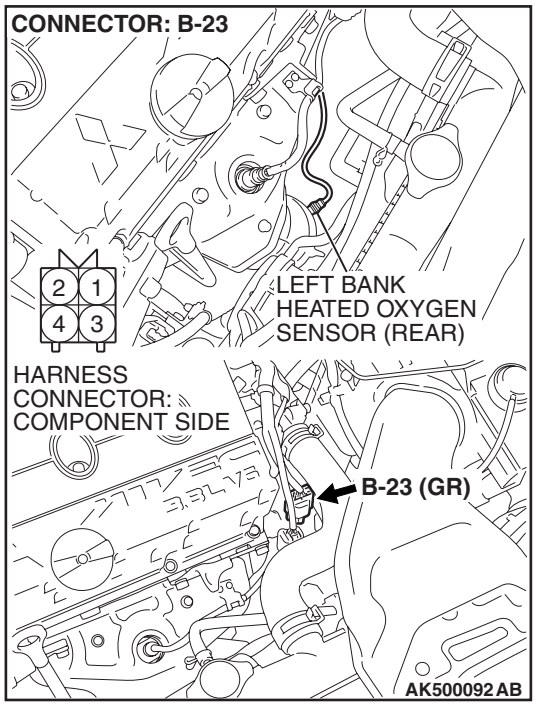
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Replace the left bank heated oxygen sensor (rear).

(1) Replace the left bank heated oxygen sensor (rear).
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0160 set?

YES : Refer to, P0157 –Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-385, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-401.

NO : The inspection is complete.

NEXT>>