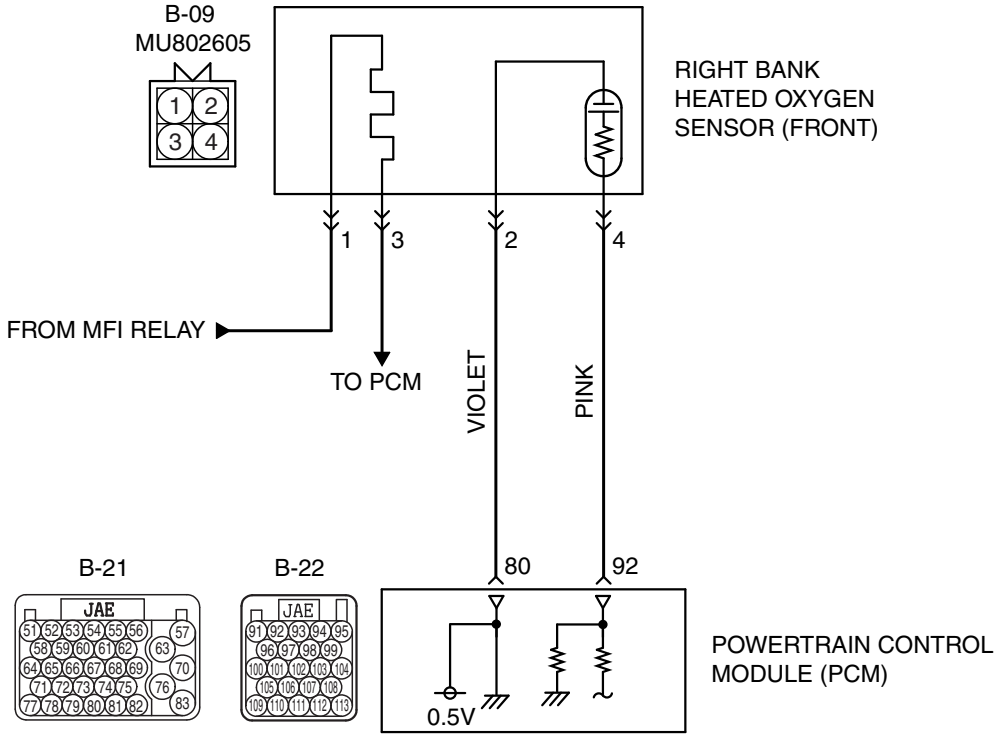
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



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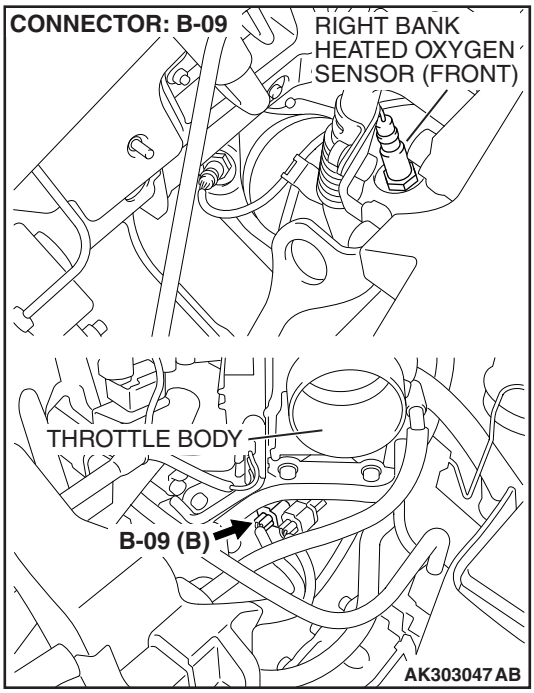

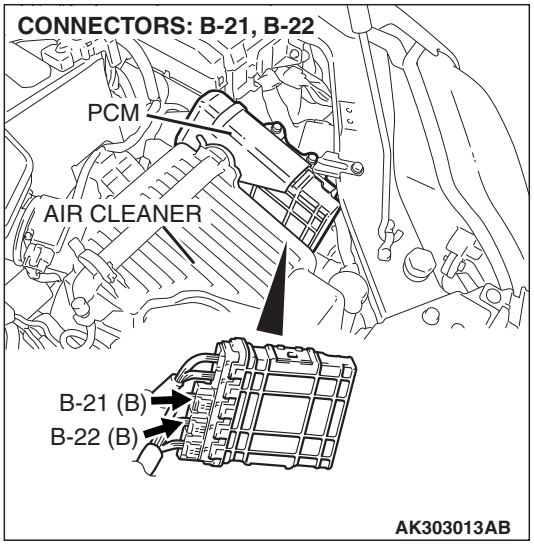

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CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 80).
- The PCM 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 PCM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for 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)

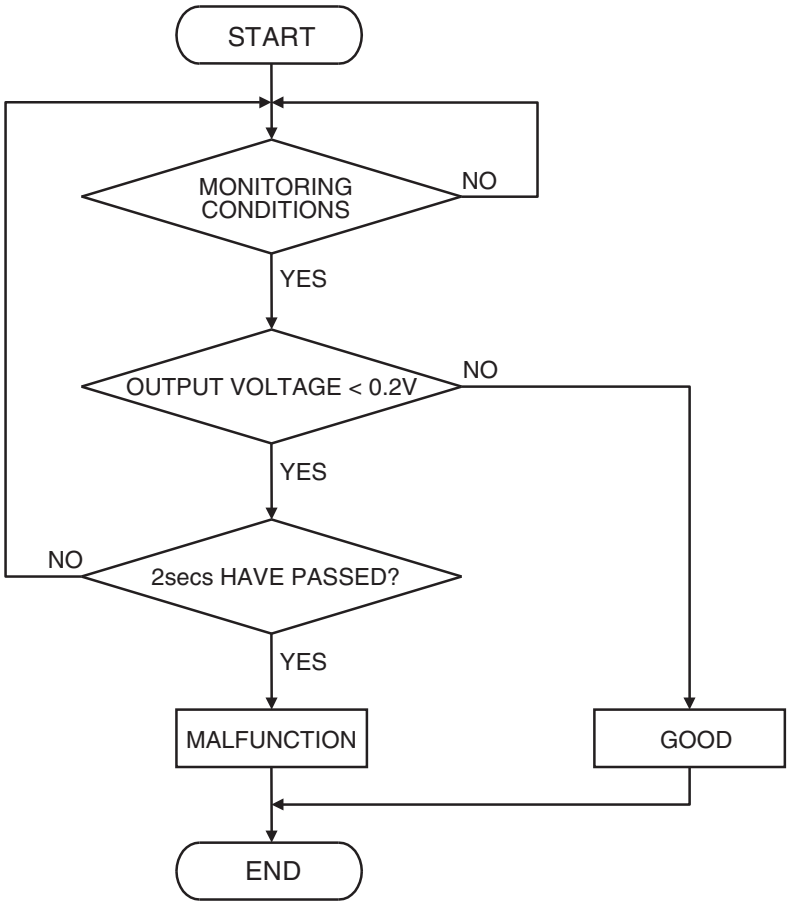
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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



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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.
- More than 180 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 for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-5.

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) circuit, or harness damage.
- Connector damage.
- PCM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ 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.

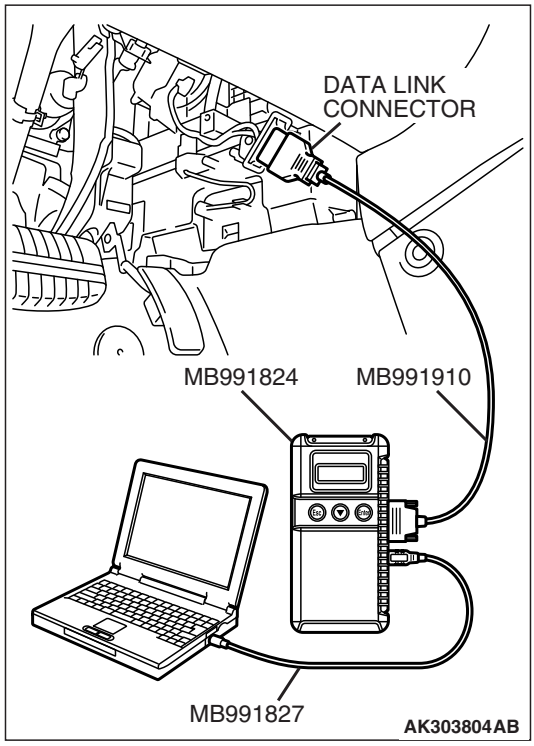
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

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

Q: Is the sensor operating properly?

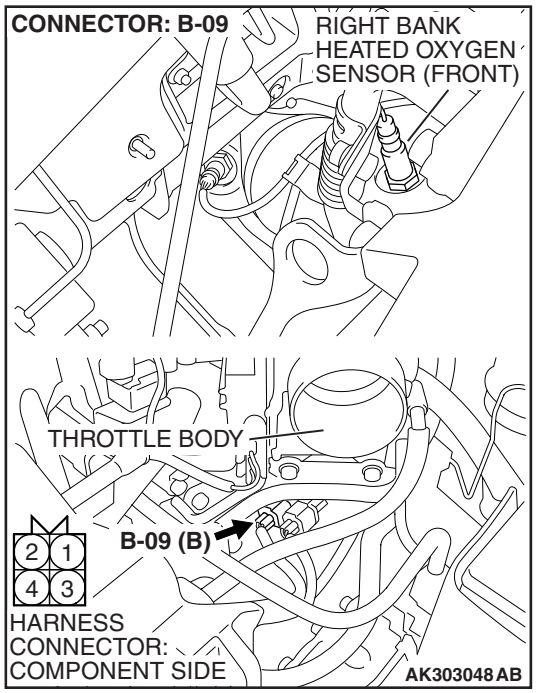
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

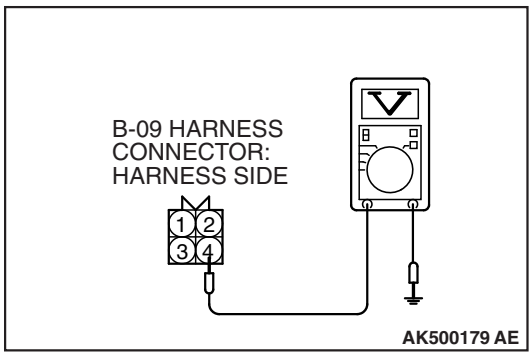
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at right bank heated oxygen sensor (front) connector B-09 by backprobing

(1) Do not disconnect the connector B-09.
(2) Start the engine and run at idle.



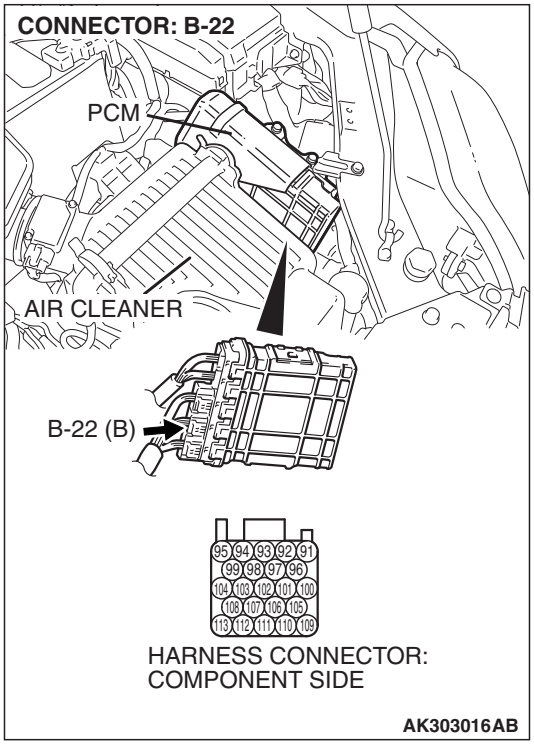


(3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

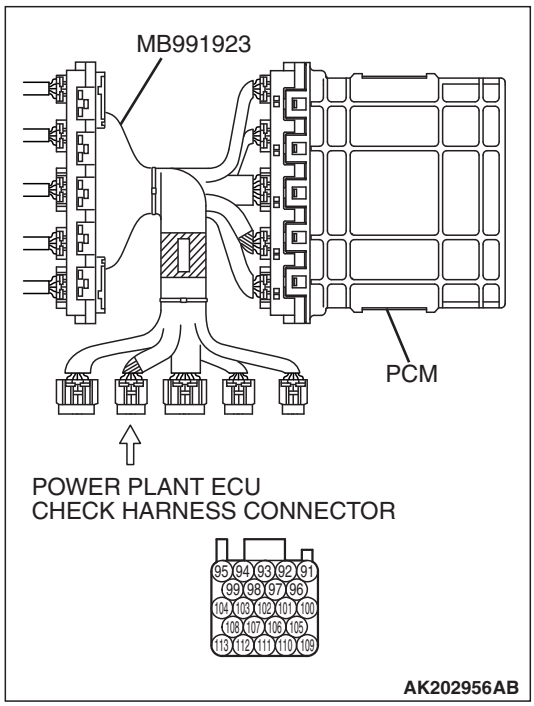
Q: Is the measured voltage within the specified range?

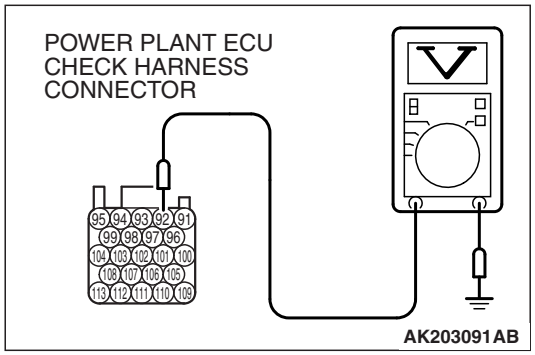
YES : Go to Step 3.
NO : Go to Step 7.



STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



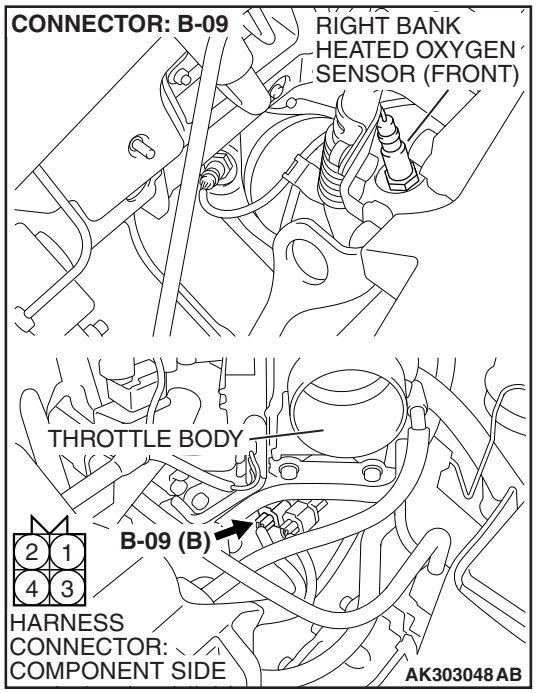


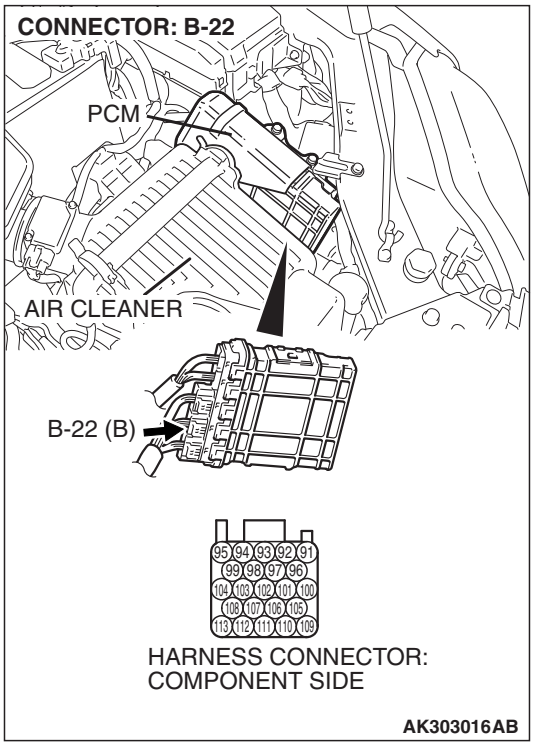
(3) Measure the voltage between terminal No. 92 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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



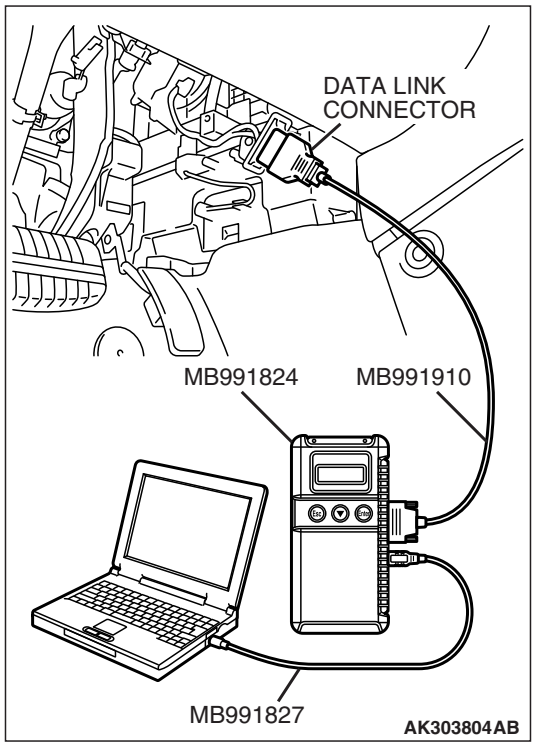


STEP 4. Check harness connector B-09 at right bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 14.



STEP 5. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ 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.

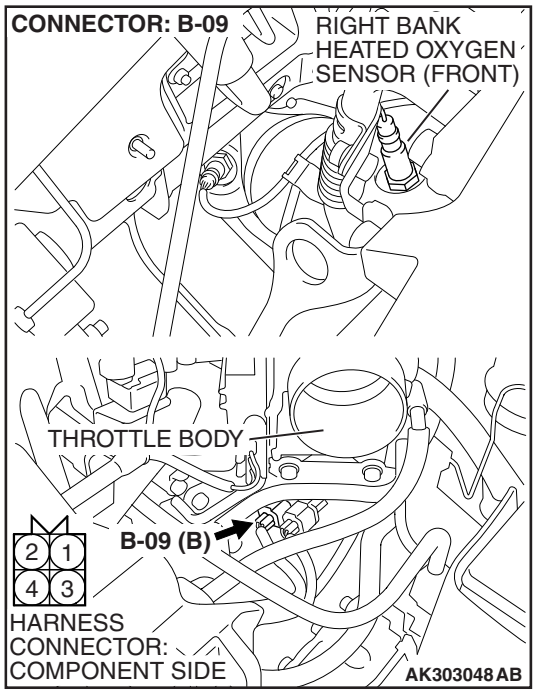
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

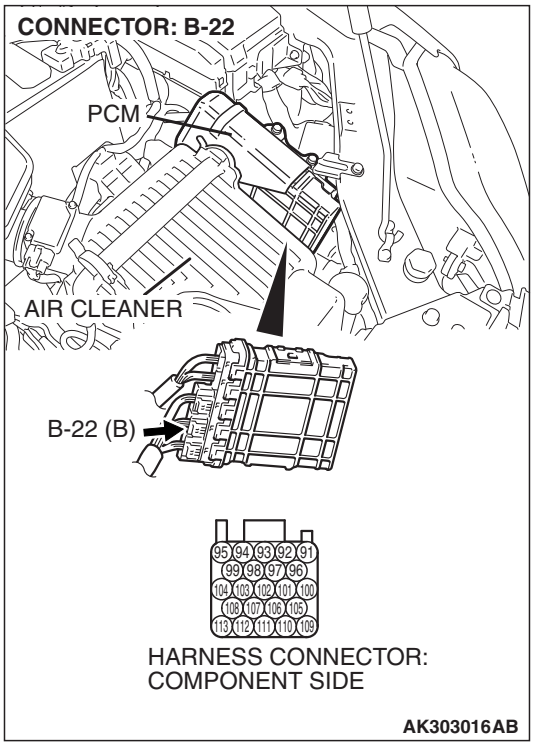
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.



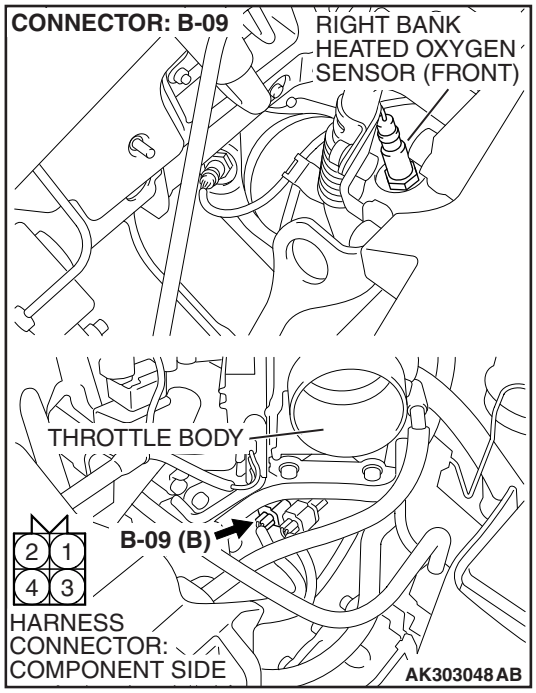


STEP 6. Check harness connector B-09 at right bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-09 (terminal No. 4) and PCM connector B-22 (terminal No. 92) because of open circuit or harness damage. Then go to Step 14.

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

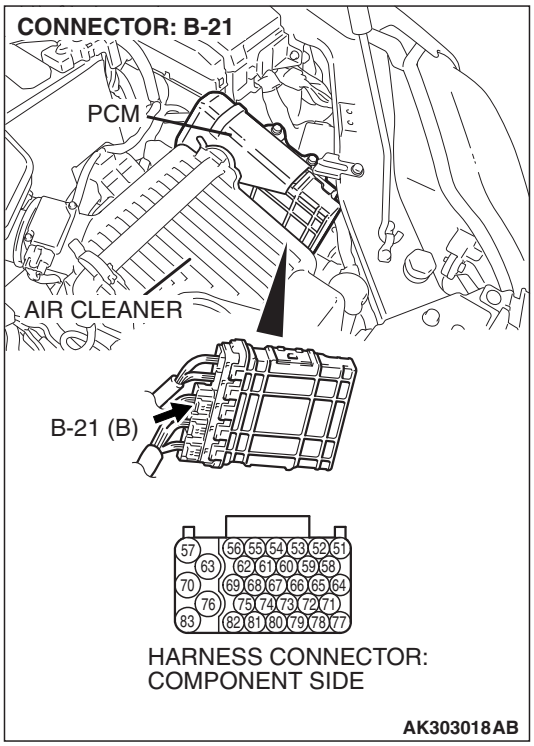


STEP 7. Check harness connector B-09 at right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

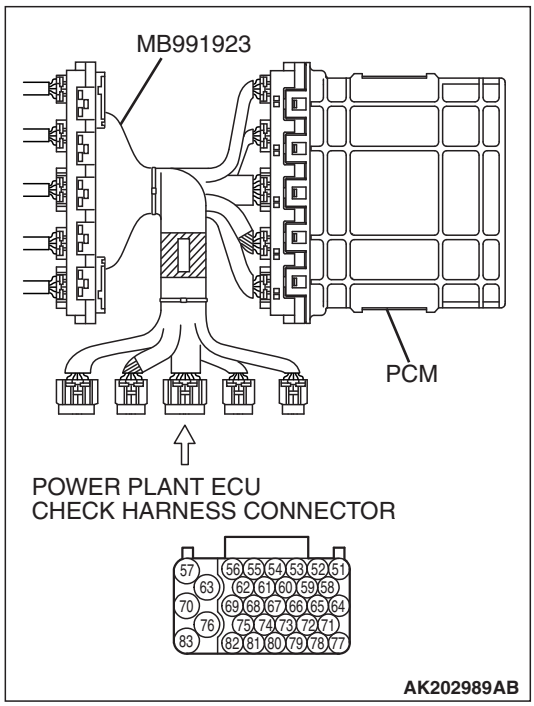
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

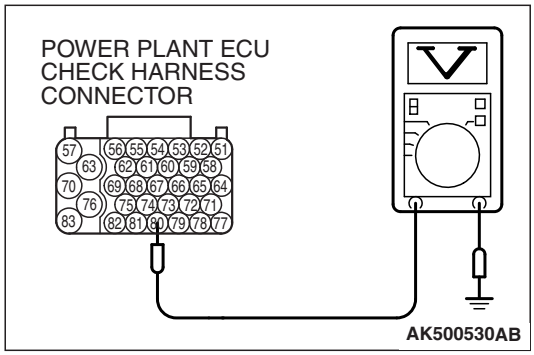


STEP 8. Measure the sensor offset voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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



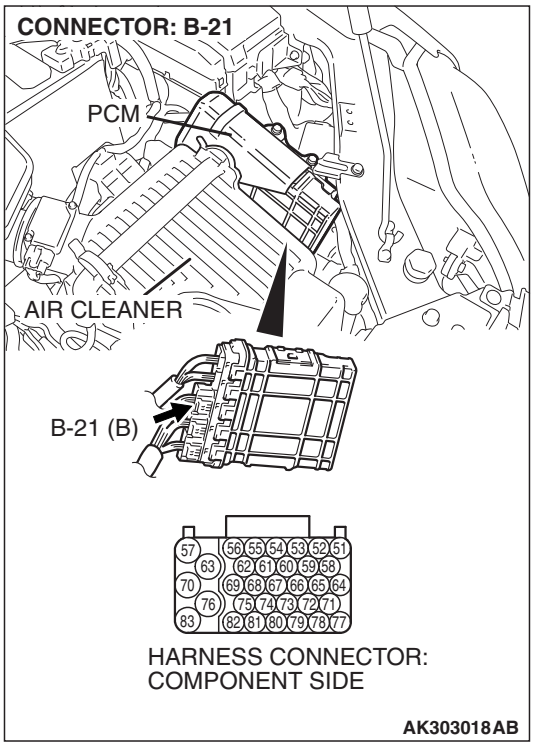


(3) Measure the voltage between terminal No. 80 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(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 10.
NO : Go to Step 9.

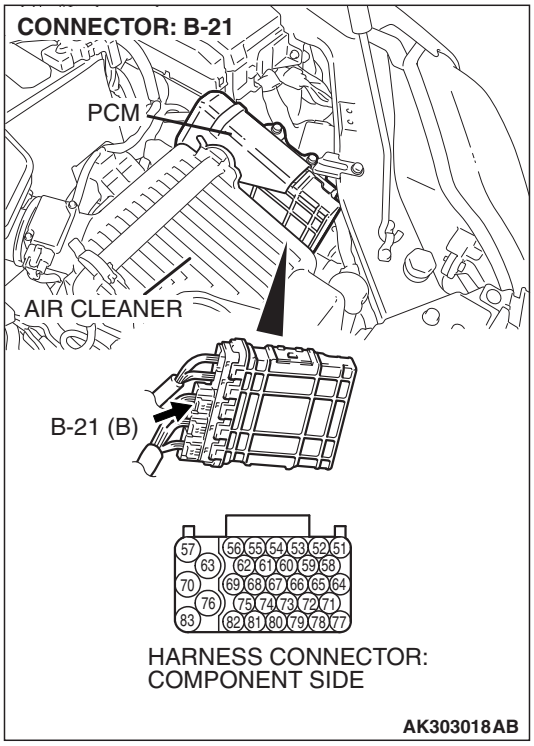


STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-09 (terminal No. 2) and PCM connector B-21 (terminal No. 80) because of short circuit to ground. Then go to Step 14.

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



STEP 10. Check harness connector B-21 at PCM 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.

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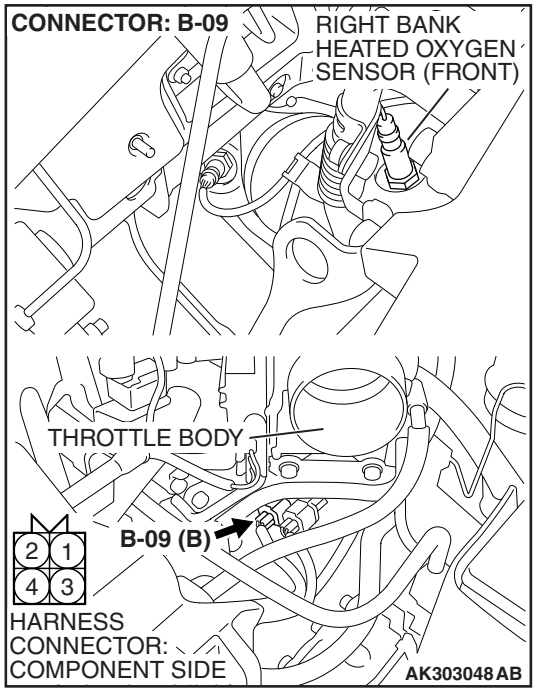
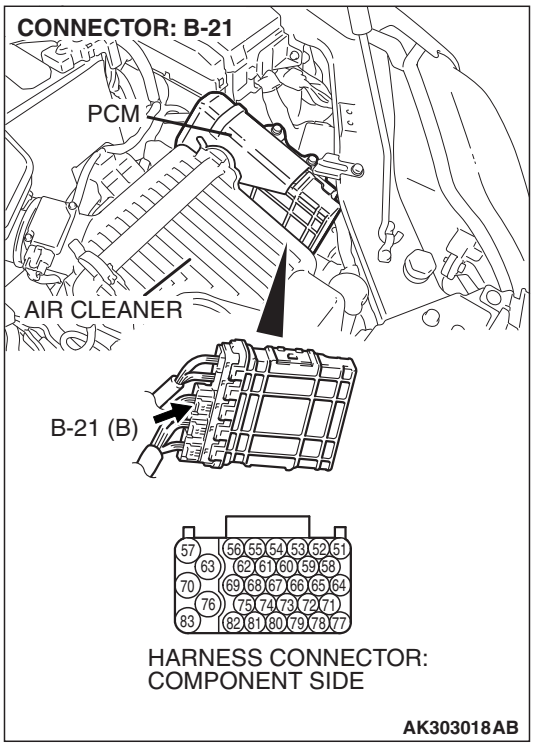


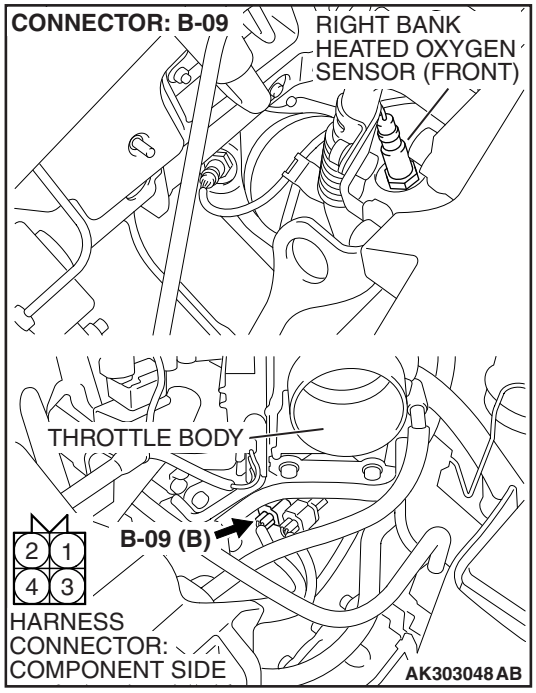


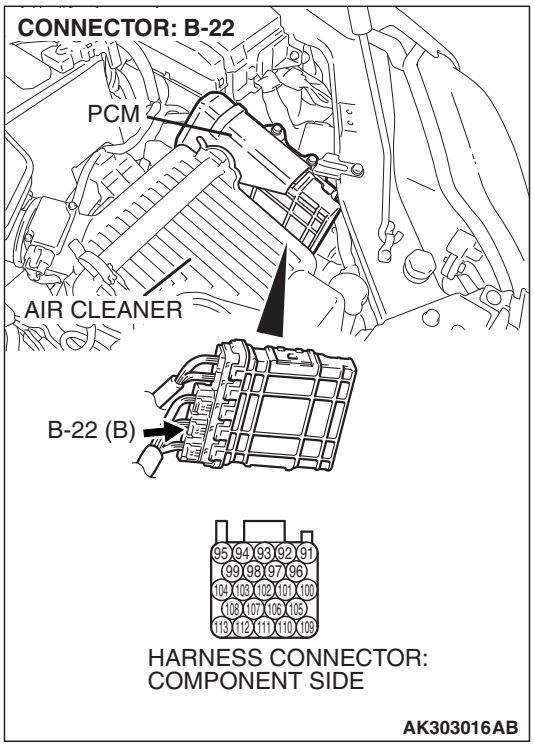
STEP 11. Check for open circuit or harness damage between right bank heated oxygen sensor (front) connector B-09 (terminal No. 2) and PCM connector B-21 (terminal No. 80).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.



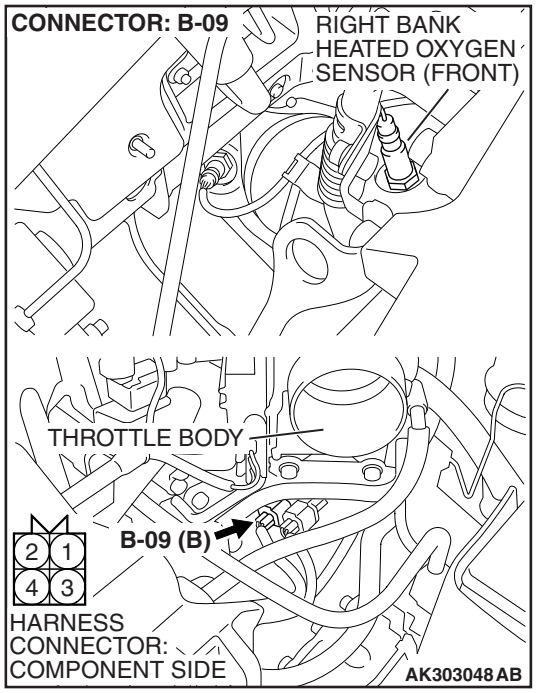


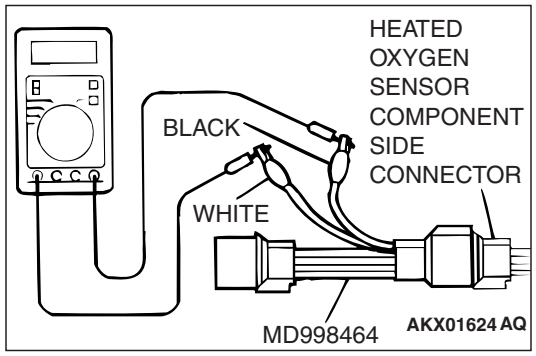
STEP 12. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (front) connector B-09 (terminal No. 4) and PCM connector B-22 (terminal No. 92).

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 right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-09 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 2,000 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 V

⚠ 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 temperature of sensing area does not reach the high temperature [of approximately 400 °C (752 °F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.

NO : Replace the right bank heated oxygen sensor (front). 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 22 P.13B-5.

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

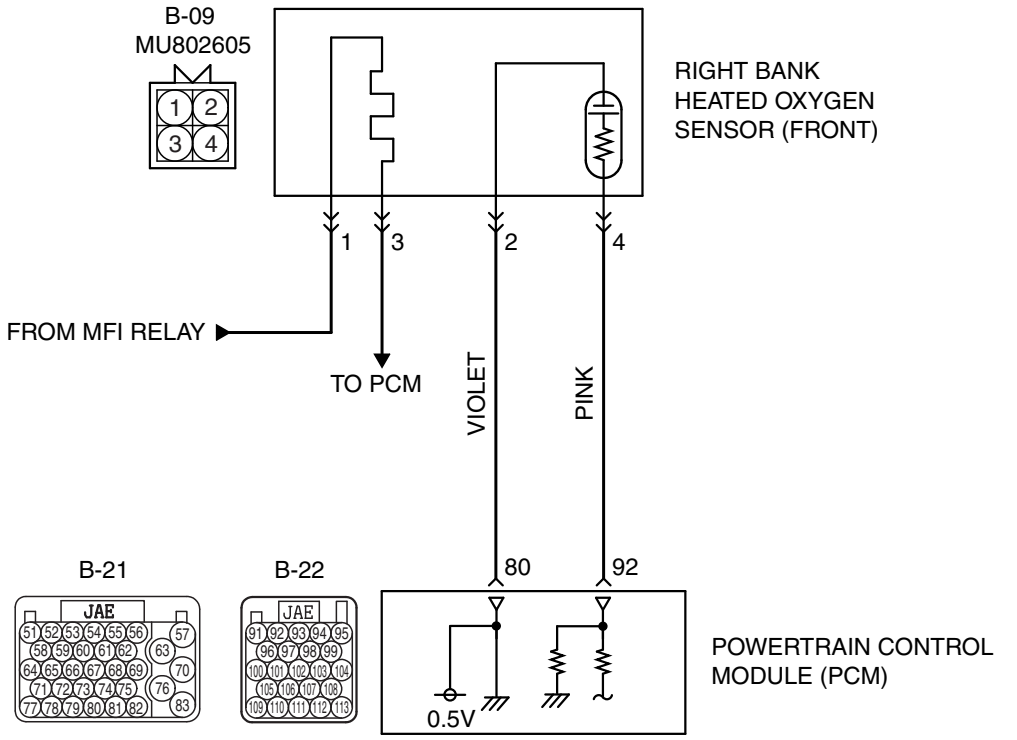
Q: Is DTC P0131 set?

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



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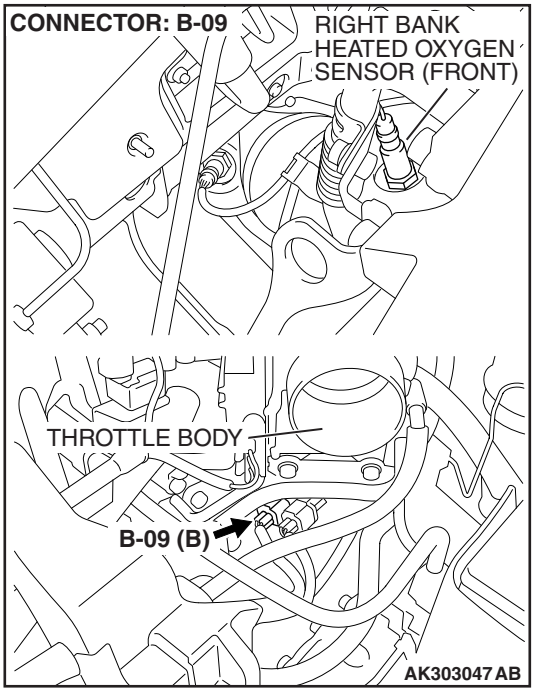
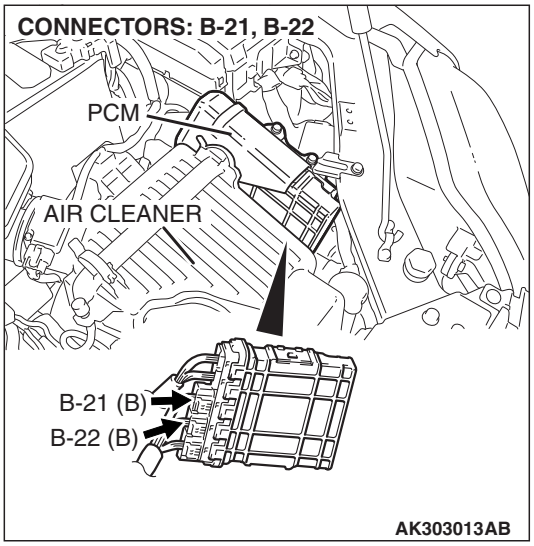




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 80).
- The PCM applies an offset 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 PCM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM checks for 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)

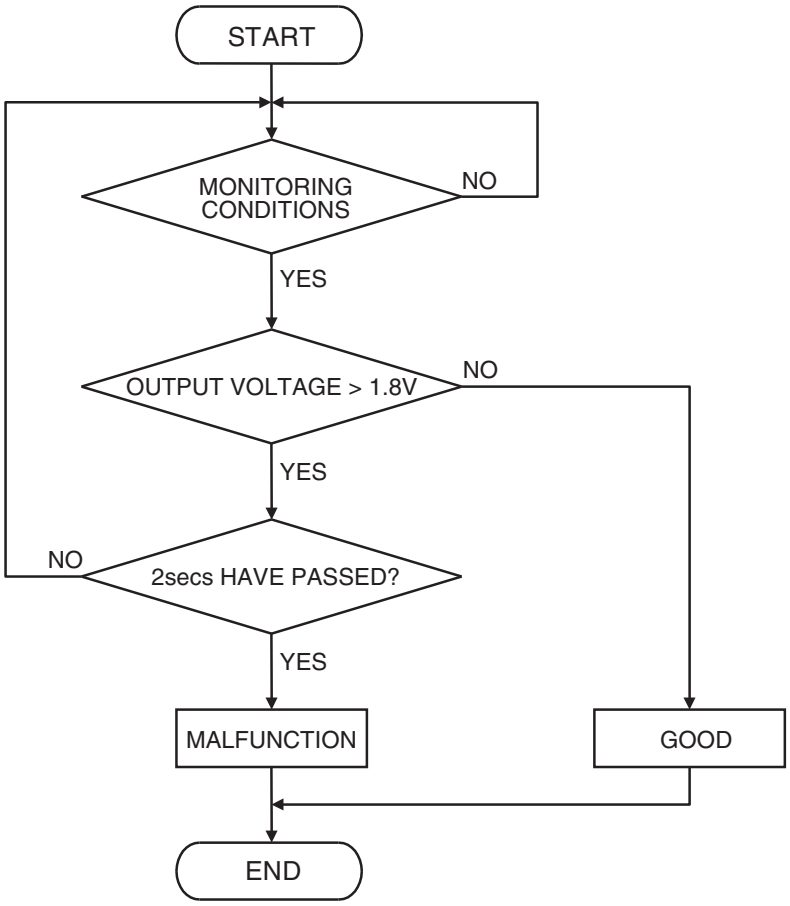
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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



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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.

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 23 P.13B-5.

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.
- PCM failed.

TSB Revision

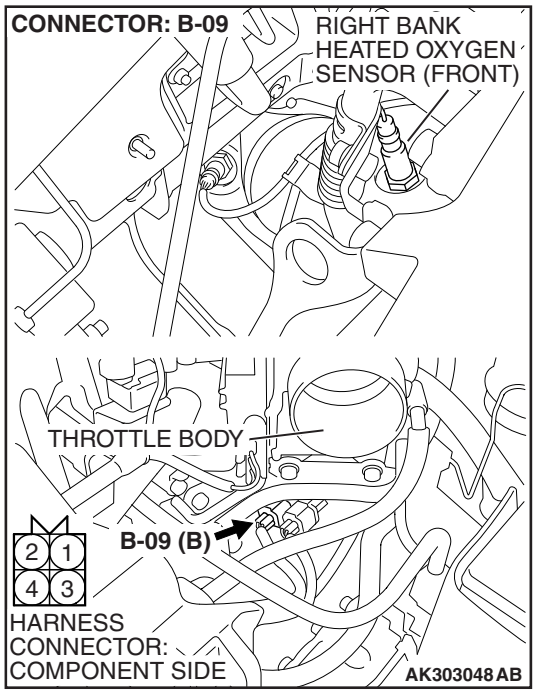
DIAGNOSIS

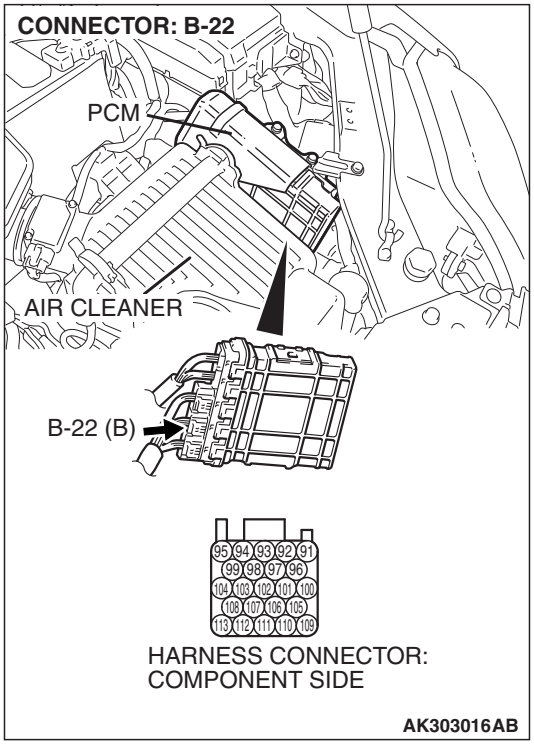
STEP 1. Check harness connector B-09 at right bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

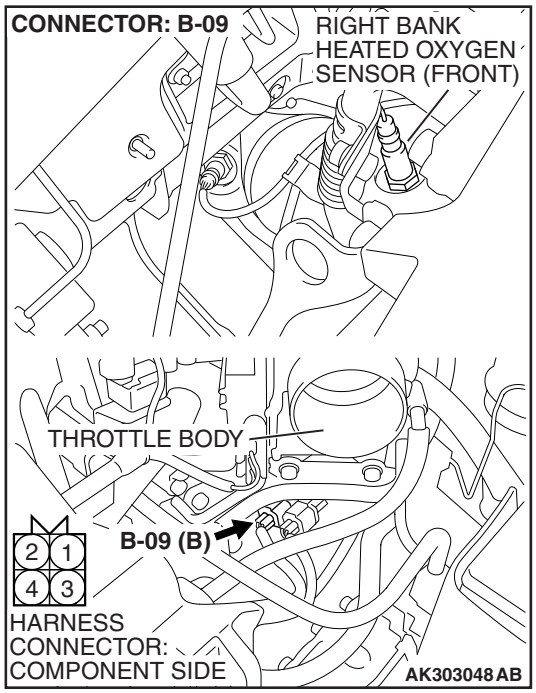
Q: Is the harness connector in good condition?

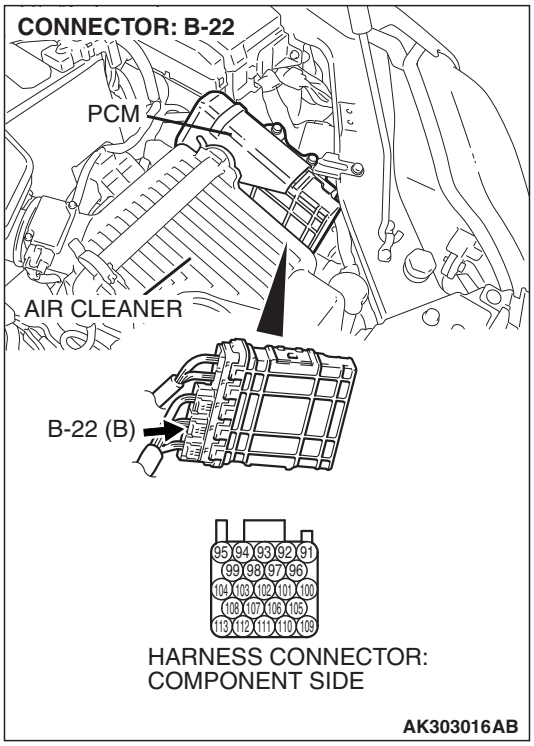
YES : Go to Step 2.

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-09 (terminal No. 4) and PCM connector B-22 (terminal No. 92).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

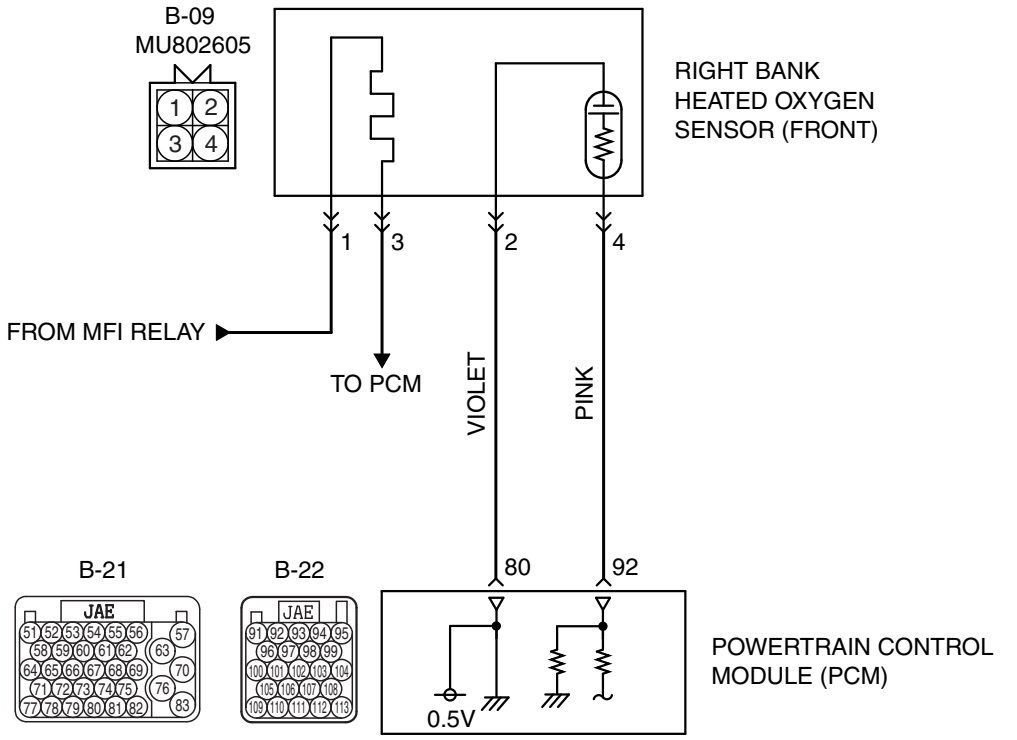
Q: Is DTC P0132 set?

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



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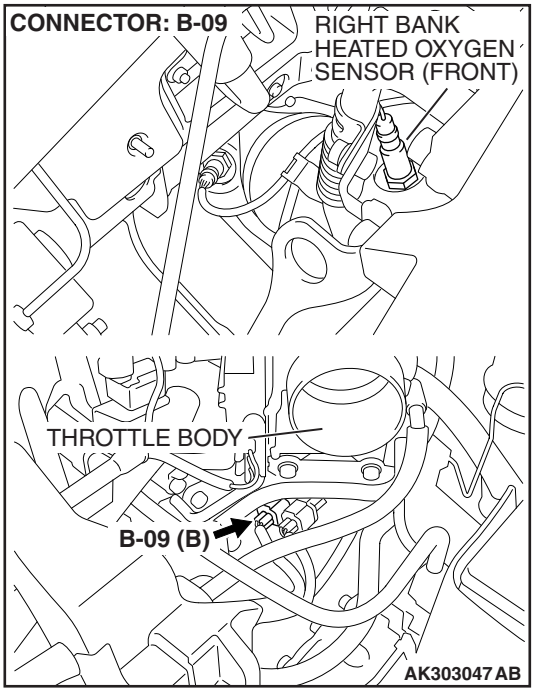
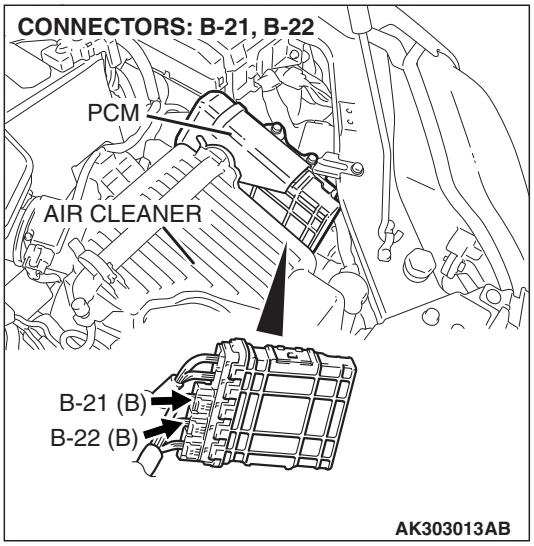




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 80).
- The PCM 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 PCM.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM 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)

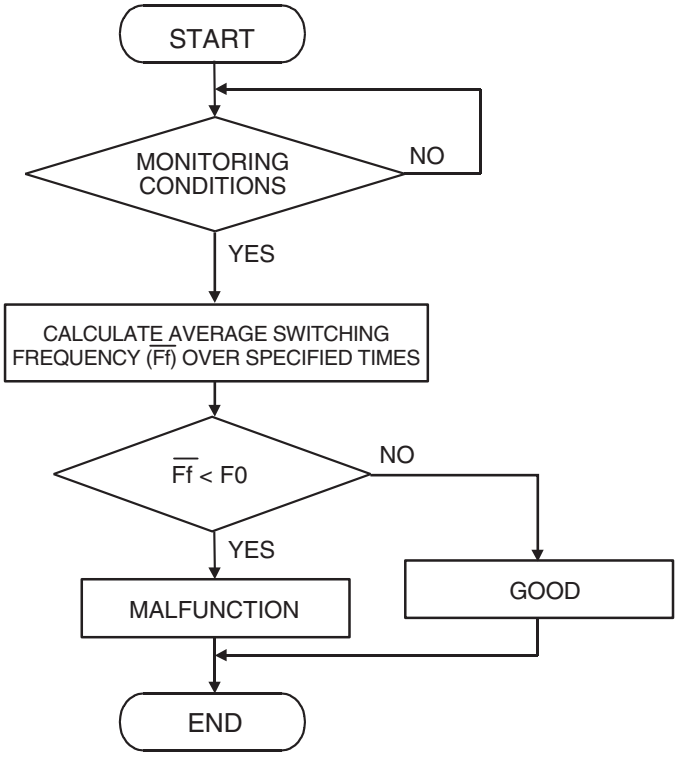
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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 1,300 and 3,000 r/min.
- Volumetric efficiency is between 20 and 65 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is depressed.
- Short-term fuel trim is between –30 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- During the drive cycle, the PCM performs monitoring with the accumulated total time of 12 seconds, 5 times.

Judgement Criteria

- The average of the right bank heated oxygen sensor (front) rich/lean switching frequency is less than 10 times for the accumulated time of 12 seconds.
- The right bank heated oxygen sensor (front) rich/lean switching frequency is less than 20 times for the accumulated time of 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the M.U.T.-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-5.

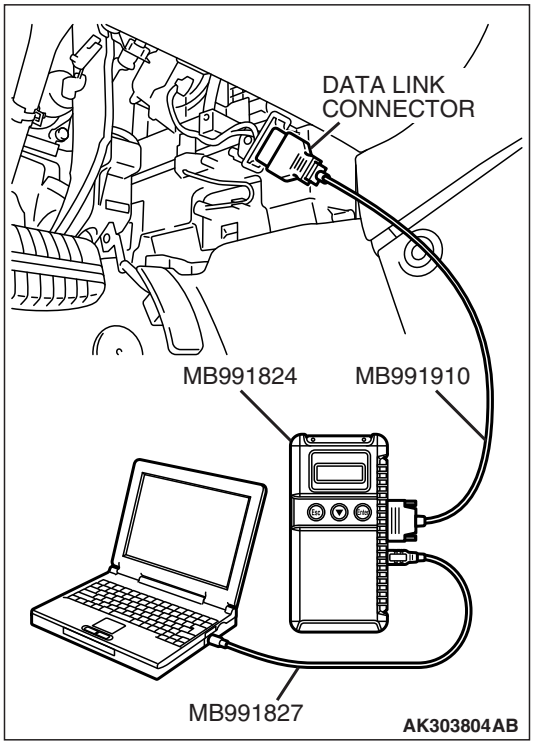
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

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

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ 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.

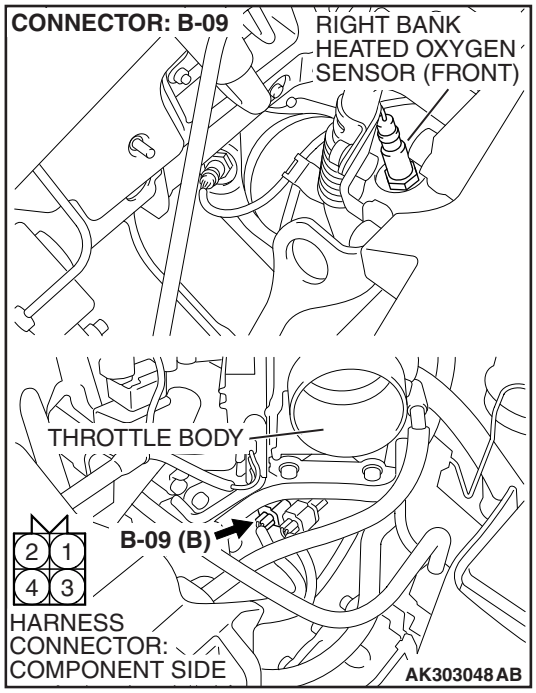
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 –1.0 volt 10 times or more within 12 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

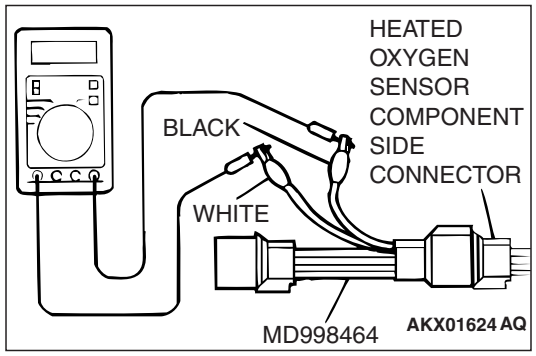
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

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



(1) Disconnect the right bank heated oxygen sensor (front) connector B-09 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 2,000 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 volt 10 times or more within 12 seconds.

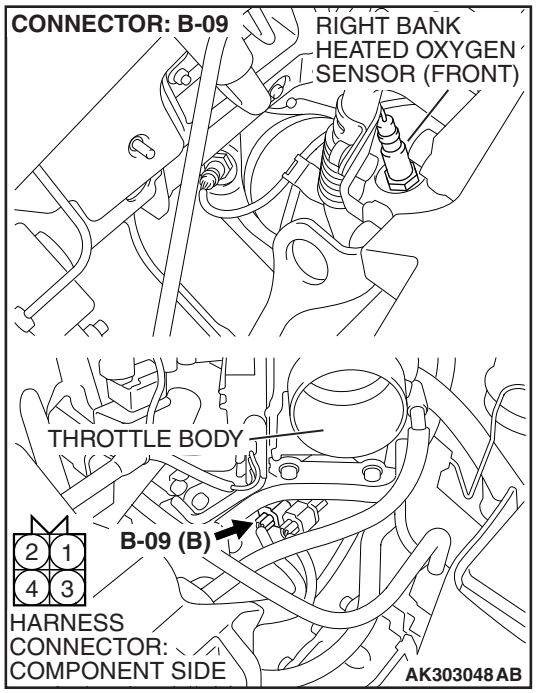
⚠ CAUTION

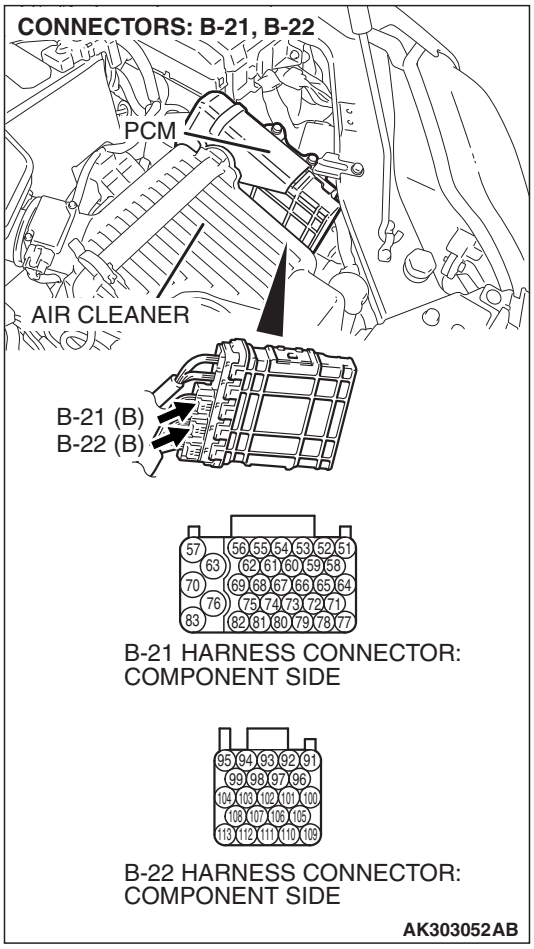
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400 °C (752 °F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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 3.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 4.





STEP 3. Check harness connector B-09 at right bank heated oxygen sensor (front) and harness connector B-21, B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 4.

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

STEP 4. 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-5.

(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 –Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 1) P.13B-304.
- Refer to, DTC P0201P.13B-492, P0203P.13B-515, P0205P.13B-538 –Injector Circuit.

CIRCUIT OPERATION

- Refer to, DTC P0131 –Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 1) P.13B-304.
- Refer to, DTC P0201P.13B-492, P0203P.13B-515, P0205P.13B-538 –Injector Circuit.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the right bank heated 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 lean/rich criteria (about 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)

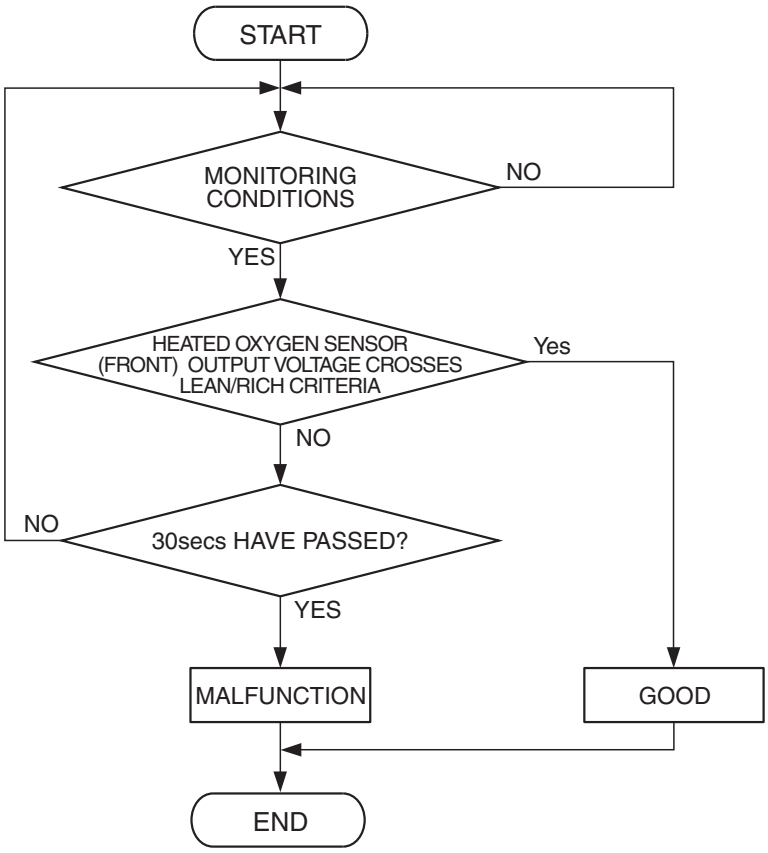
- Misfire monitor

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



AK503626

Check Conditions

- 128 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 3 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 lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13B-5.

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

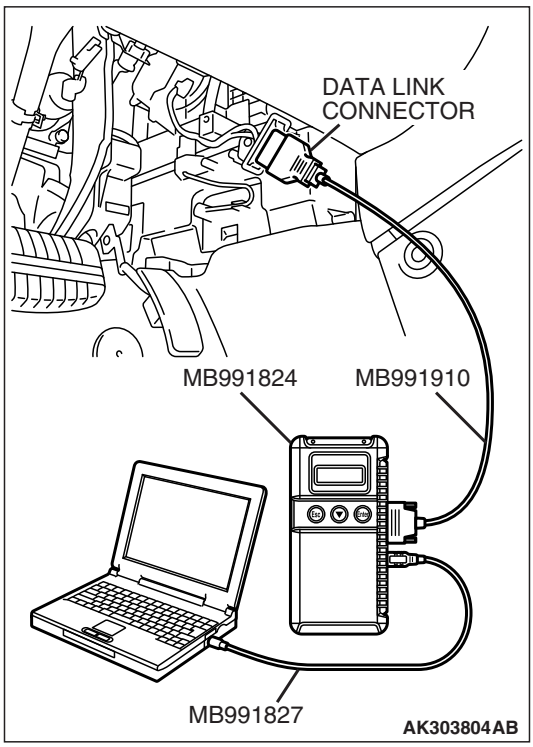
If the right bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the right bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the right bank heated oxygen sensor (front) output voltage decreases, 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.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ 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 AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 2) P.13B-341, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1 sensor 2) P.13B-357, DTC P0139 –Heated Oxygen Sensor Circuit Slow Response (bank 1 sensor 2) P.13B-362, DTC P0140 –Heated Oxygen Sensor Circuit No Activity Detected (bank 1 sensor 2) P.13B-367.

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.

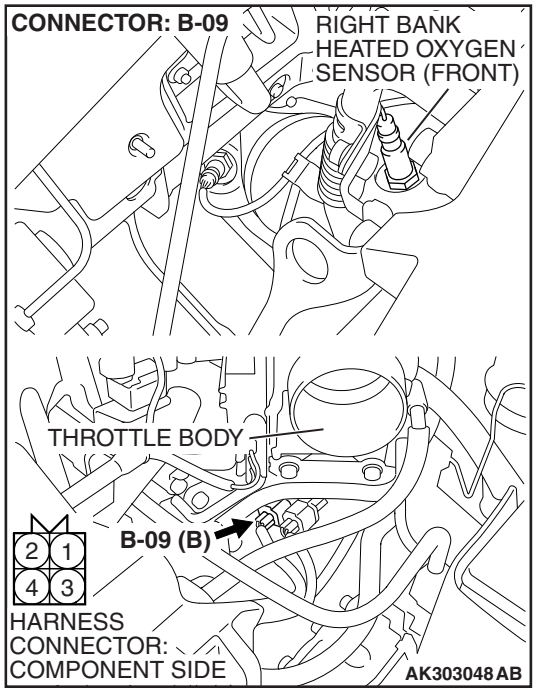
Q: Are there any abnormalities?

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

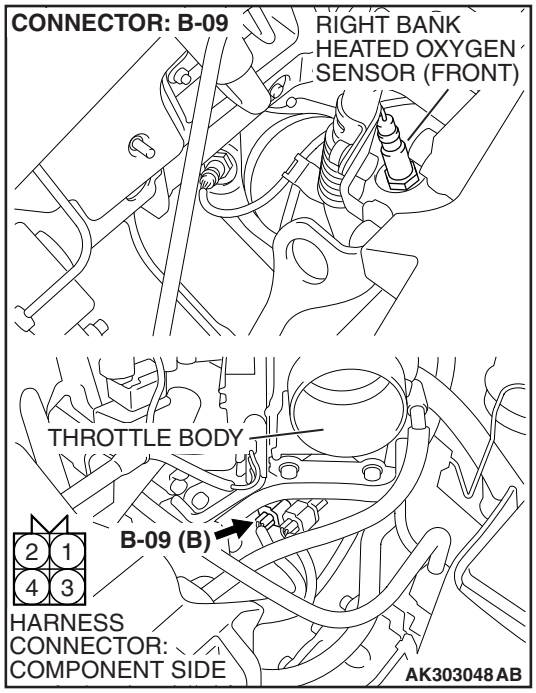
STEP 4. Check harness connector B-09 at the right bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

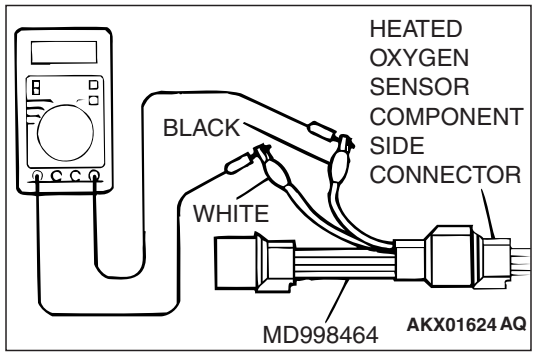
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



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



(1) Disconnect the right bank heated oxygen sensor (front) connector B-09 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 2,000 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 V

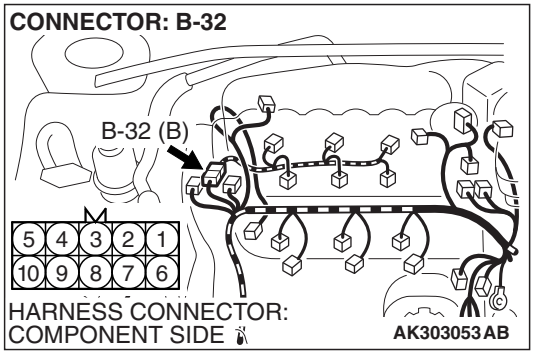
⚠ CAUTION

- **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 temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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.

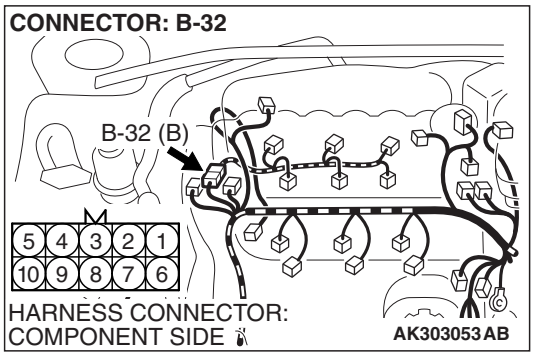


STEP 6. Check harness connector B-32 at intermediate connector for damage.

Q: Is the harness connector in good condition?

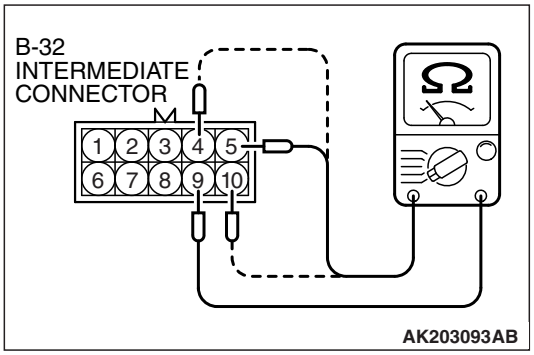
YES : Go to Step 7.

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-32.

(1) Disconnect the intermediate connector B-32.



(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.

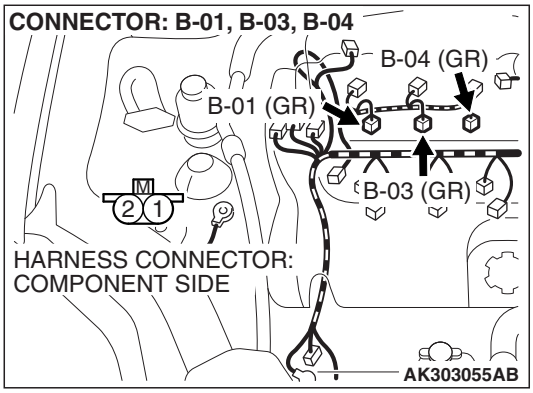
c. Measure the resistance between terminal No. 4 and No. 9 when measuring No. 5 cylinder.

- 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-01, B-03, B-04 at right bank injector for damage.

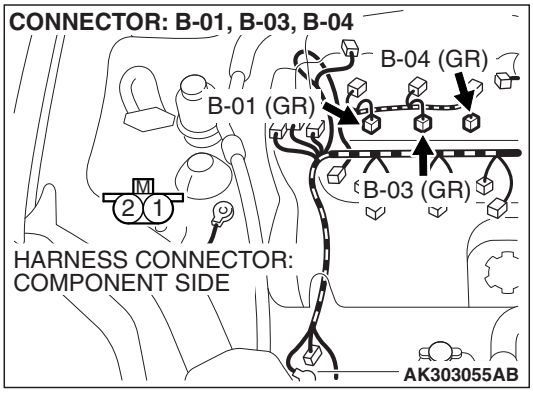
(1) Remove the intake manifold.

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

Q: Is the harness connector in good condition?

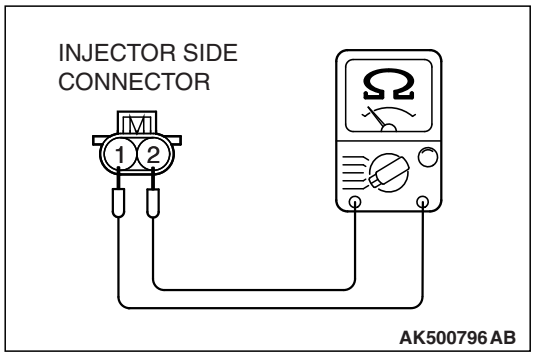
YES : Go to Step 9.

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.



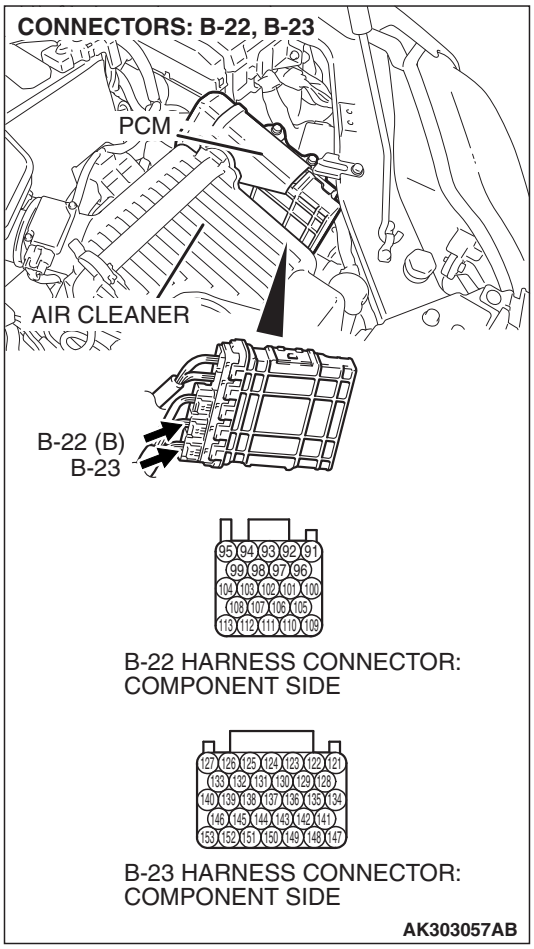
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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.

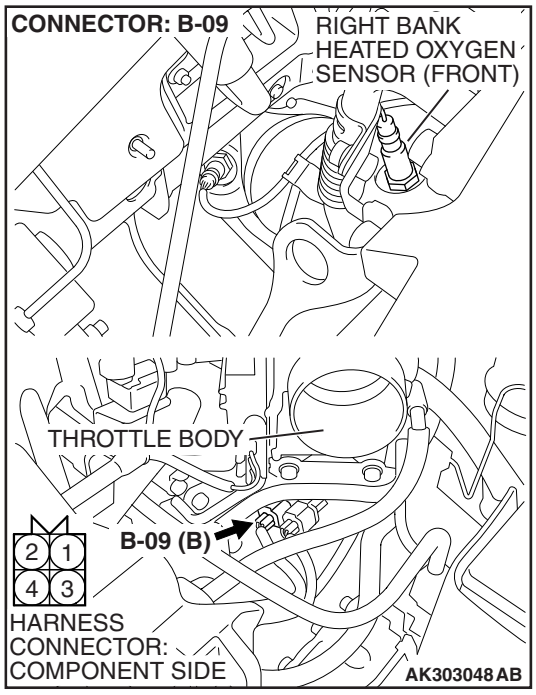


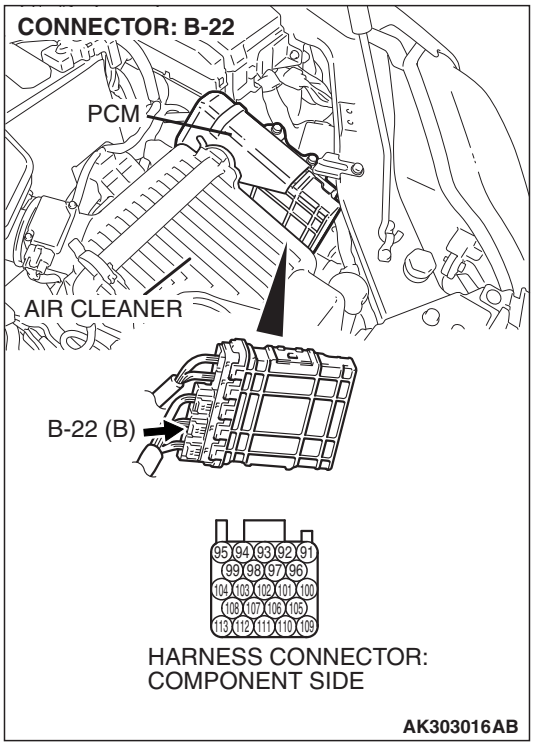
STEP 10. Check harness connector B-22, B-23 at PCM for damage.

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.



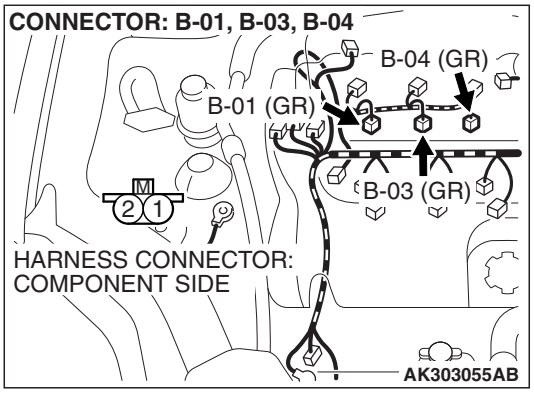


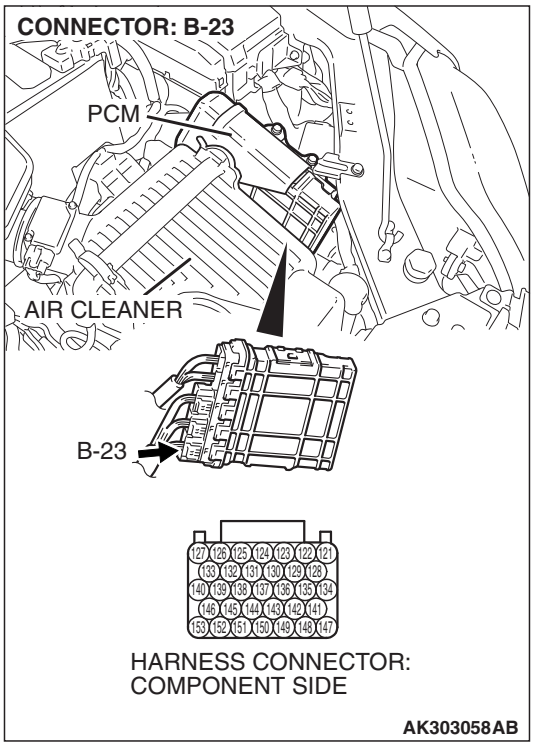
STEP 11. Check for harness damage between right bank heated oxygen sensor (front) connector B-09 (terminal No. 4) and PCM connector B-22 (terminal No. 92).

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 PCM connector.

a. Check the harness wire between right bank injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) when checking No. 1 cylinder.
b. Check the harness wire between right bank injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) when checking No. 3 cylinder.
c. Check the harness wire between right bank injector connector B-04 (terminal No. 2) and PCM connector B-23 (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-1250.

Q: Is the fuel pressure normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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-5.

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

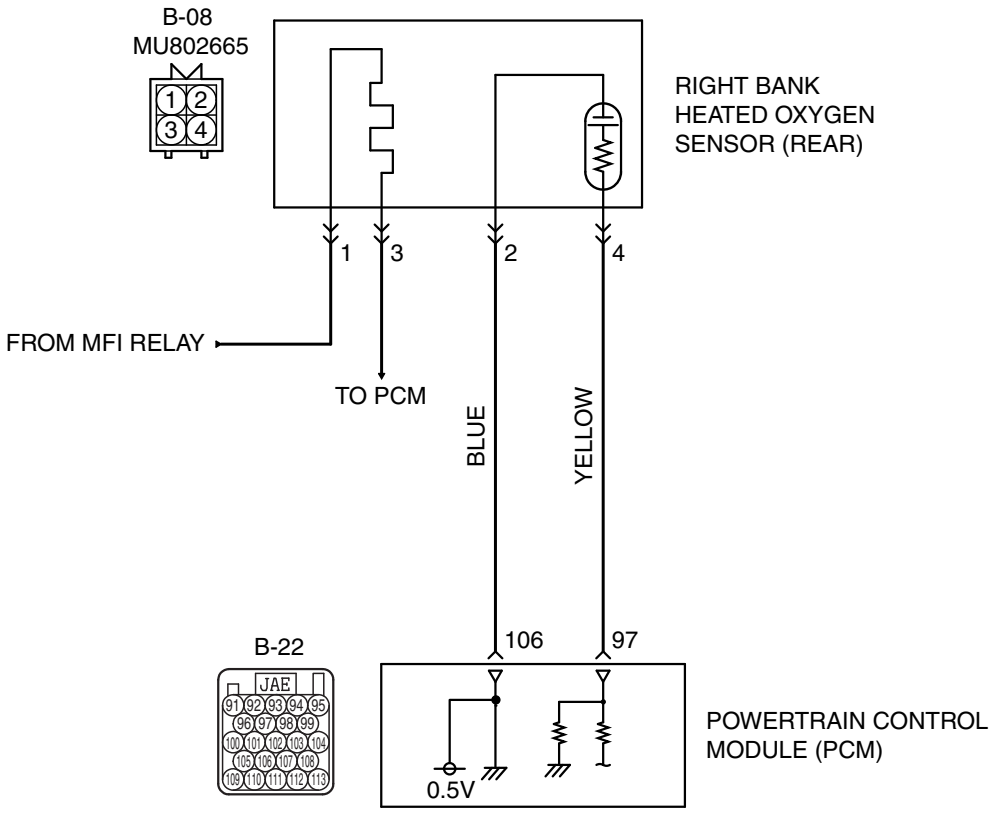
Q: Is DTC P0134 set?

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



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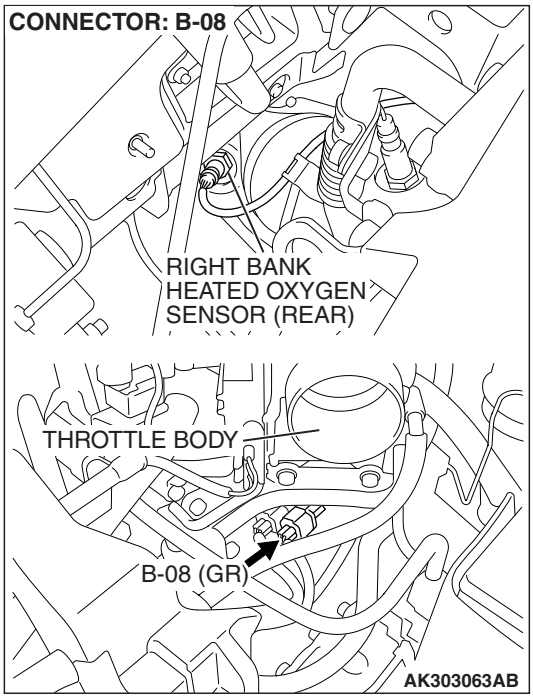
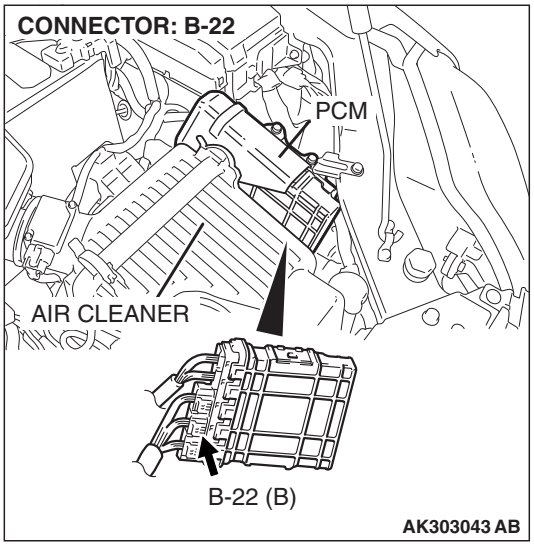




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 106).
- The PCM 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 PCM 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)

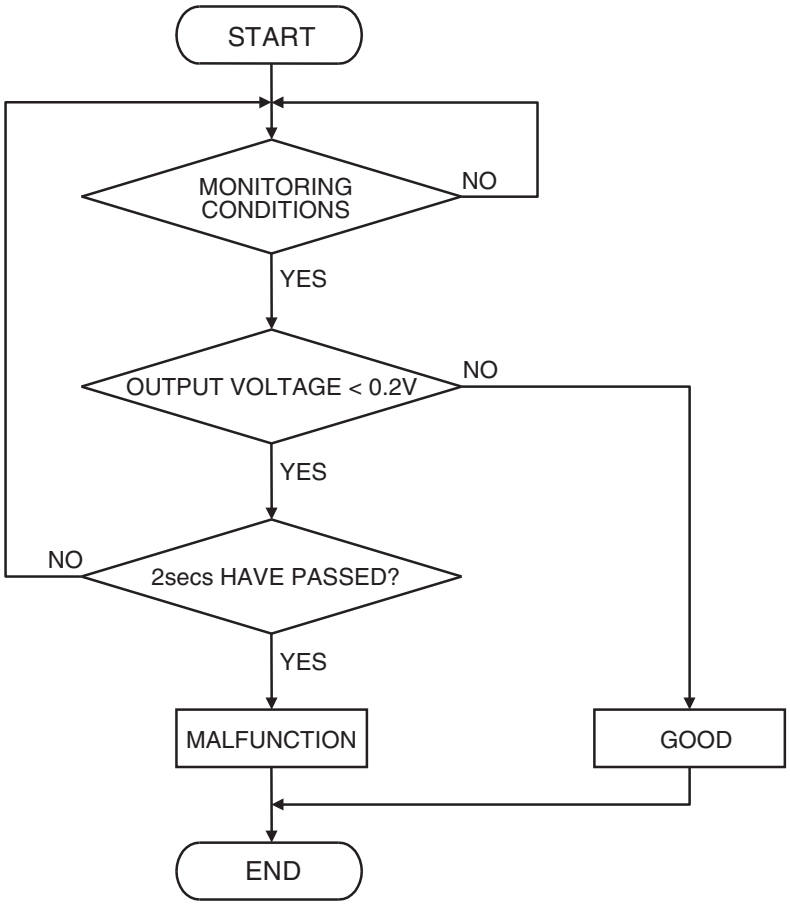
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



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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 (rear) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-5.

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) circuit or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

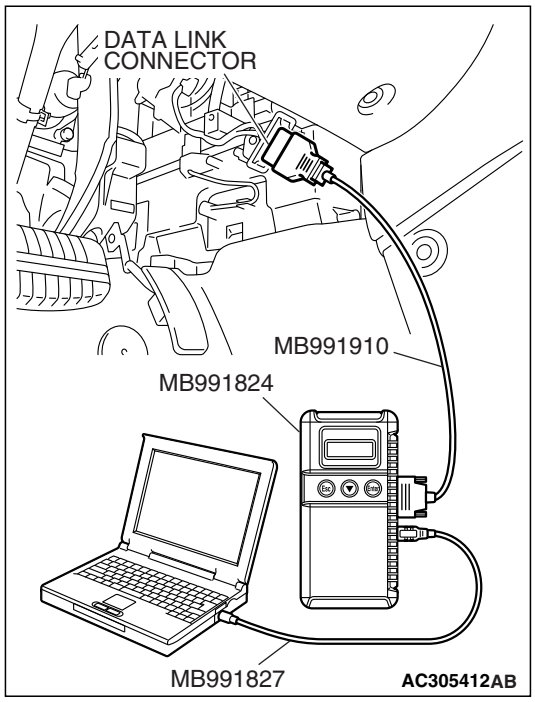
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

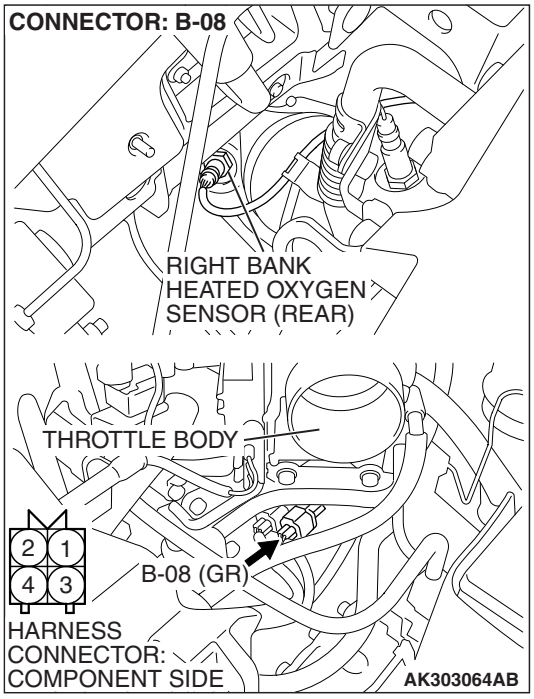
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

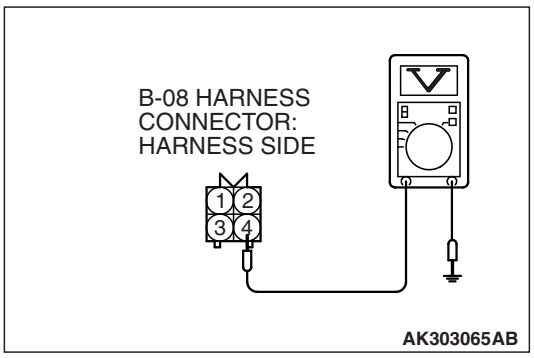
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at right bank heated oxygen sensor (rear) connector B-08 by backprobing

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

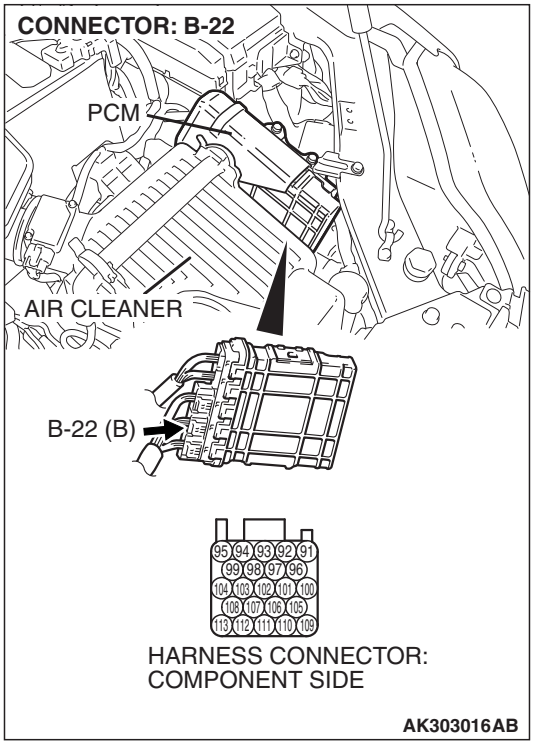




(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      • The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK"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

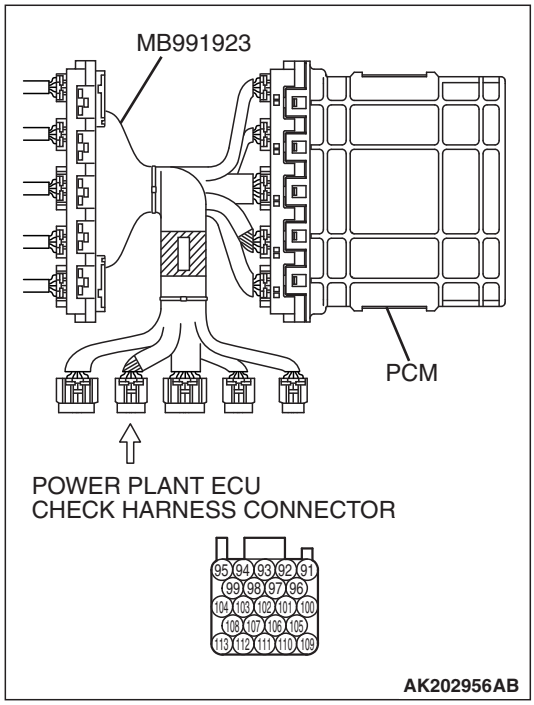
Q: Is the measured voltage between 1.0 and 1.5 volts?

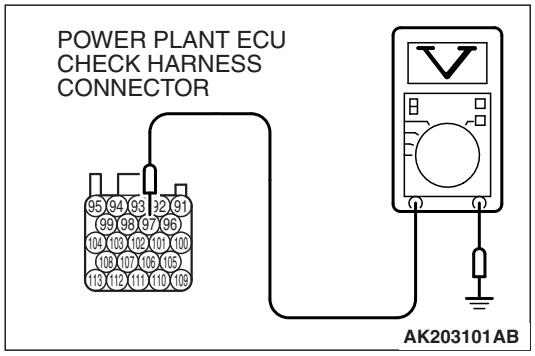
YES : Go to Step 3.
NO : Go to Step 7.



STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors and connect power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



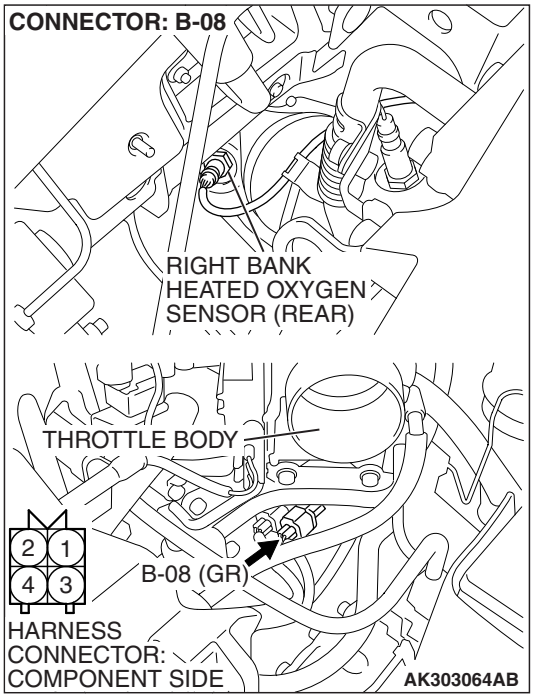


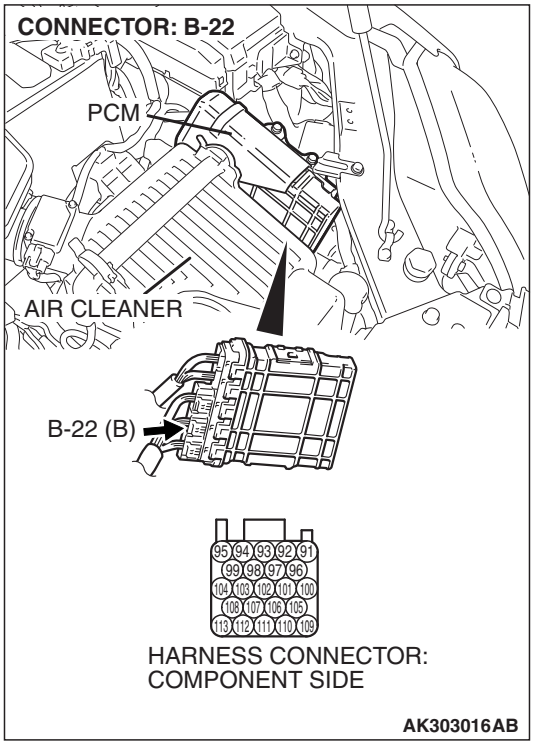
(3) Measure the voltage between terminal No. 97 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      • The output voltage should be between 1.0 and 1.5 volts.

(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 4.
NO : Go to Step 6.



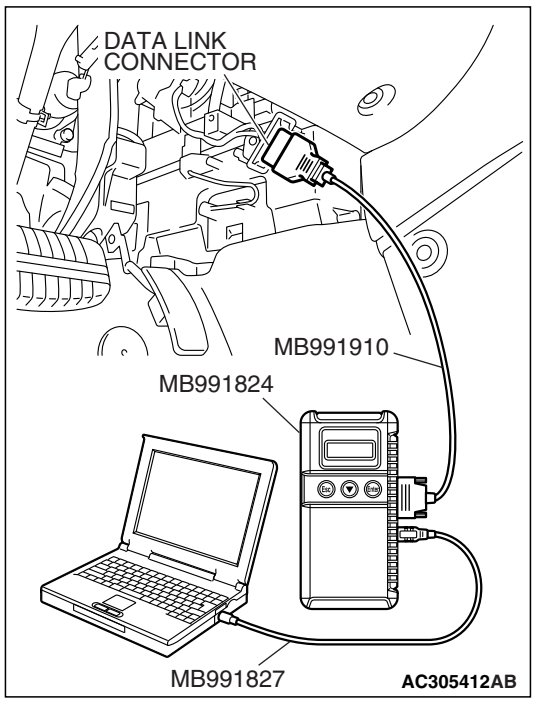


STEP 4. Check harness connector B-08 at right bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 14.



STEP 5. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

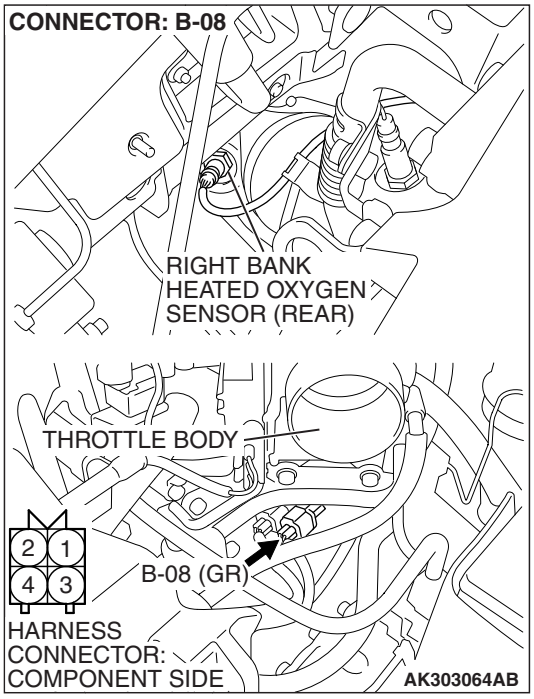
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

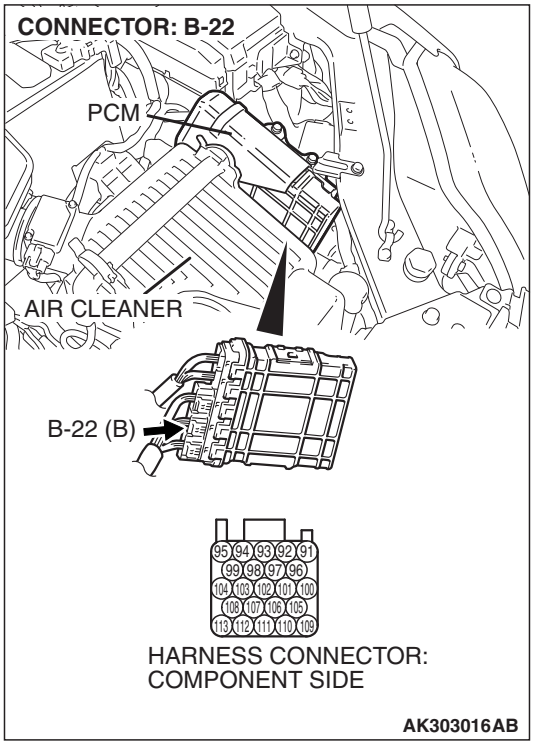
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    • The output voltage should be between 0.6 and 1.0 volt.
(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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.



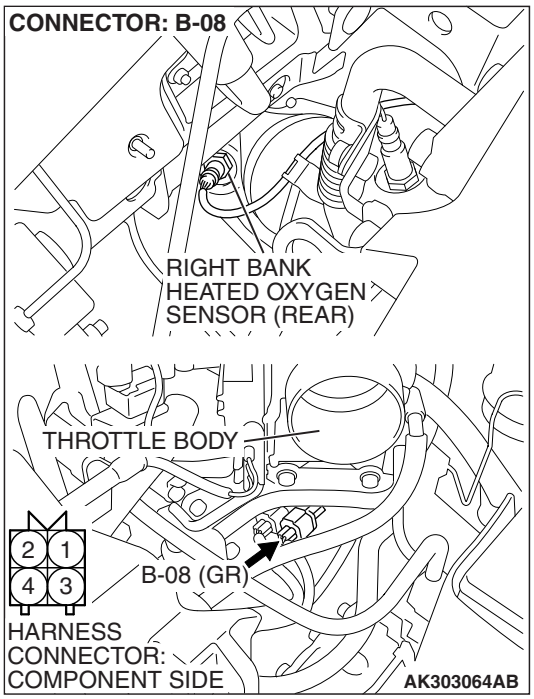


STEP 6. Check harness connector B-08 at right bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 4) and PCM connector B-22 (terminal No. 97) because of open circuit or harness damage. Then go to Step 14.

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

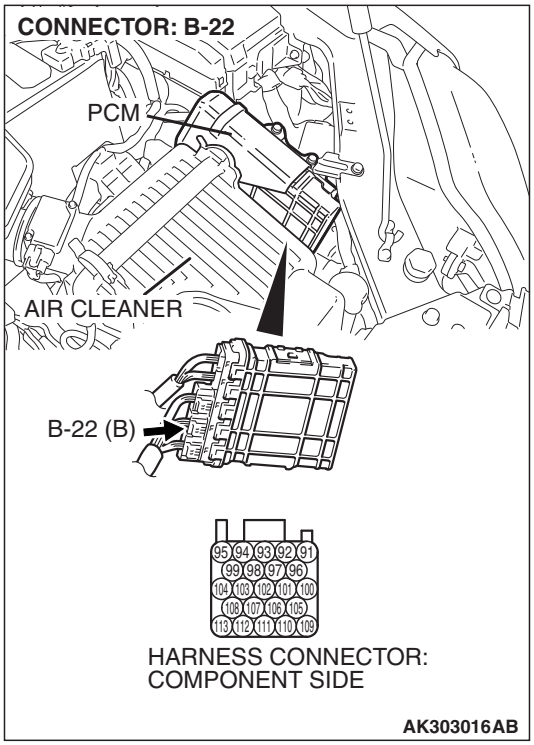


STEP 7. Check harness connector B-08 at right bank heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

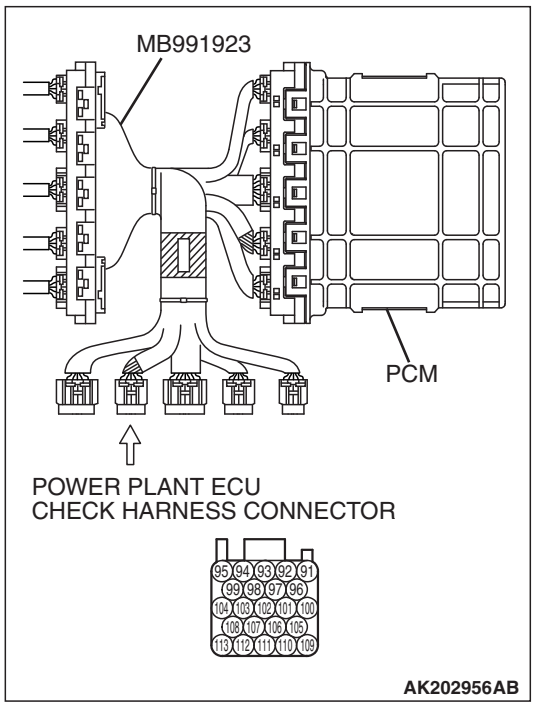
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

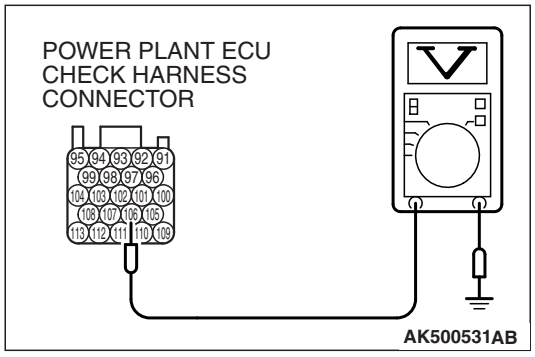


STEP 8. Measure the sensor offset voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.

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



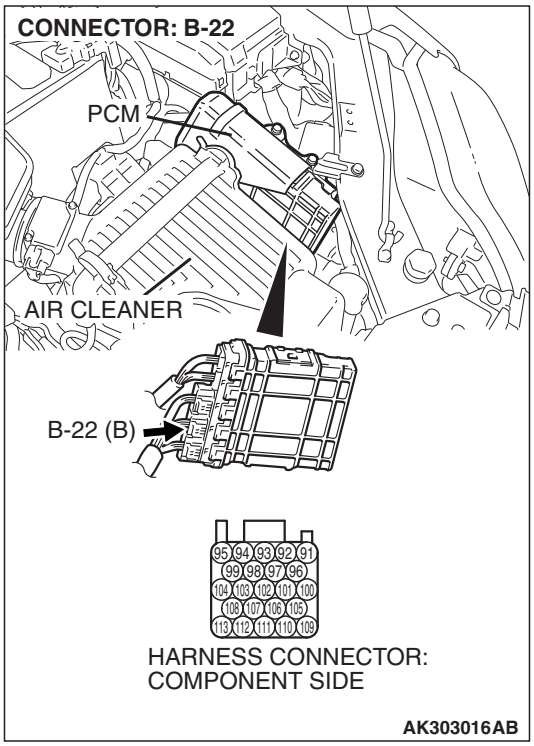


(3) Measure the voltage between terminal No. 106 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(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 10.
NO : Go to Step 9.

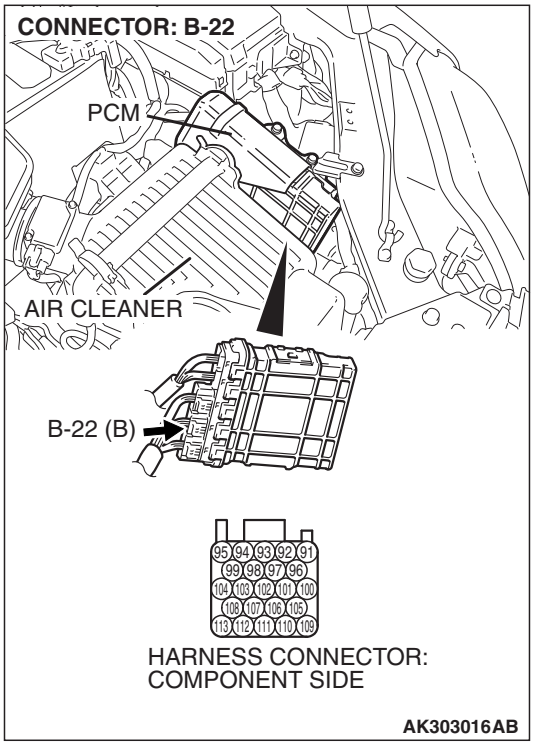


STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 2) and PCM connector B-22 (terminal No. 106) because of short circuit to ground. Then go to Step 14.

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

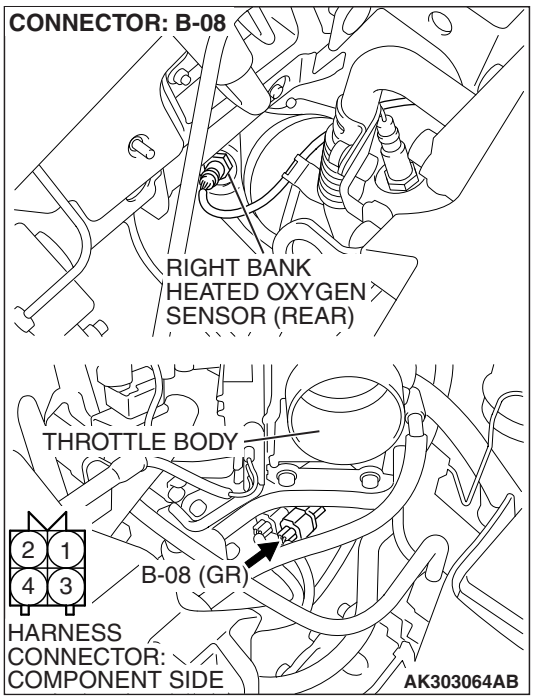


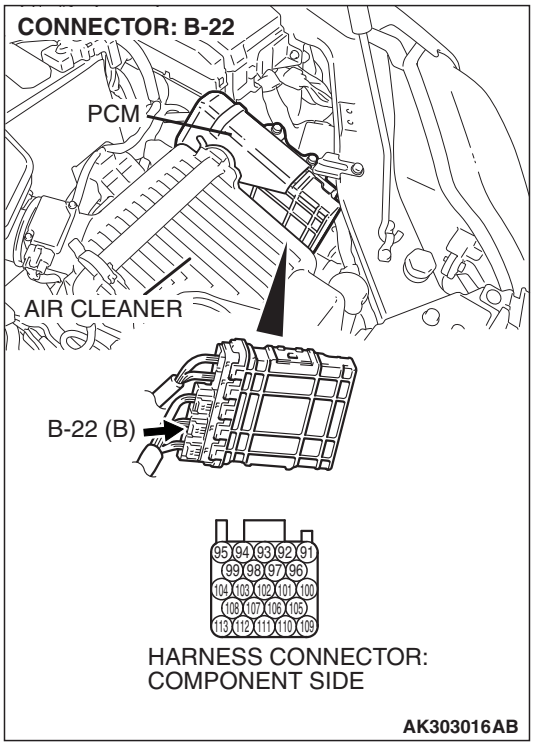
STEP 10. Check harness connector B-22 at PCM for damage.

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 open circuit or harness damage between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 2) and PCM connector B-22 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

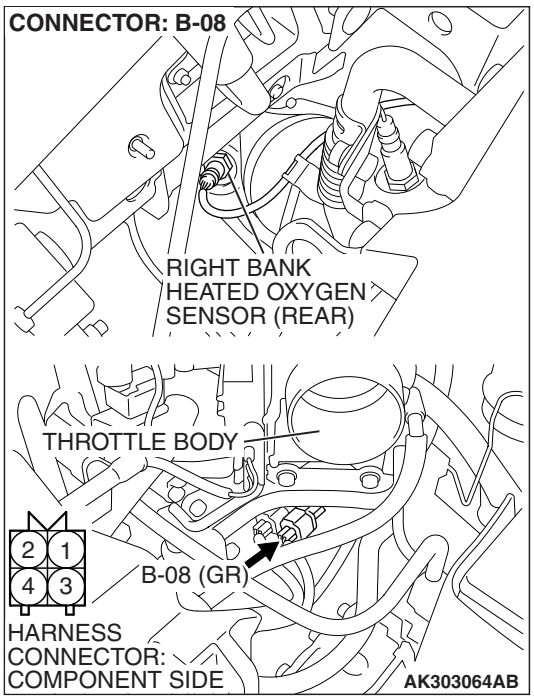
NO : Repair it. Then go to Step 14.

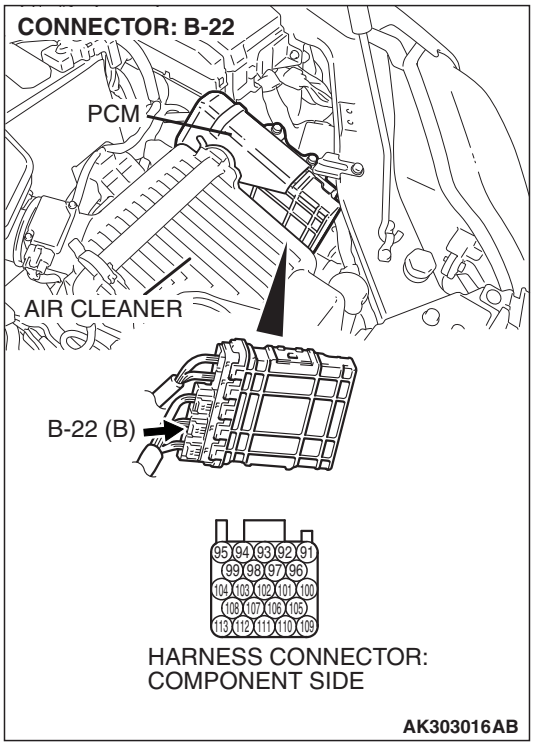
STEP 12. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 4) and PCM connector B-22 (terminal No. 97).

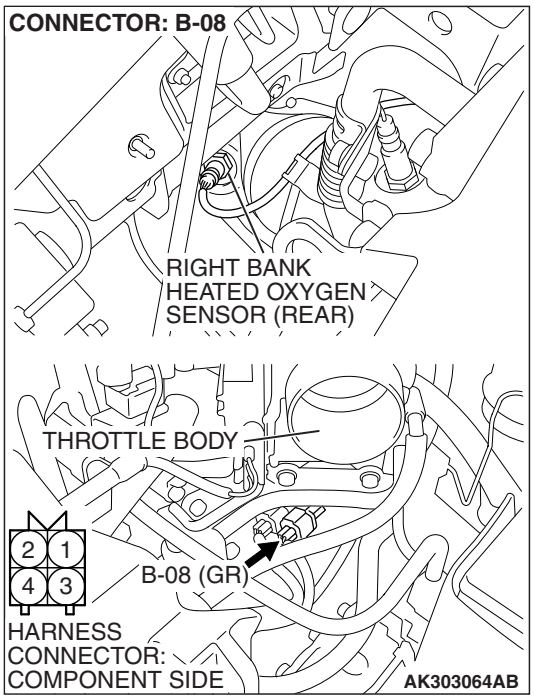
Q: Is the harness wire in good condition?

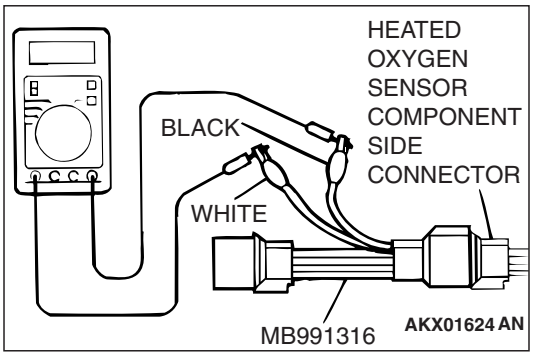
YES : Go to Step 13.

NO : Repair it. Then go to Step 14.









STEP 13. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-08 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: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more

   Standard value: 0.6 –1.0 V

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400 °C (752 °F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio.

NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.

NO : Replace the right bank heated oxygen sensor (rear). 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 22 P.13B-5.

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

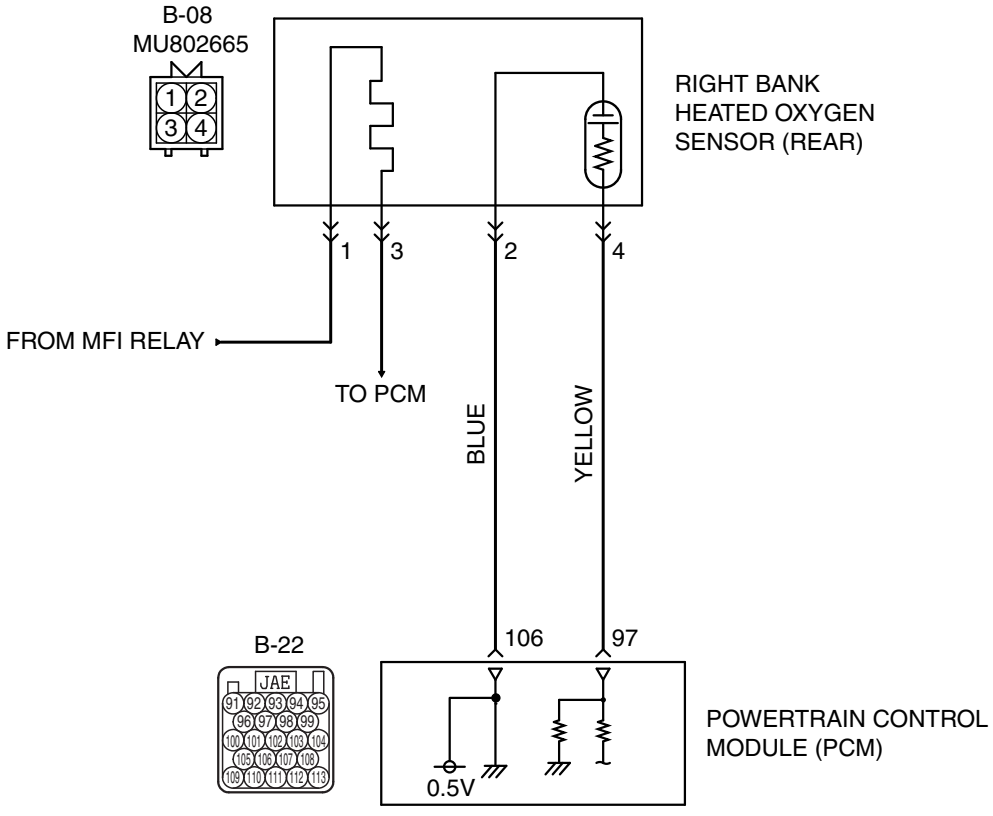
Q: Is DTC P0137 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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

Right Bank Heated Oxygen Sensor (rear) Circuit



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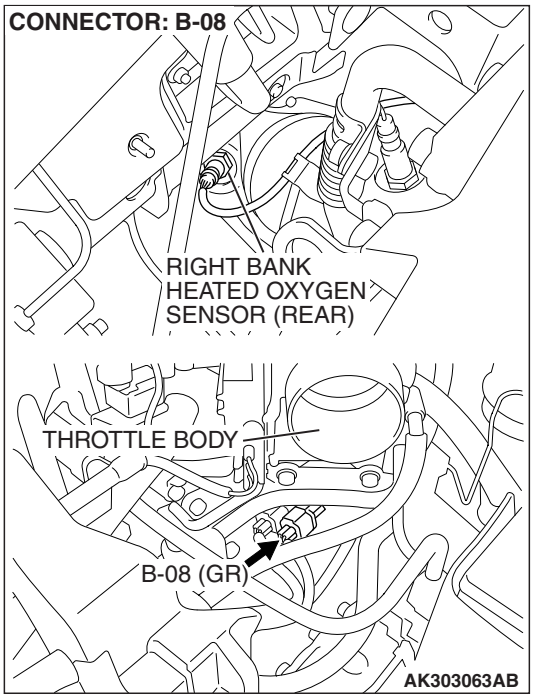
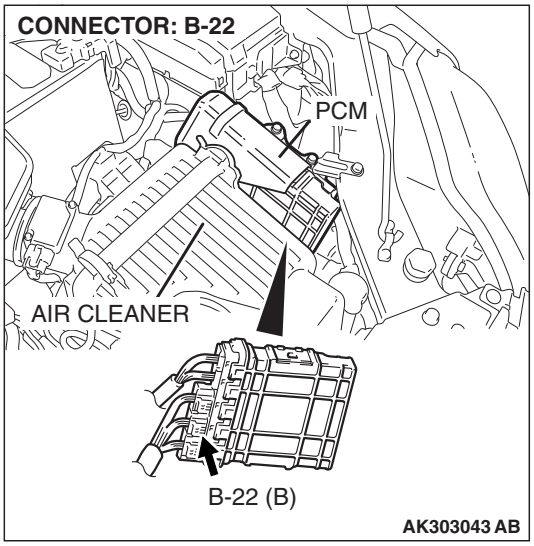




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 106).
- The PCM 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 PCM 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)

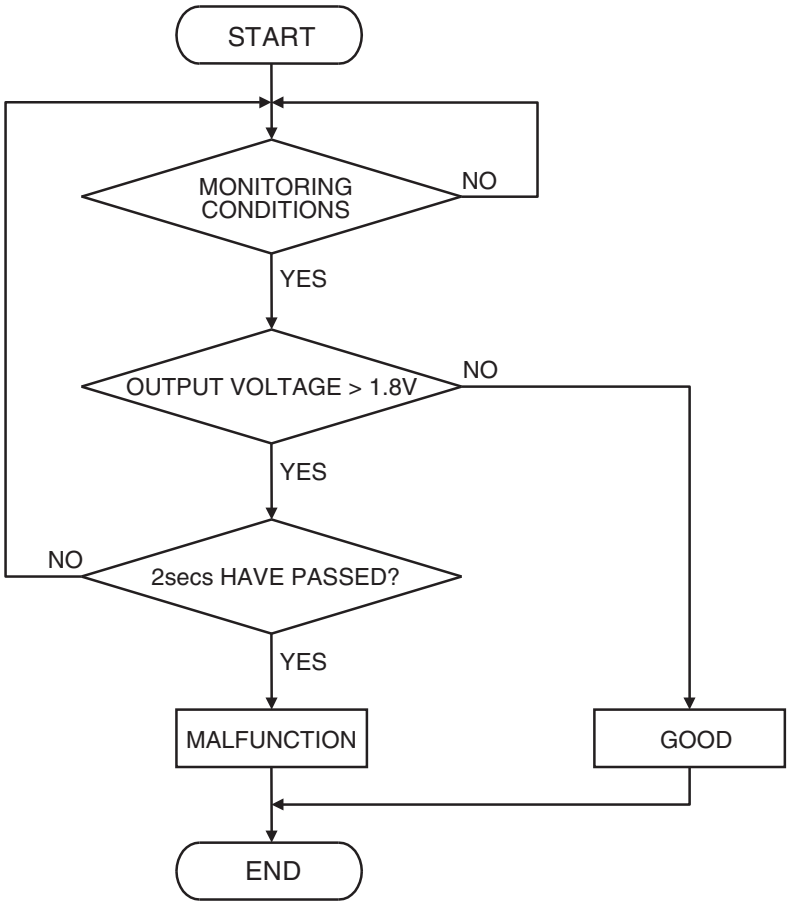
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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 offset 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 23 P.13B-5.

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.
- PCM failed.

DIAGNOSIS

Required Special Tools:

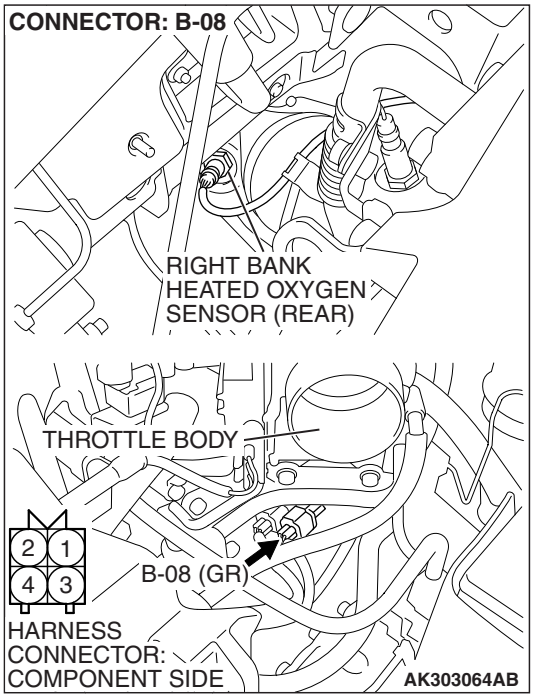
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

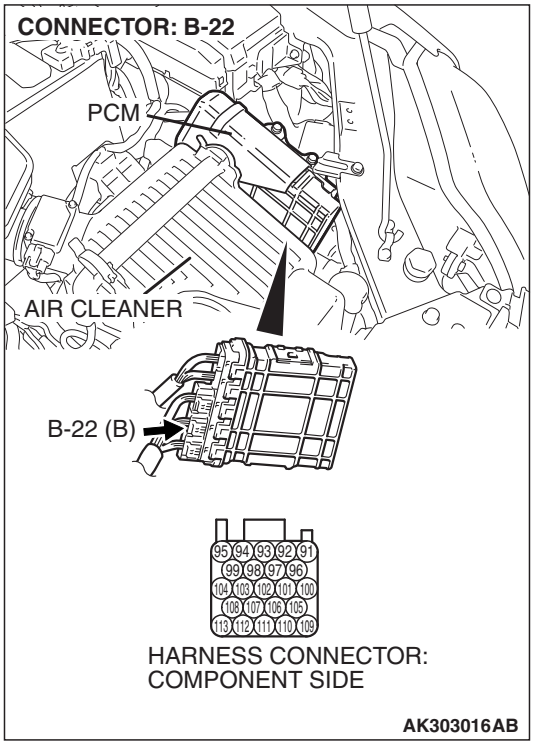
STEP 1. Check harness connector B-08 at right bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

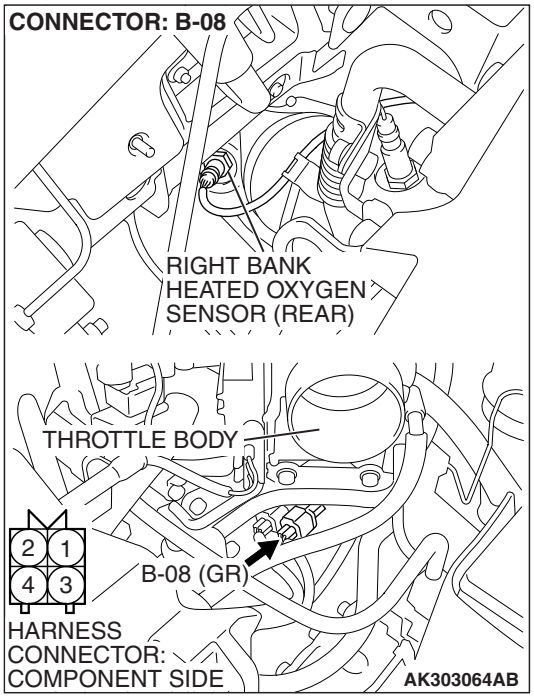
YES : Go to Step 2.

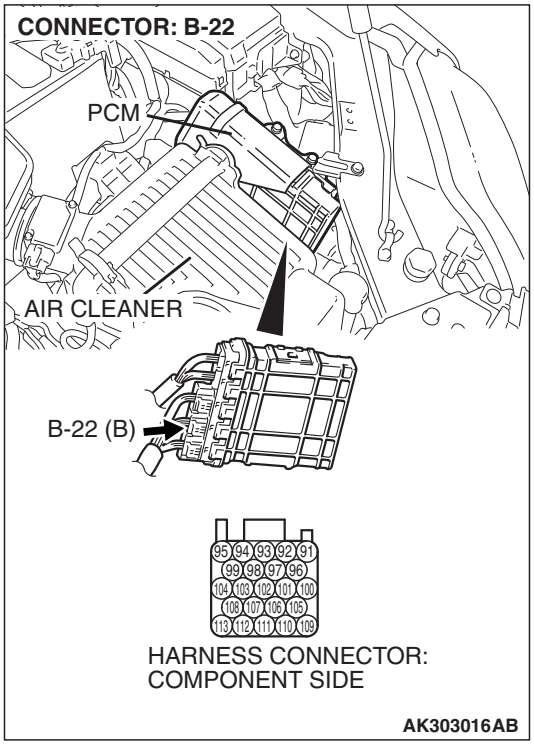
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.





TSB Revision





STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 4) and PCM connector B-22 (terminal No. 97).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

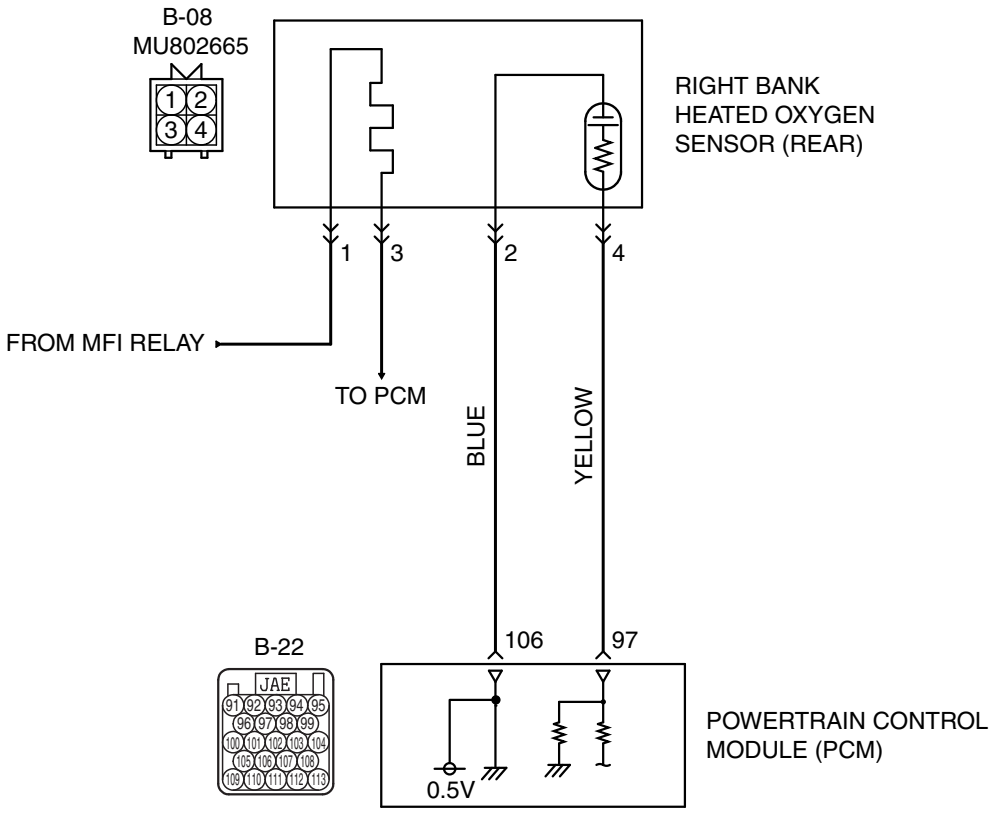
Q: Is DTC P0138 set?

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



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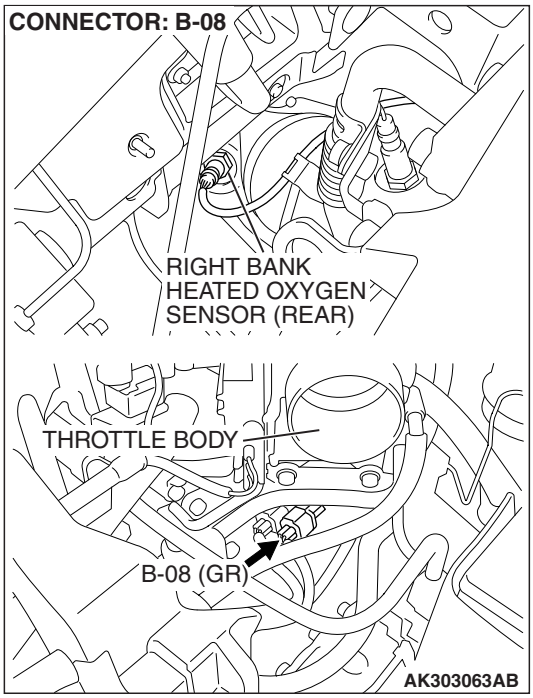
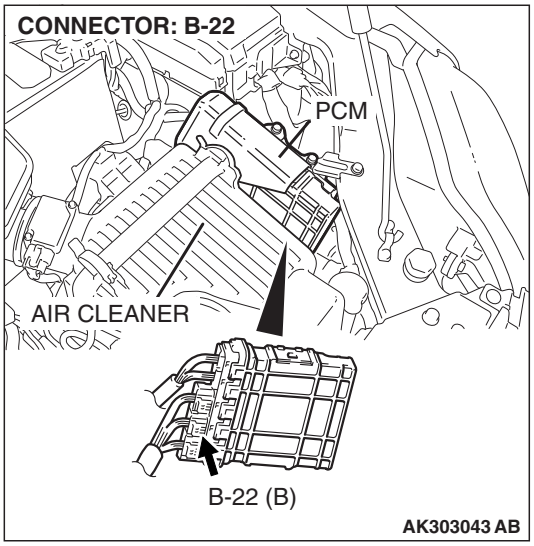




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 106).
- The PCM 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 PCM 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)

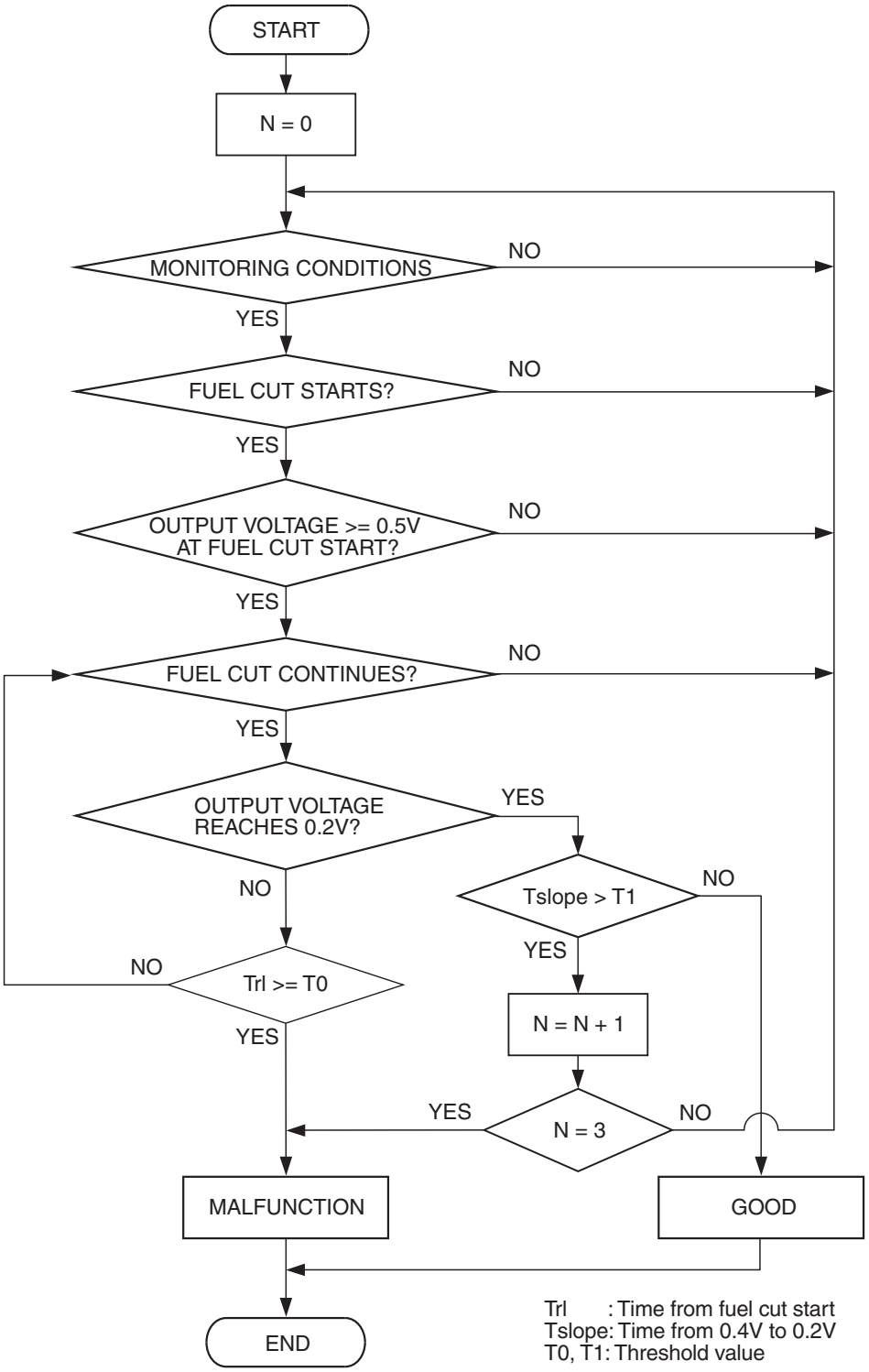
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



AK900276

TSB Revision

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 1,638 g.
- Fuel is being shut off.
- The right bank heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the right bank heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).

Judgement Criterion
- Right bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

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 1,638 g.
- Fuel is being shut off.
- The right bank heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the right bank heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The PCM monitors for this condition for 3 cycles of 0.5 second each during drive cycles.

Judgement Criteria
- The right bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 0.5 second from 0.4 volt while fuel is being shut off.
- The PCM monitors for this condition once during the drive cycle.

OBD-II DRIVE CYCLE PATTERN

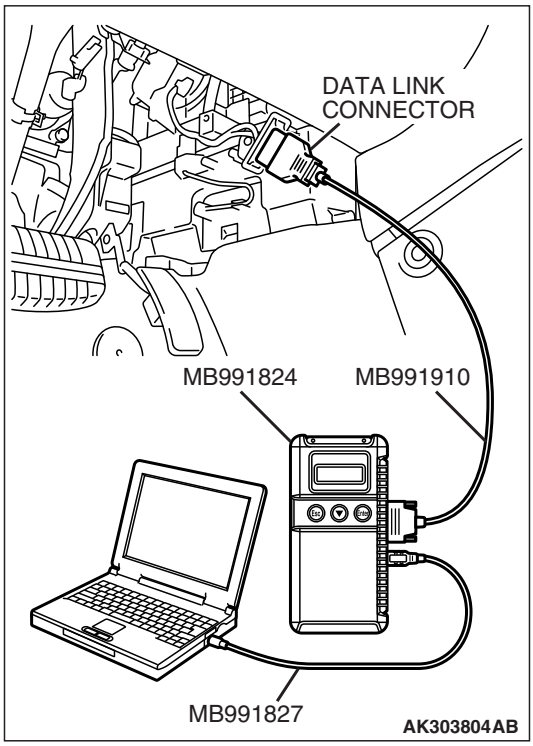
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13B-5.

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

- Right bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ 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 AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
(4) Warm up the engine.
- After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.

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

Q: Is the sensor operating properly?

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

NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

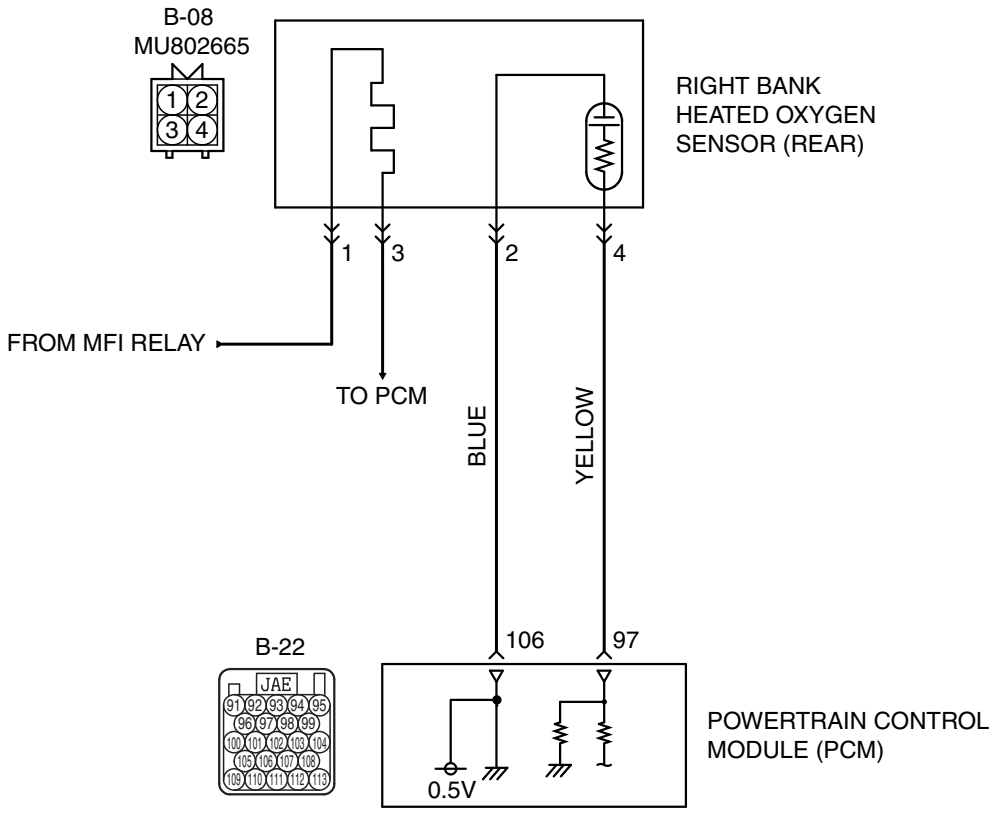
Q: Is DTC P0139 set?

YES : Refer to DTC P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 2) P.13B-341, DTC P0138 –Heated Oxygen Sensor Circuit High Voltage (bank 1 sensor 2) P.13B-357.

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



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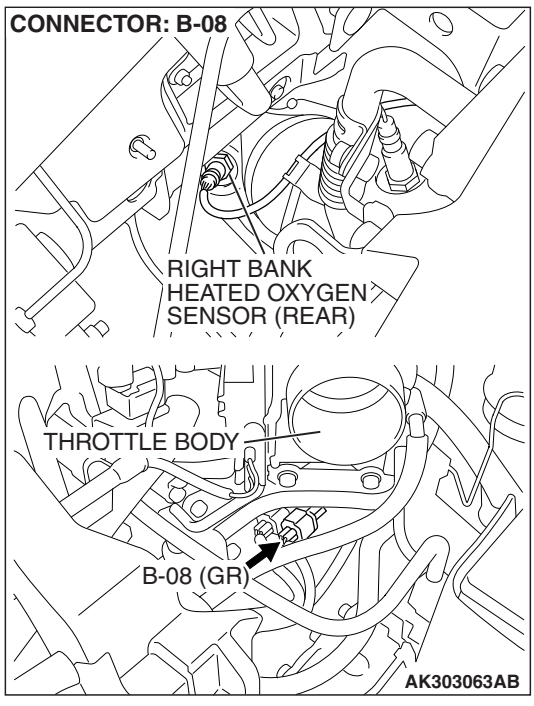
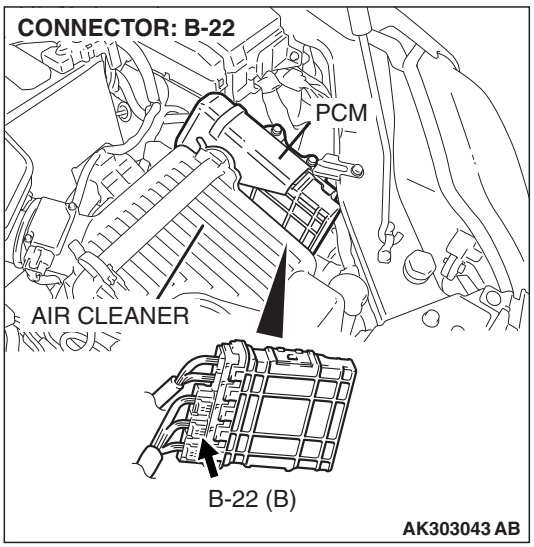




TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 106).
- The PCM 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 PCM 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 go/stop operations including fuel cut 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)

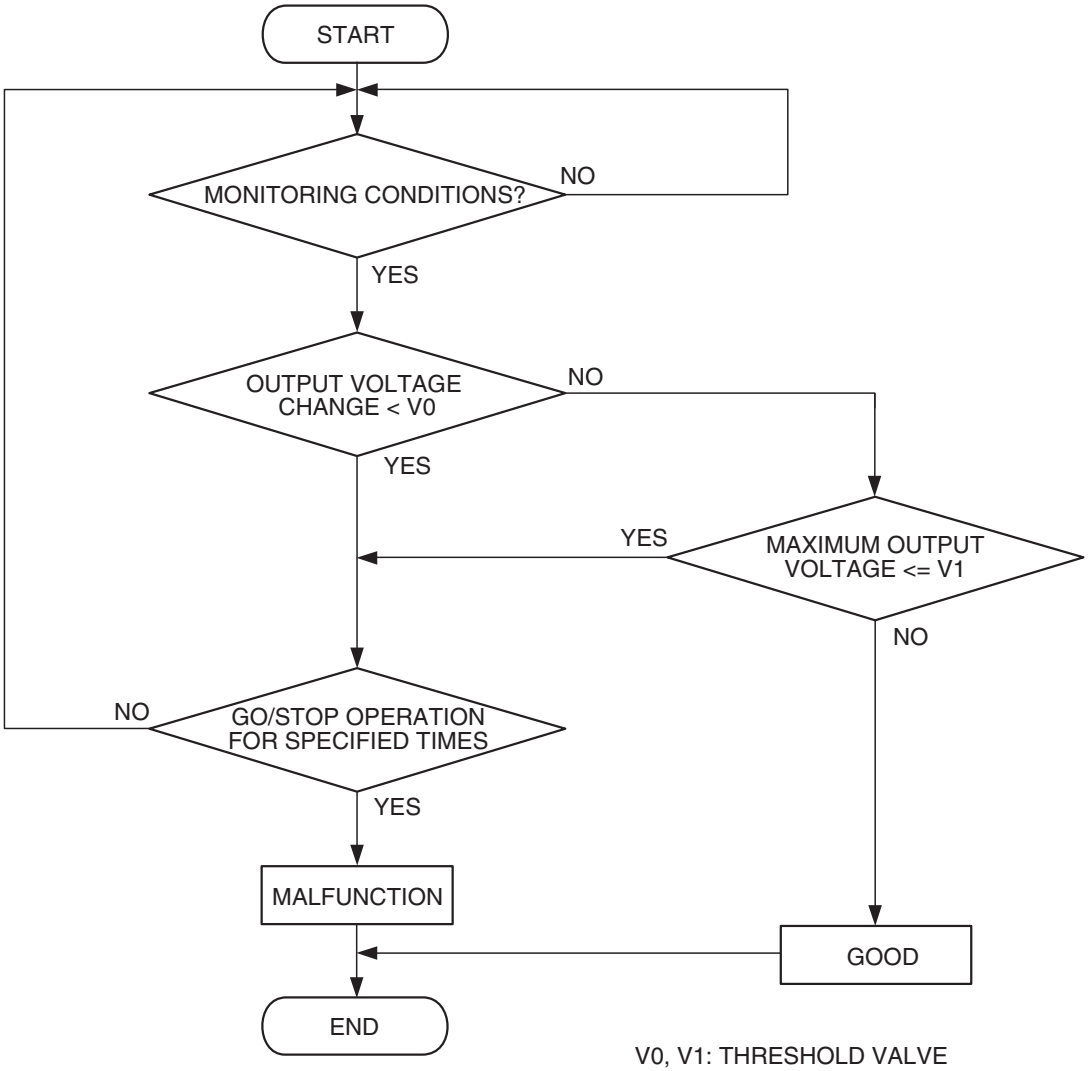
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



AK802638

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 1,638 g.
- Repeat 1 time or more: 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 60 seconds have elapsed with the above mentioned conditions, and more than 3 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1.0 mph).

TSB Revision

Judgement Criterion

- Change in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.313 volt.

or

- The maximum output voltage of the right bank heated oxygen sensor (rear) is lower than 0.508 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13B-5.

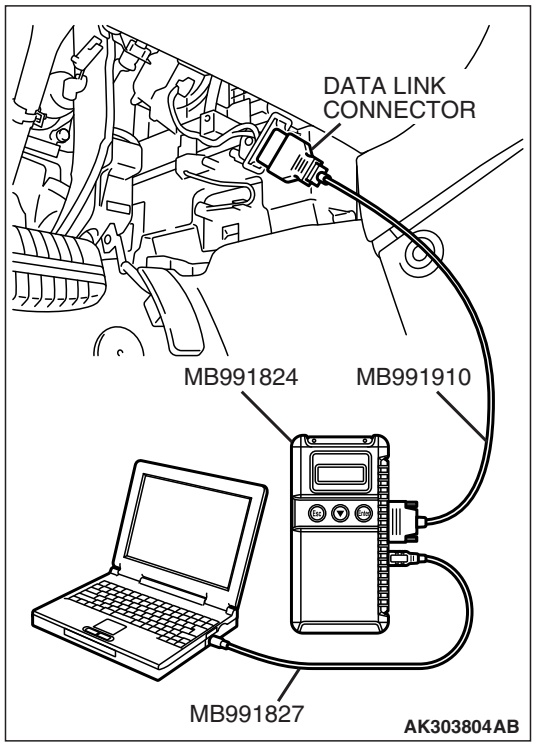
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ 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 AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(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 right bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13B-5.

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

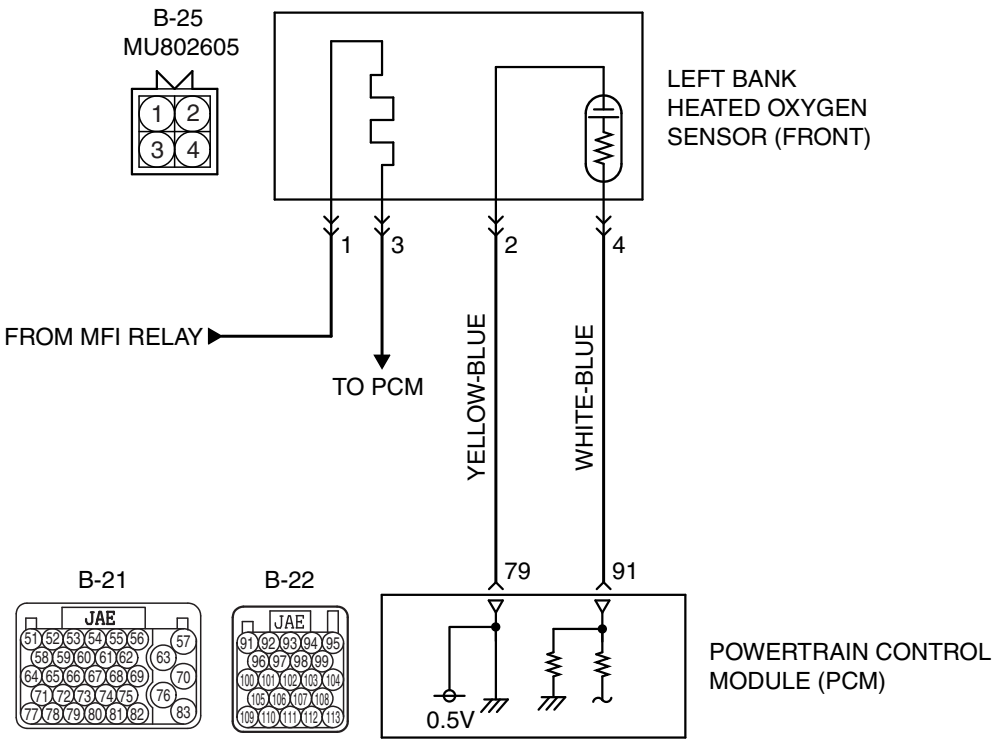
Q: Is DTC P0140 set?

YES : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (bank 1 sensor 2) P.13B-341, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1 sensor 2) P.13B-357.

NO : The inspection is complete.

DTC P0151: Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



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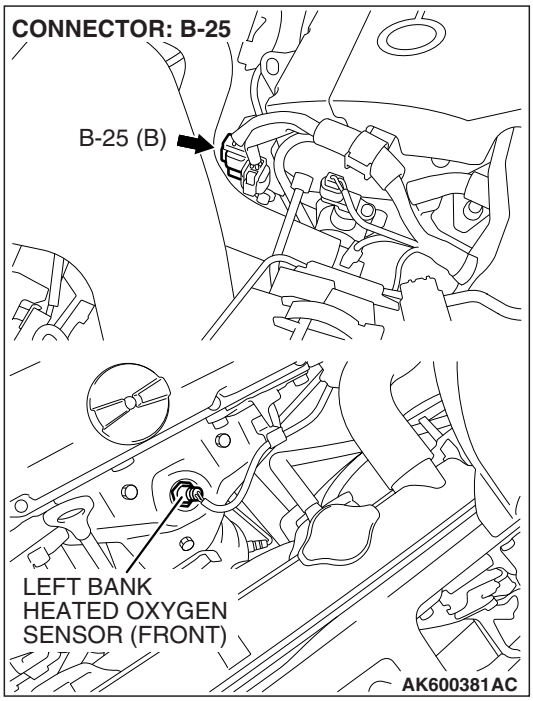
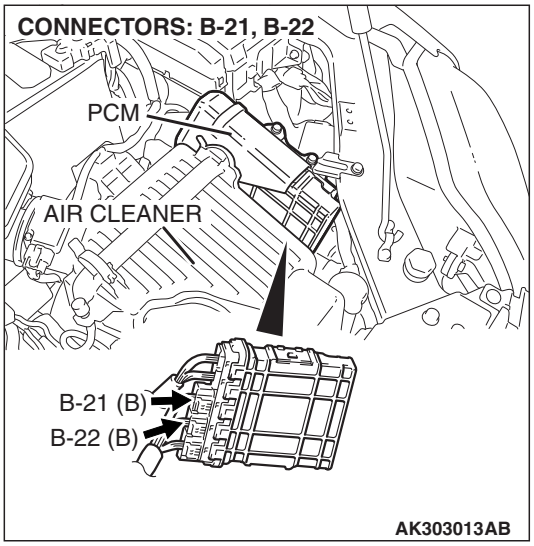




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 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 PCM (terminal No. 79).
- The PCM 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 PCM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The PCM 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)

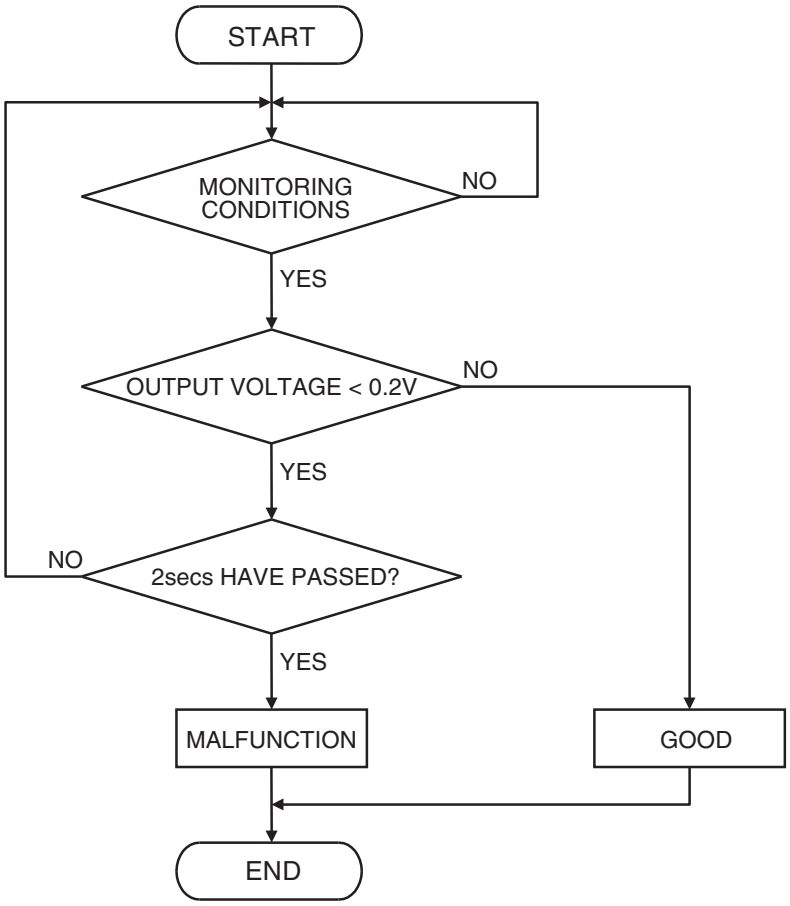
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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.
- More than 180 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 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22. P.13B-5

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) circuit, or harness damage.
- Connector damage.
- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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. Using scan tool MB991958, check data list item AE: Heated Oxygen Sensor Bank 2, sensor 1 (left front).

⚠ CAUTION

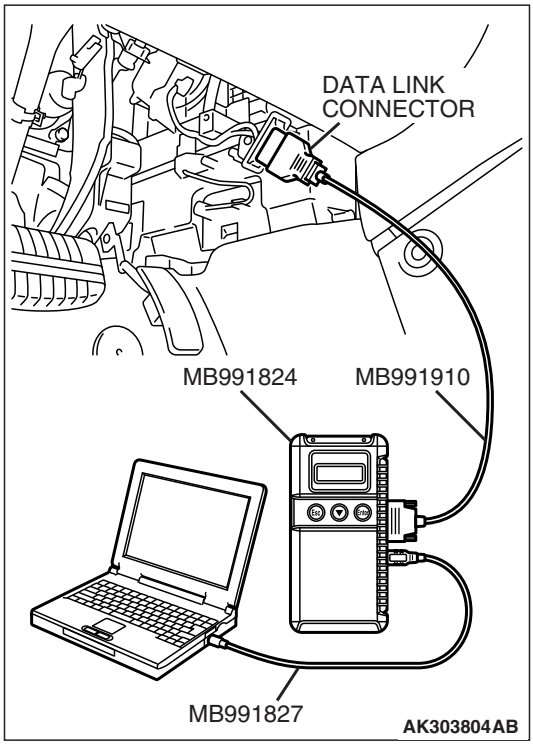
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

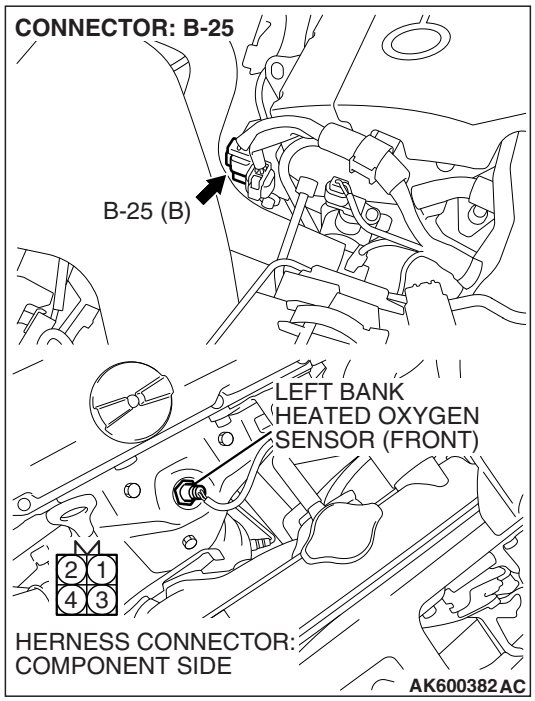
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

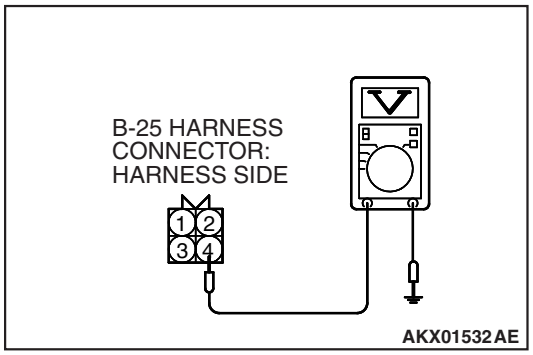
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at left bank heated oxygen sensor (front) connector B-25 by backprobing

(1) Do not disconnect the connector B-25.
(2) Start the engine and run at idle.



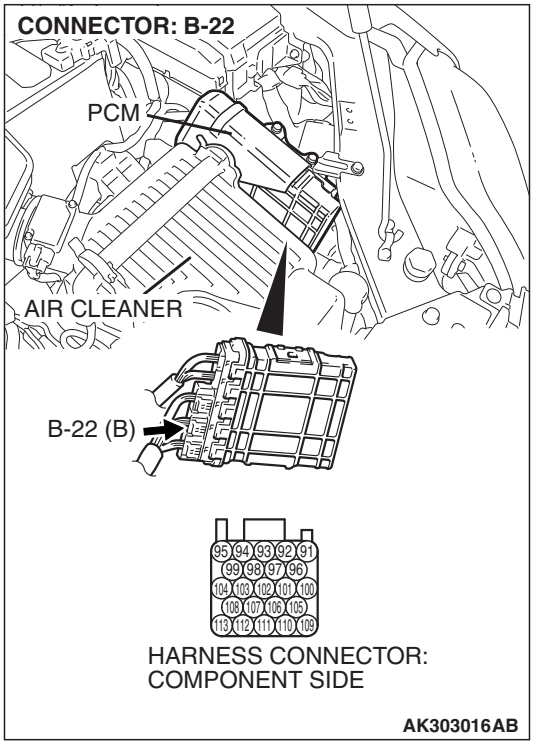


(3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

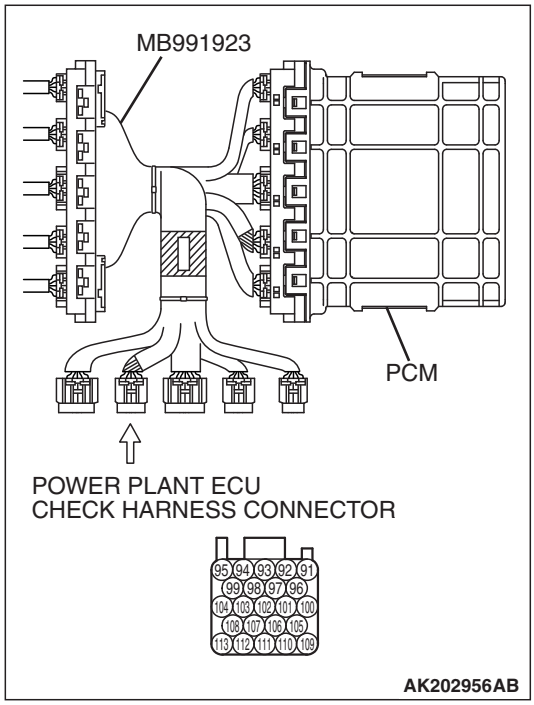
Q: Is the measured voltage within the specified range?

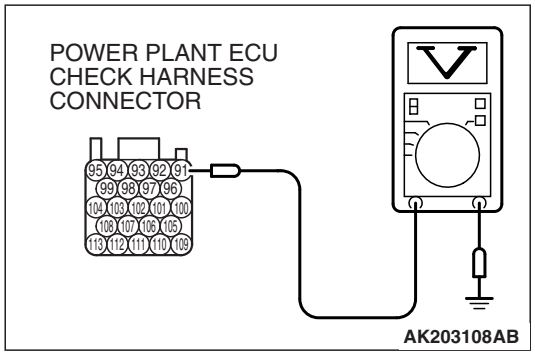
YES : Go to Step 3.
NO : Go to Step 7.



STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.



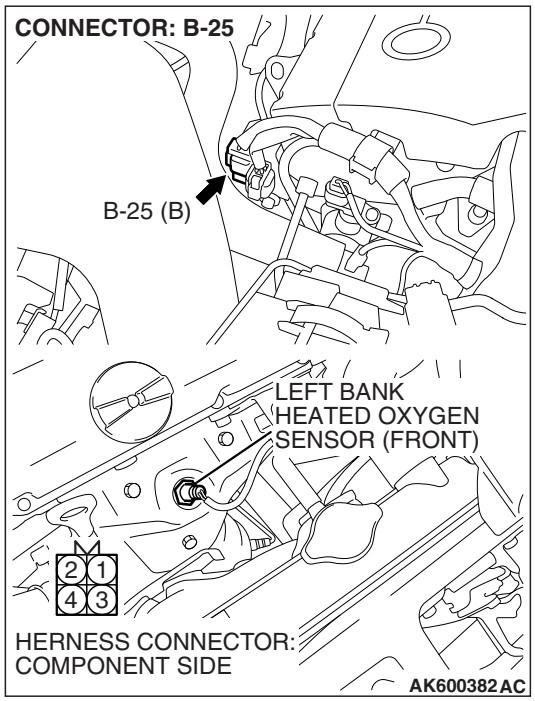


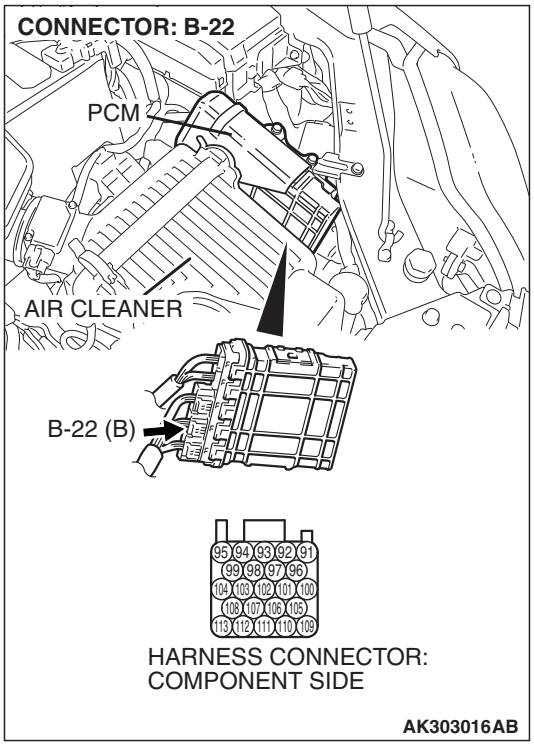
(3) Measure the voltage between terminal No. 91 and ground.
- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.5 to 1.4 volts alternately.

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

Q: Is the measured voltage within the specified range?

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



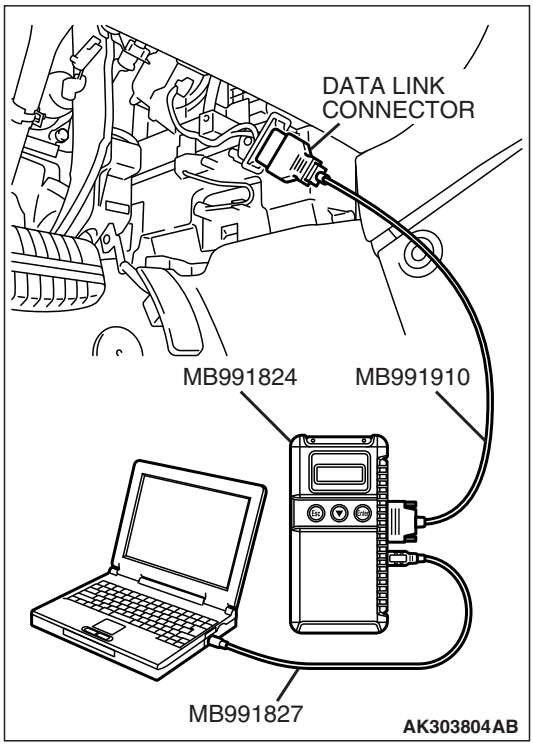


STEP 4. Check harness connector B-25 at left bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 14.



STEP 5. Using scan tool MB991958, check data list item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ 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.

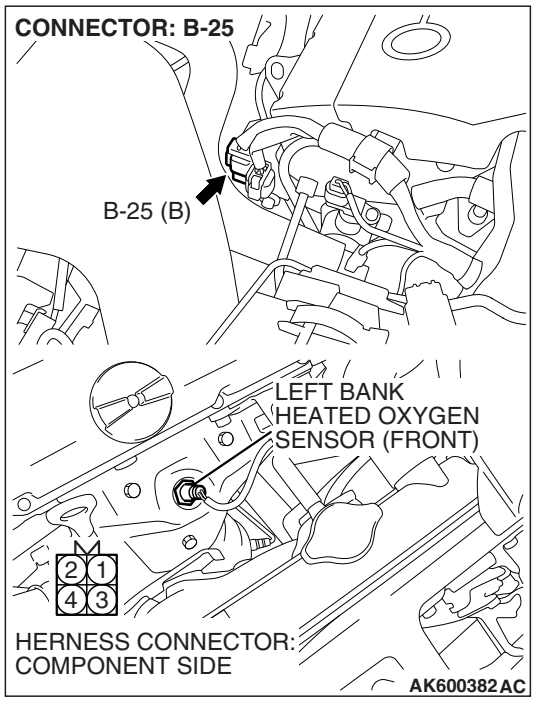
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

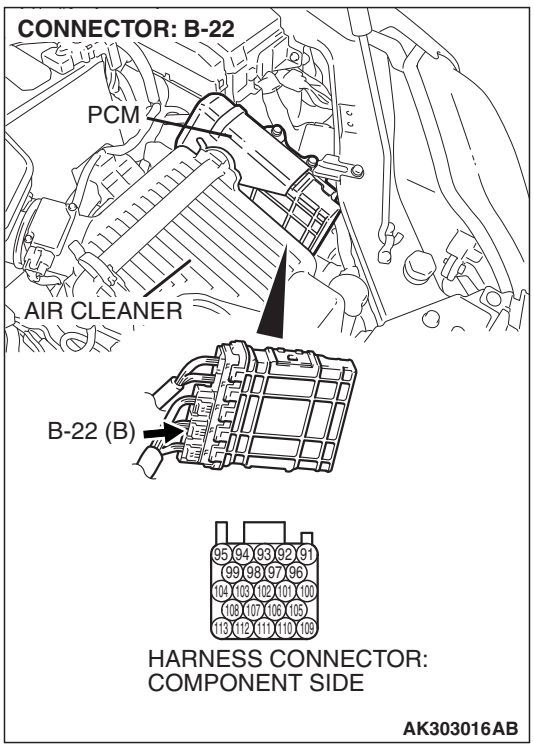
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.



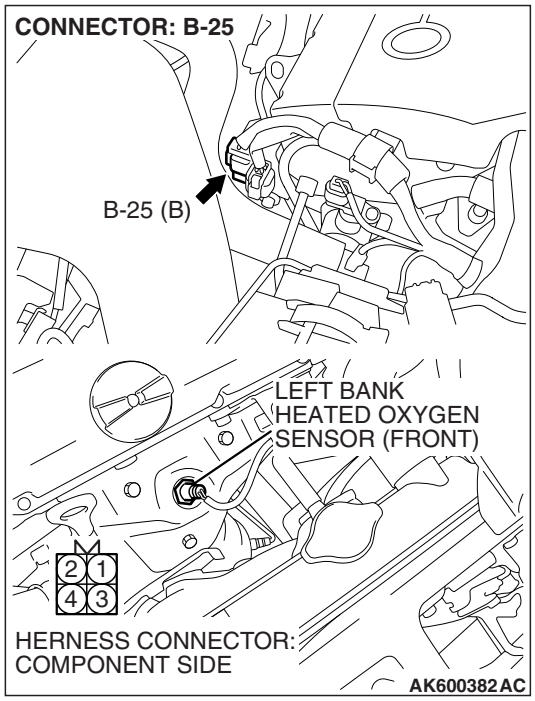


STEP 6. Check harness connector B-25 at left bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-25 (terminal No. 4) and PCM connector B-22 (terminal No. 91) because of open circuit or harness damage. Then go to Step 14.

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

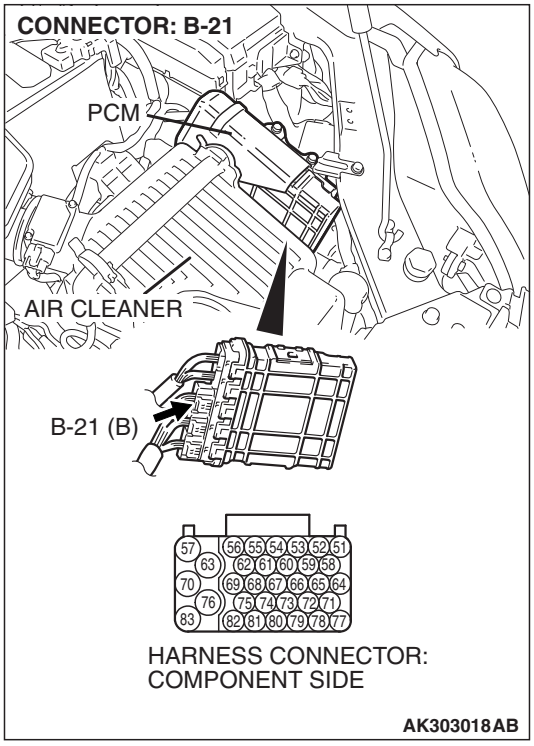


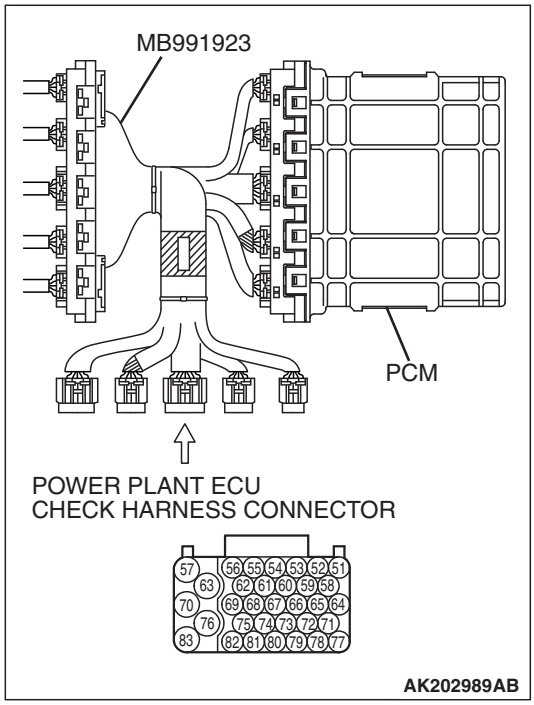
STEP 7. Check harness connector B-25 at left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

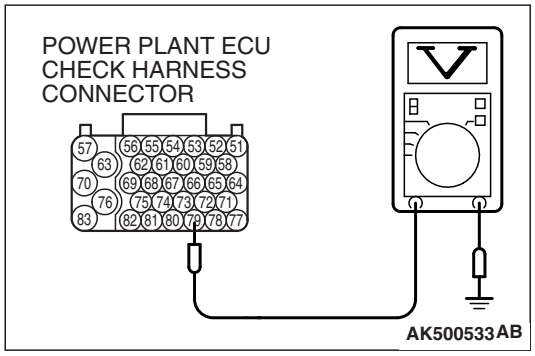
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 8. Measure the sensor offset voltage at PCM connector B-21 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.

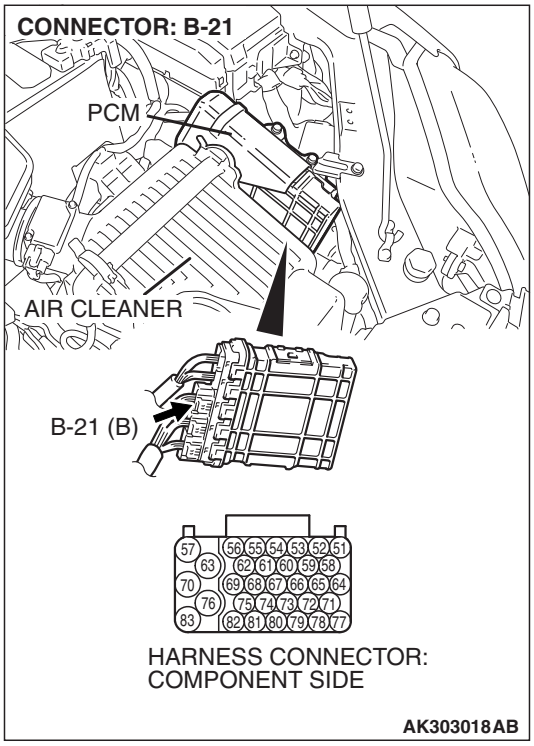


(3) Measure the voltage between terminal No. 79 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

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

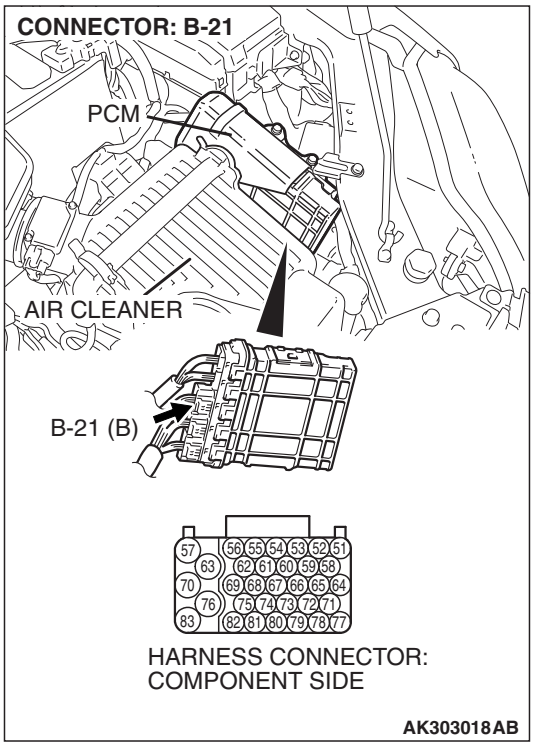
YES : Go to Step 10.
NO : Go to Step 9.



STEP 9. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-25 (terminal No. 2) and PCM connector B-21 (terminal No. 79) because of short circuit to ground. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 10. Check harness connector B-21 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

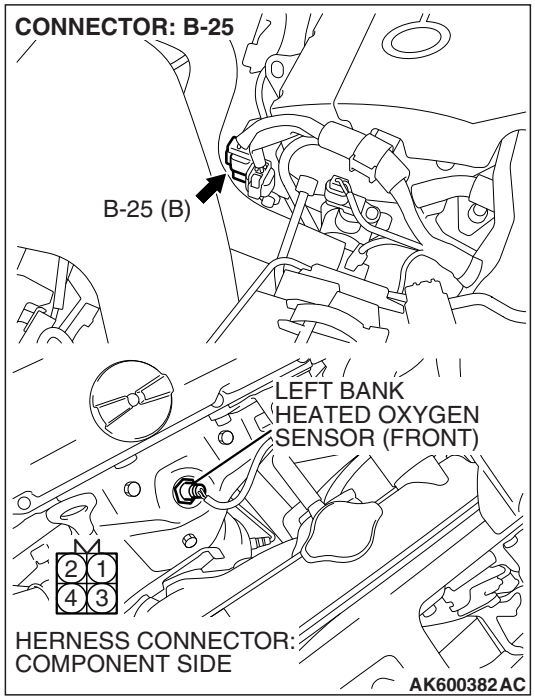
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

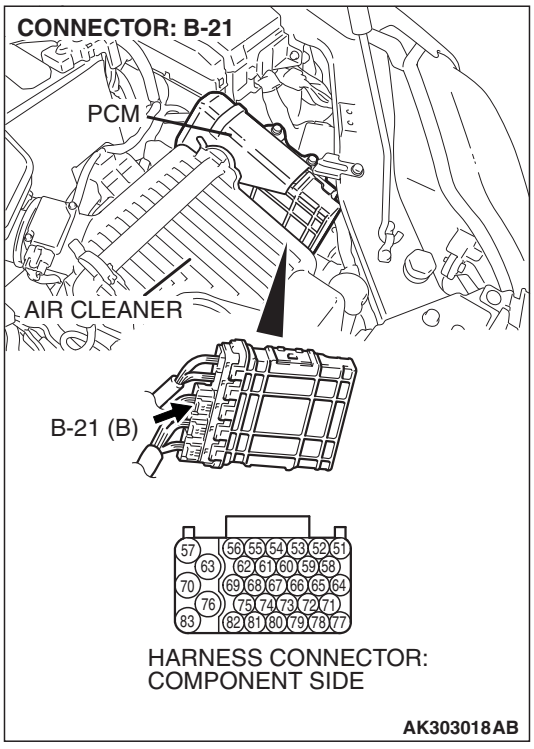
STEP 11. Check for open circuit or harness damage between left bank heated oxygen sensor (front) connector B-25 (terminal No. 2) and PCM connector B-21 (terminal No. 79).

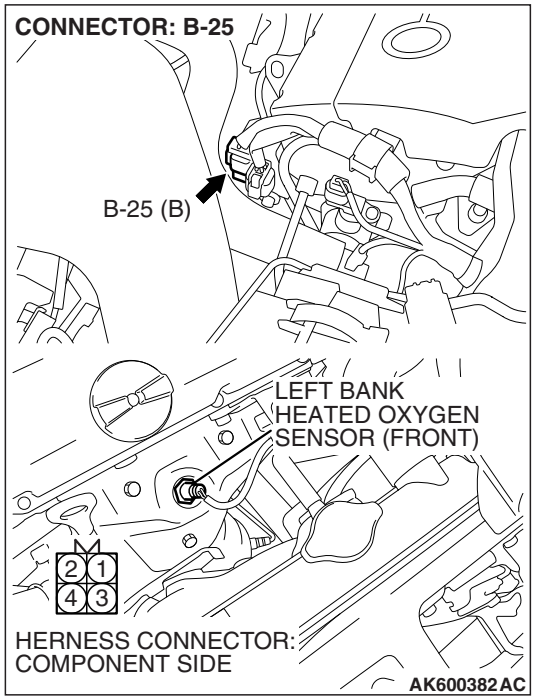
Q: Is the harness wire in good condition?

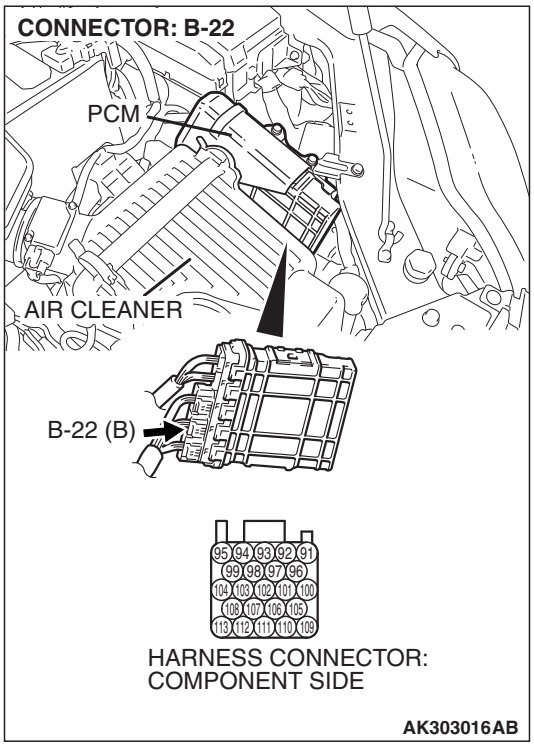
YES : Go to Step 12.

NO : Repair it. Then go to Step 14.







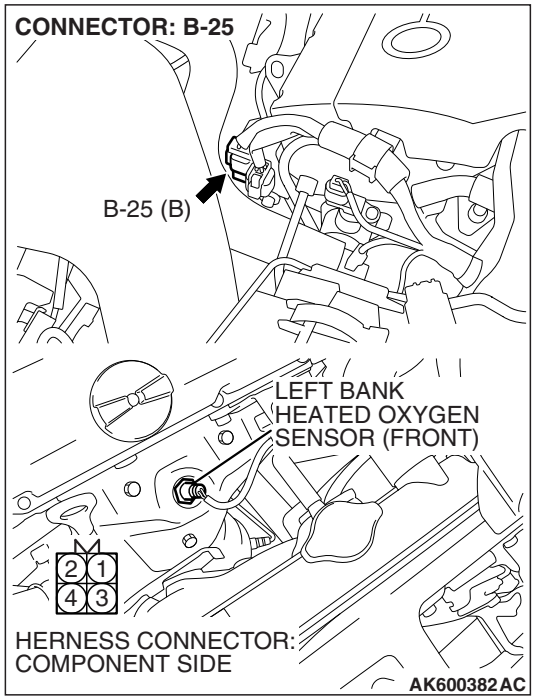


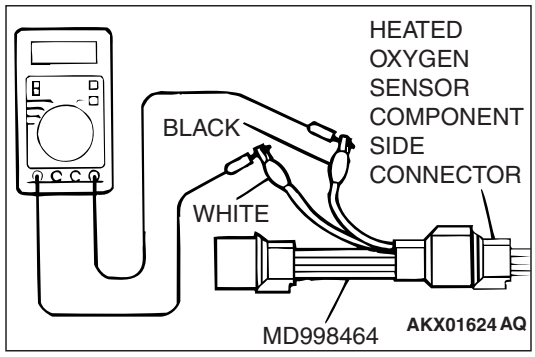
STEP 12. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (front) connector B-25 (terminal No. 4) and PCM connector B-22 (terminal No. 91).

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 left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-25 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 2,000 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 V

⚠ 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 temperature of sensing area does not reach the high temperature [of approximately 400 °C (752 °F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.

NO : Replace the left bank heated oxygen sensor (front). 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 22 P.13B-5.

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

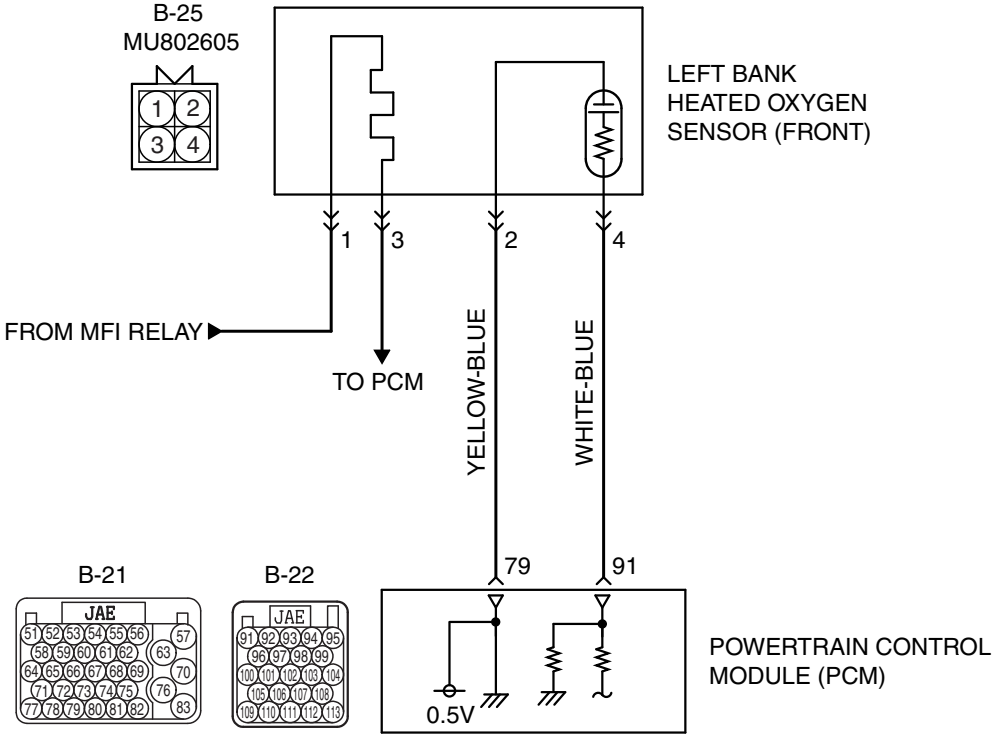
Q: Is DTC P0151 set?

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



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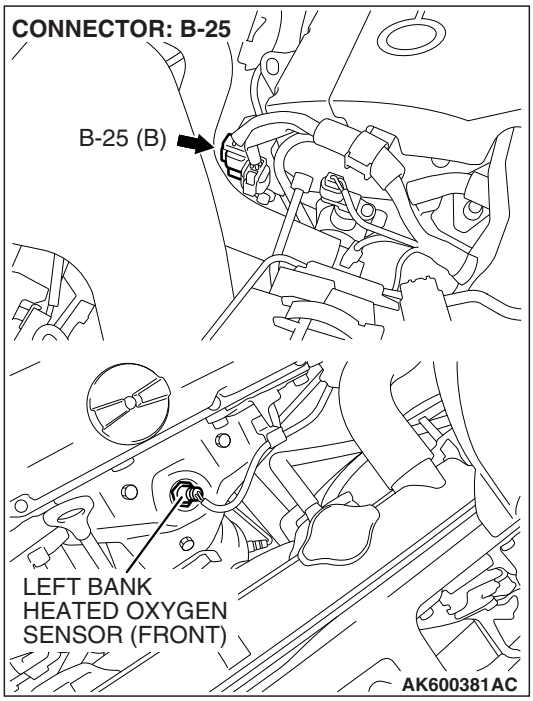
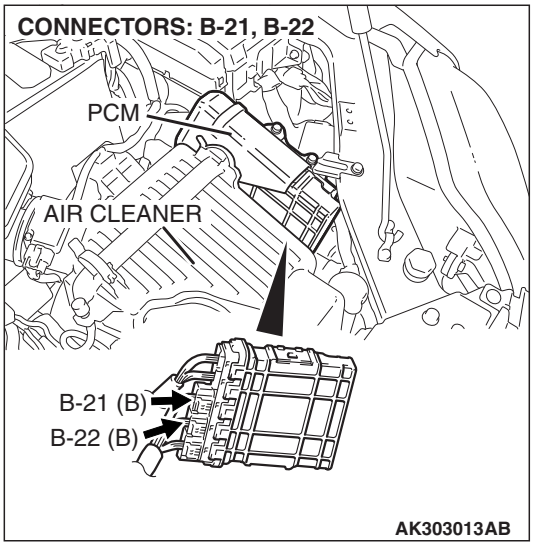




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 79).
- The PCM 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 PCM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The PCM 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)

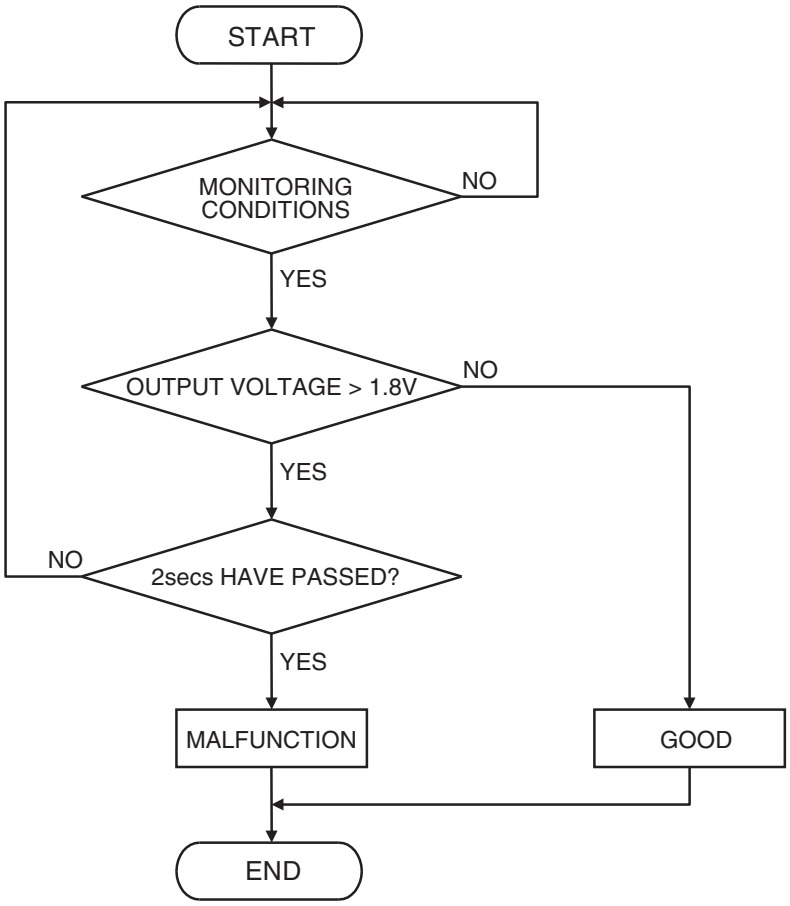
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

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.

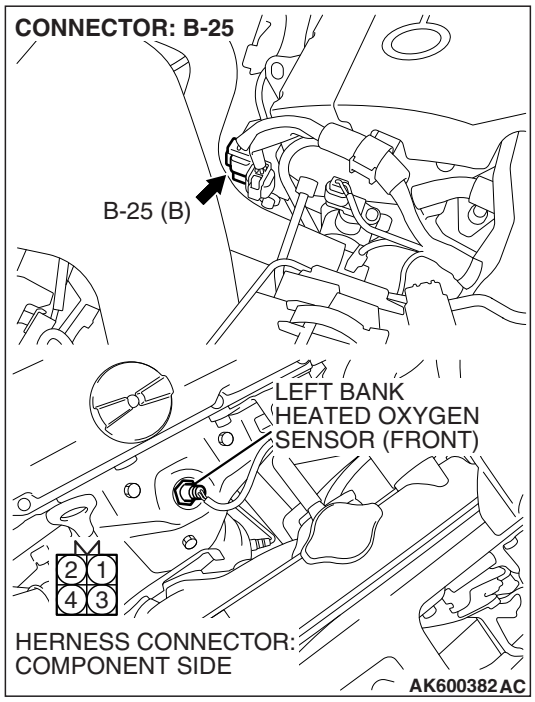
OBD-II DRIVE CYCLE PATTERN

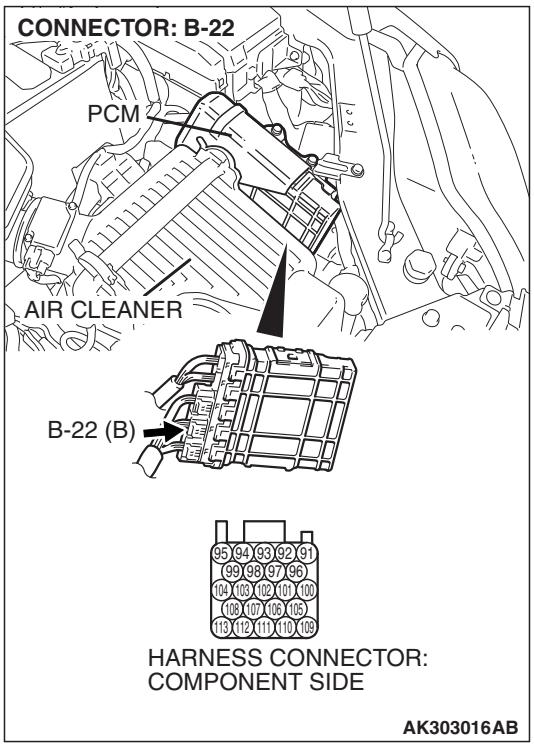
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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.
- PCM failed.

DIAGNOSIS



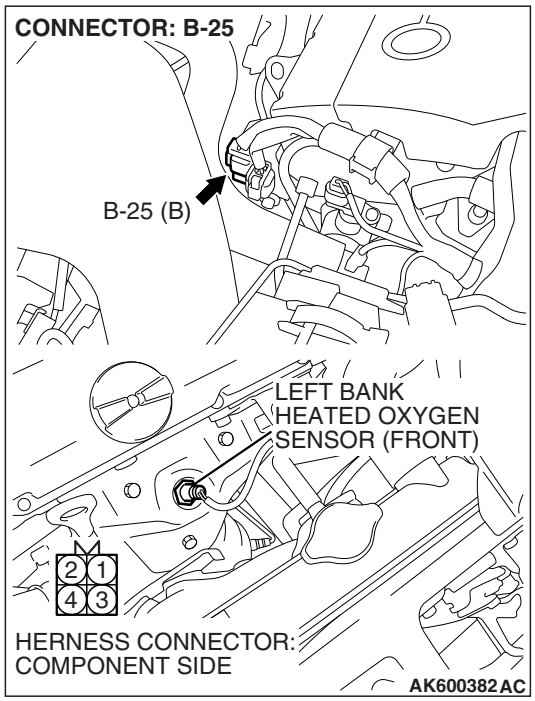


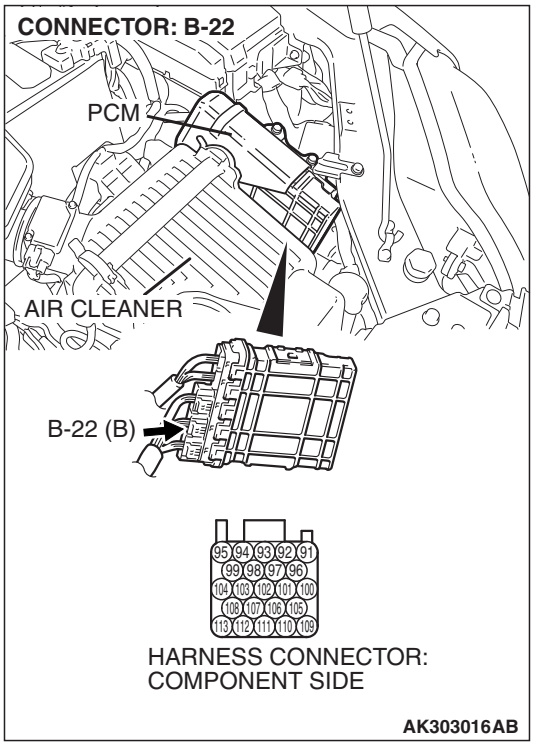
STEP 1. Check harness connector B-25 at left bank heated oxygen sensor (front) and harness connector B-22 at PCM for damage.

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 left bank heated oxygen sensor (front) connector B-25 (terminal No. 4) and PCM connector B-22 (terminal No. 91).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

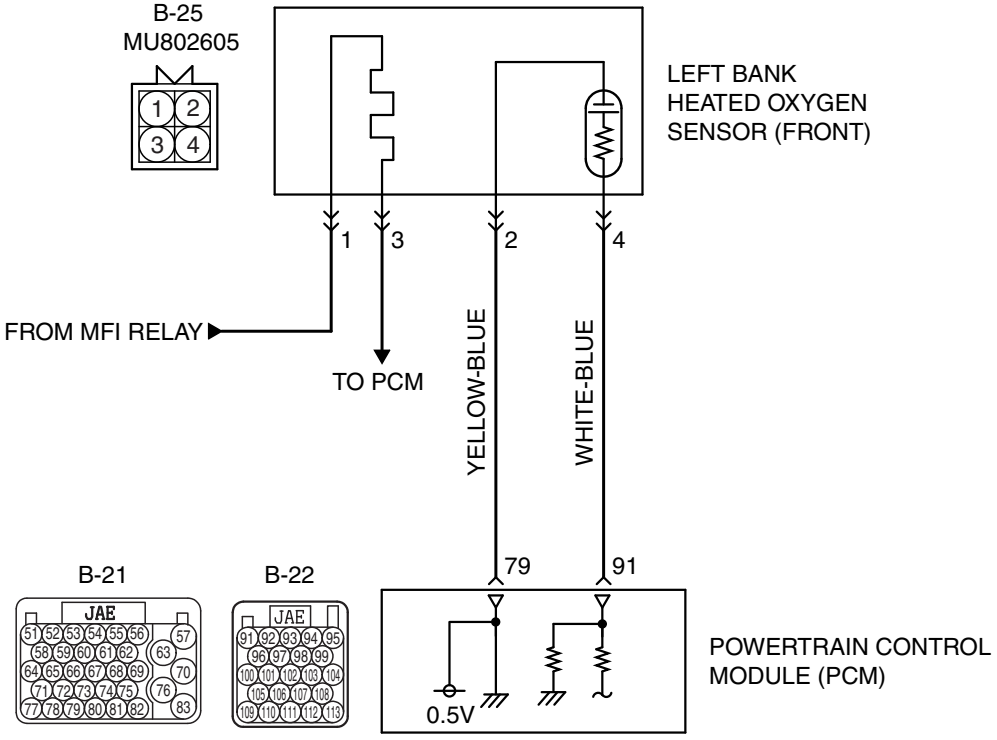
Q: Is DTC P0152 set?

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



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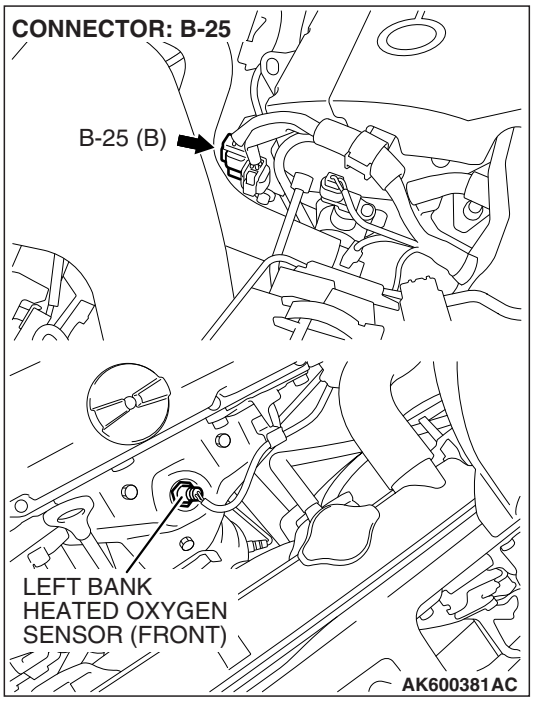
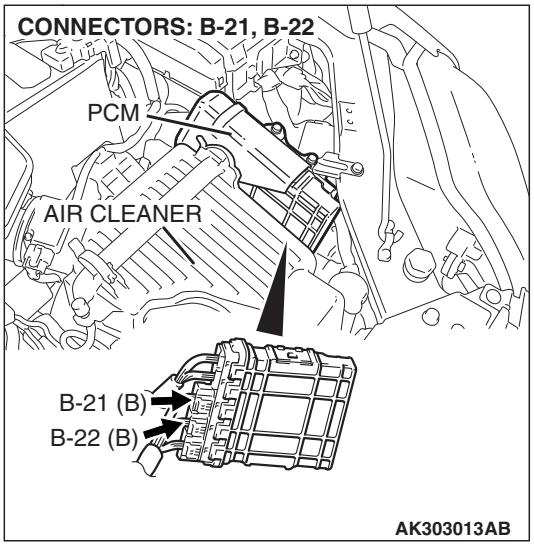




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 79).
- The PCM 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 PCM.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the left bank heated oxygen sensor signal response becomes poor.
- The PCM 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

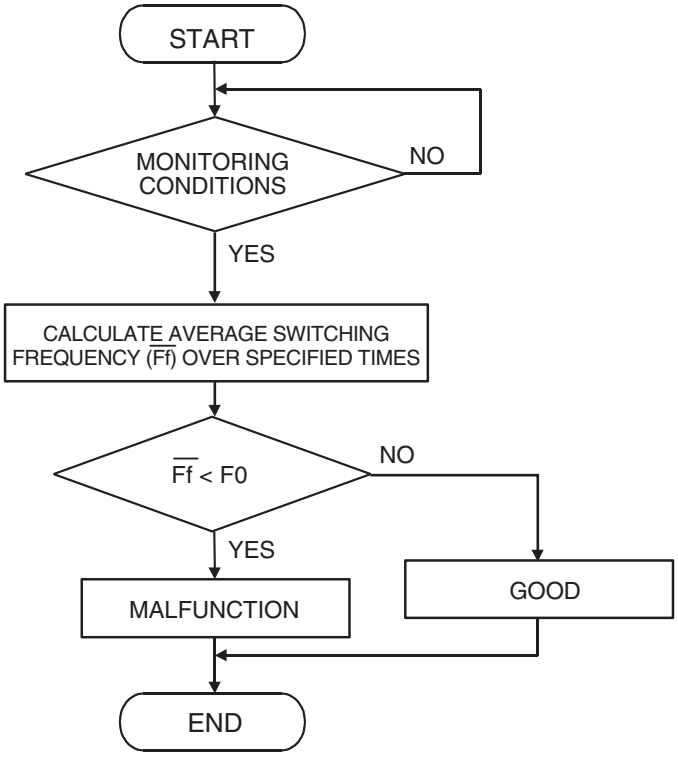
Sensor (The sensor below is determined to be normal)

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

TSB Revision

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 1,300 and 3,000 r/min.
- Volumetric efficiency is between 20 and 65 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is depressed.
- Short-term fuel trim is between –30 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- During the drive cycle, the PCM performs monitoring with the accumulated total time of 12 seconds, 5 times.

Judgement Criteria

- The average of the left bank heated oxygen sensor (front) rich/lean switching frequency is less than 10 times for the accumulated time of 12 seconds.
- The left bank heated oxygen sensor (front) rich/lean switching frequency is less than 20 times for the accumulated time of 12 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the M.U.T.-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.

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OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 1 P.13B-5.

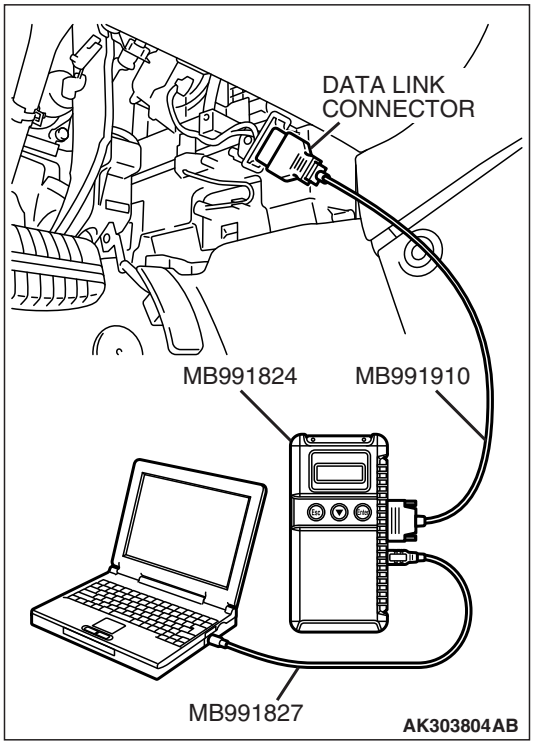
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

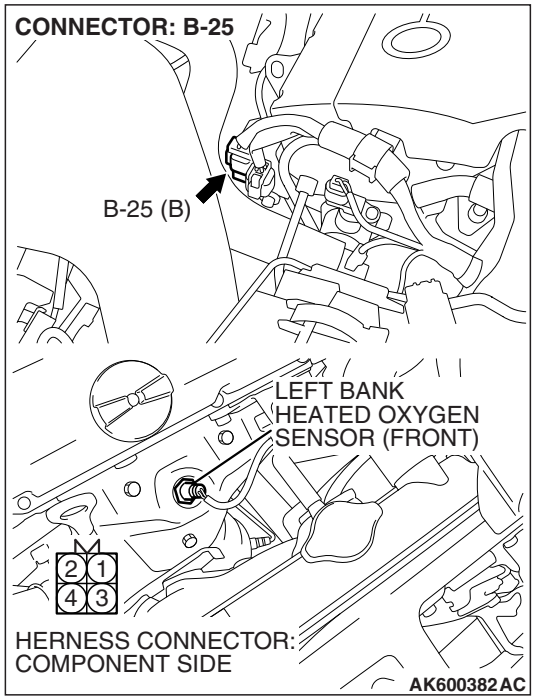
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 –1.0 volt 10 times or more within 12 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

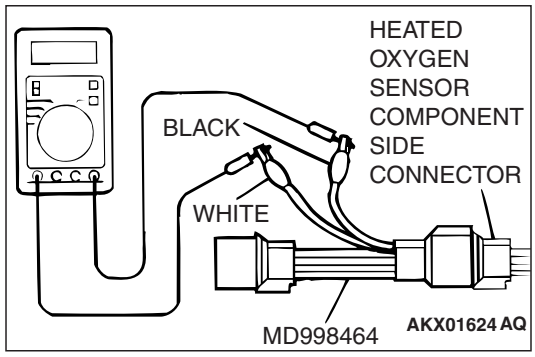
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



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

(1) Disconnect the left bank heated oxygen sensor (front) connector B-25 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 2,000 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 repeats 0 –0.4 volt and 0.6 –1.0 volt 10 times or more within 12 seconds.

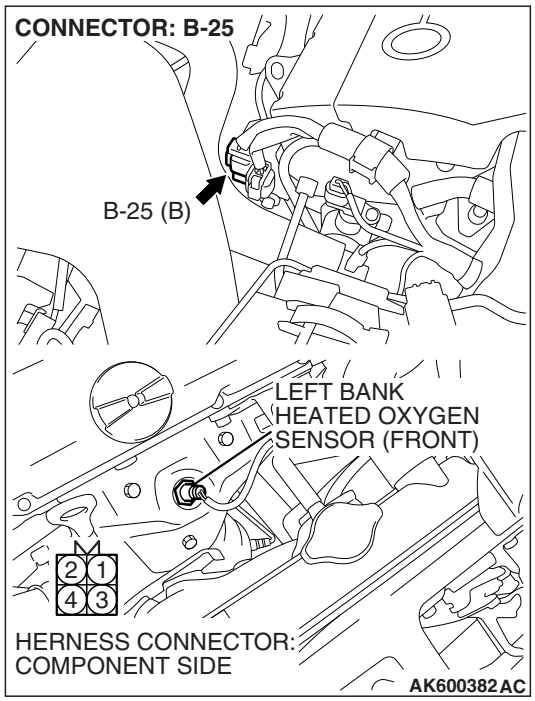
⚠ CAUTION

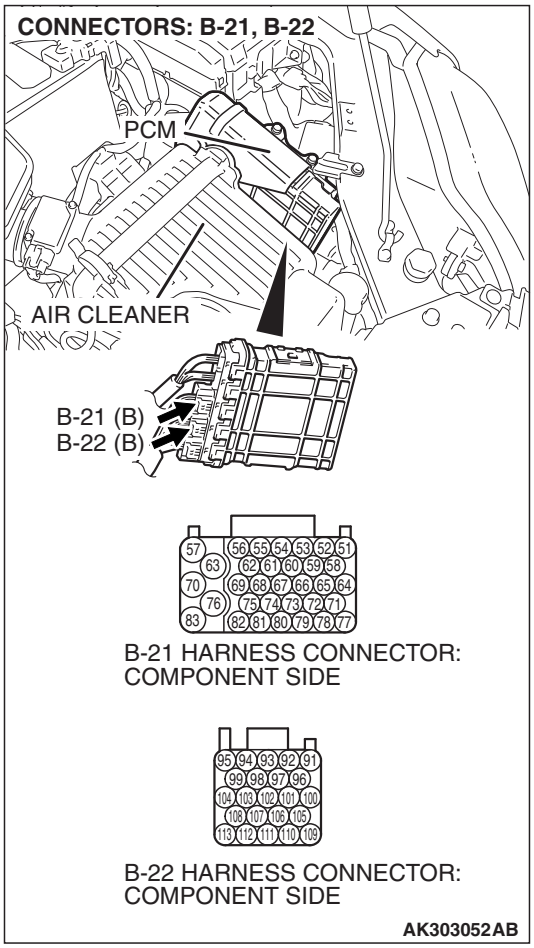
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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 3.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 4.





STEP 3. Check harness connector B-25 at left bank heated oxygen sensor (front) and harness connector B-21, B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 4.

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

STEP 4. 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-5.

(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 –Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 1) P.13B-371.
- Refer to, DTC P0202P.13B-504, P0204P.13B-527, P0206P.13B-550 –Injector Circuit.

CIRCUIT OPERATION

- Refer to, DTC P0151 –Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 1) P.13B-371.
- Refer to, DTC P0202P.13B-504, P0204P.13B-527, P0206P.13B-550 –Injector Circuit.

TECHNICAL DESCRIPTION

- The PCM effects air/fuel ratio feedback control in accordance with the signals from the left bank heated oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the left bank 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 lean/rich criteria (about 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)

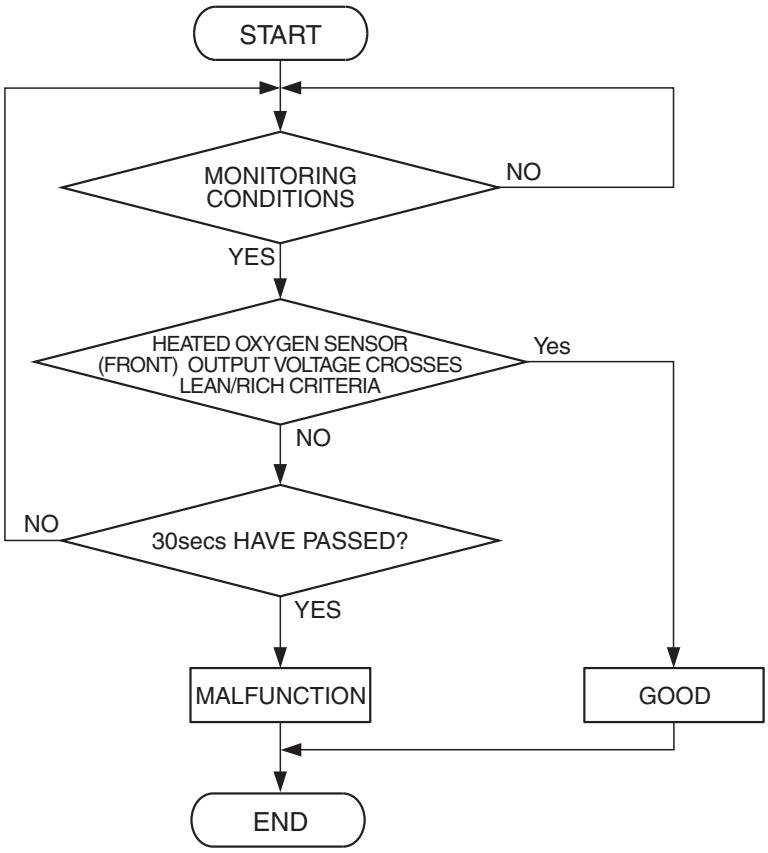
- Misfire monitor

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



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Check Conditions

- 128 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 3 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 lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13B-5.

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).

TSB Revision

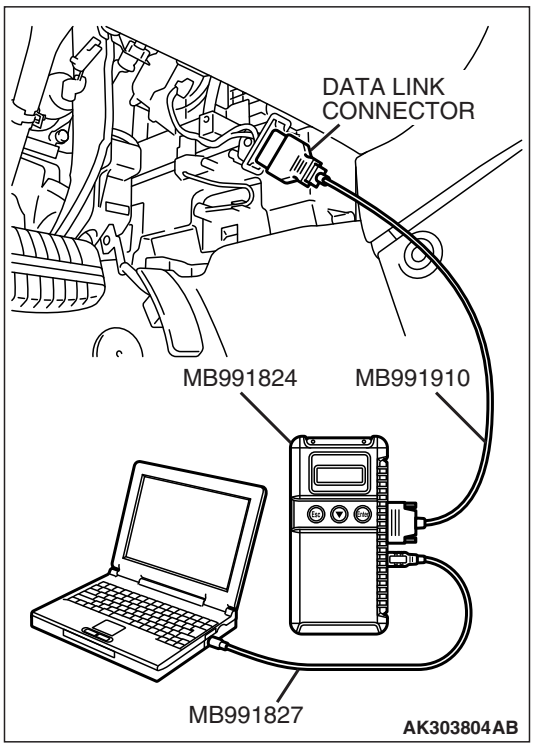
If the left bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the left bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the left bank heated oxygen sensor (front) output voltage decreases, 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.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ 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 AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0157 –Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 2) P.13B-408, DTC P0158–Heated Oxygen Sensor Circuit High Voltage (bank 2 sensor 2) P.13B-425, DTC P0159 –Heated Oxygen Sensor Circuit Slow Response (bank 2 sensor 2) P.13B-430, DTC P0160 –Heated Oxygen Sensor Circuit No Activity Detected (bank 2 sensor 2) P.13B-435.

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.

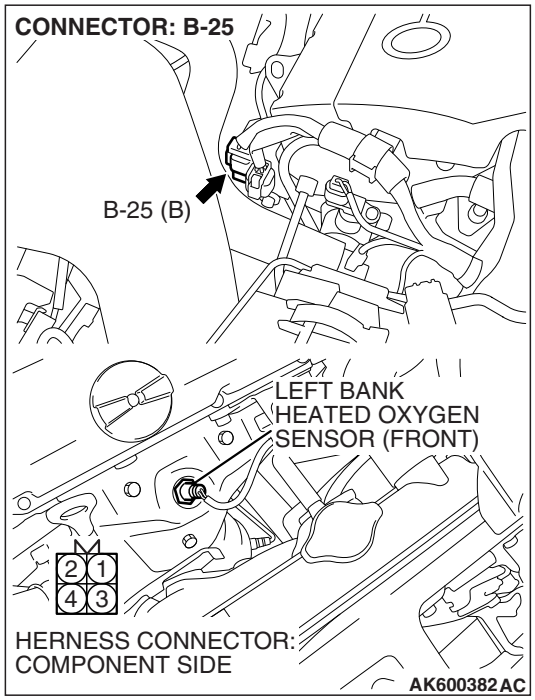
Q: Are there any abnormalities?

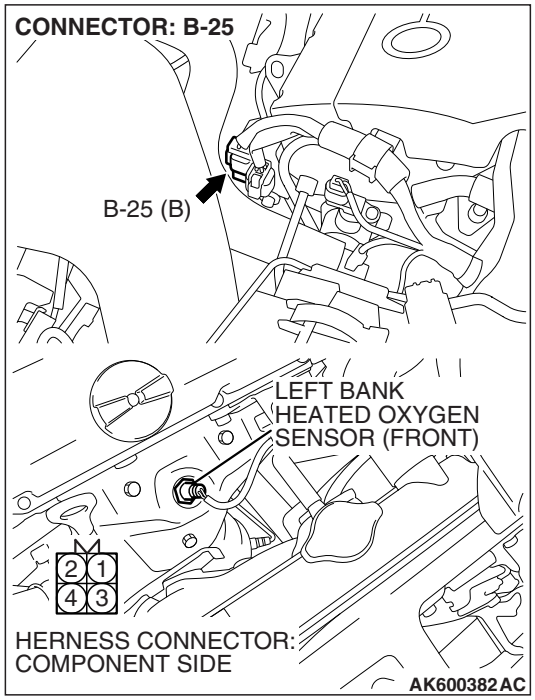
YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

STEP 4. Check harness connector B-25 at the left bank heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

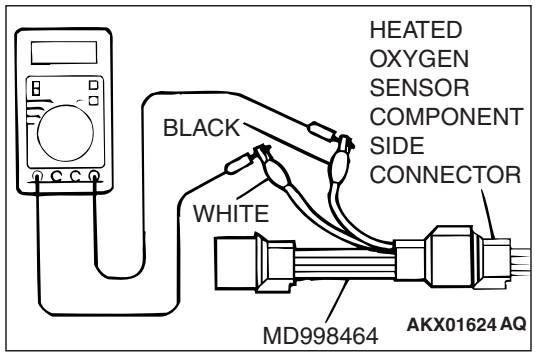
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





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

(1) Disconnect the left bank heated oxygen sensor (front) connector B-25 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 2,000 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 V

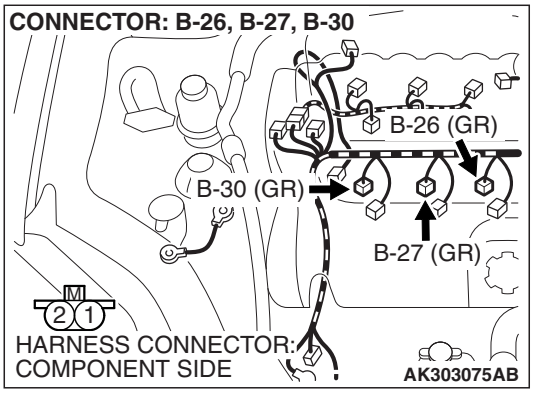
⚠ CAUTION

- **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 temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of 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 : Go to Step 6.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 12.



STEP 6. Check harness connector B-26, B-27, B-30 at left bank injector for damage.

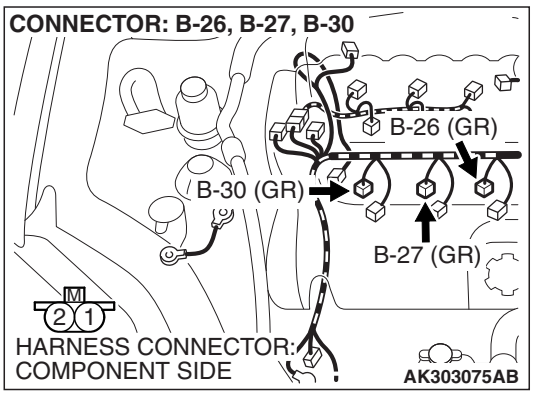
(1) Remove the intake manifold.

(2) Check the left bank injector connector for damage.

Q: Is the harness connector in good condition?

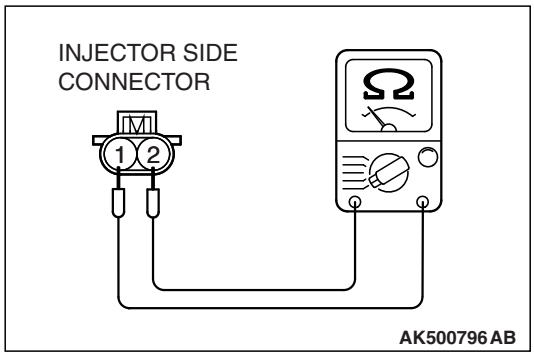
YES : Go to Step 7.

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.



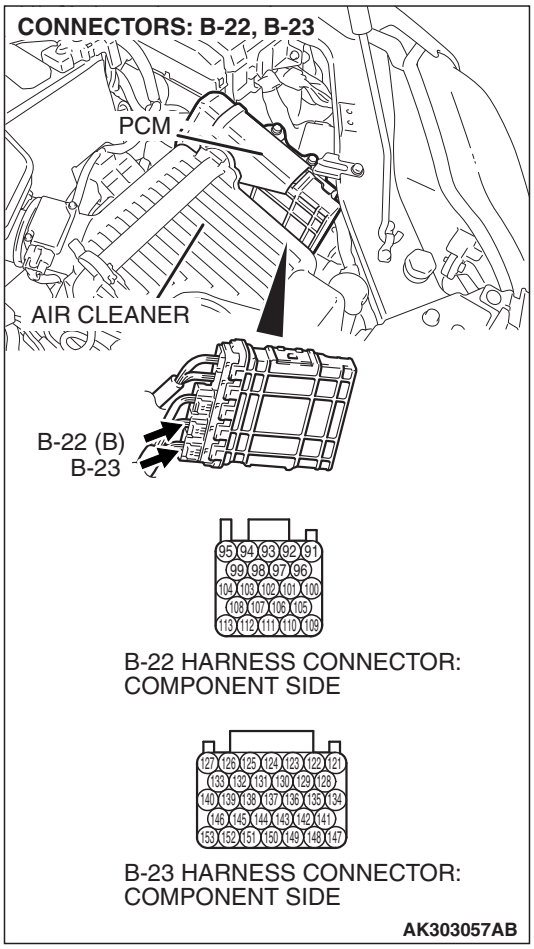
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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.

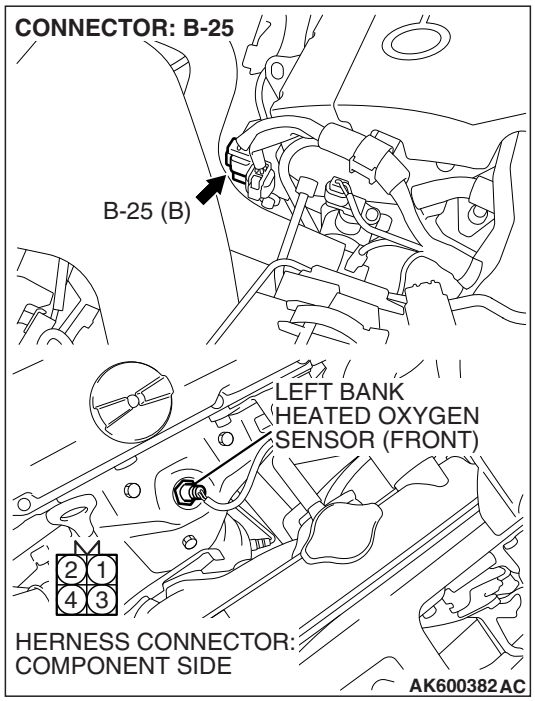


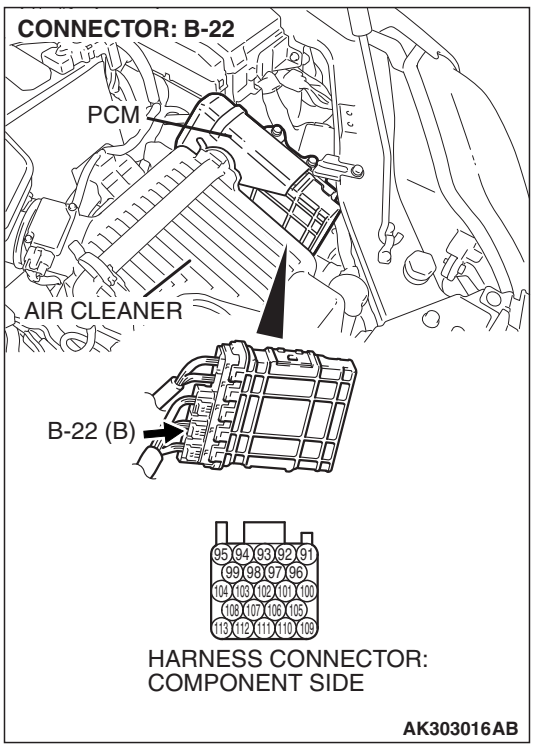
STEP 8. Check harness connector B-22, B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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



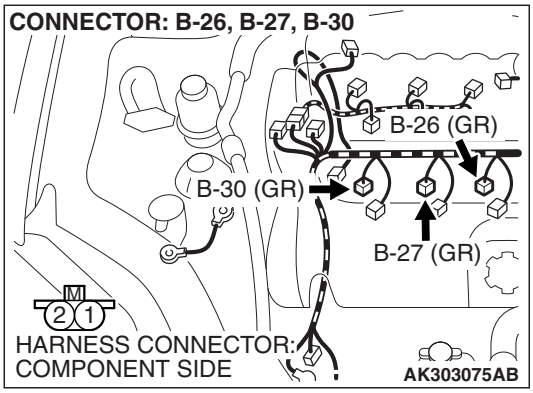


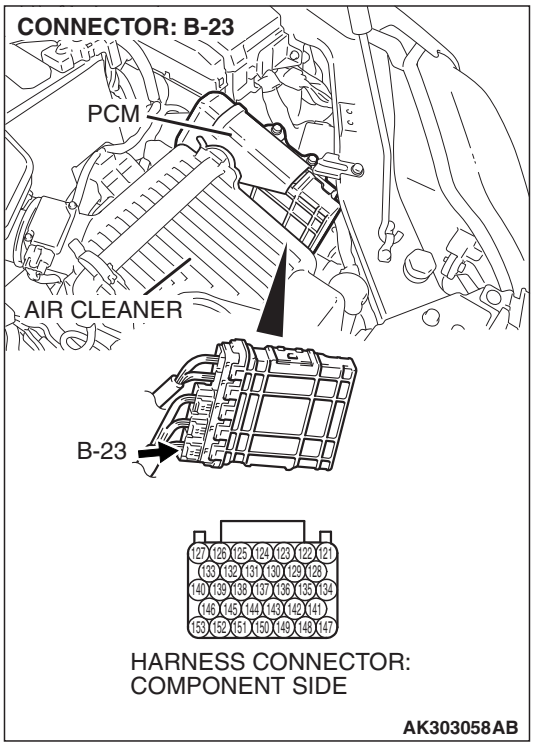
STEP 9. Check for harness damage between left bank heated oxygen sensor (front) connector B-25 (terminal No. 4) and PCM connector B-22 (terminal No. 91).

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 PCM connector.

a. Check the harness wire between left bank injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder.
b. Check the harness wire between left bank injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder.
c. Check the harness wire between left bank injector connector B-26 (terminal No. 2) and PCM connector B-23 (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-1250.

Q: Is the fuel pressure normal?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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-5.

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

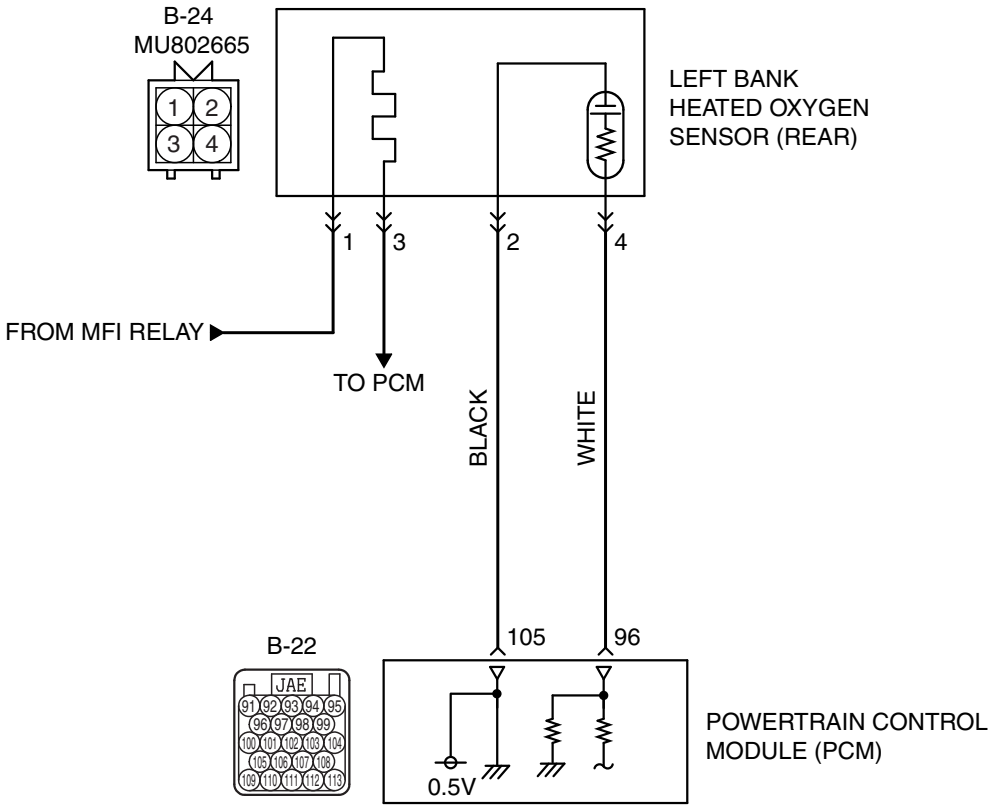
Q: Is DTC P0154 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0157: Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



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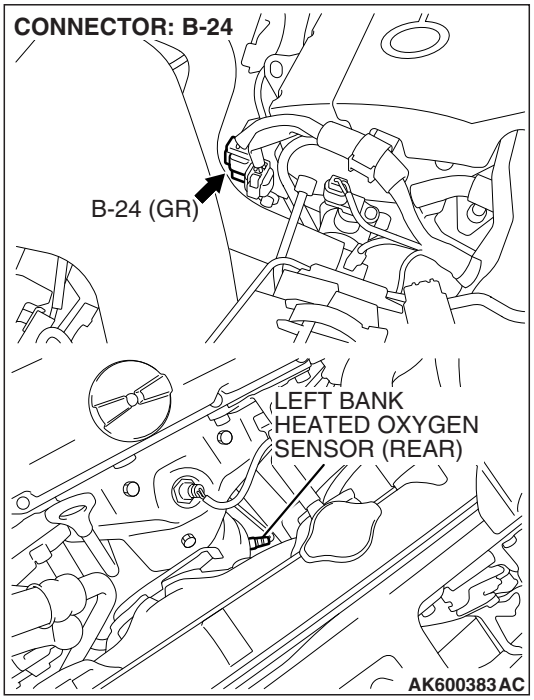
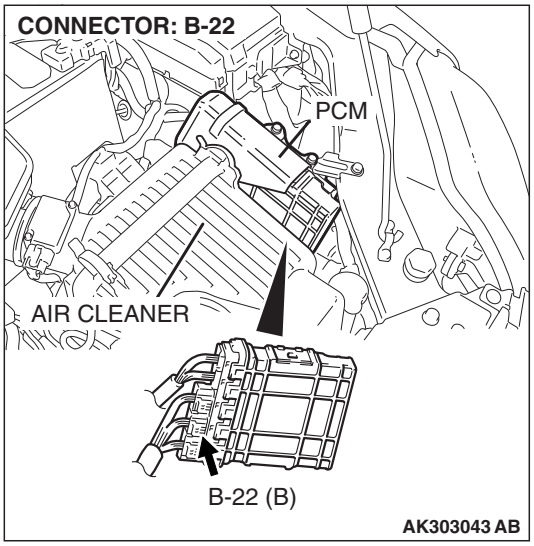




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 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 PCM (terminal No. 105).
- The PCM 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 PCM checks for the left bank heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Left 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)

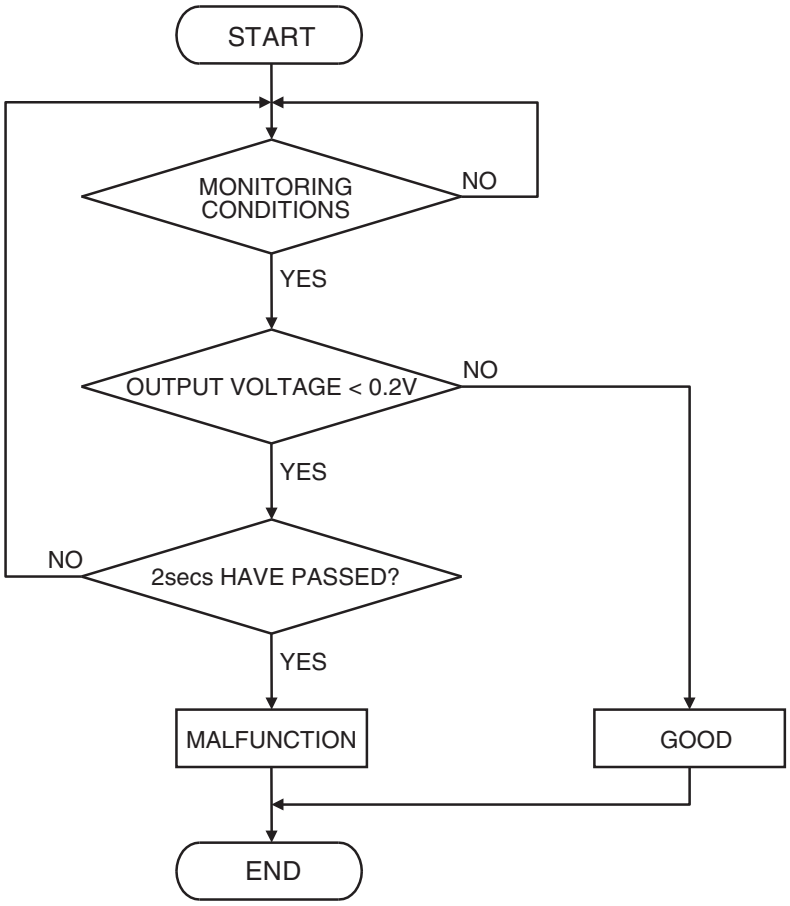
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



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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 (rear) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-5.

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) circuit, or harness damage.
- Connector damage.
- PCM failed.

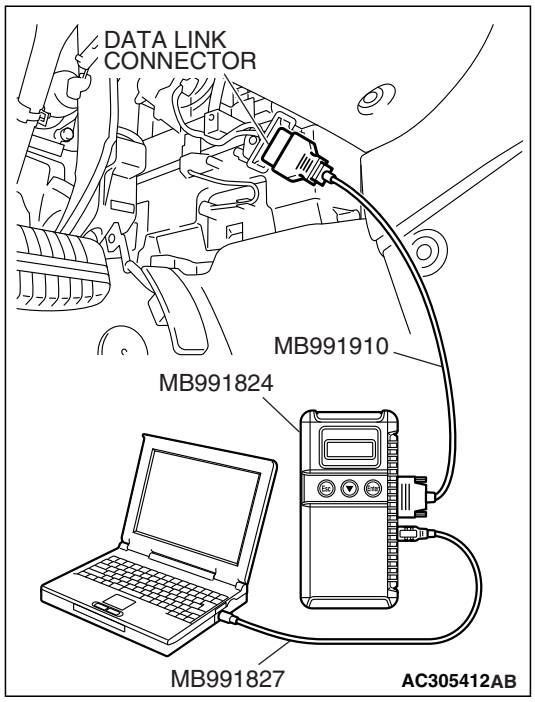
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).



⚠ 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 AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

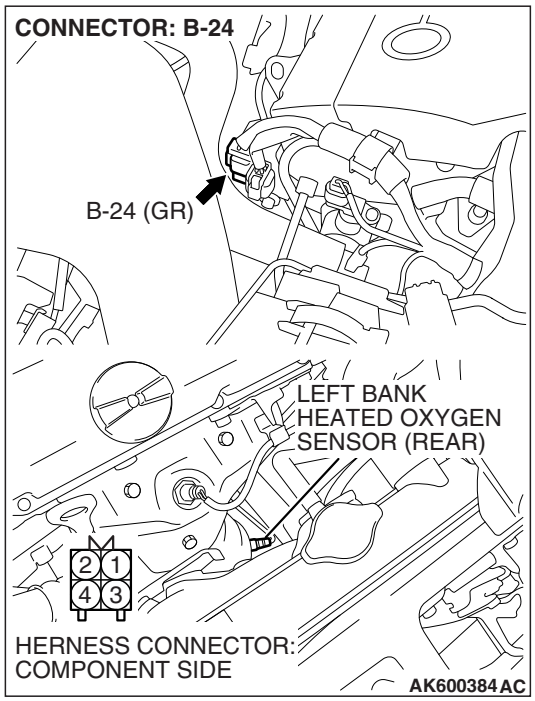
Q: Is the sensor operating properly?

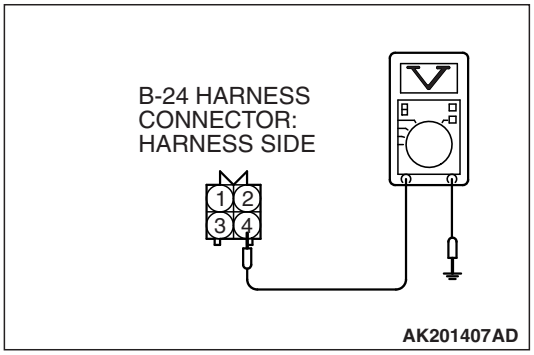
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at left bank heated oxygen sensor (rear) connector B-24 by backprobing.

(1) Do not disconnect the connector B-24.
(2) Start the engine and run at idle.

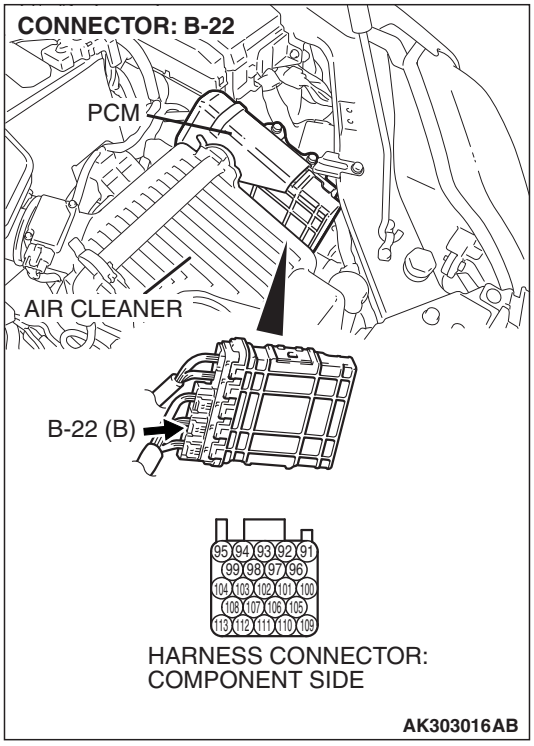


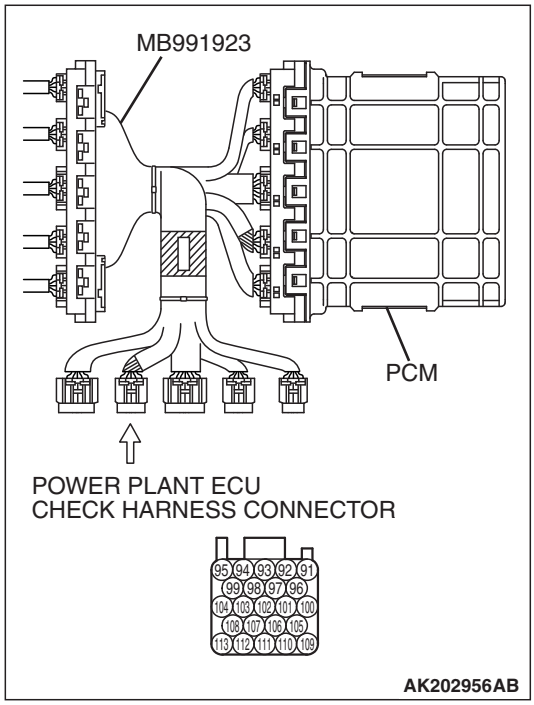


(3) Measure the voltage between terminal No. 4 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      • The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK"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

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

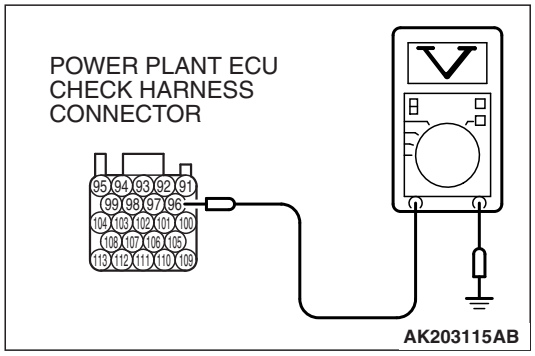
YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Measure the sensor output voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Start the engine and run at idle.

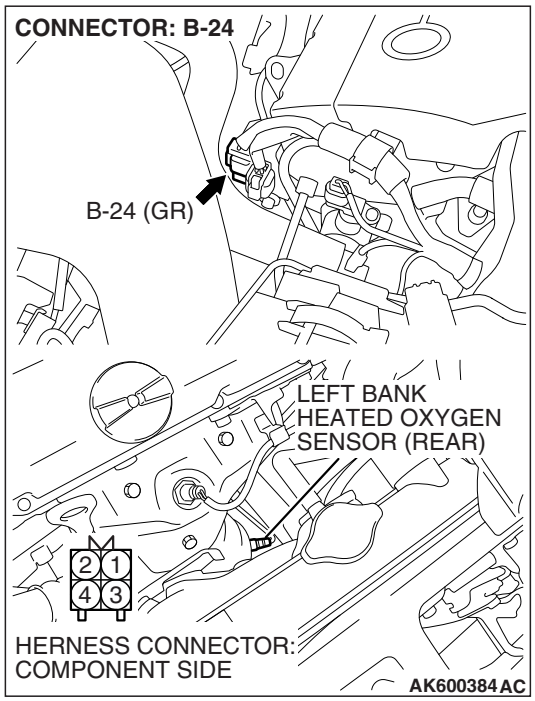


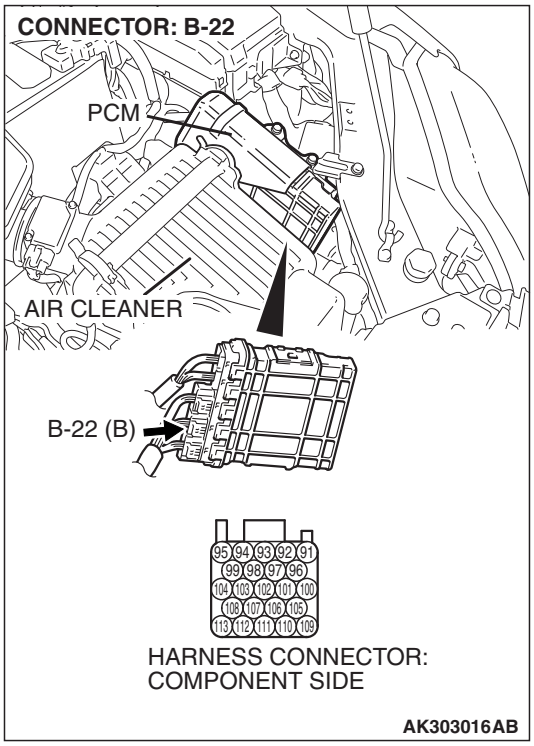
(3) Measure the voltage between terminal No. 96 and ground by backprobing under the following driving.
   a. Transaxle: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      • The output voltage should be between 1.0 and 1.5 volts.

(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 4.
NO : Go to Step 6.



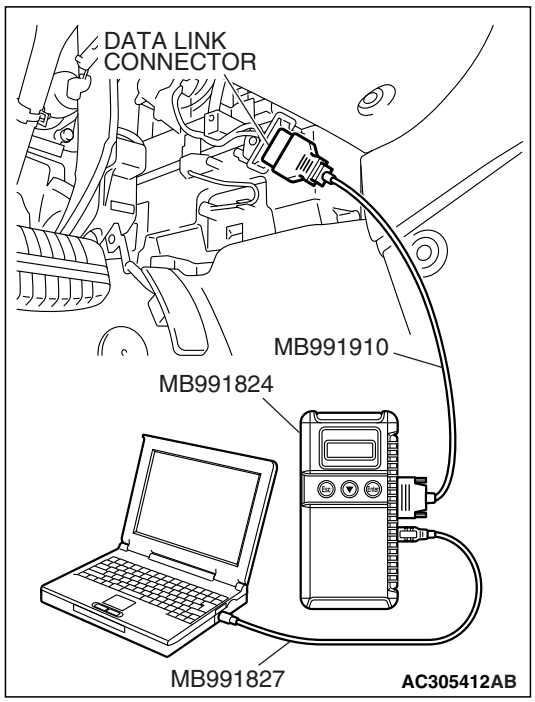


STEP 4. Check harness connector B-24 at left bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

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 14.



STEP 5. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

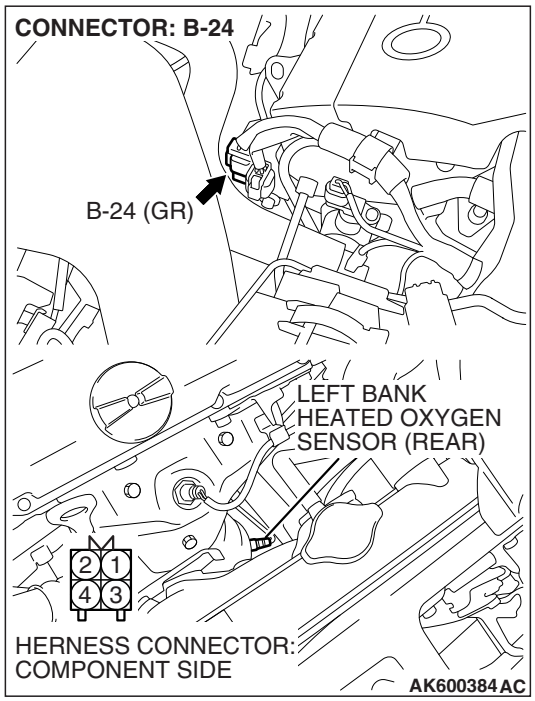
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

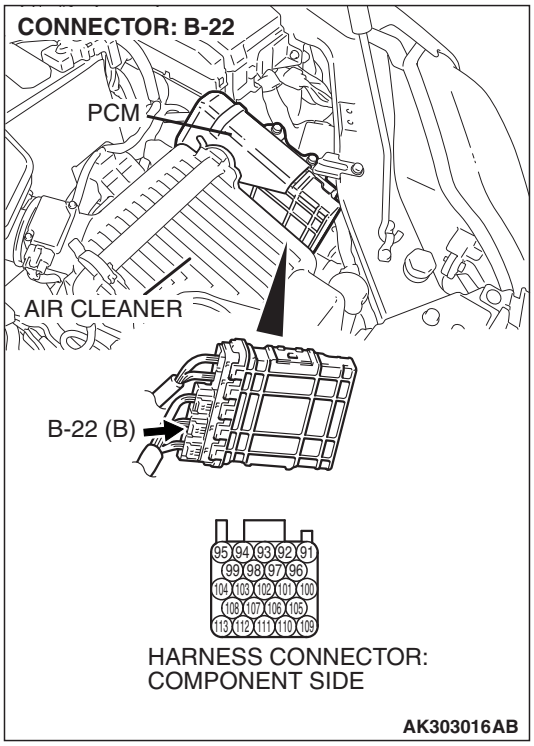
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    • The output voltage should be between 0.6 and 1.0 volt.
(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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.



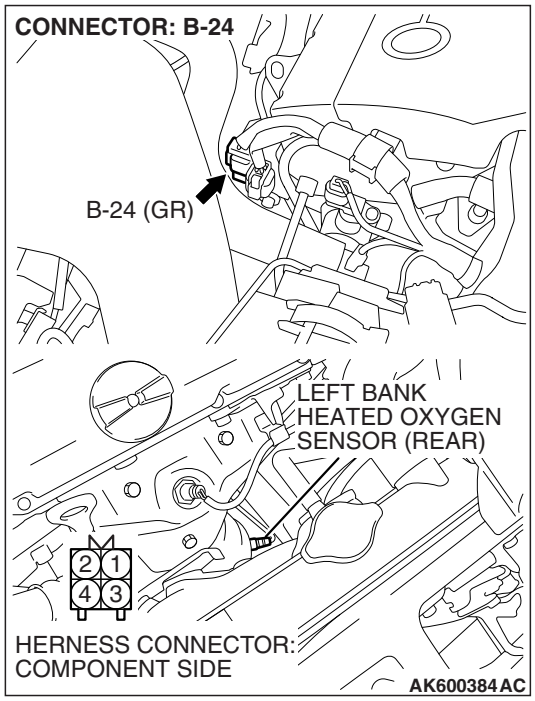


STEP 6. Check harness connector B-24 at left bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 4) and PCM connector B-22 (terminal No. 96) because of open circuit or harness damage. Then go to Step 14.

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

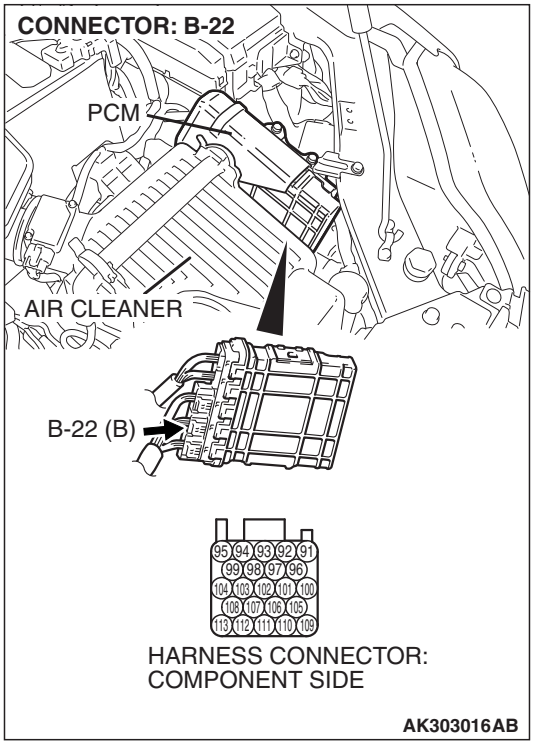


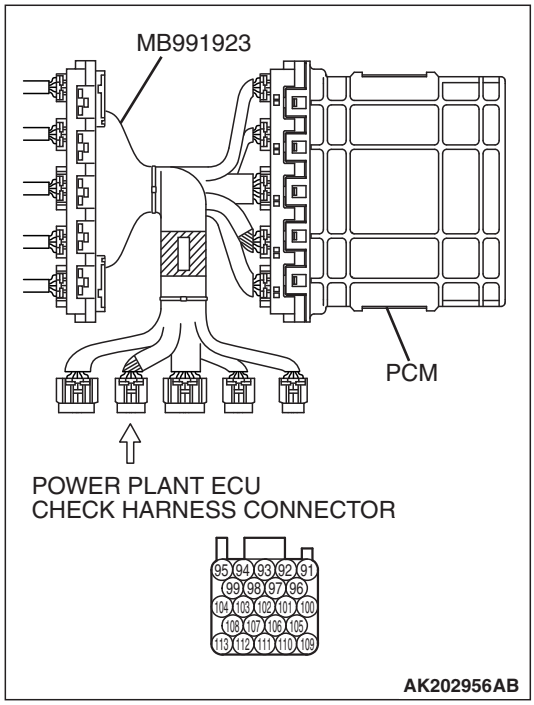
STEP 7. Check harness connector B-24 at left bank heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

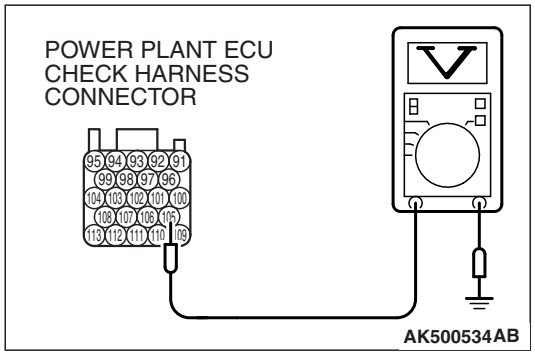
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 8. Measure the sensor offset voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.

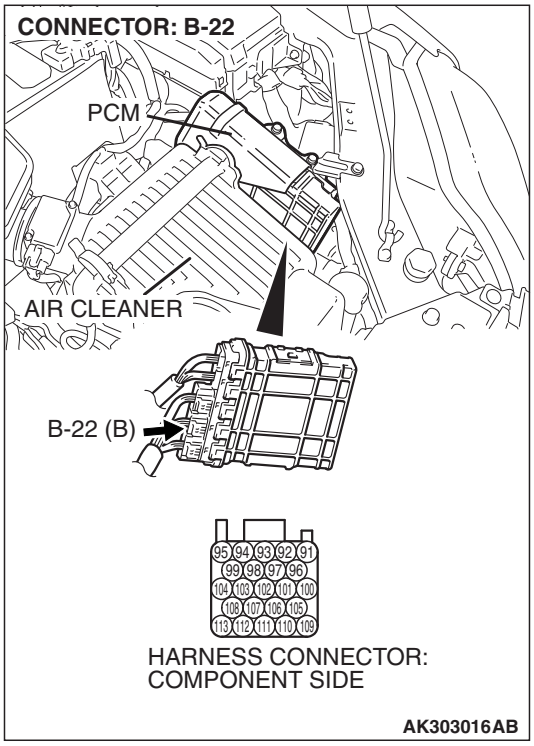


(3) Measure the voltage between terminal No. 105 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

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

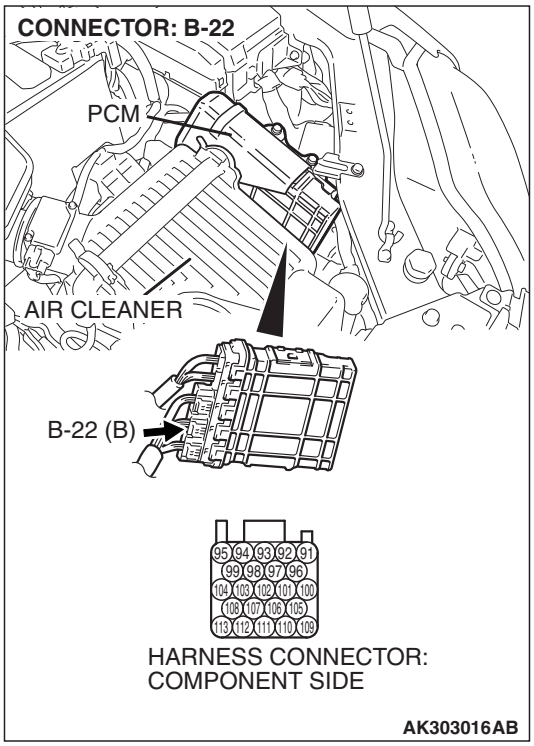
YES : Go to Step 10.
NO : Go to Step 9.



STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (rear) connector B-25 (terminal No. 2) and PCM connector B-22 (terminal No. 105) because of short circuit to ground. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

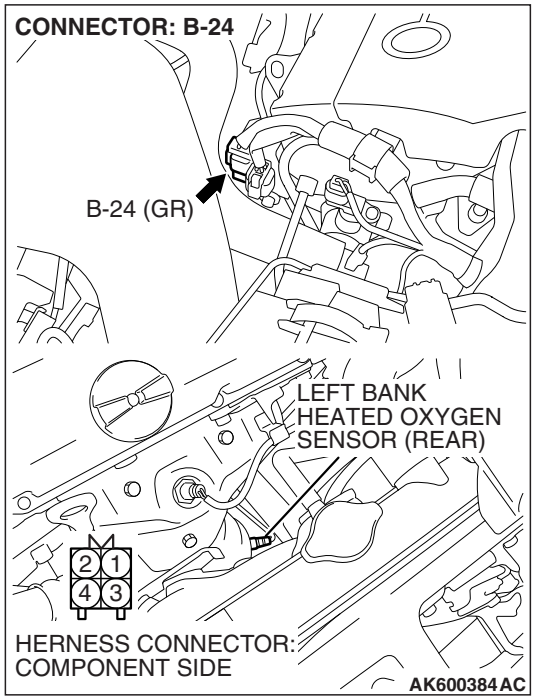


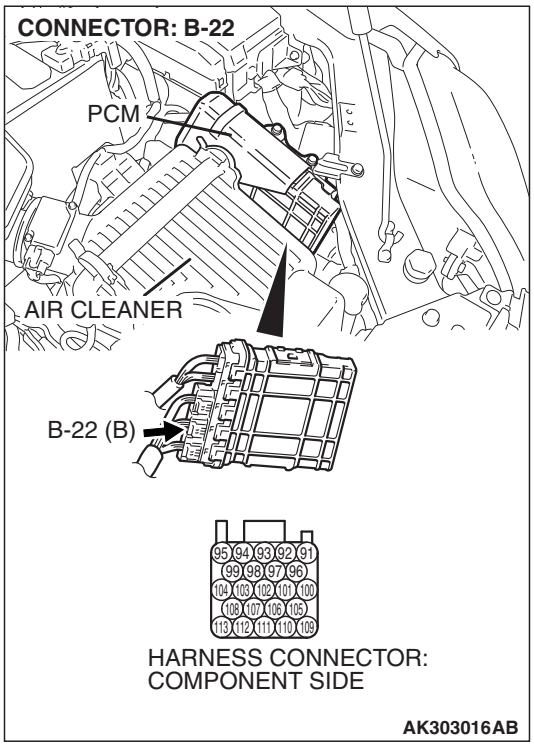
STEP 10. Check harness connector B-22 at PCM for damage.

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.



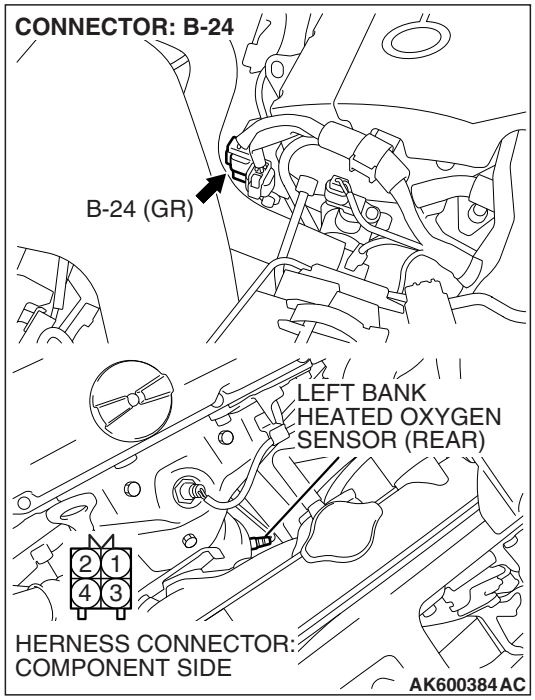


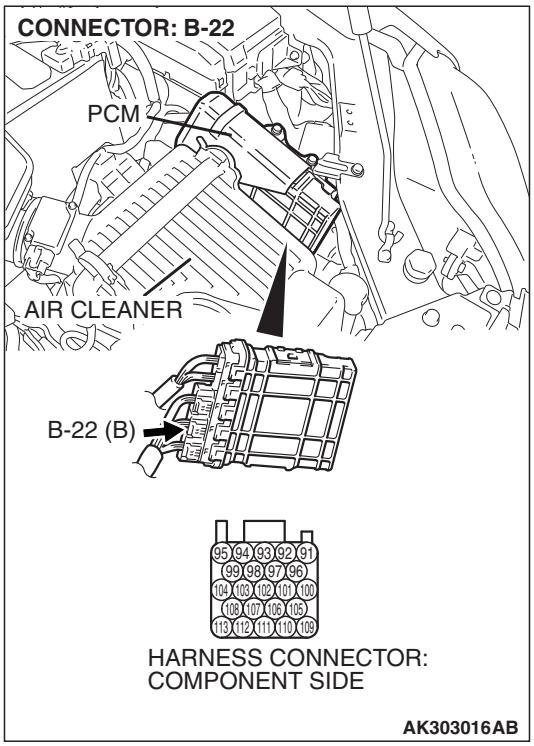
STEP 11. Check for open circuit or harness damage between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 2) and PCM connector B-22 (terminal No. 105).

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.



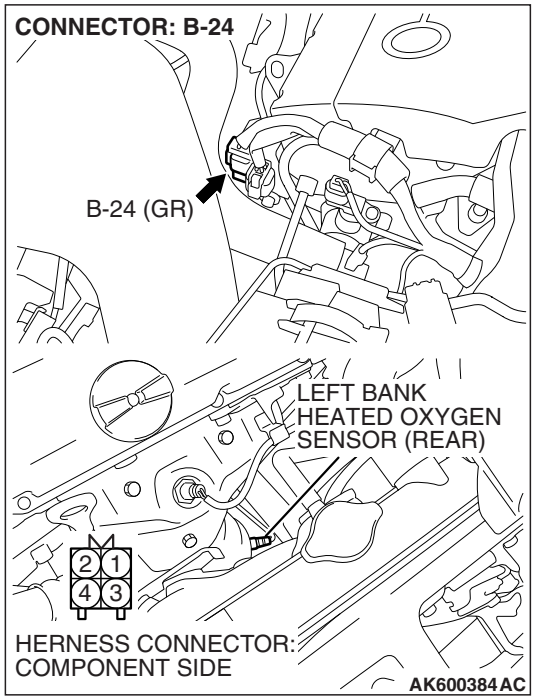


STEP 12. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 4) and PCM connector B-22 (terminal No. 96).

Q: Is the harness wire in good condition?

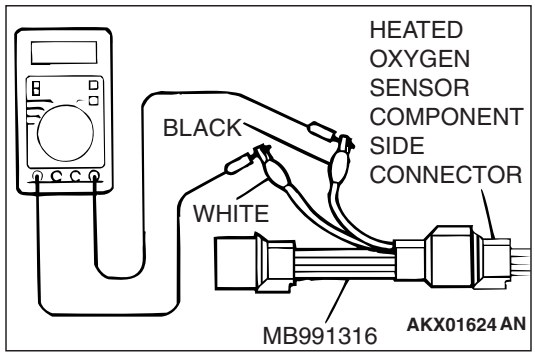
YES : Go to Step 13.

NO : Repair it. Then go to Step 14.



STEP 13. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-24 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: "L" range
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more

   Standard value: 0.6 –1.0 V

   NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400 °C (752 °F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio.

   NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

Q: Is the voltage between 0.6 and 1.0 volt?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.

NO : Replace the left bank heated oxygen sensor (rear). 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 22 P.13B-5.

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

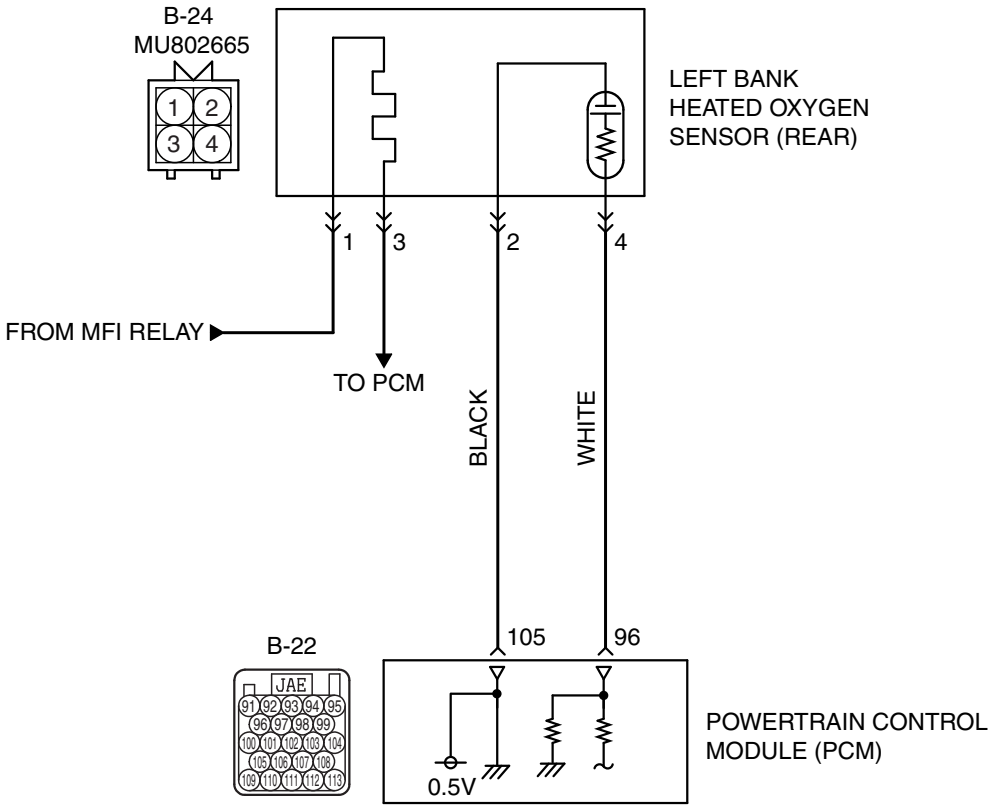
Q: Is DTC P0157 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0158: Heated Oxygen Sensor Circuit High Voltage (bank 2 sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



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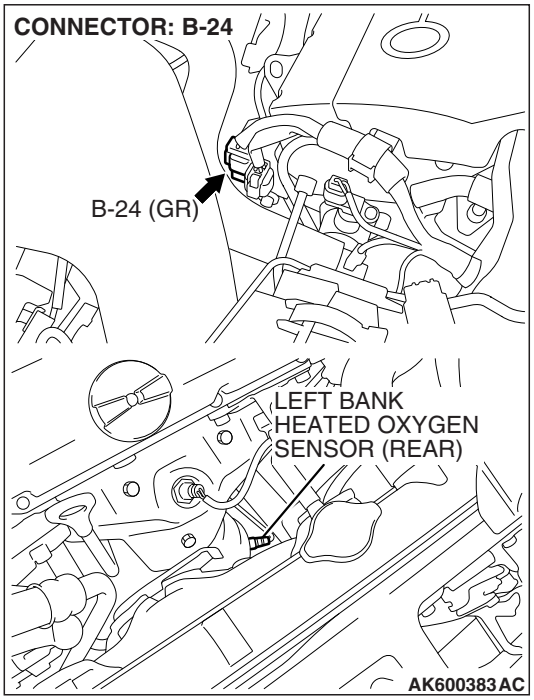
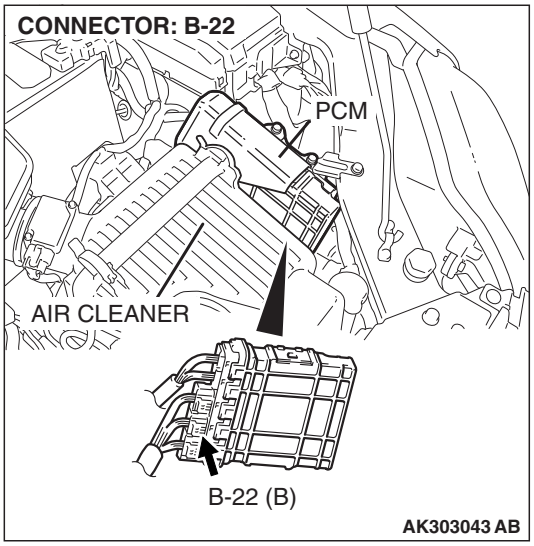




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (terminal No. 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 PCM (terminal No. 105).
- The PCM 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 PCM 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)

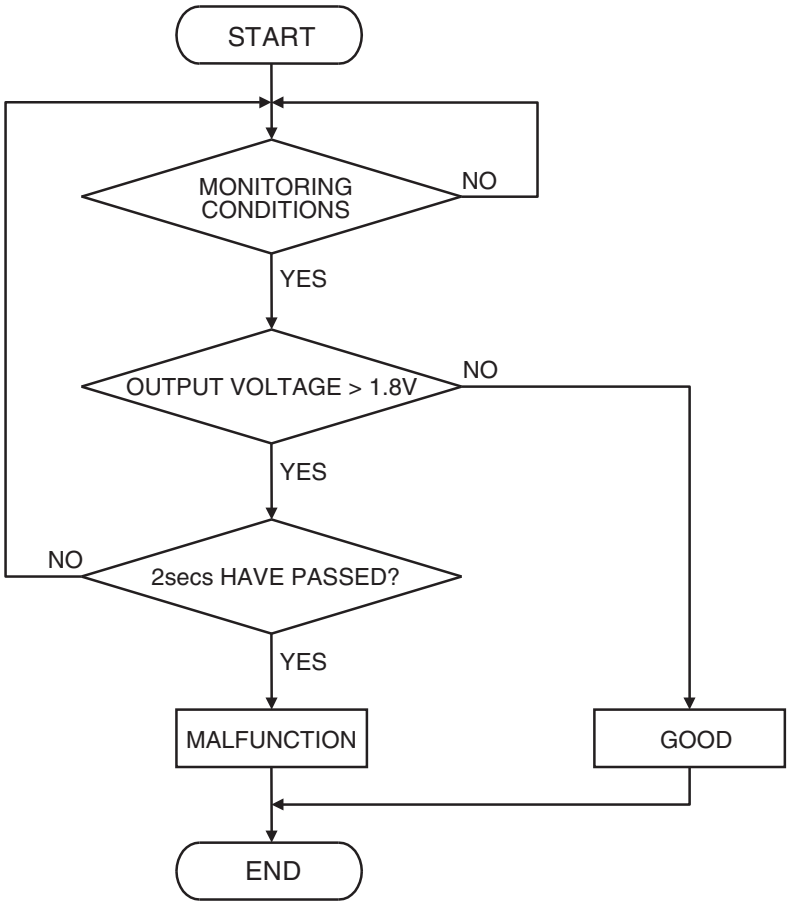
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



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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.

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 23 P.13B-5.

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.
- PCM failed.

DIAGNOSIS

Required Special Tools:

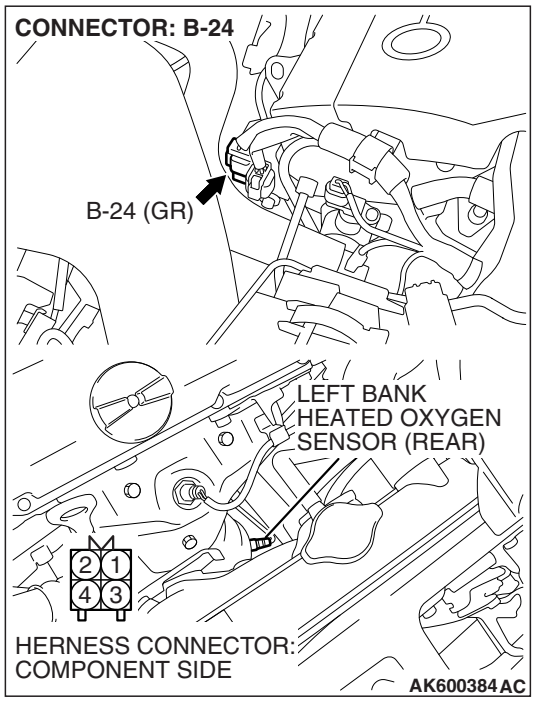
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

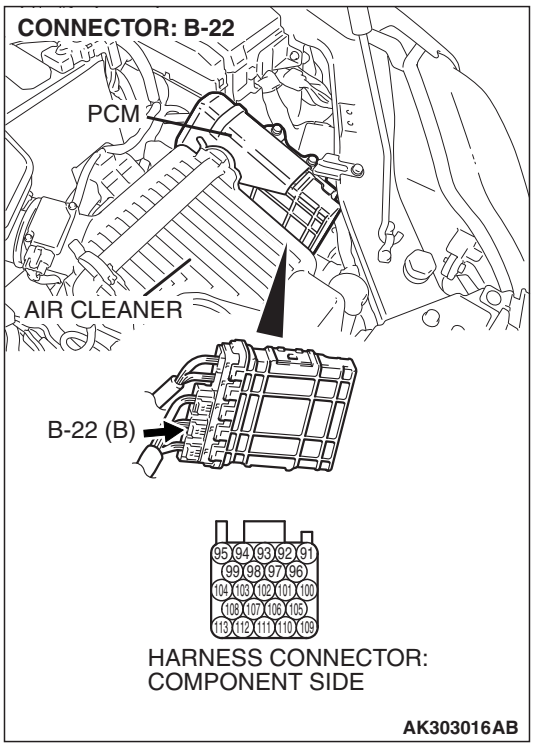
STEP 1. Check harness connector B-24 at left bank heated oxygen sensor (rear) and harness connector B-22 at PCM for damage.

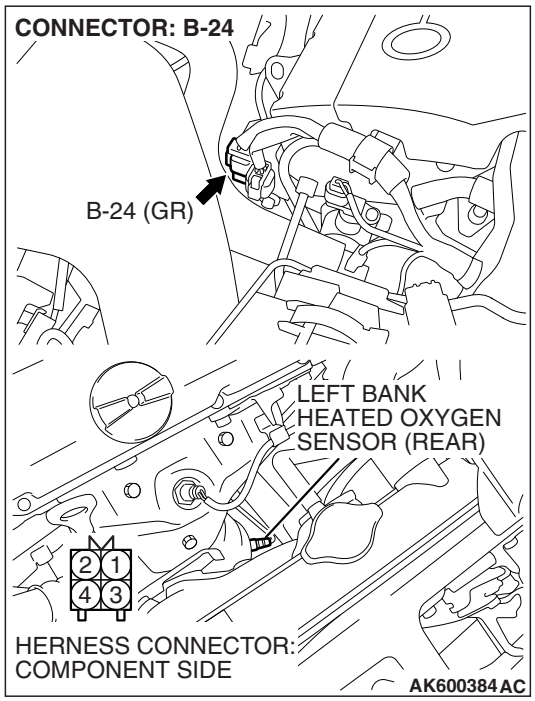
Q: Is the harness connector in good condition?

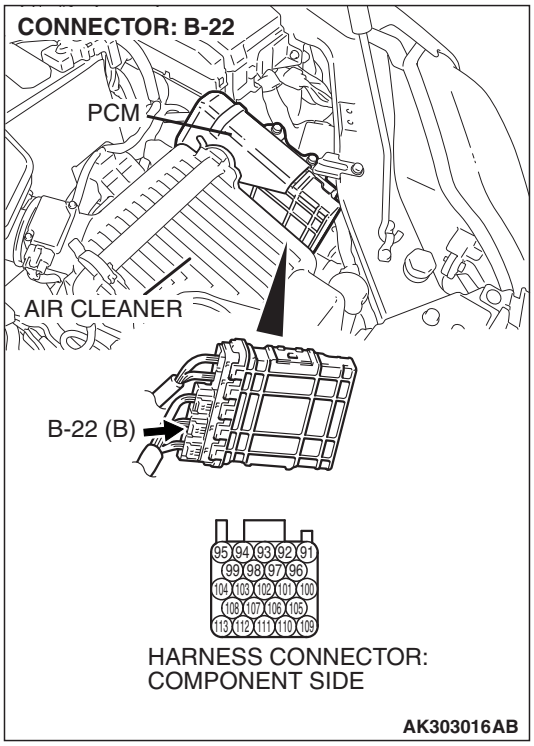
YES : Go to Step 2.

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 left bank heated oxygen sensor (rear) connector B-24 (terminal No. 4) and PCM connector B-22 (terminal No. 96).
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

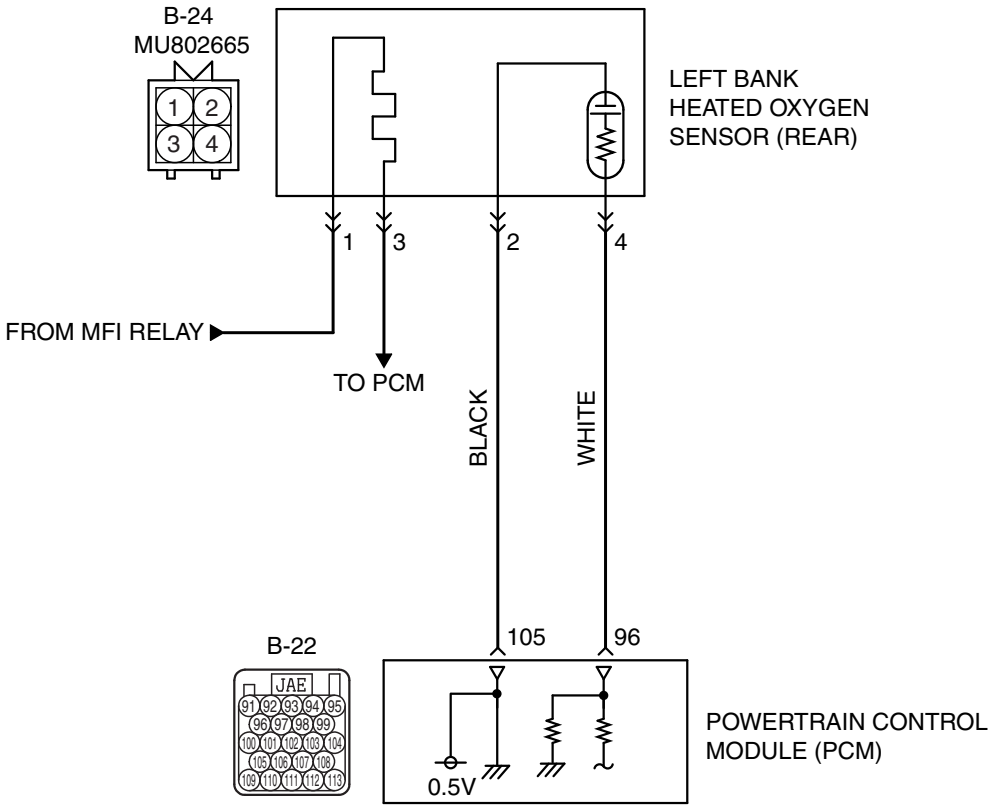
Q: Is DTC P0158 set?

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



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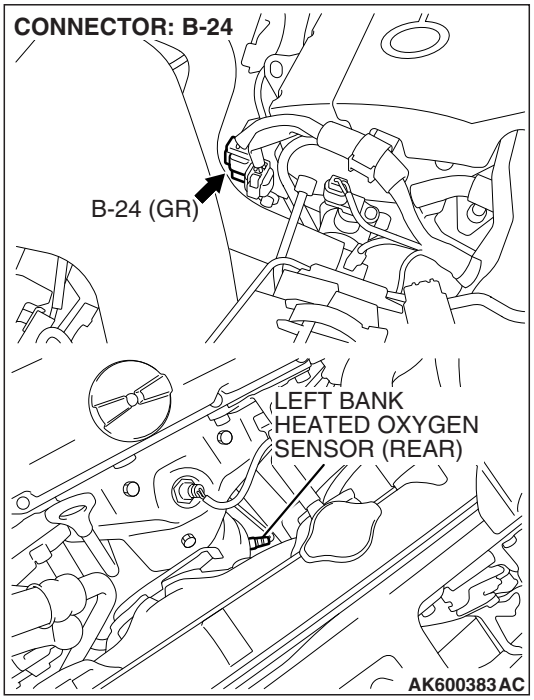
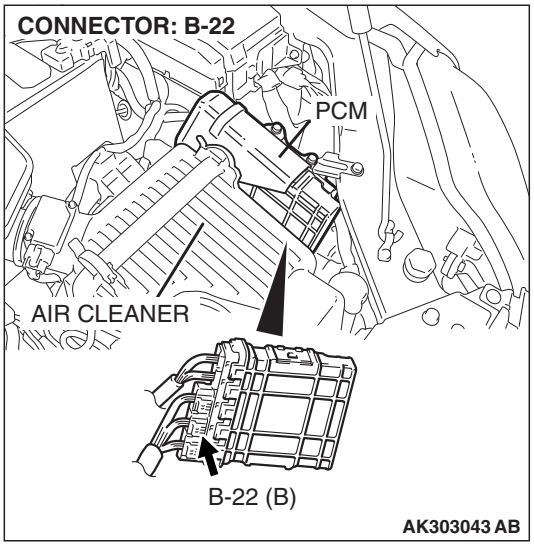




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 105).
- The PCM 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 PCM 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 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)

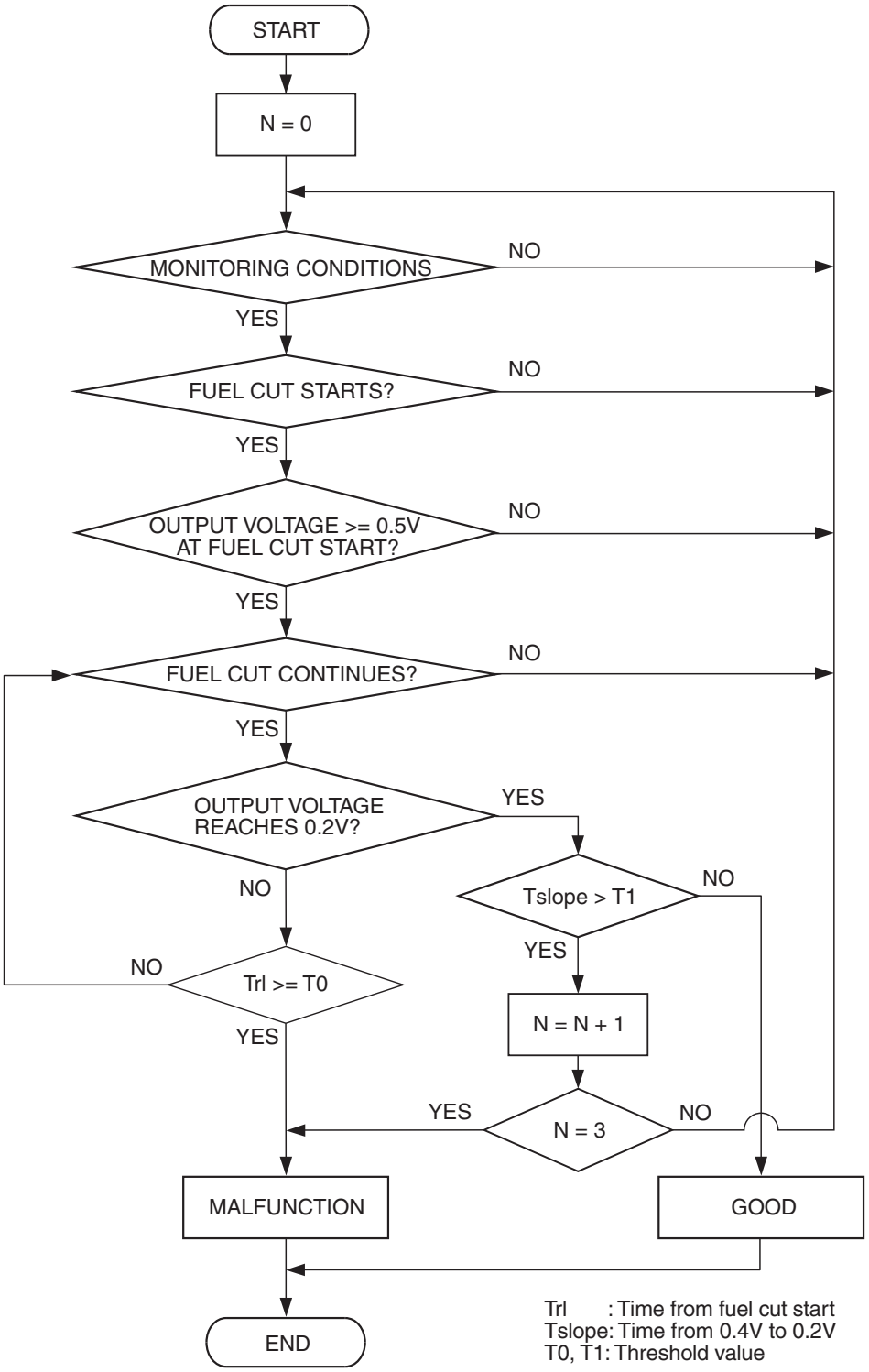
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



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TSB Revision

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.
- The left bank heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the left bank heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).

Judgement Criterion
- Left bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

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.
- The left bank heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the left bank heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The PCM monitors for this condition for 3 cycles of 0.5 second each during drive cycles.

Judgement Criteria
- The left bank heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 0.5 second from 0.4 volt while fuel is being shut off.
- The PCM monitors for this condition once during the drive cycle.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13B-5.

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

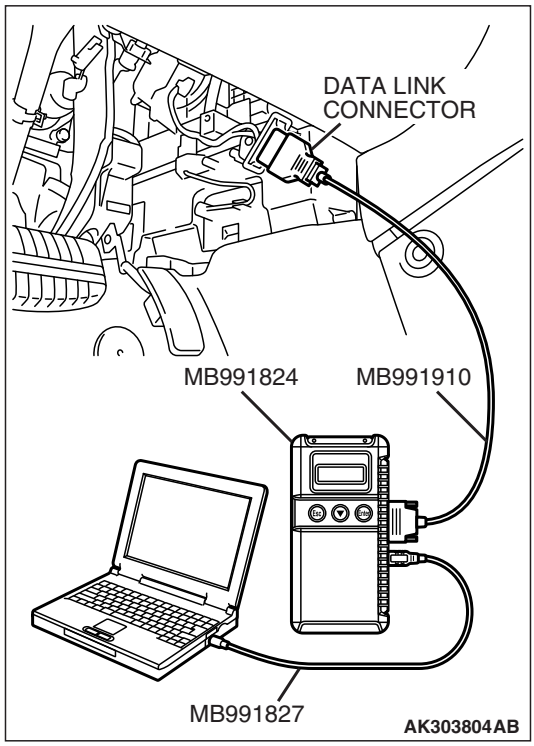
- Left bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).



⚠ 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 AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

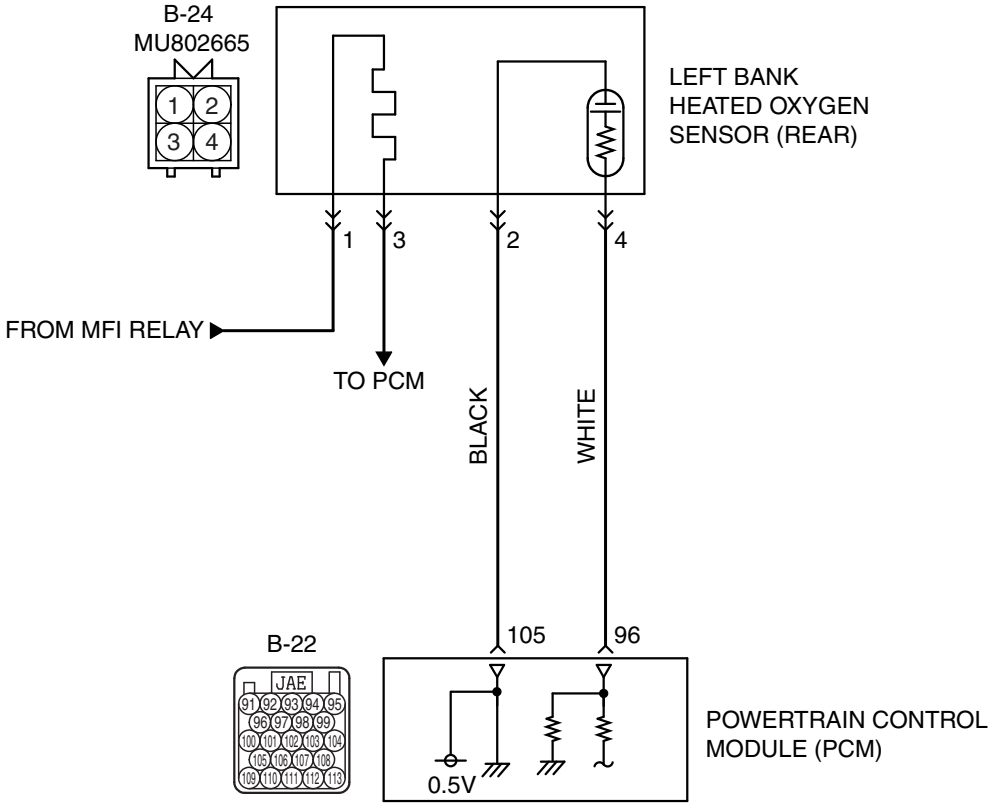
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0159 set?

YES : Refer to, P0157 –Heated Oxygen Sensor Circuit Low Voltage (bank 2 sensor 2) P.13B-408, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2 sensor 2) P.13B-425.
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



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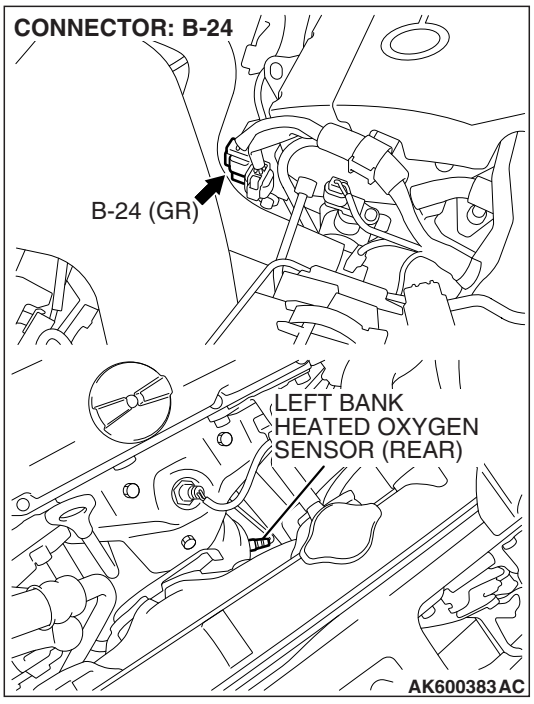
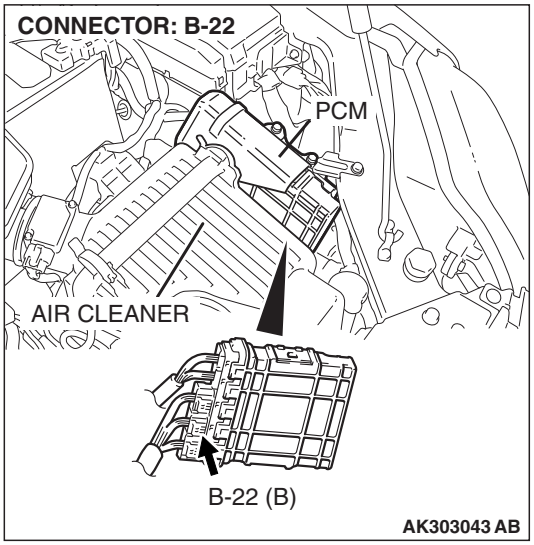




TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the PCM (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 PCM (terminal No. 105).
- The PCM 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 PCM 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 go/stop operations including fuel cut 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)

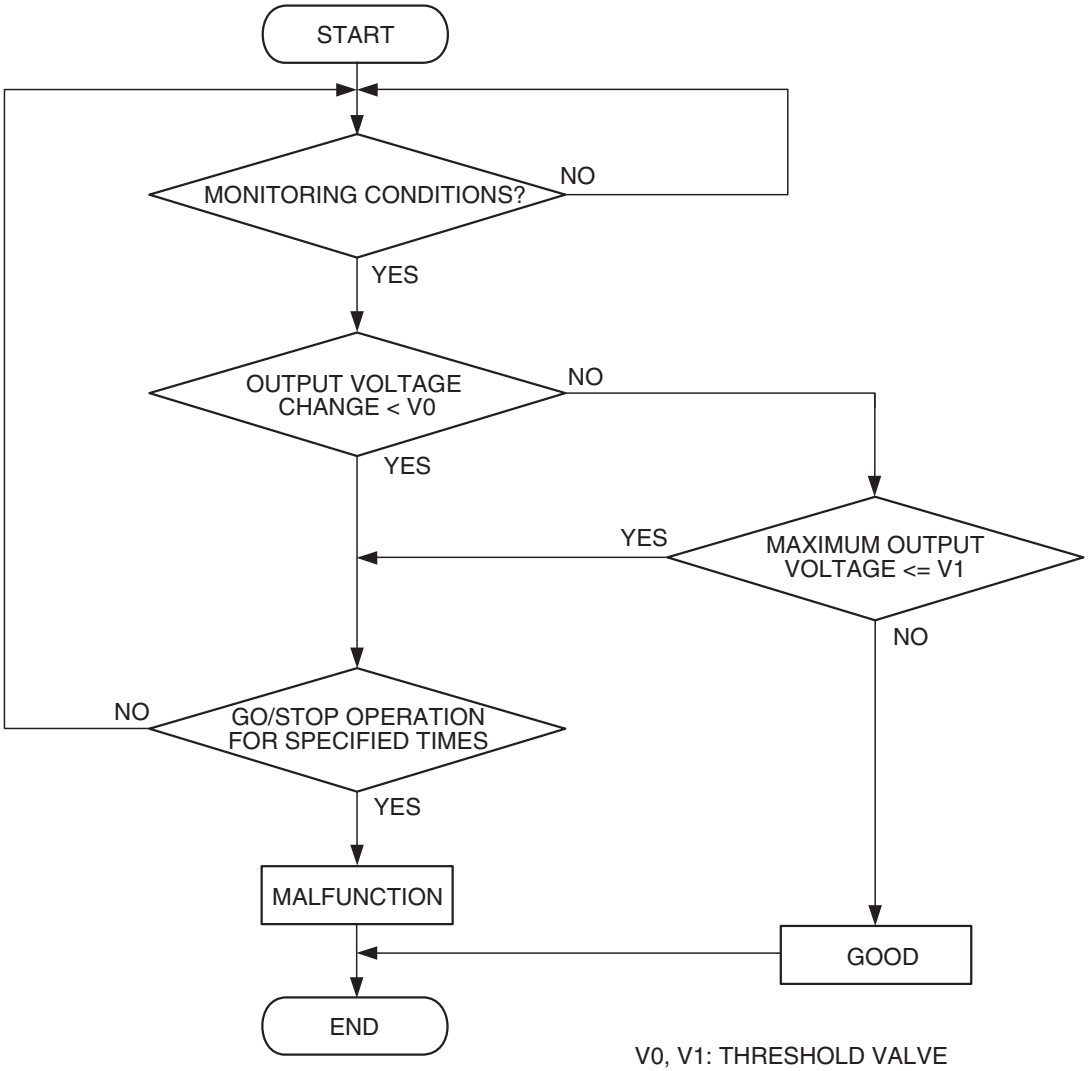
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

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



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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 1 time or more: 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 60 seconds have elapsed with the above mentioned conditions, and more than 3 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1.0 mph).

TSB Revision

Judgement Criterion

- Change in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.313 volt.

or

- The maximum output voltage of the left bank heated oxygen sensor (rear) is lower than 0.508 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13B-5.

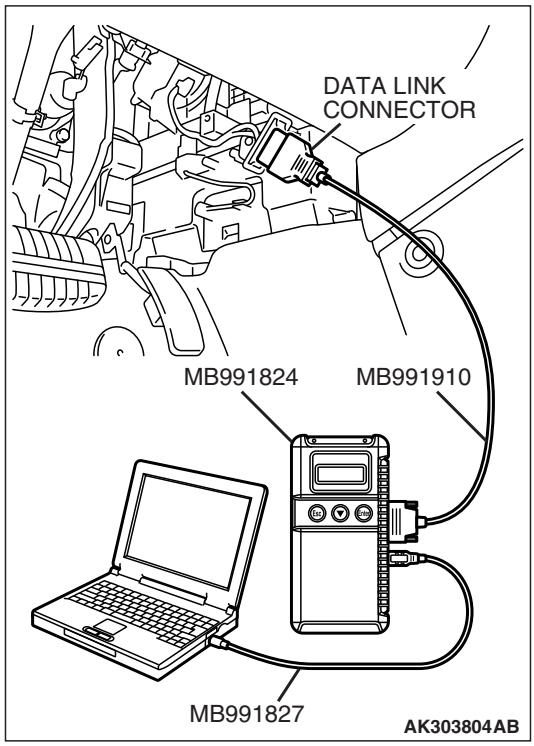
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) deteriorated.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ 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 AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  a. Transaxle: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(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 left bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13B-5.

(2) 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-408, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2 sensor 2) P.13B-425.

NO : The inspection is complete.

DTC P0171: System too Lean (bank 1)

⚠ CAUTION

If DTC P0171 has been set, TCL related DTC U1120 is also set. After P0171 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit

- Refer to DTC P0201–Injector Circuit –Cylinder 1P.13B-492, P0203–Injector Circuit –Cylinder 3P.13B-515, P0205–Injector Circuit –Cylinder 5.P.13B-538

CIRCUIT OPERATION

- Refer to DTC P0201–Injector Circuit –Cylinder 1P.13B-492, P0203–Injector Circuit –Cylinder 3P.13B-515, P0205–Injector Circuit –Cylinder 5.P.13B-538

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Right bank air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too lean.

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)

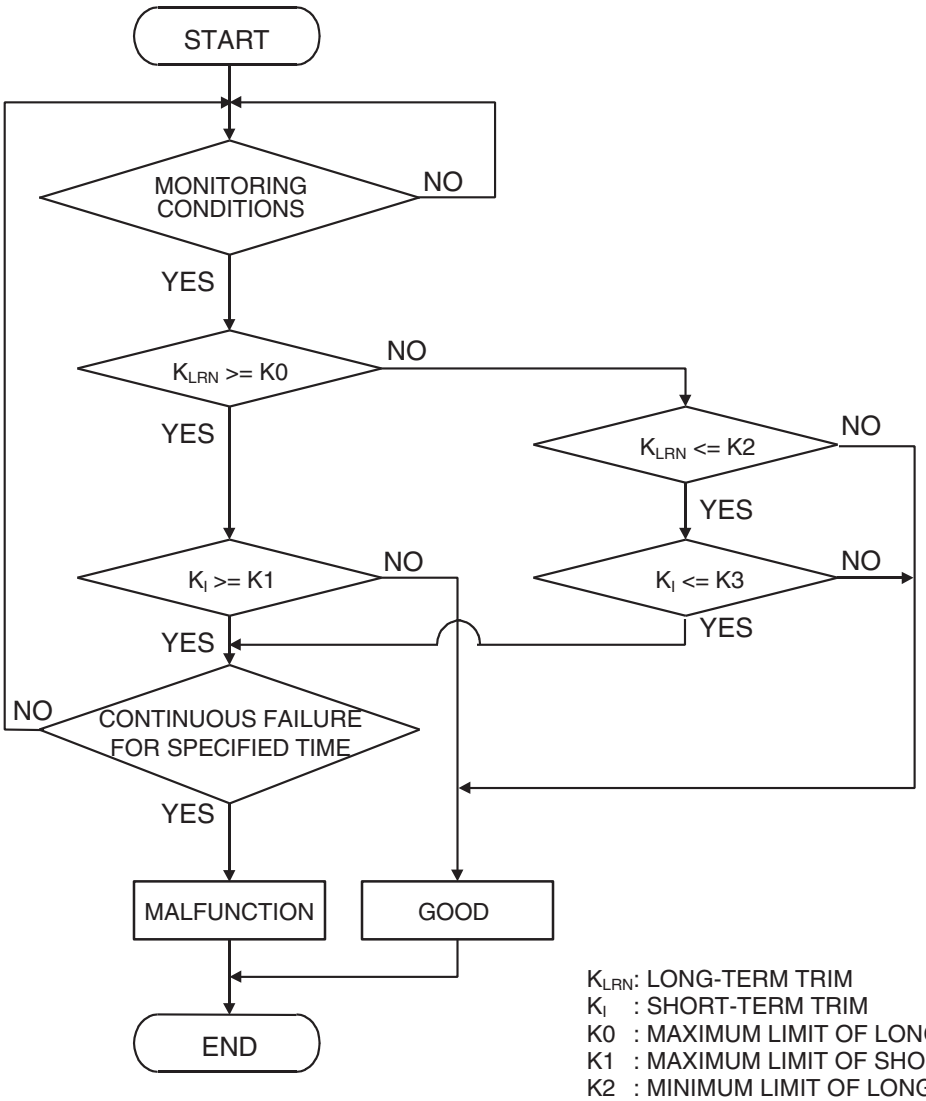
- Misfire monitor

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



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

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Check Conditions
- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

TSB Revision

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria
- Long-term fuel trim has continued to be +12.5 percent for 2 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-5.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in right bank injector circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check for exhaust leak.

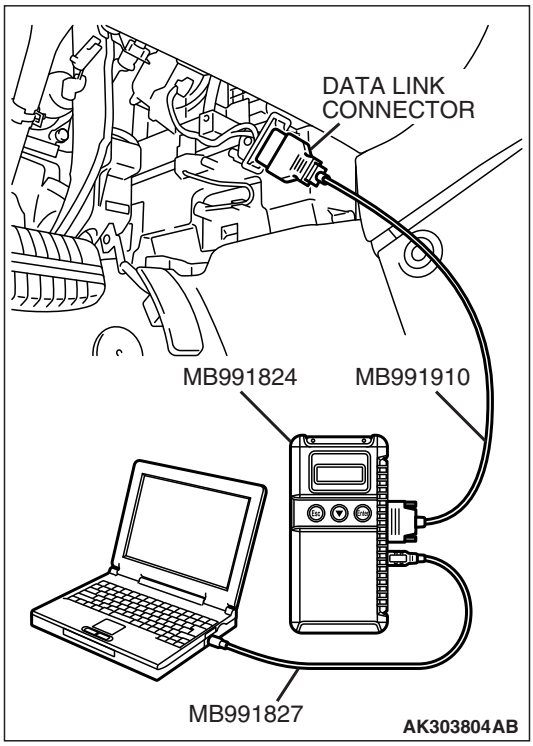
Q: Are there any abnormalities?

YES : Repair it. Then go to Step 16.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 16.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

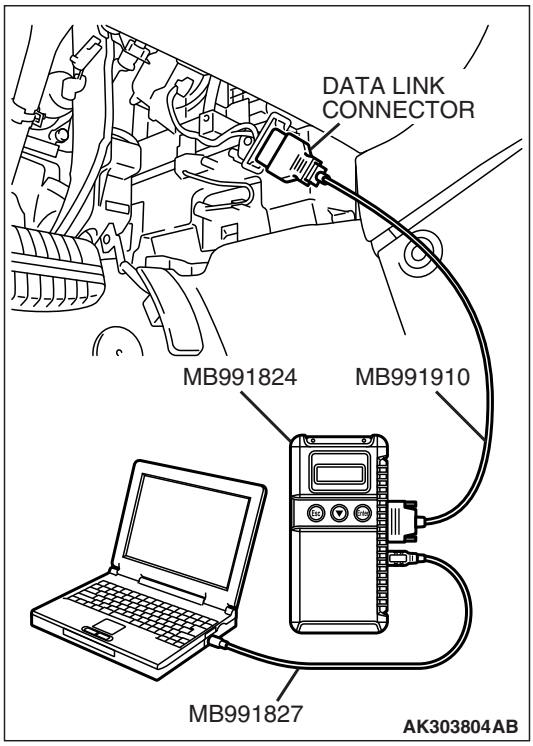
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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).
- When idling, between 1,360 and 1,650 millivolts.
- When 2,500 r/min, between 1,760 and 2,090 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-155, DTC P0102 –Mass Airflow Circuit Low Input P.13B-166, DTC P0103 –Mass Airflow Circuit High Input P.13B-175.



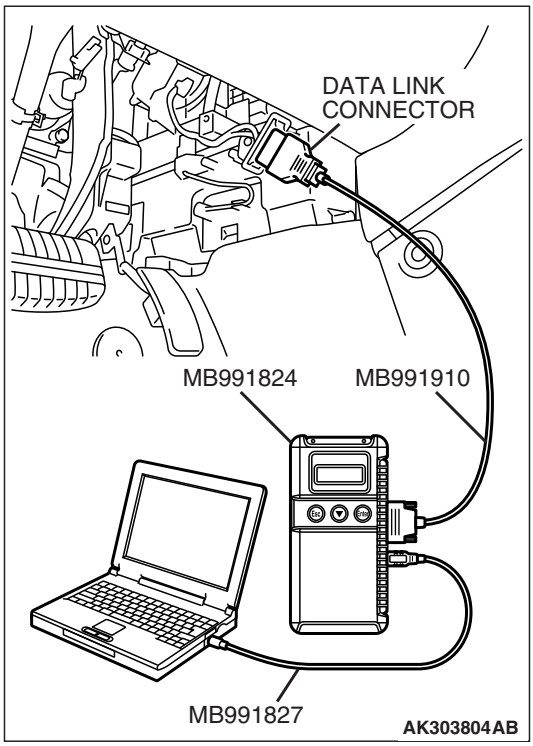
STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-217, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-226, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-233.



STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

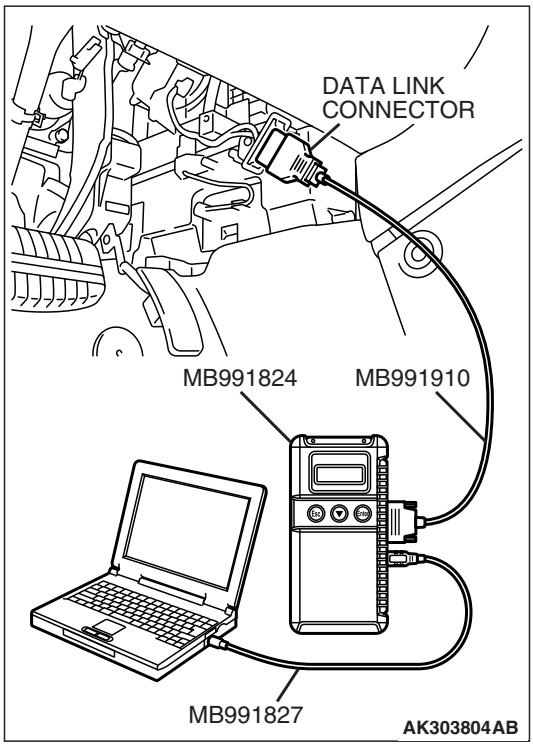
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.

NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-243, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-252, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-259.



STEP 6. 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).

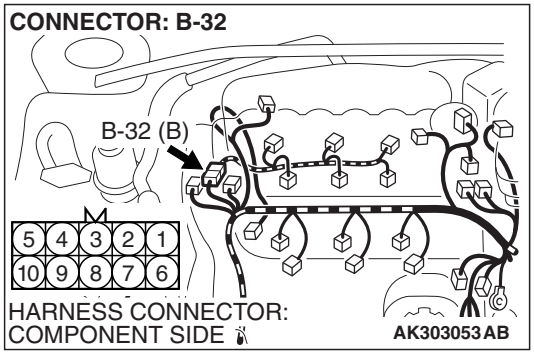
(3) Start the engine and run at idle.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F)
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

Q: Is the sensor operating properly?

YES : Go to Step 7.

NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-182, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-196, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13B-208.

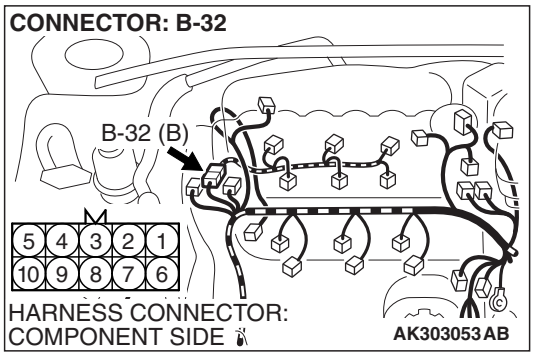


STEP 7. Check harness connector B-32 at intermediate connector for damage.

Q: Is the harness connector in good condition?

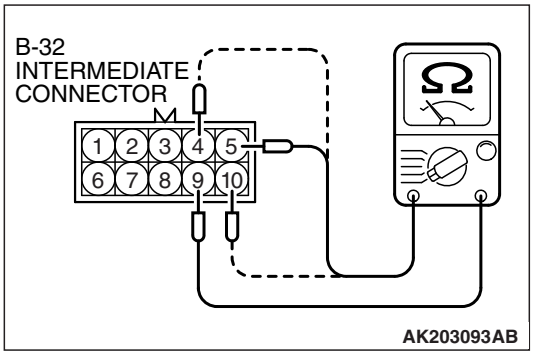
YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 8. Check the right bank injector resistance at intermediate connector B-32.

(1) Disconnect the intermediate connector B-32.



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

a. Measure the resistance between terminal No. 5 and No. 9 at No. 1 cylinder injector.

b. Measure the resistance between terminal No. 9 and No. 10 at No.3 cylinder injector.

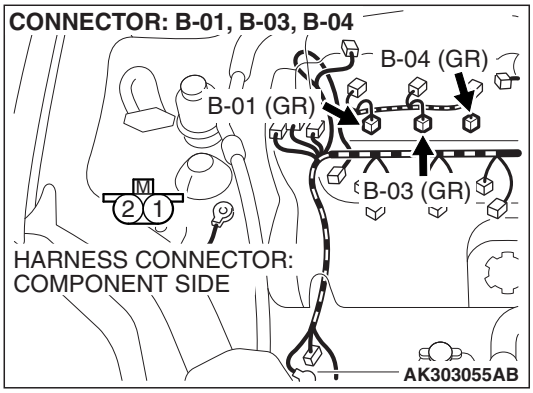
c. Measure the resistance between terminal No. 4 and No. 9 at No. 5 cylinder injector.

- 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 11.

NO : Go to Step 9.

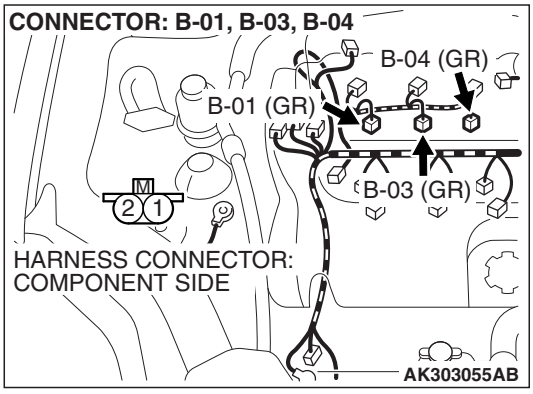


STEP 9. Check harness connector B-01, B-03, B-04 at right bank injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

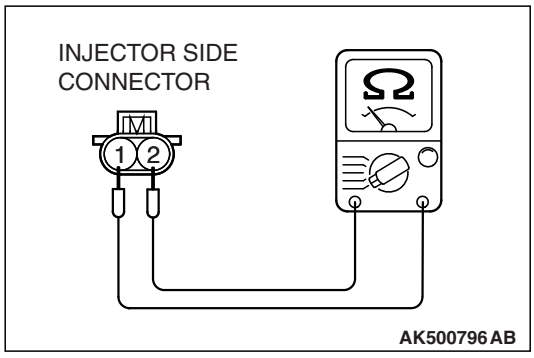
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 10. Check the right bank injector.

(1) Remove the intake manifold.

(2) Disconnect the right bank injector connector.



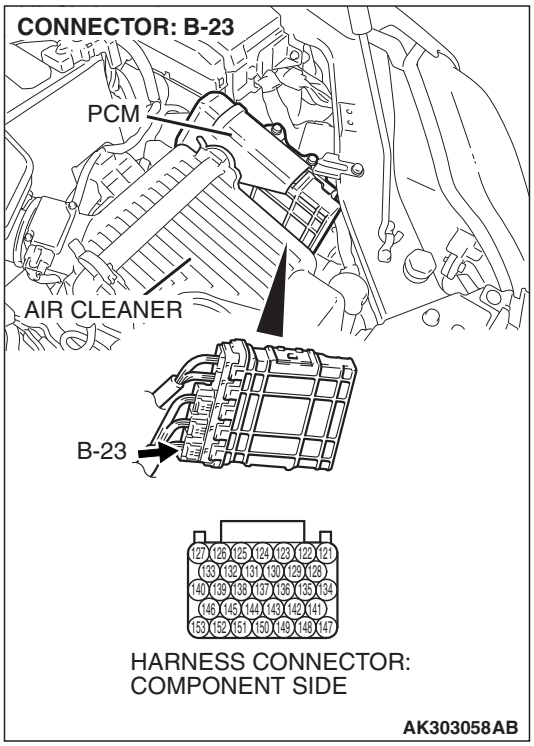
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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 16.

NO : Replace the injector. Then go to Step 16.

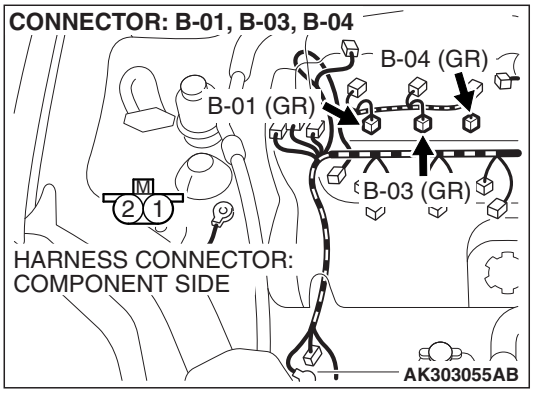


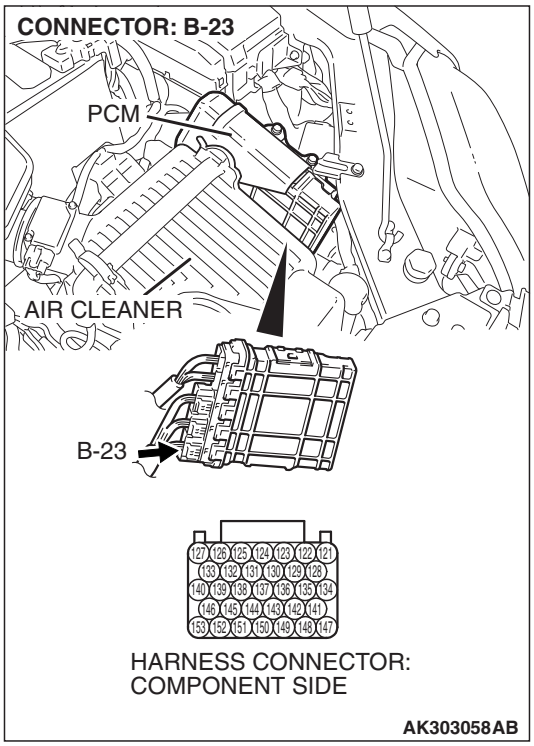
STEP 11. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.





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

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector B-23 (terminal No. 153) at No. 1 cylinder injector.
b. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector B-23 (terminal No. 140) at No. 3 cylinder injector.
c. Check the harness wire between injector connector B-04 (terminal No. 2) and PCM connector B-23 (terminal No. 133) at No. 5 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 16.

STEP 13. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1250.

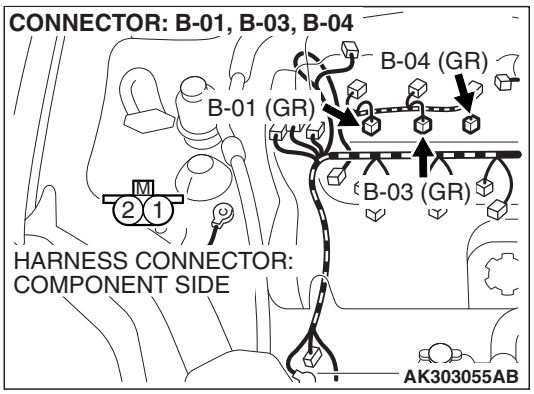
Q: Is the fuel pressure normal?

YES : Go to Step 14.
NO : Repair it. Then go to Step 16.

STEP 14. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 16.
NO : Go to Step 15.



STEP 15. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 16.
NO : The inspection is complete.

STEP 16. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

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

DTC P0172: System too Rich (bank 1)

⚠ CAUTION
If DTC P0172 has been set, TCL related DTC U1120 is also set. After P0172 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit

- Refer to DTC P0201–Injector Circuit –Cylinder 1 P.13B-492, P0203–Injector Circuit –Cylinder 3 P.13B-515, P0205–Injector Circuit –Cylinder 5 P.13B-538

CIRCUIT OPERATION

- Refer to DTC P0201–Injector Circuit –Cylinder 1 P.13B-492, P0203–Injector Circuit –Cylinder 3 P.13B-515, P0205–Injector Circuit –Cylinder 5 P.13B-538

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Right bank air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

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)

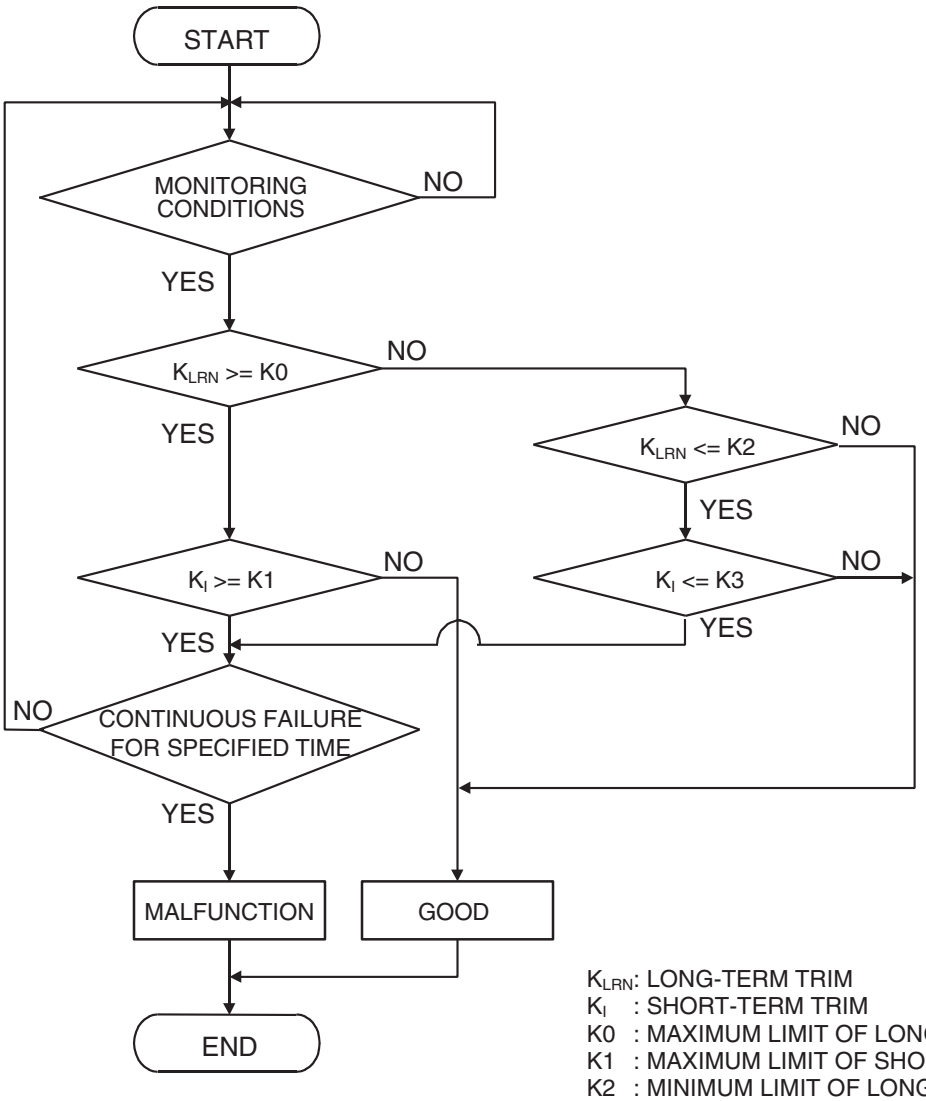
- Misfire monitor

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



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

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Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –5.5 percent for 5 seconds.

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –10.5 percent for 5 seconds.

TSB Revision

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be –12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be –30.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-5.

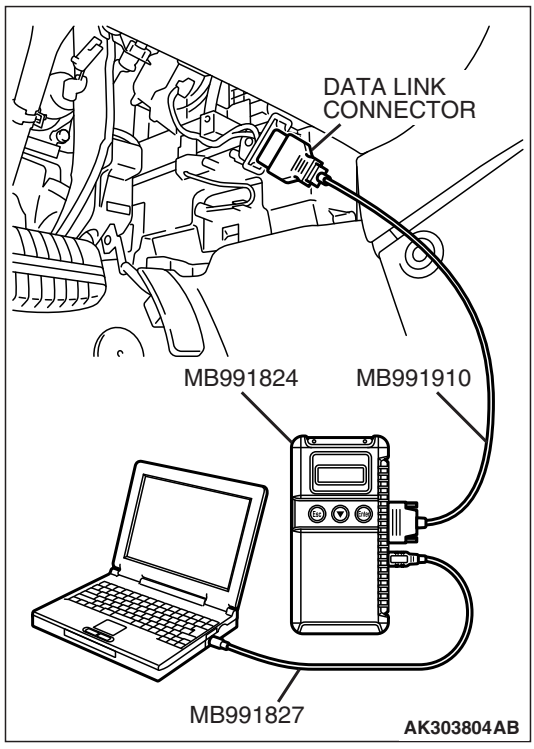
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in right bank injector circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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

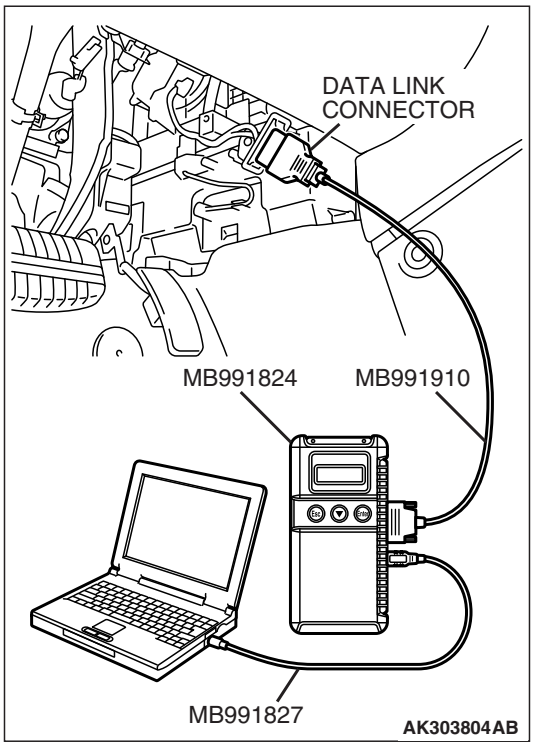
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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).
  - When idling, between 1,360 and 1,650 millivolts.
  - When 2,500 r/min, between 1,760 and 2,090 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.

NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-155, DTC P0102 –Mass Airflow Circuit Low Input P.13B-166, DTC P0103 –Mass Airflow Circuit High Input P.13B-175.



STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

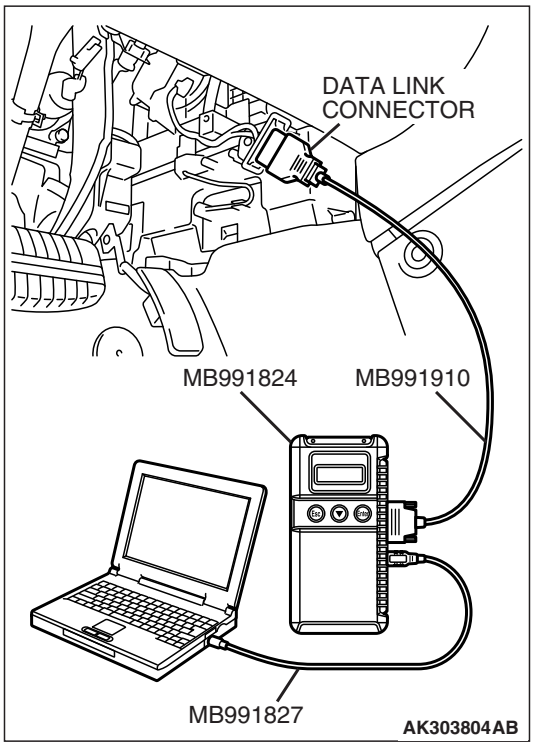
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-217, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-226, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-233.



STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

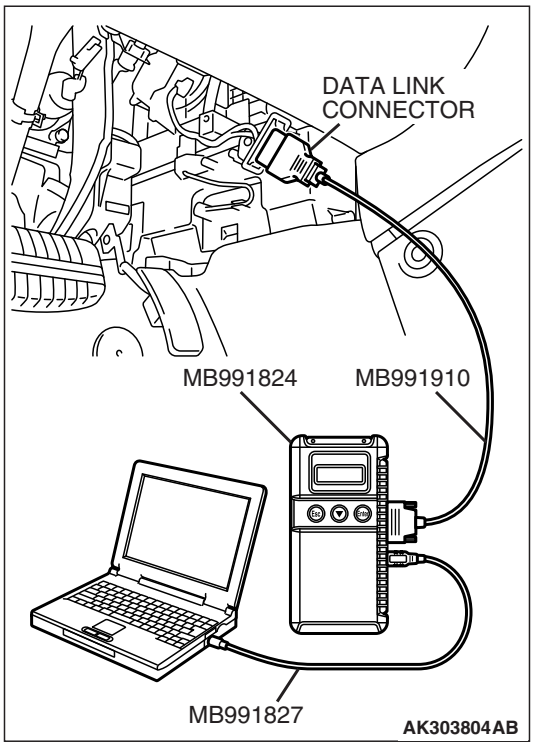
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance ProblemP.13B-243, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-252, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-259.



STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

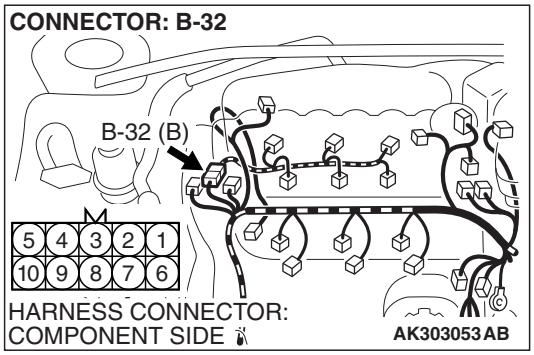
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 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 and run at idle.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F)
- 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 : Go to Step 5.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-182, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-196, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13B-208.



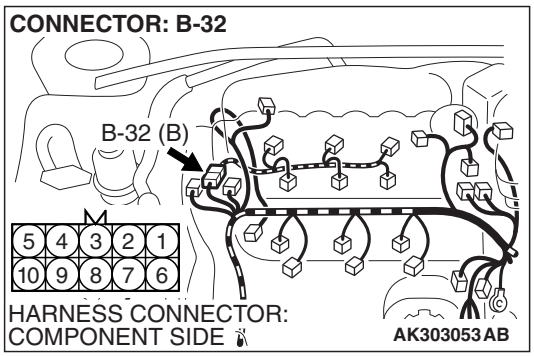
STEP 5. Check harness connector B-32 at intermediate connector for damage.

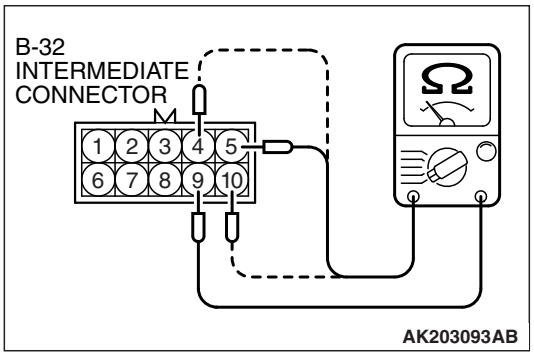
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check the right bank injector resistance at intermediate connector B-32.

(1) Disconnect the intermediate connector B-32.





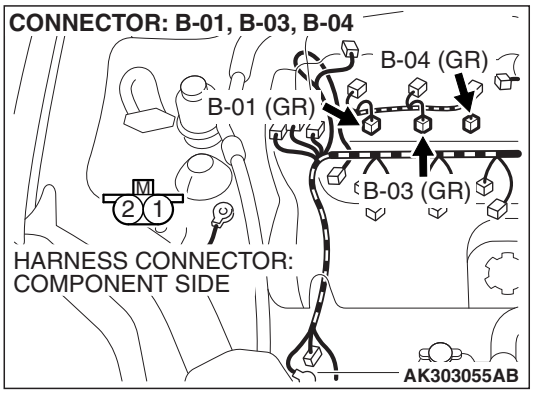
(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal No. 5 and No. 9 at No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 9 and No. 10 at No. 3 cylinder injector.
   c. Measure the resistance between terminal No. 4 and No. 9 at No. 5 cylinder injector.
   - Resistance should be between 10.5 and 13.5 ohms [at 20° C (68° F)].

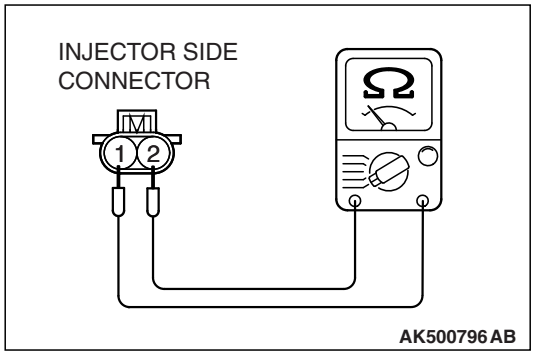
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

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

STEP 7. Check the right bank injector.

(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 6.





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

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

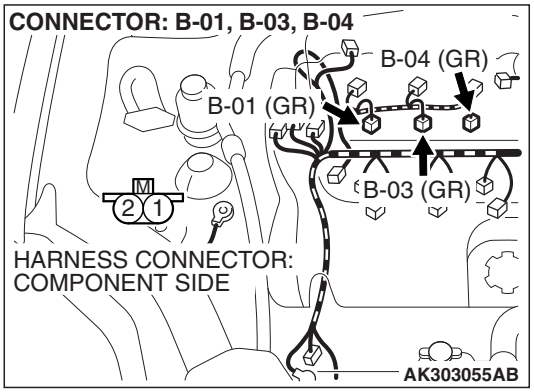
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 10.
NO : Replace the injector. Then go to Step 10.

STEP 8. Check the fuel pressure.
Refer to On-vehicle Service –Fuel Pressure Test P.13B-1250.

Q: Is the fuel pressure normal?

YES : Go to Step 9.
NO : Repair it. Then go to Step 10.



STEP 9. Replace the right bank injector.
(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 10.
NO : The inspection is complete.

STEP 10. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

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

DTC P0174: System too Lean (bank 2)

⚠ CAUTION
If DTC P0174 has been set, TCL related DTC U1120 is also set. After P0174 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit
- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-504, P0204–Injector Circuit –Cylinder 4 P.13B-527, P0206–Injector Circuit –Cylinder 6 P.13B-550

CIRCUIT OPERATION
- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-504, P0204–Injector Circuit –Cylinder 4 P.13B-527, P0206–Injector Circuit –Cylinder 6 P.13B-550

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS
Left bank air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too lean.

MONITOR EXECUTION
Continuous

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

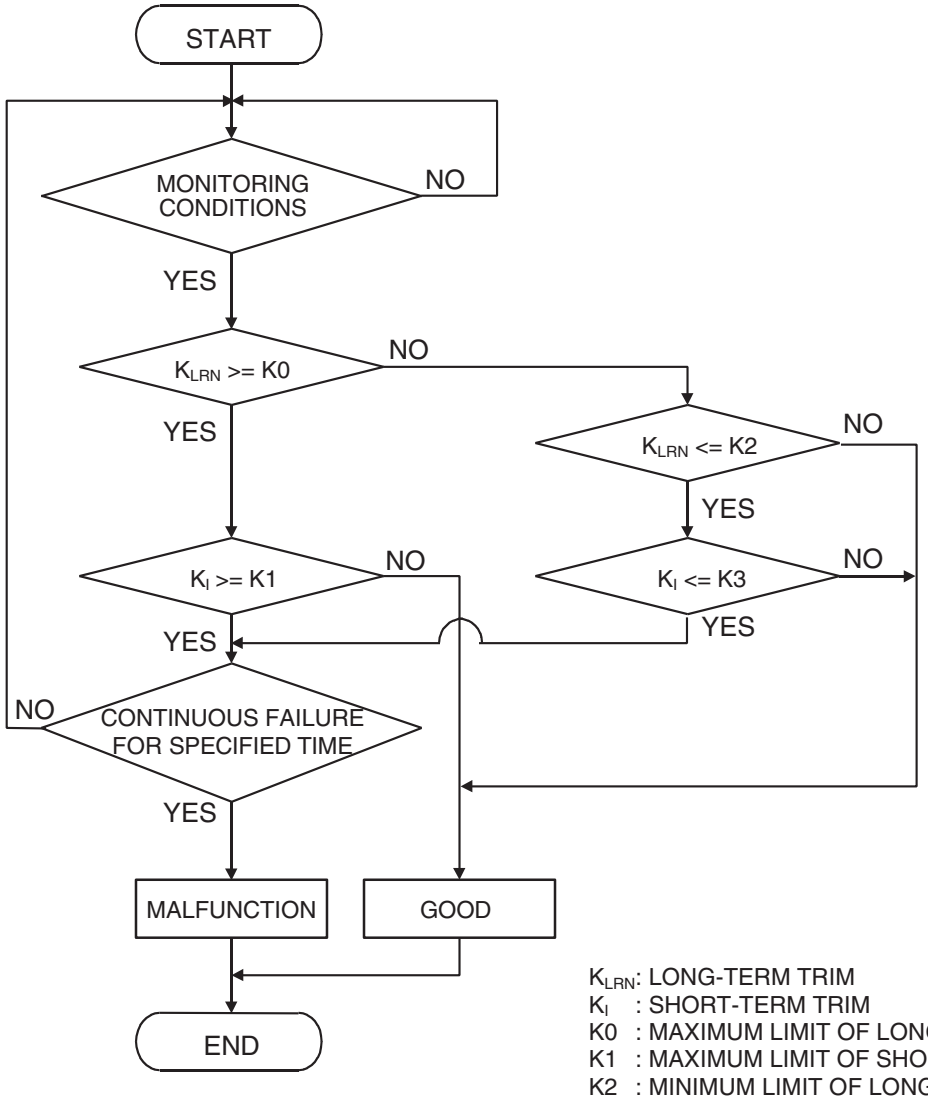
- Misfire monitor

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



K_{LRN}: LONG-TERM TRIM
K_I : SHORT-TERM TRIM
K0 : MAXIMUM LIMIT OF LONG-TERM TRIM
K1 : MAXIMUM LIMIT OF SHORT-TERM TRIM
K2 : MINIMUM LIMIT OF LONG-TERM TRIM
K3 : MINIMUM LIMIT OF SHORT-TERM TRIM

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TSB Revision

Check Conditions
- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria
- Long-term fuel trim has continued to be +12.5 percent for 2 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-5.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in left bank injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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

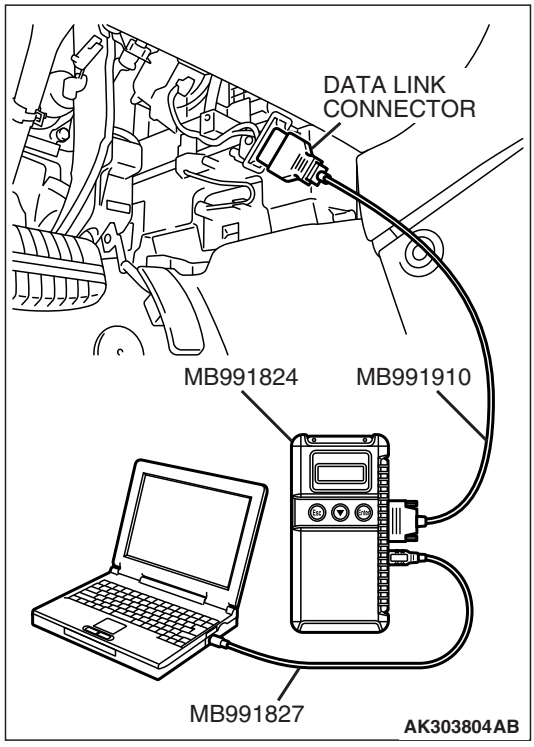
STEP 3. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

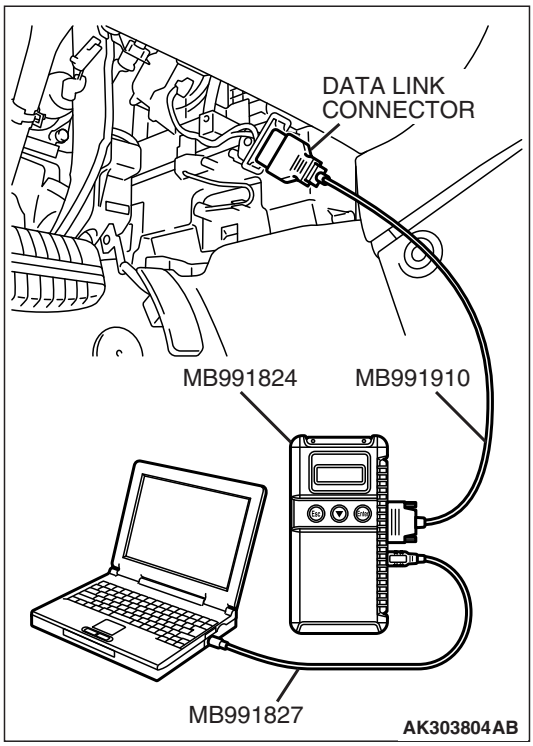
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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).
  - When idling, between 1,360 and 1,650 millivolts.
  - When 2,500 r/min, between 1,760 and 2,090 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-155, DTC P0102 –Mass Airflow Circuit Low Input P.13B-166, DTC P0103 –Mass Airflow Circuit High Input P.13B-175.





STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

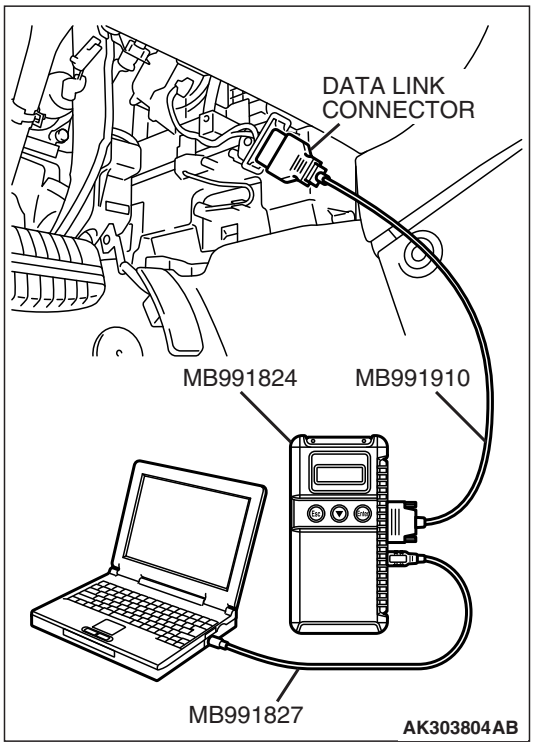
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.

NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-217, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-226, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-233.



STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

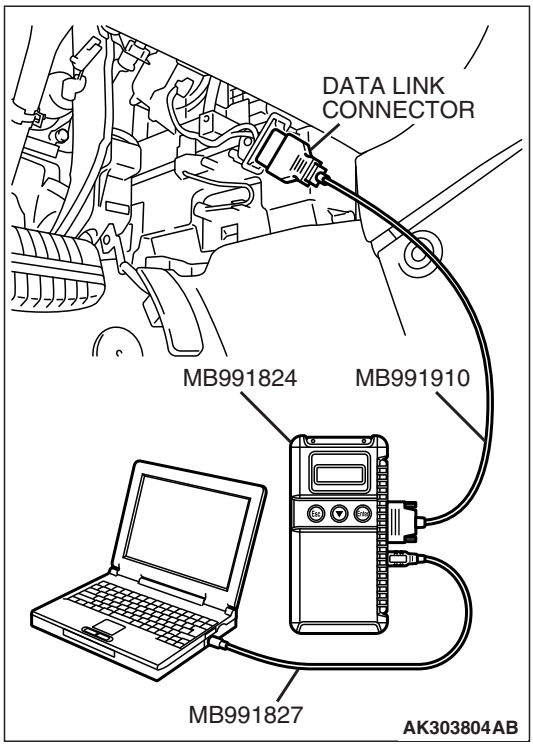
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.

NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-243, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-252, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-259.



STEP 6. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

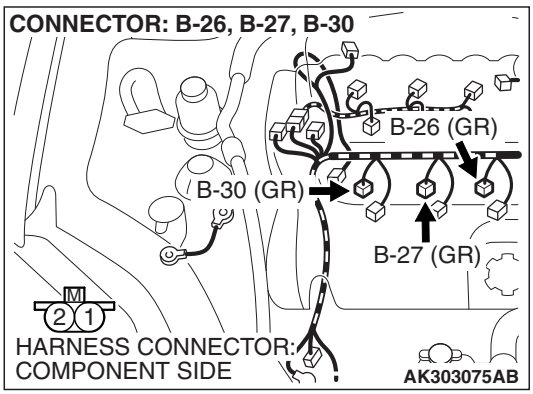
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 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 and run at idle.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F)
- 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?

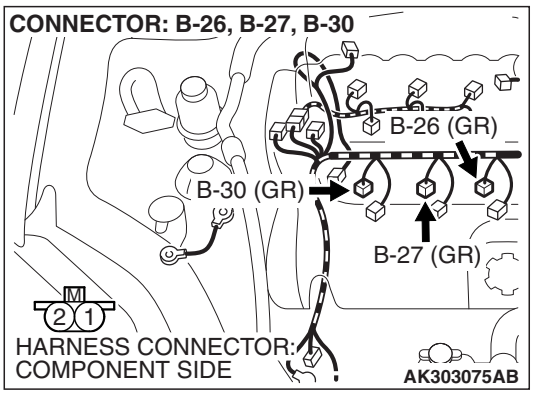
YES : Go to Step 7.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-182, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-196, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13B-208.



STEP 7. Check harness connector B-26, B-27, B-30 at left bank injector for damage.

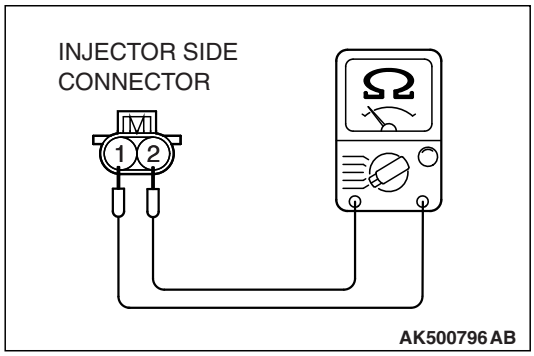
Q: Is the harness connector in good condition?

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



STEP 8. Check the left bank injector.

(1) Disconnect the left bank injector connector B-26, B-27, B-30.



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

Standard value: 10.5 –13.5 Ω [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 9.

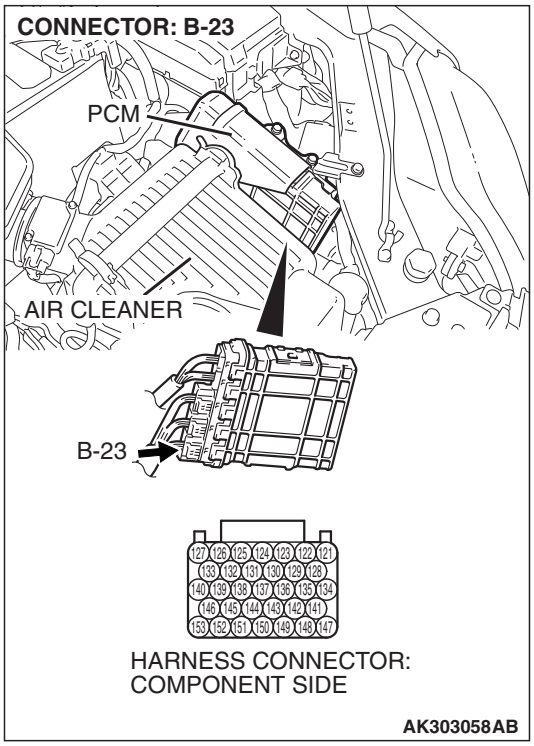
NO : Replace the injector. Then go to Step 14.

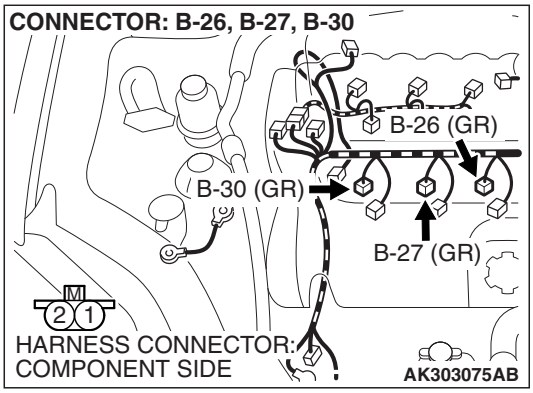
STEP 9. Check harness connector B-23 at PCM for damage.

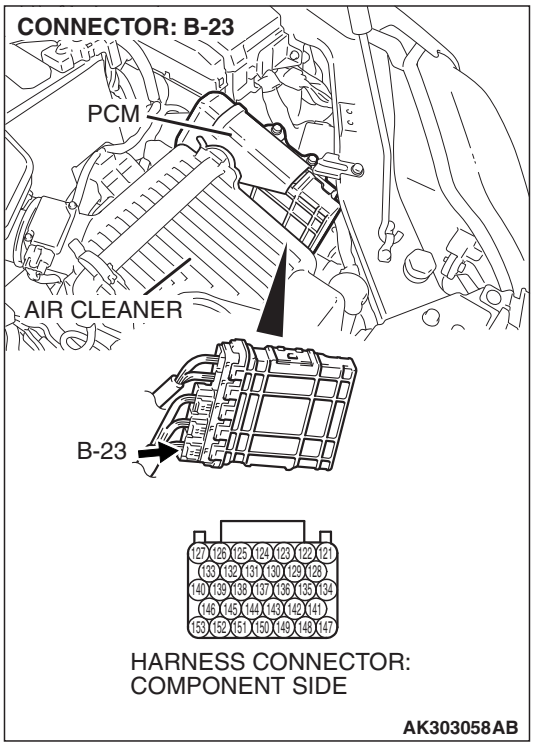
Q: Is the harness connector in good condition?

YES : Go to Step 10.

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







STEP 10. Check for harness damage between left bank injector connector and PCM connector.

a. Check the harness wire between injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146) at No. 2 cylinder injector.
b. Check the harness wire between injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139) at No. 4 cylinder injector.
c. Check the harness wire between injector connector B-26 (terminal No. 2) and PCM connector B-23 (terminal No. 127) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

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

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1250.

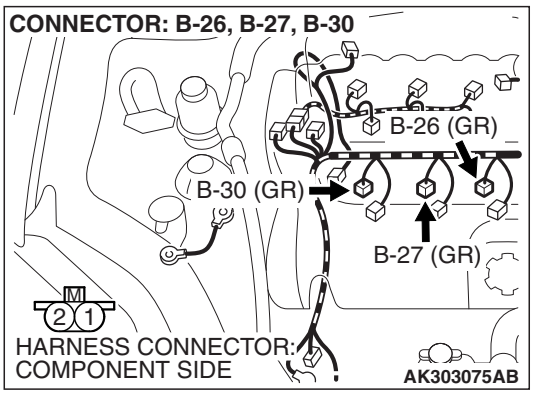
Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 14.
NO : Go to Step 13.



STEP 13. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

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

DTC P0175: System too Rich (bank 2)

⚠ CAUTION
If DTC P0175 has been set, TCL related DTC U1120 is also set. After P0175 has been diagnosed, don't forget to erase DTC U1120.

Fuel Trim Circuit

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-504, P0204–Injector Circuit –Cylinder 4 P.13B-527, P0206–Injector Circuit –Cylinder 6 P.13B-550.

CIRCUIT OPERATION

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-504, P0204–Injector Circuit –Cylinder 4 P.13B-527, P0206–Injector Circuit –Cylinder 6 P.13B-550.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The PCM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Left bank air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

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)

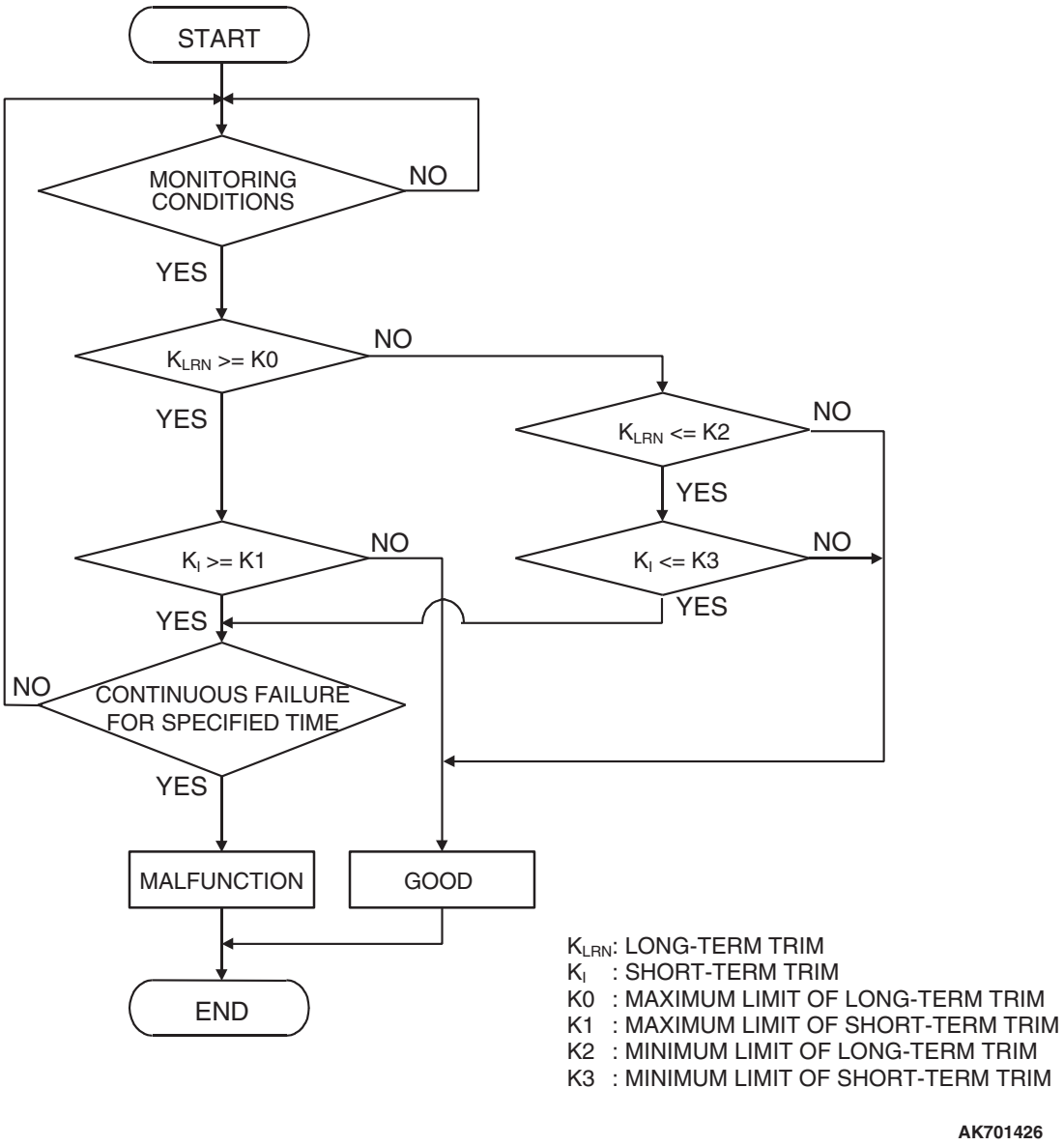
- Misfire monitor

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



AK701426

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or more.

Judgement Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –5.5 percent for 5 seconds.

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec or less.

Judgement Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –10.5 percent for 5 seconds.

TSB Revision

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be –12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be –30.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13B-5.

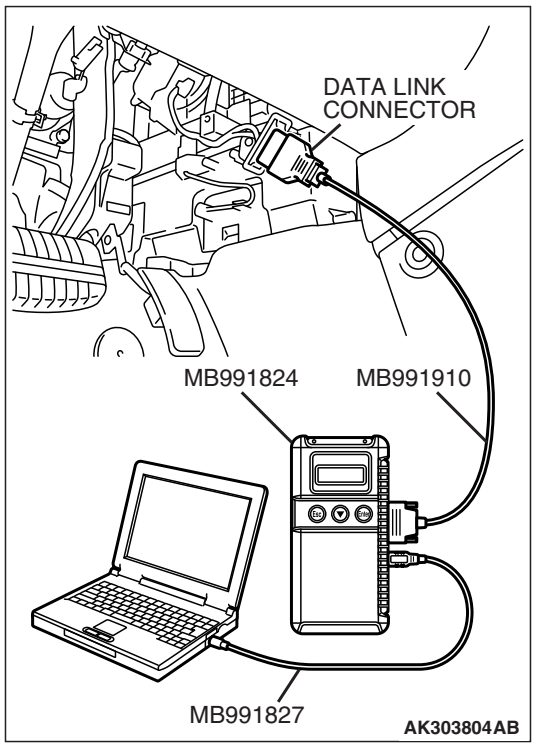
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in left bank injector circuit or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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.

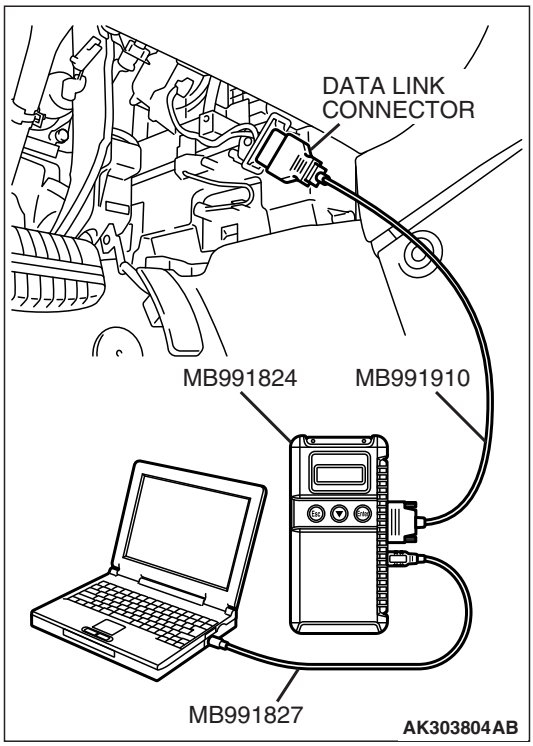
⚠ CAUTION

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).
  - When idling, between 1,360 and 1,650 millivolts.
  - When 2,500 r/min, between 1,760 and 2,090 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-155, DTC P0102 –Mass Airflow Circuit Low Input P.13B-166, DTC P0103 –Mass Airflow Circuit High Input P.13B-175.



STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

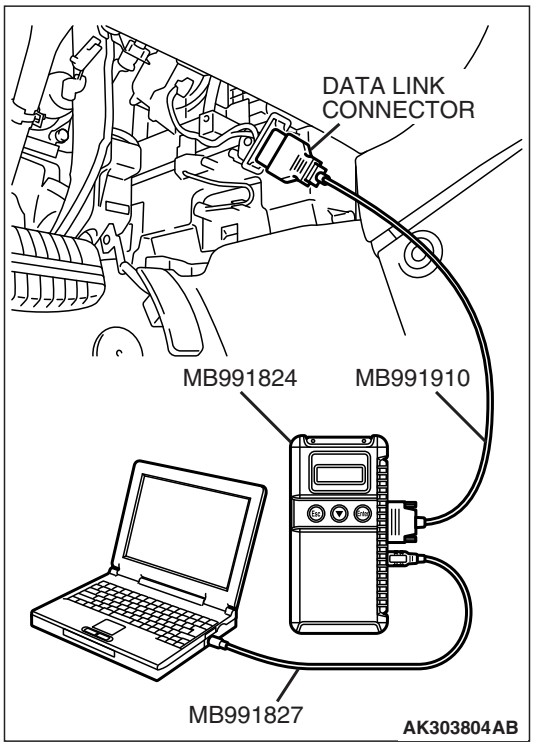
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-217 DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-226, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-233.



STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

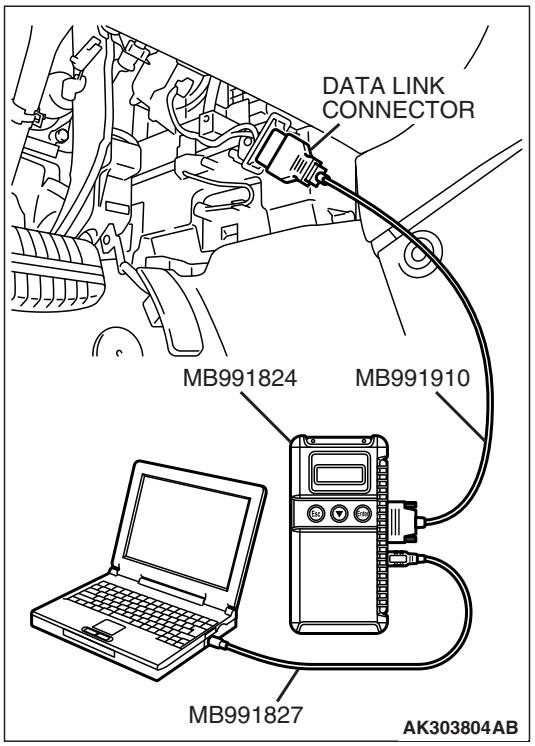
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-243, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-252, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-259.



STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

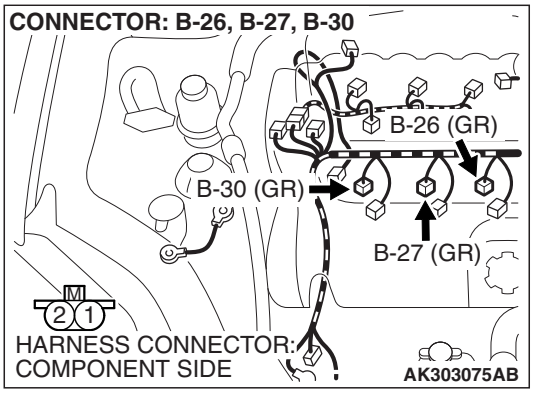
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 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 and run at idle.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F)
- 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.

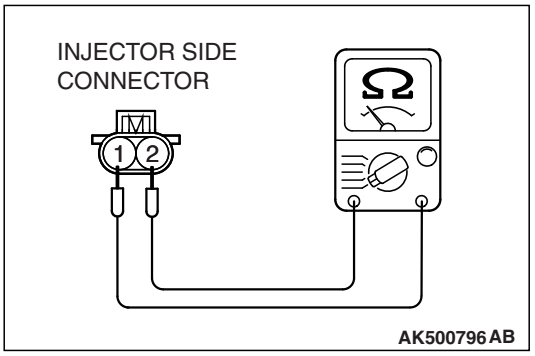
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance ProblemP.13B-182, DTC P0107 –Manifold Absolute Pressure Circuit Low InputP.13B-196, DTC P0108 –Manifold Absolute Pressure Circuit High InputP.13B-208.



STEP 5. Check the left bank injector.

(1) Disconnect the left bank injector connector B-26, B-27, B-30.



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

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

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

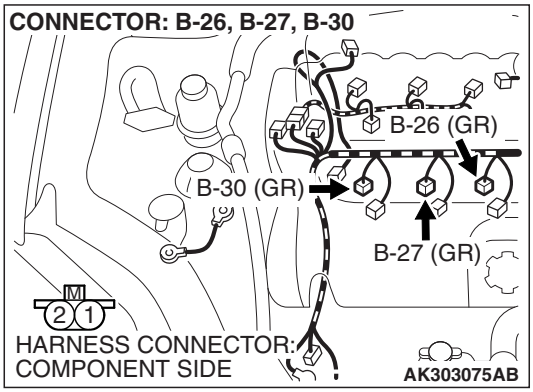
YES : Go to Step 6.
NO : Replace the injector. Then go to Step 8.

STEP 6. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1250.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.



STEP 7. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0175 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

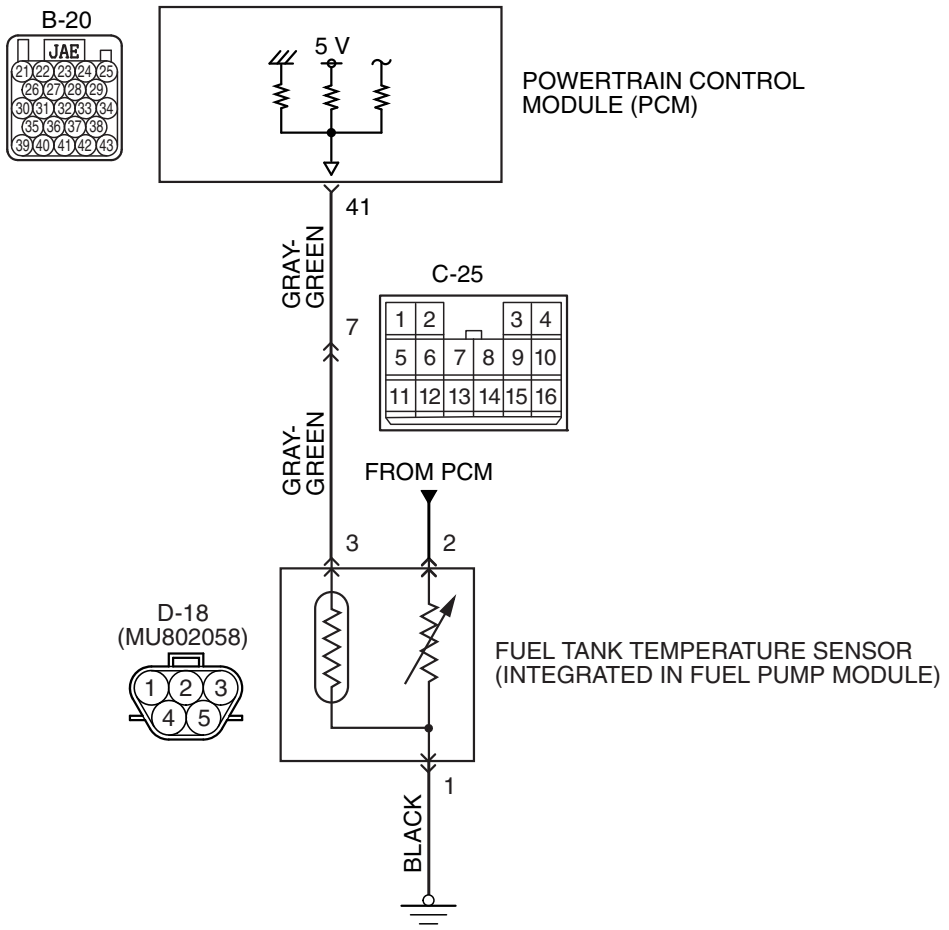
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0175 output?

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

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

Fuel Tank Temperature Sensor Circuit



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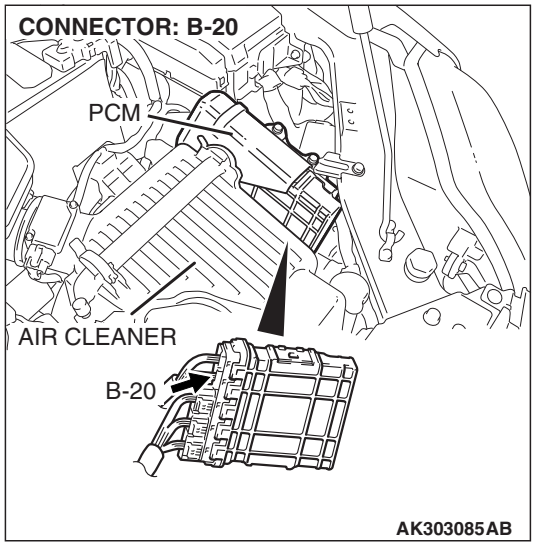
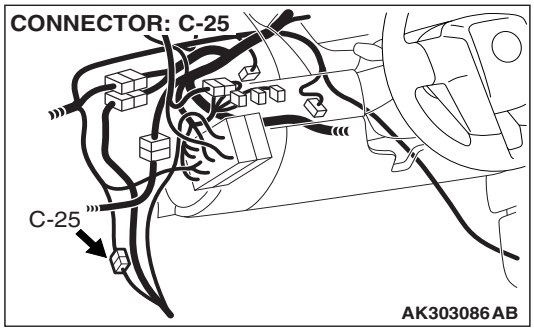
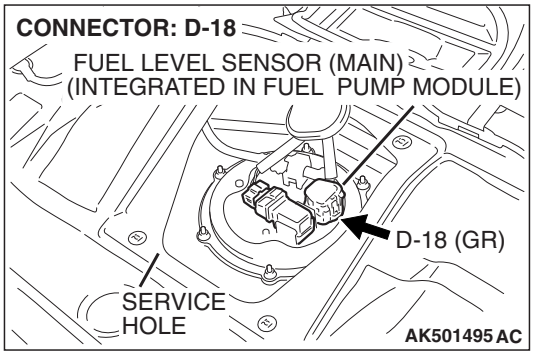




TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature at engine start is higher than engine coolant temperature at engine start by specified value when engine is cold start condition.

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)

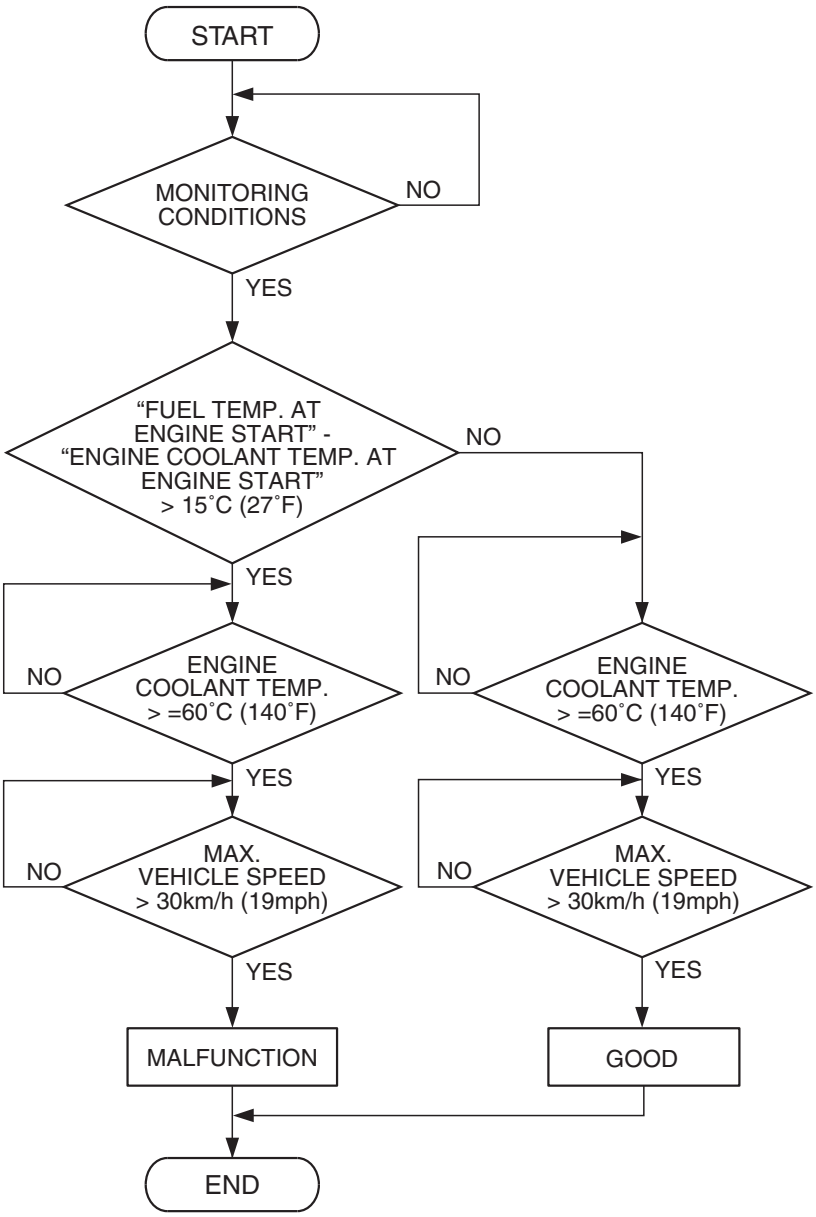
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The engine coolant temperature –intake air temperature is 5° C (9° F) or less when the engine is started.
- The engine coolant temperature is between –10° C (14° F) and 36° C (97° F) when the engine is started.
- The engine coolant temperature is higher than 60° C (140° F).
- Maximum vehicle speed is higher than 30 km/h (19 mph) after the engine starting sequence has been completed.

TSB Revision

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 14 P.13B-5.

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

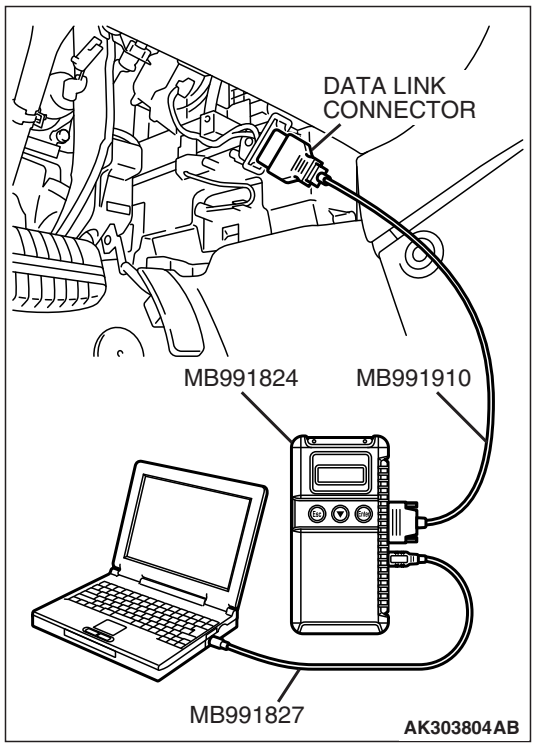
- Fuel tank temperature sensor failed.
- Harness damage or connector damage.
- PCM failed.

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

DIAGNOSIS

Required Special Tools:

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



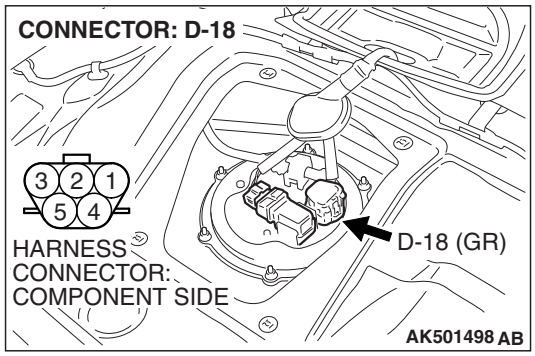
STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ 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 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

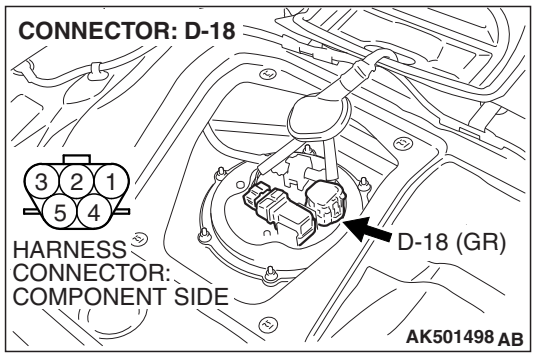


STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

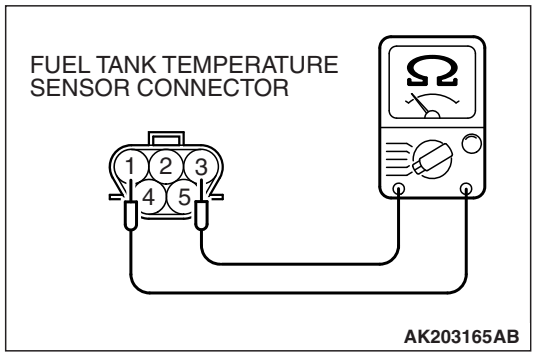
YES : Go to Step 3.

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



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

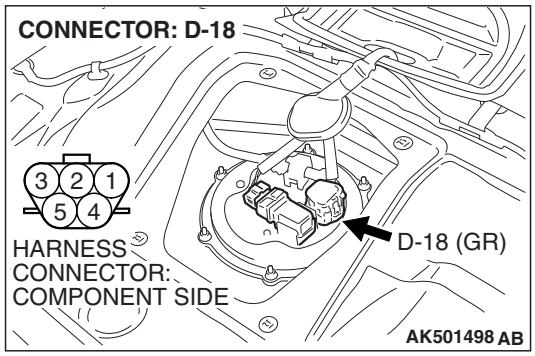
Standard value:
0.5 –12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

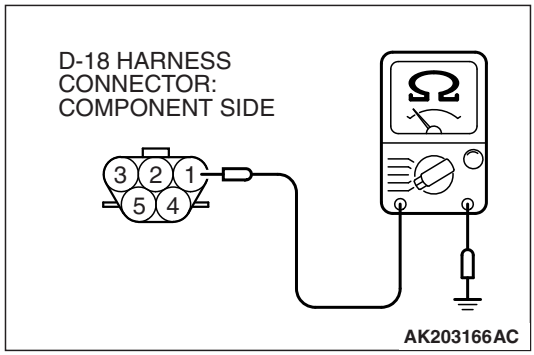
YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 7.

STEP 4. Check the continuity at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 and measure at the harness side.



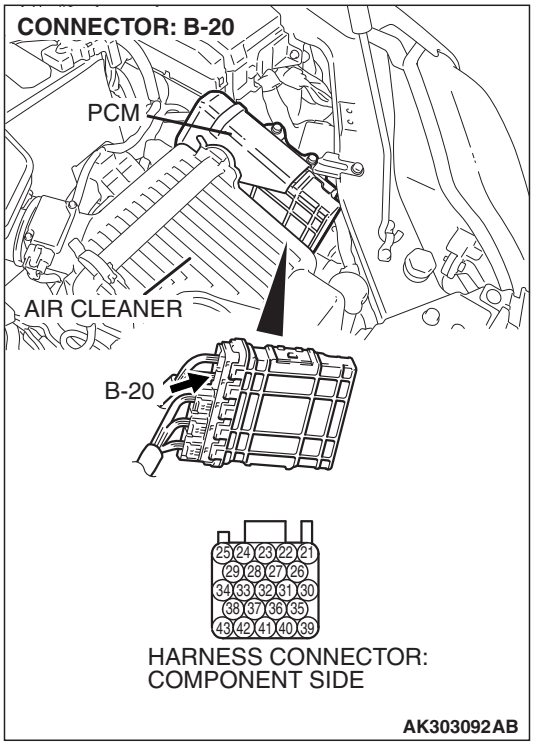
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 5.

NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of harness damage. Then go to Step 7.

STEP 5. Check harness connector B-20 at PCM for damage.

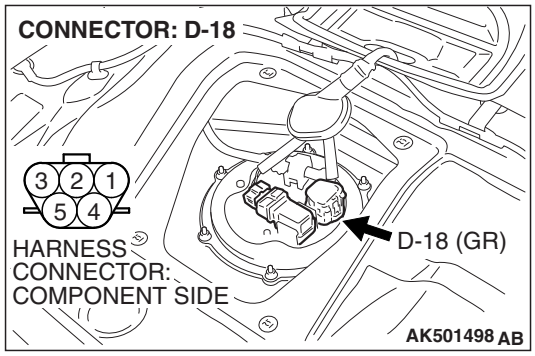


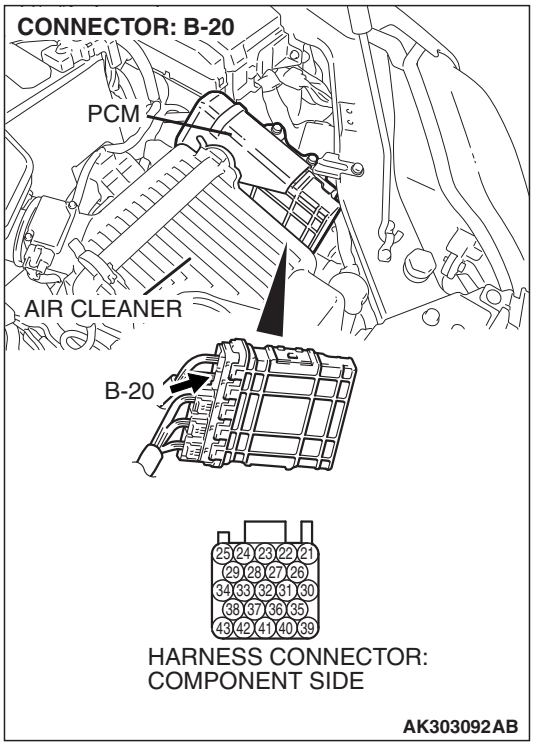
Q: Is the harness connector in good condition?

YES : Go to Step 6.

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

STEP 6. Check for harness damage between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41).





NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 7.

NO : Repair it. 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 14 P.13B-5.

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

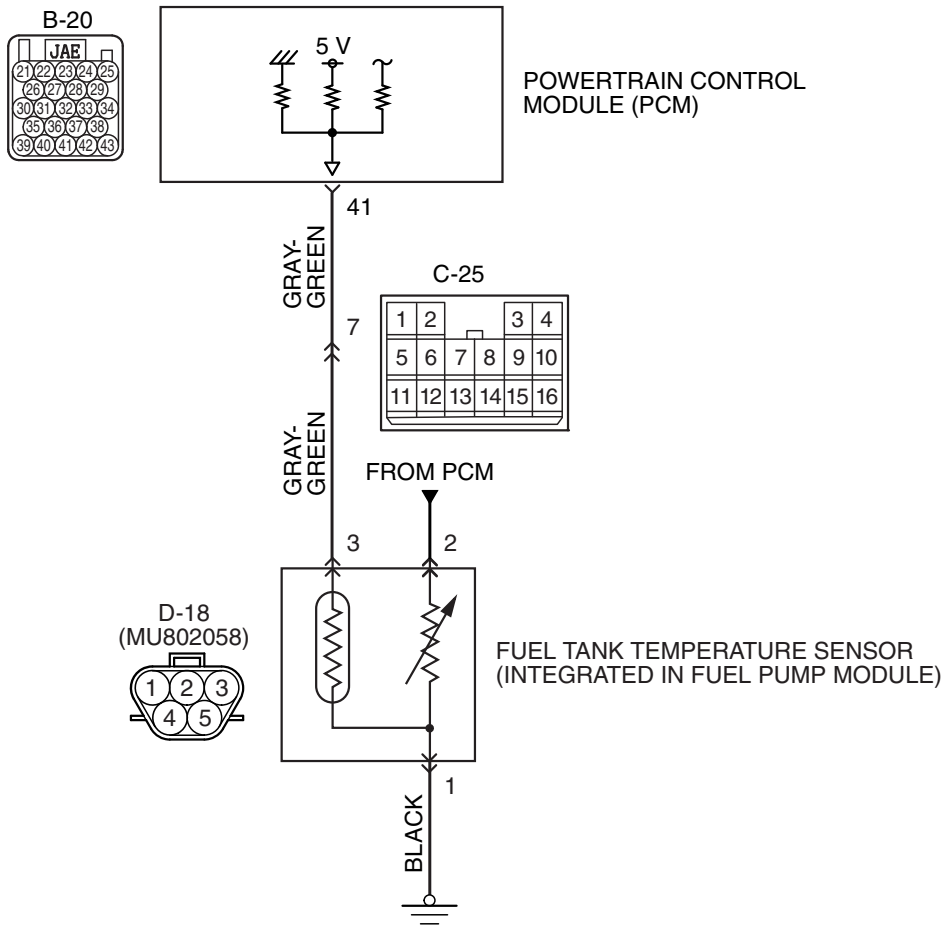
Q: Is DTC P0181 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

Fuel Tank Temperature Sensor Circuit



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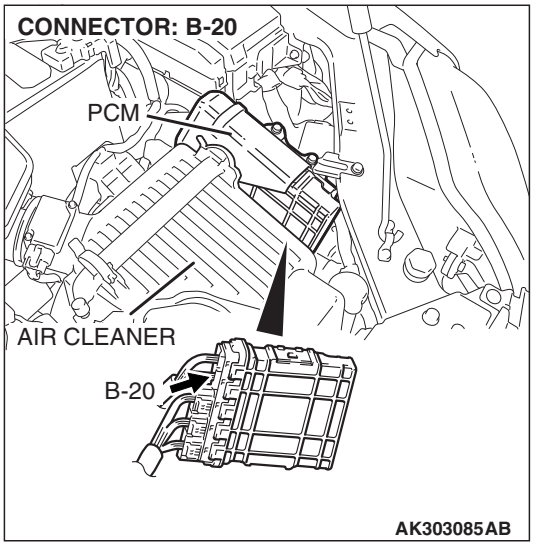
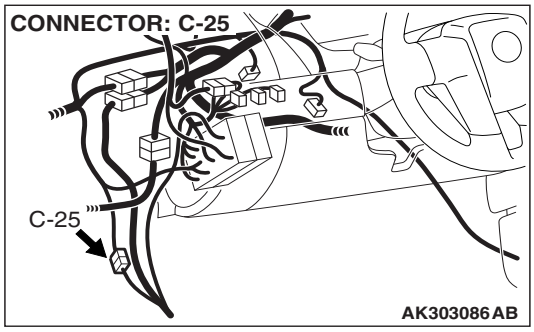
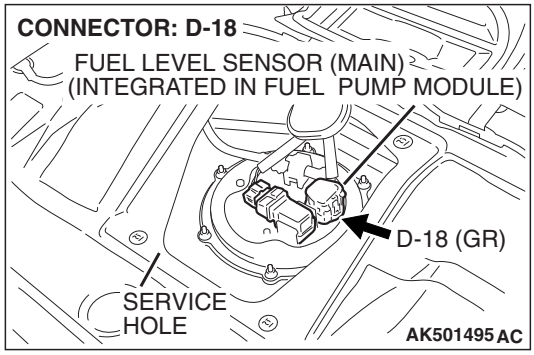






CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Fuel tank 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)

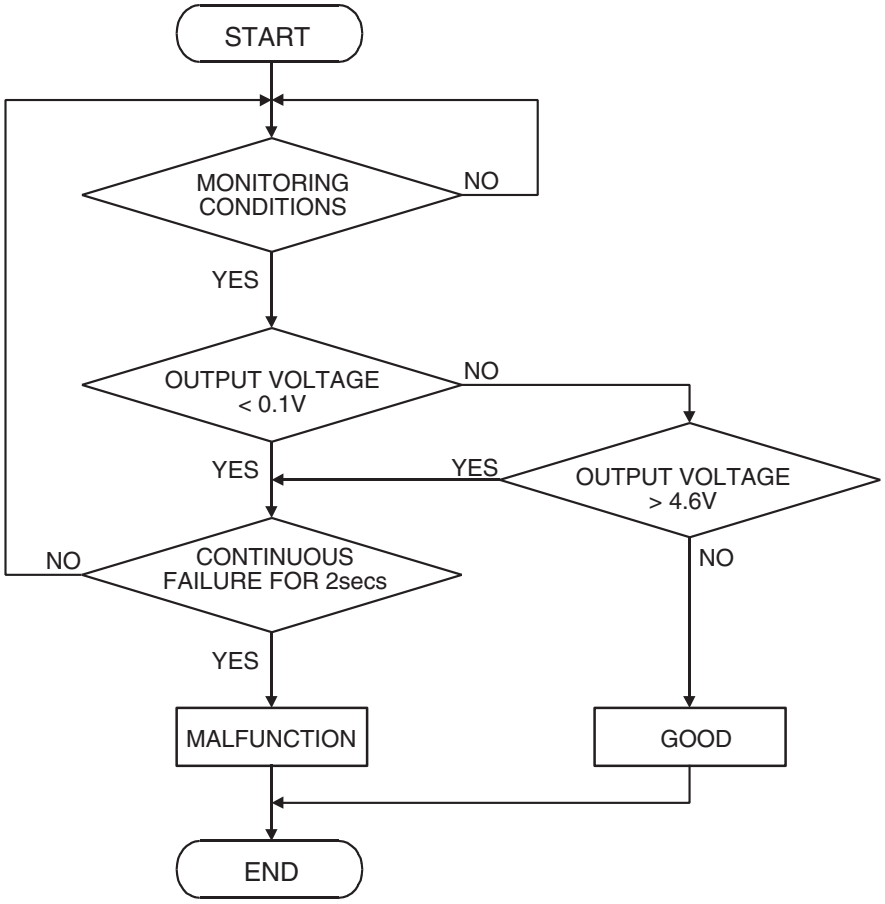
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302403

Check Condition

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

Judgement Criterion

- Sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

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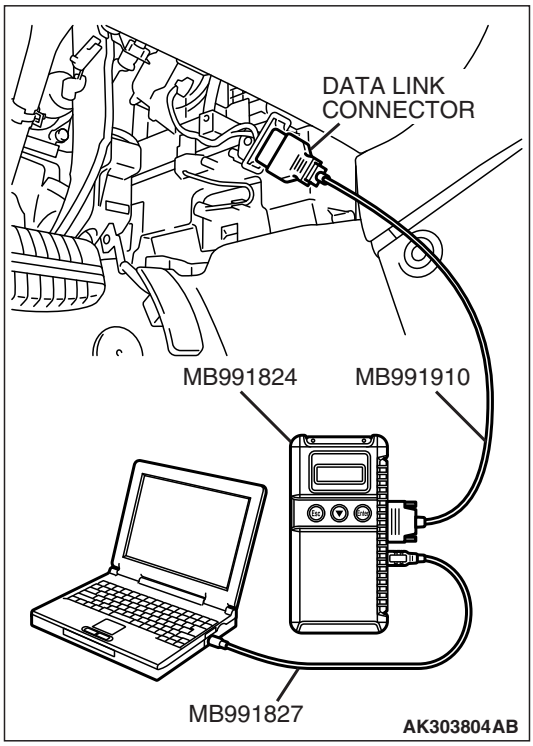


STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ 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.

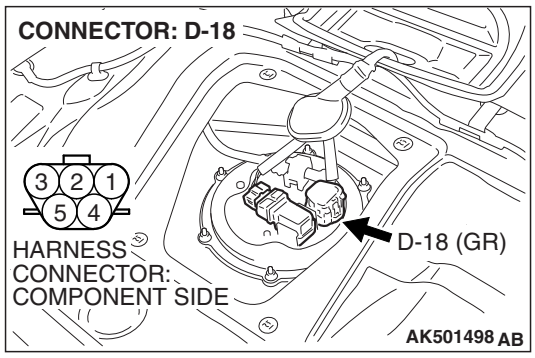
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

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

Q: Is the sensor operating properly?

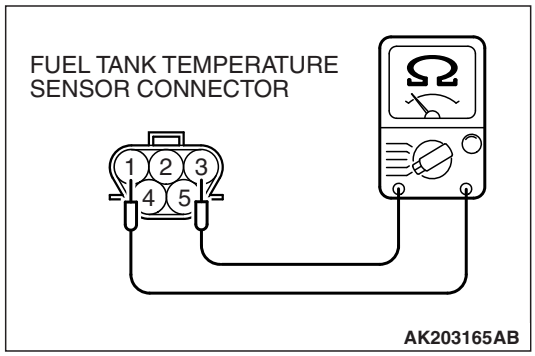
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



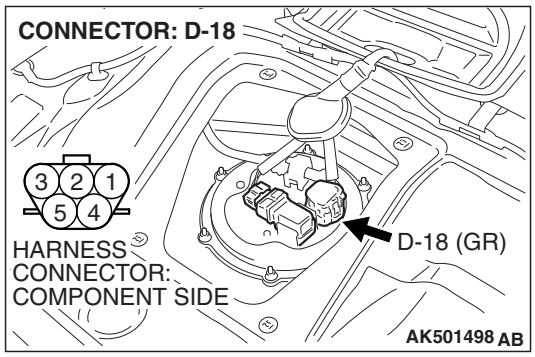
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

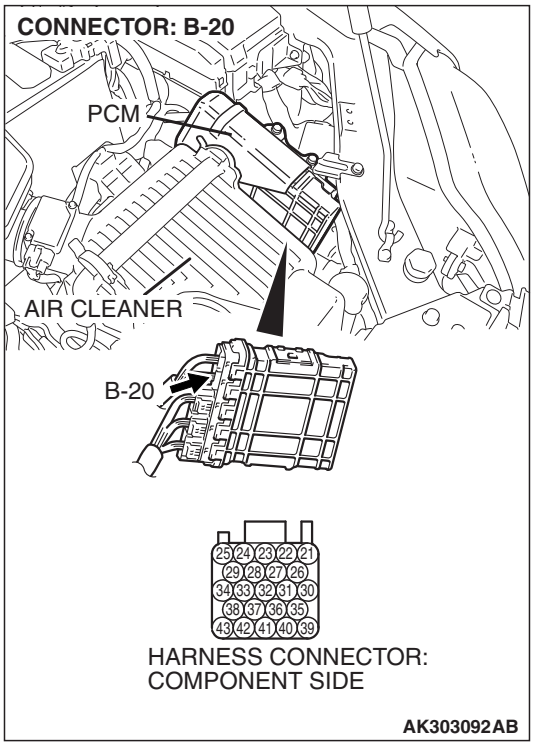
Standard value:
0.5 – 12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 3.

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





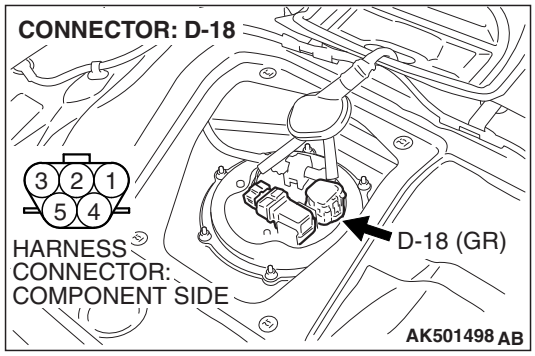
STEP 3. Check harness connector D-18 at the fuel tank temperature sensor and harness connector B-20 at PCM for damage.

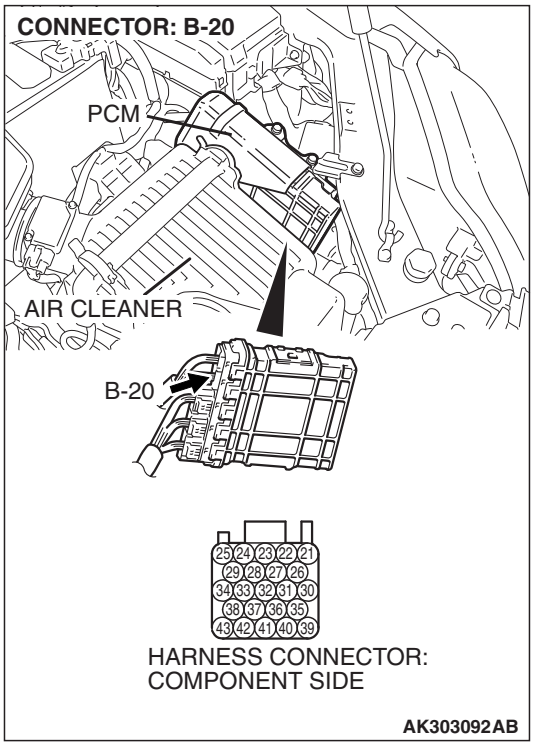
Q: Is the harness connector in good condition?

YES : Go to Step 4.

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

STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41).





NOTE: Check harness after checking intermediate connector C-25. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

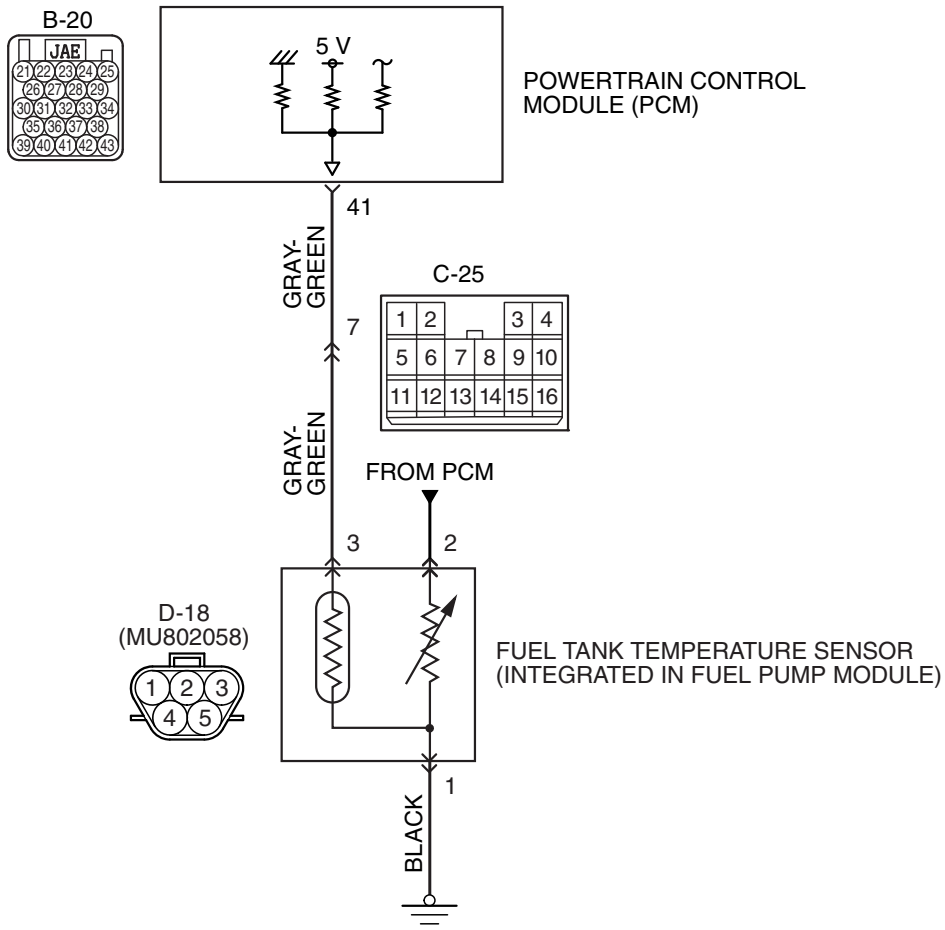
Q: Is DTC P0182 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

Fuel Tank Temperature Sensor Circuit



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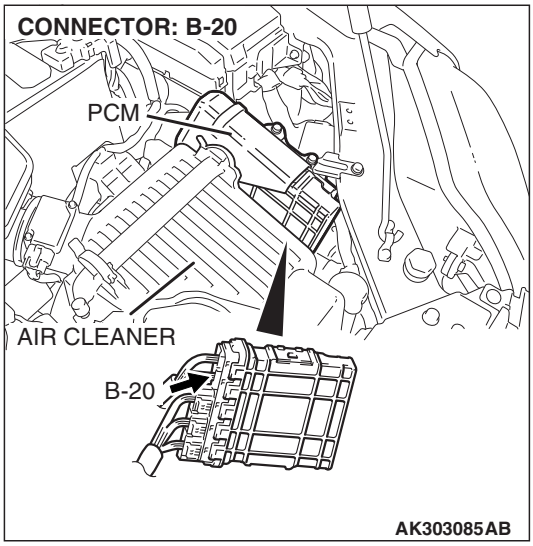
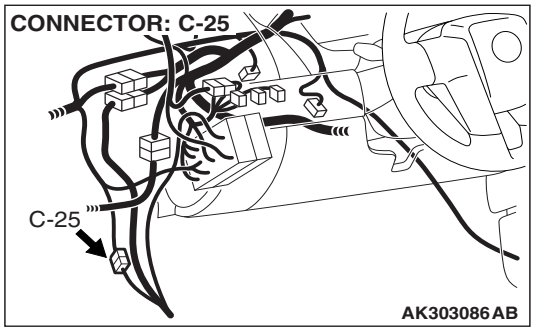
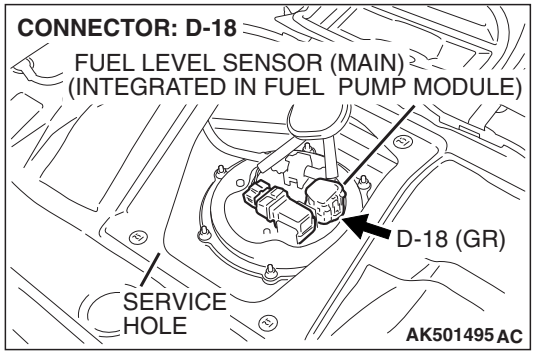






CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 41) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Fuel tank 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)

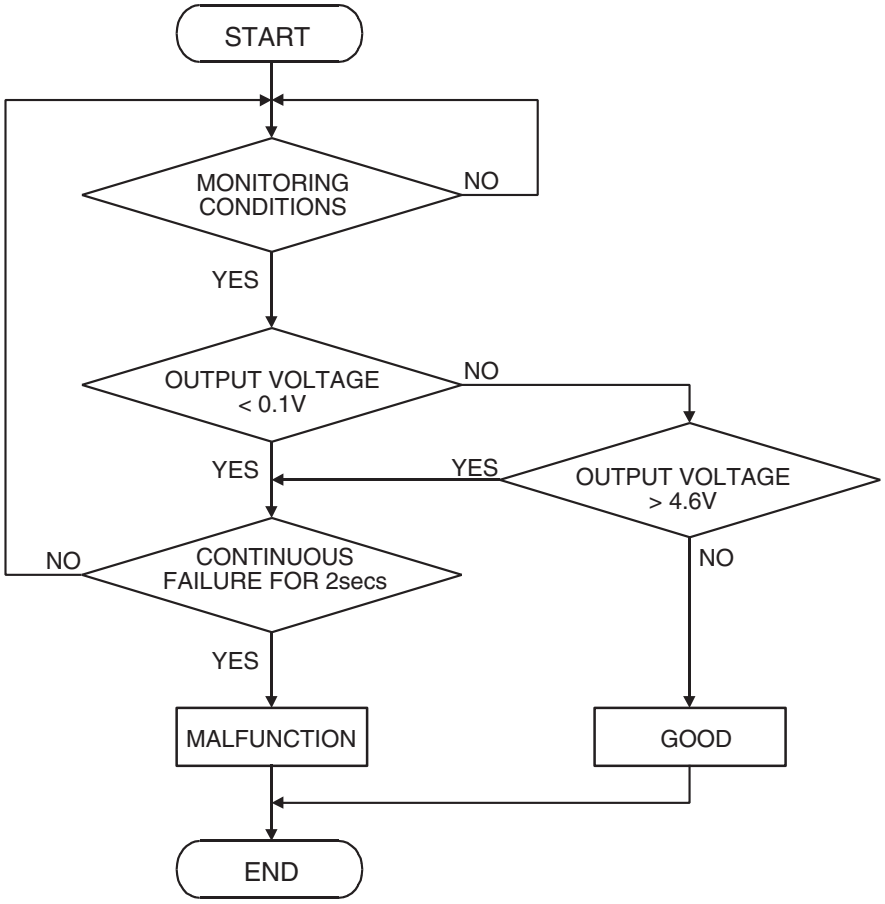
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302403

Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

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

DIAGNOSIS

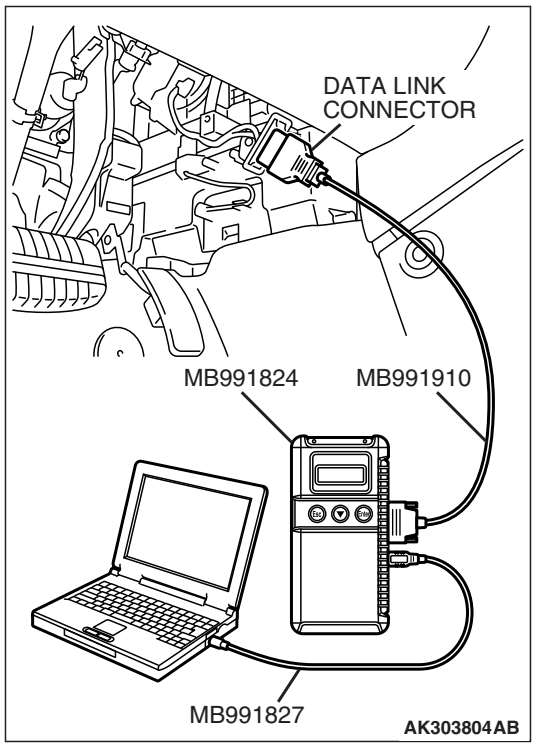
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-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 53: Fuel Tank 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.



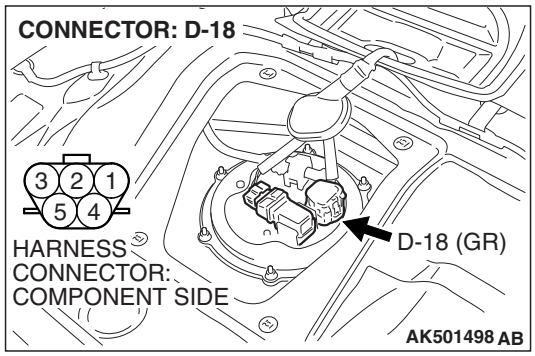
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

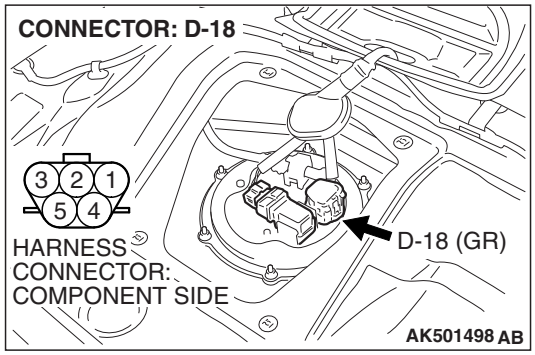
STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.



Q: Is the harness connector in good condition?

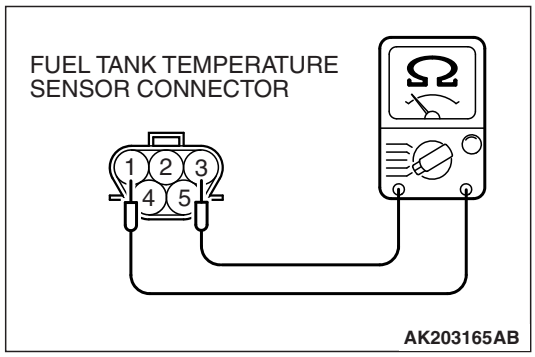
YES : Go to Step 3.

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



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.



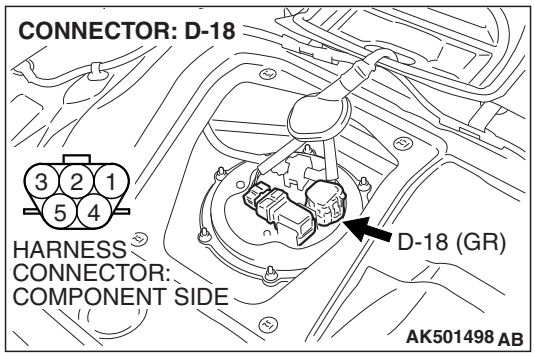
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 –12.0 kΩ

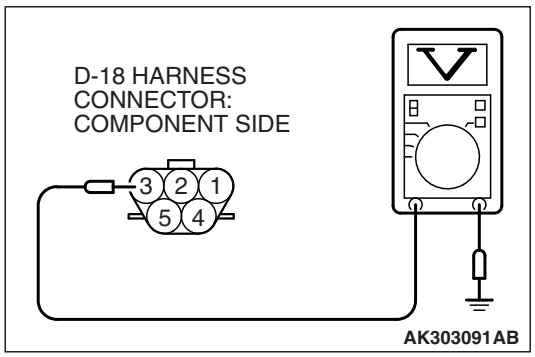
Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

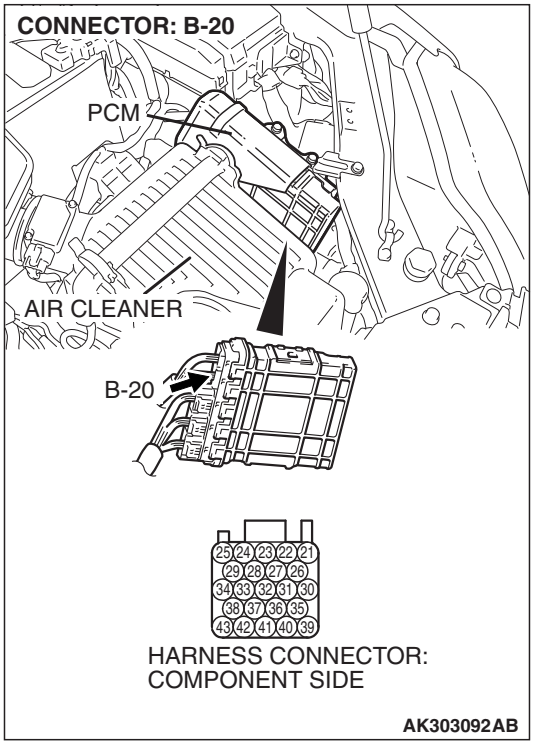


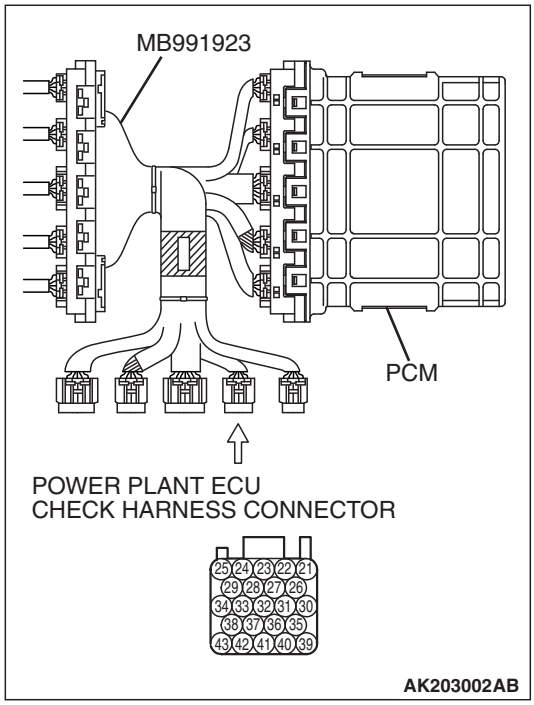
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

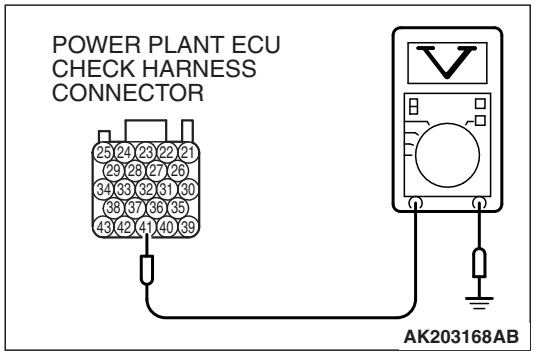
YES : Go to Step 8.
NO : Go to Step 5.





STEP 5. Check the sensor supply voltage at PCM connector B-20 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the fuel tank temperature sensor connector D-18.
(3) Turn the ignition switch to the "ON" position.

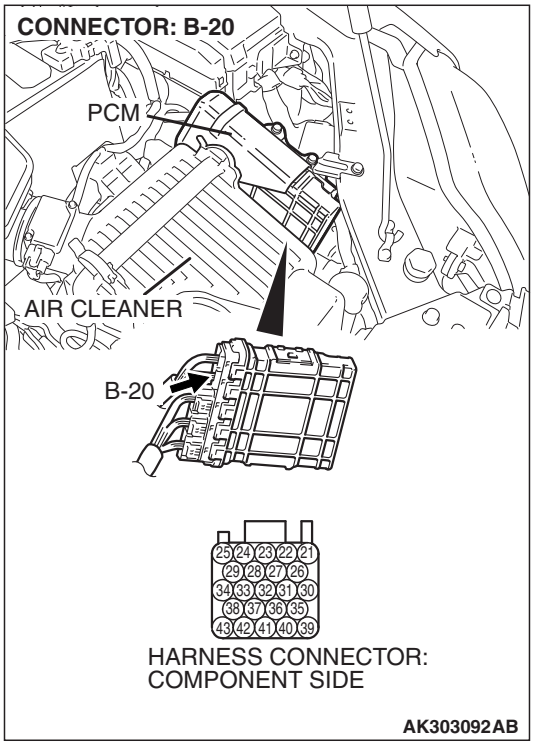


(4) Measure the voltage between terminal No. 41 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

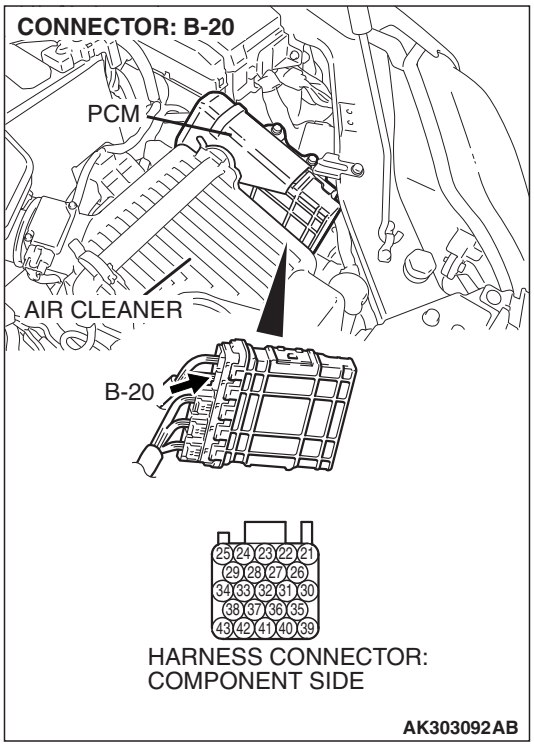
YES : Go to Step 6.
NO : Go to Step 7.



STEP 6. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector C-25 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41) 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.

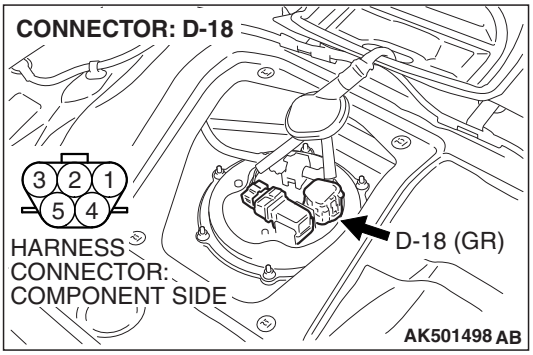


STEP 7. Check harness connector B-20 at PCM for damage.

Q: Is the harness connector in good condition?

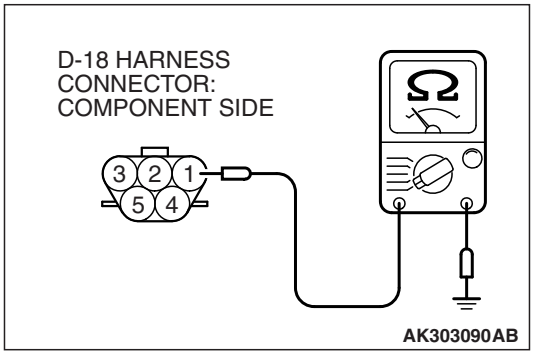
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 11.

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



STEP 8. Check the continuity at fuel tank temperature sensor harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.

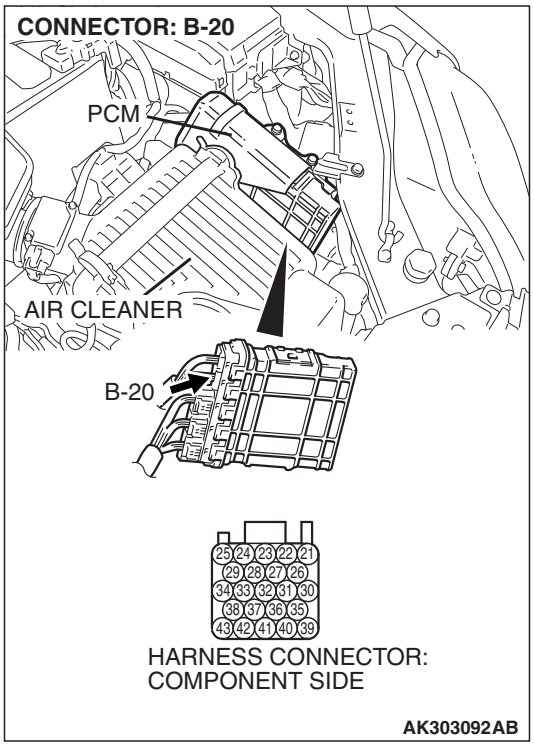


(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 9.

NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 11.



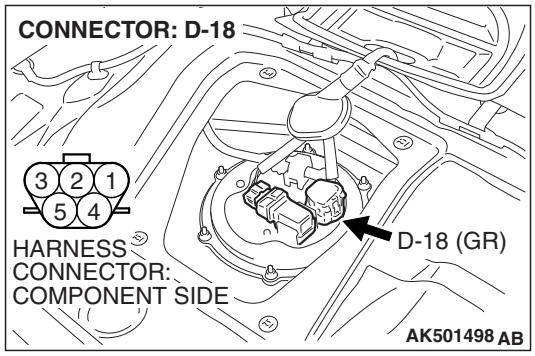
STEP 9. Check harness connector B-20 at PCM for damage.

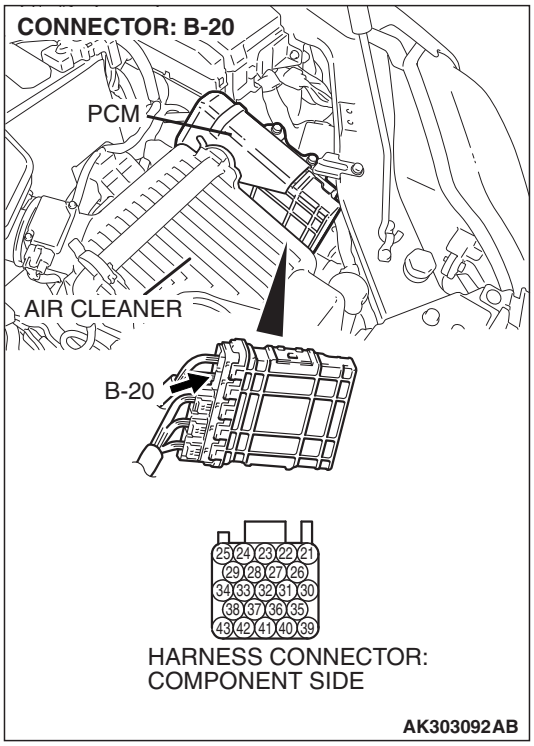
Q: Is the harness connector in good condition?

YES : Go to Step 10.

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

STEP 10. Check for harness damage between fuel tank temperature sensor connector D-18 (terminal No. 3) and PCM connector B-20 (terminal No. 41).





NOTE: Check harness after checking intermediate connector C-25. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

Q: Is DTC P0183 set?

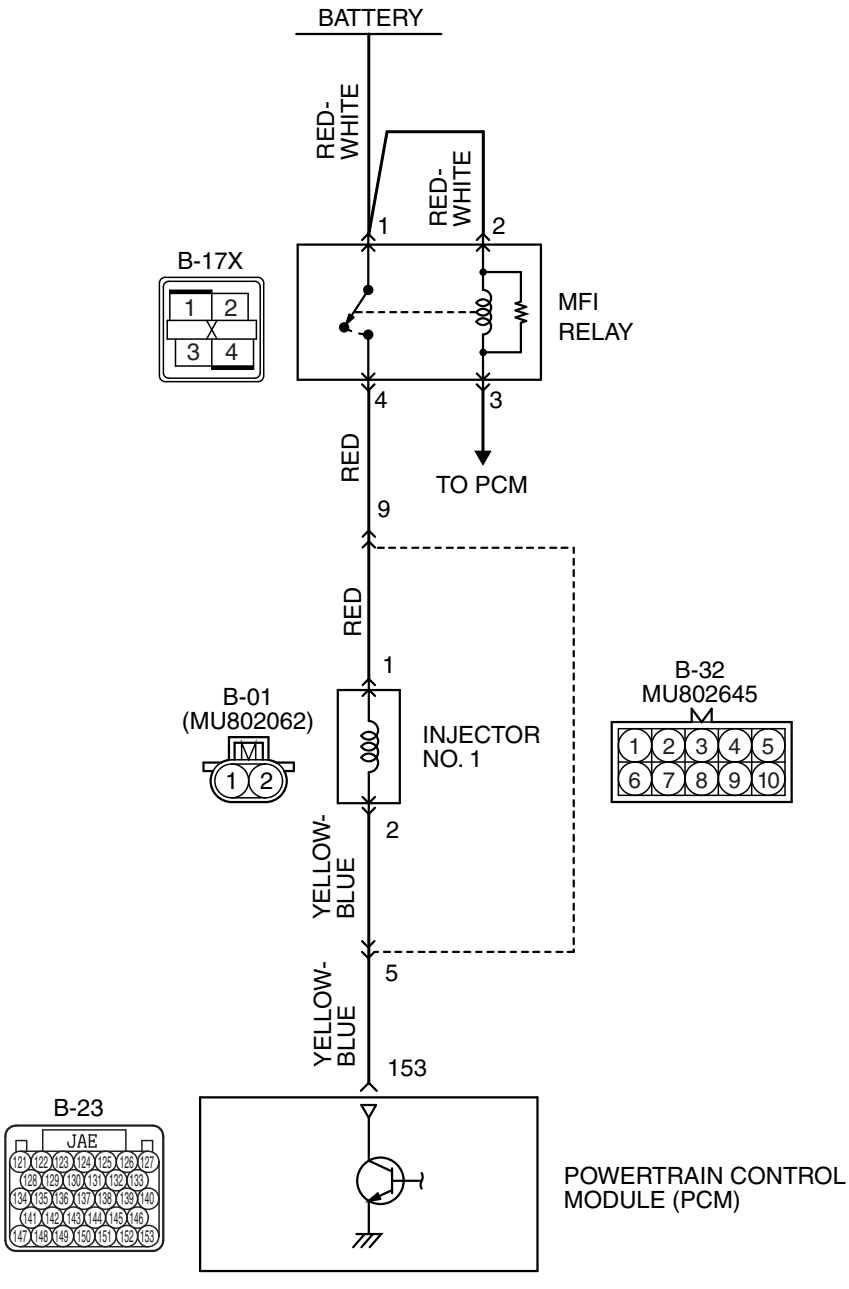
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0201: Injector Circuit - Cylinder 1

⚠ CAUTION
If DTC P0201 has been set, TCL related DTC U1120 is also set. After P0201 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 1



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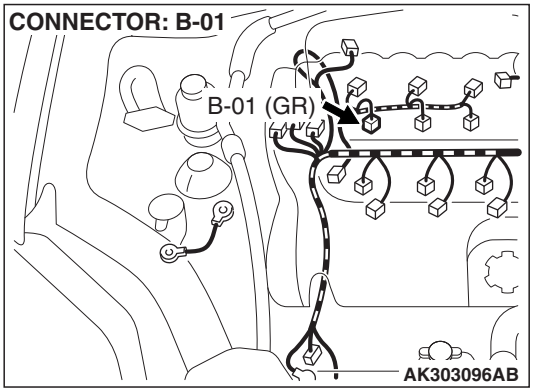
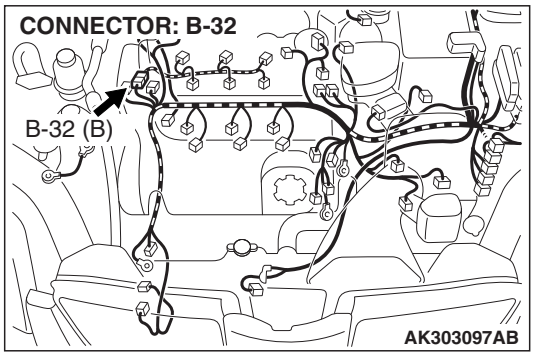
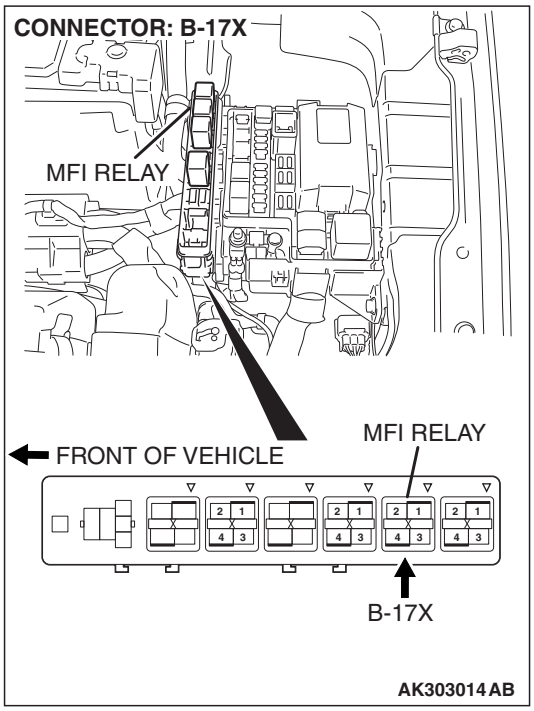
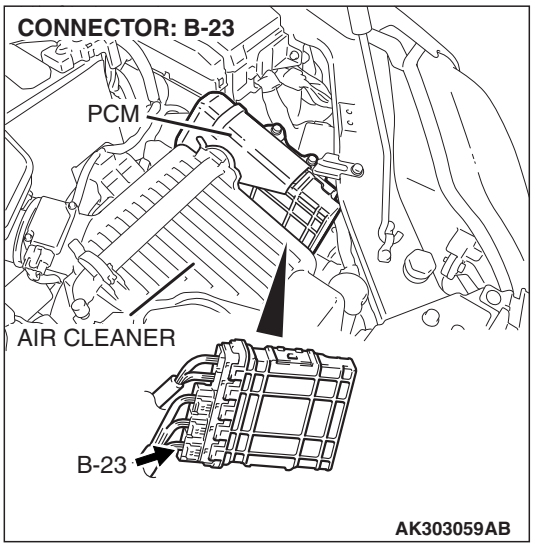








CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

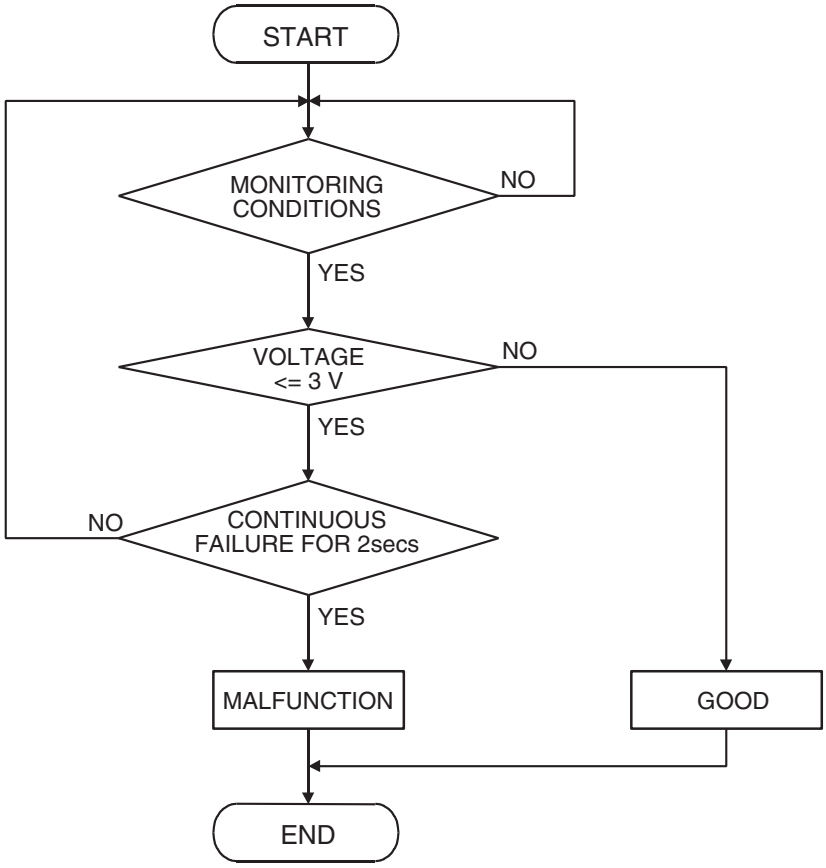
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



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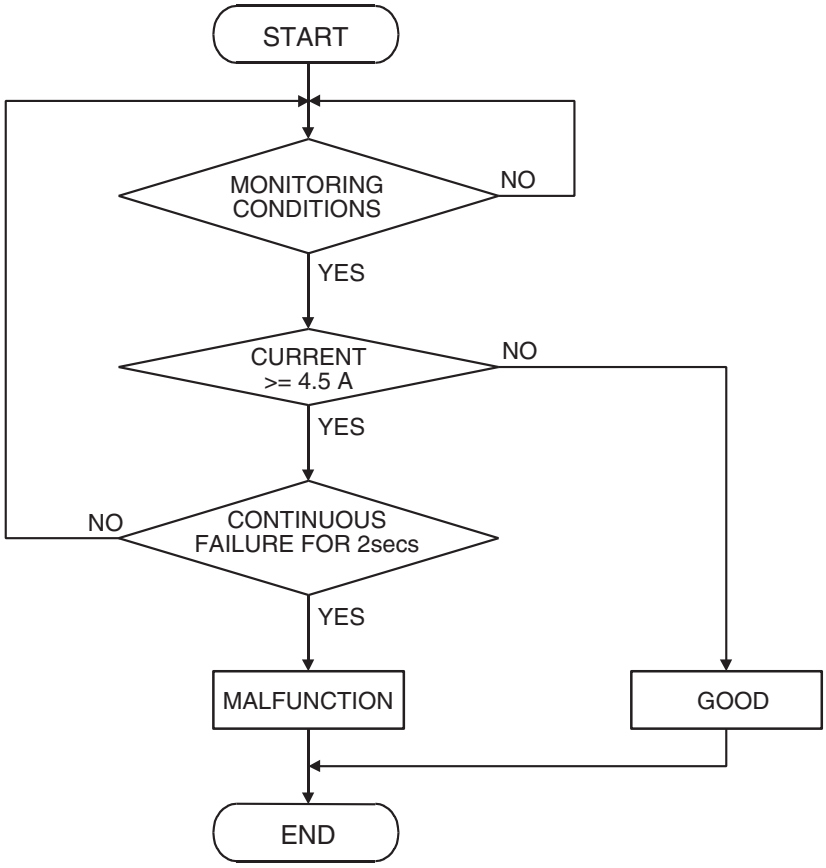
Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

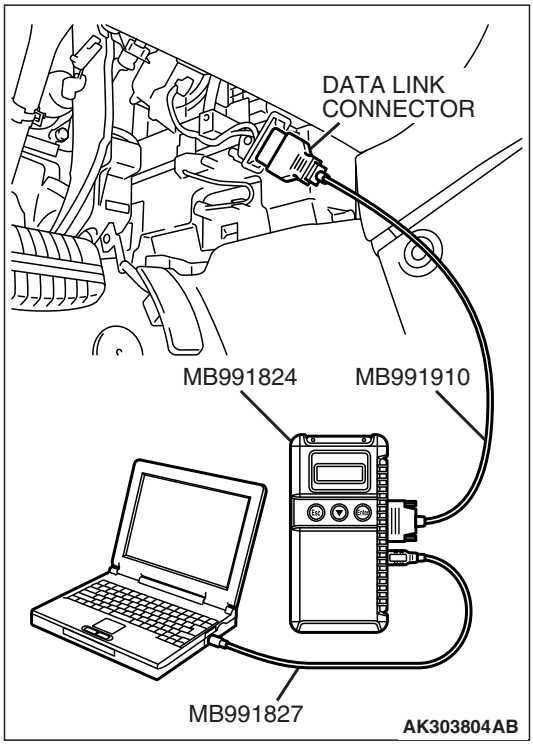
- No. 1 cylinder injector failed.
- Open or shorted No. 1cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 1: No. 1 Injector.



⚠ CAUTION

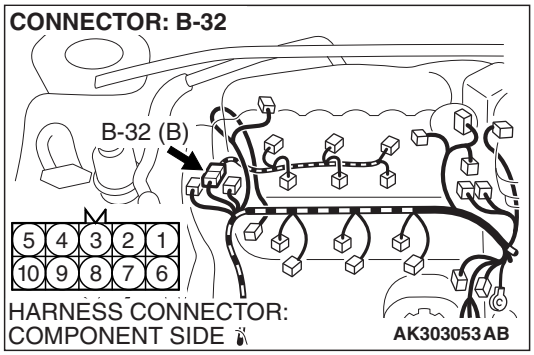
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 actuator testing mode for item 1, No. 1 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

STEP 2. Check harness connector B- 32 at intermediate connector for damage.

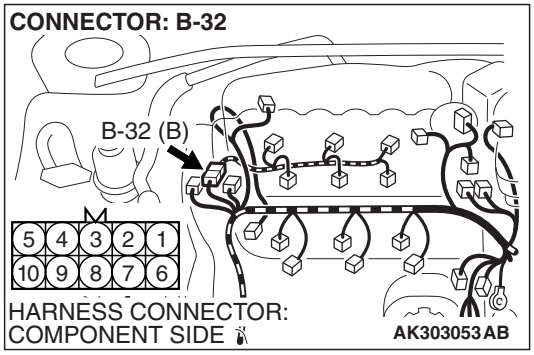


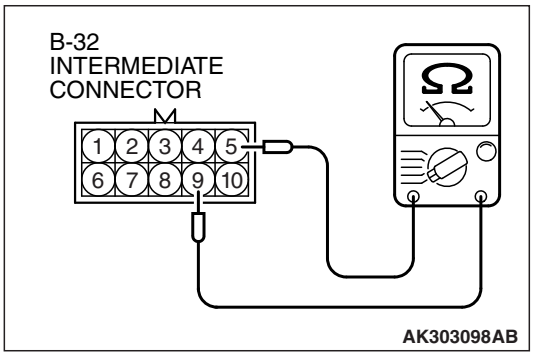
Q: Is the harness connector in good condition?

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

STEP 3. Check the No. 1 cylinder injector resistance at intermediate connector B-32.

(1) Disconnect the intermediate connector B-32.





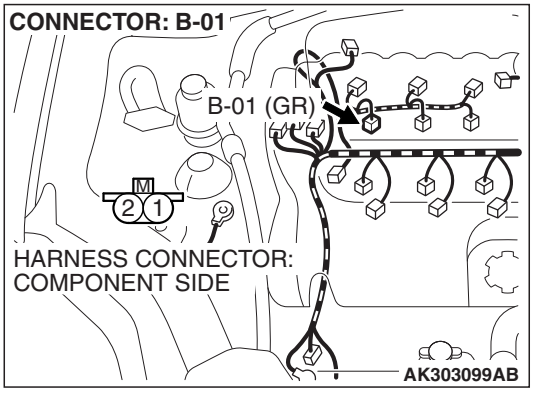
(2) Measure the resistance between terminal No. 5 and No. 9.
- Resistance should be between 10.5 and 13.5 ohms.

Q: Is the measured resistance between 10.5 and 13.5 ohms?

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

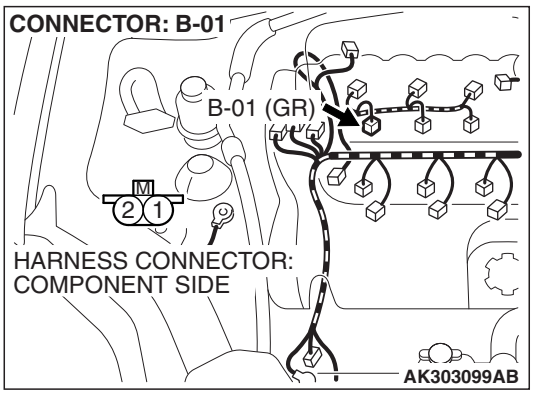
STEP 4. Check the harness connector B-01 at No. 1 cylinder injector for damage.

Remove the intake manifold.



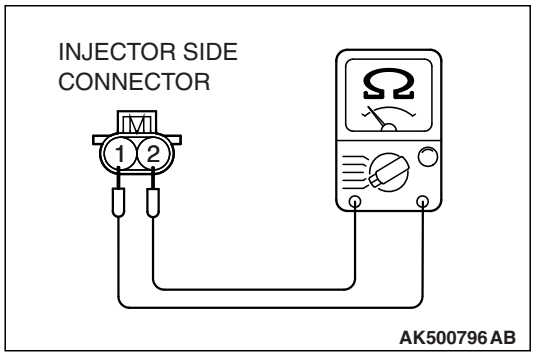
Q: Is the harness connector in good condition?

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 No. 1 cylinder injector.

(1) Disconnect the No. 1 cylinder injector connector B-01.



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

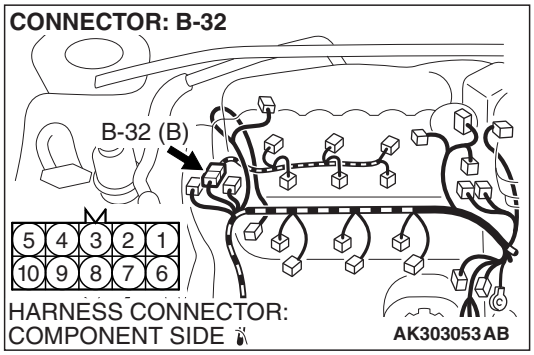
Standard value: 10.5 – 13.5 Ω [at 20° C (68° F)]

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

YES : Repair harness wire between intermediate connector B-32 (terminal No. 9) and No. 1 cylinder injector connector B-01 (terminal No. 1) and harness wire between No.1 cylinder injector connector B-01 (terminal No. 2) and intermediate connector B-32 (terminal No. 5) because of open circuit or short circuit to ground or harness damage. Then go to Step 12.

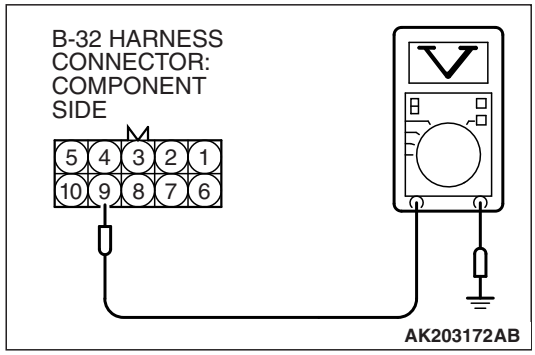
NO : Replace the No. 1 cylinder injector. Then go to Step 12.

STEP 6. Measure the power supply voltage at intermediate connector B-32.



(1) Disconnect the connector B-32 and measure at the female connector side.

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



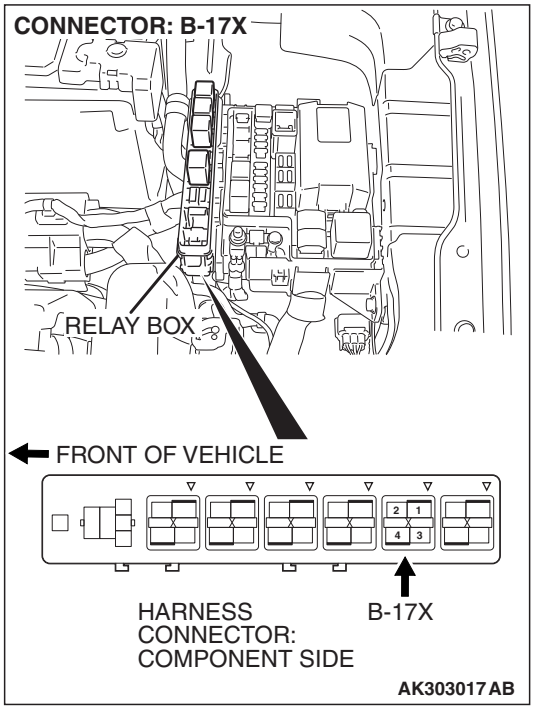
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 8.

NO : Go to Step 7.

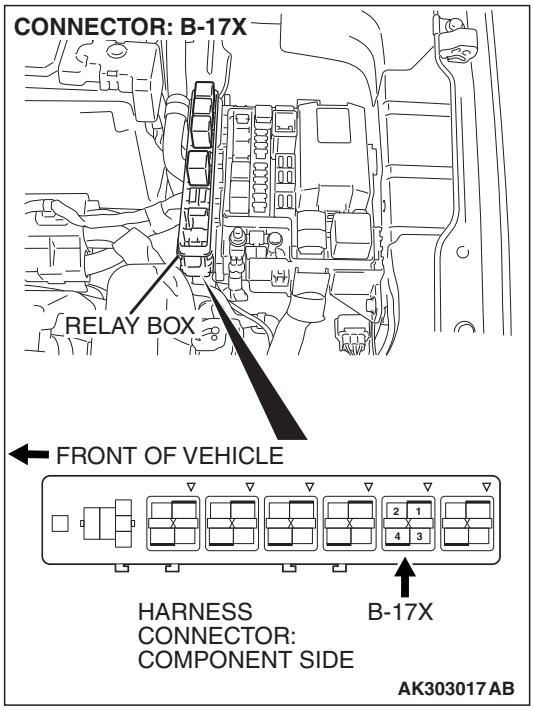


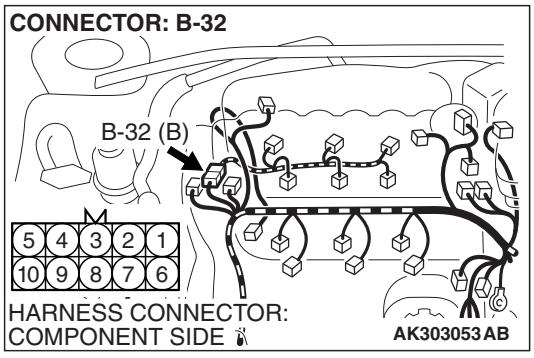
STEP 7. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.

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



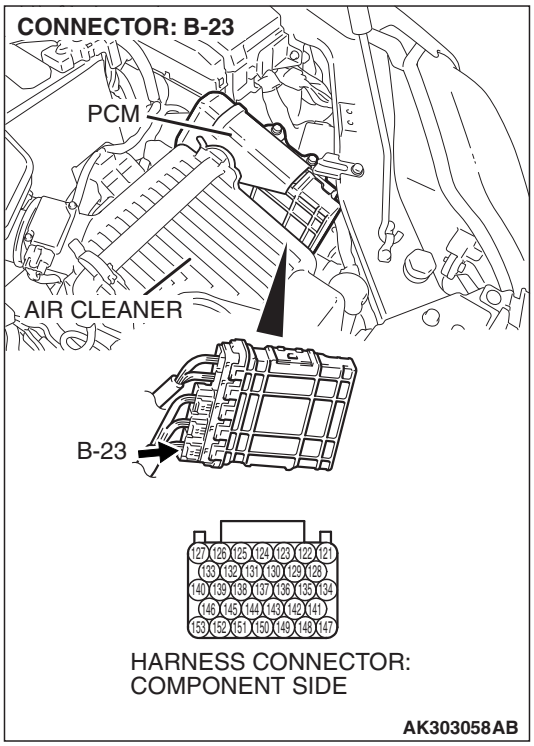


STEP 8. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

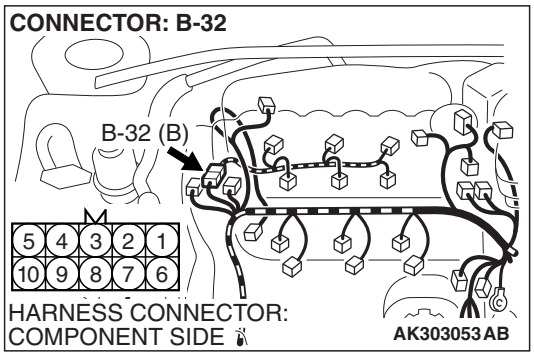


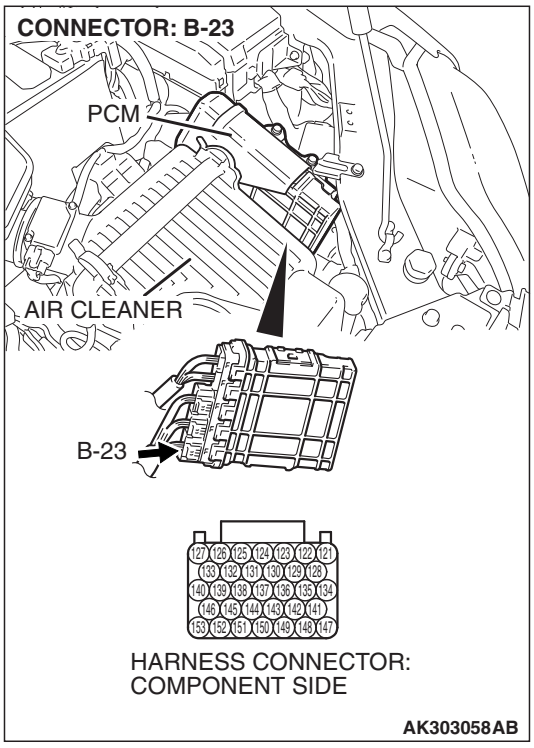
STEP 9. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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



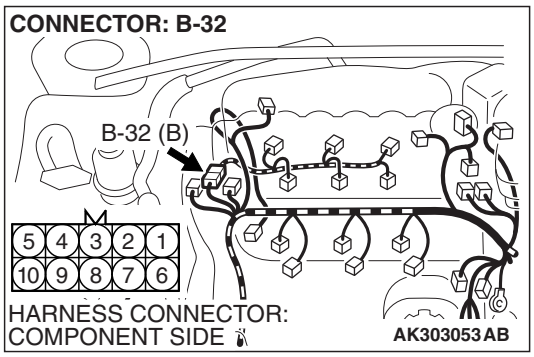


STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-32 (terminal No. 5) and PCM connector B-23 (terminal No. 153).

Q: Is the harness wire in good condition?

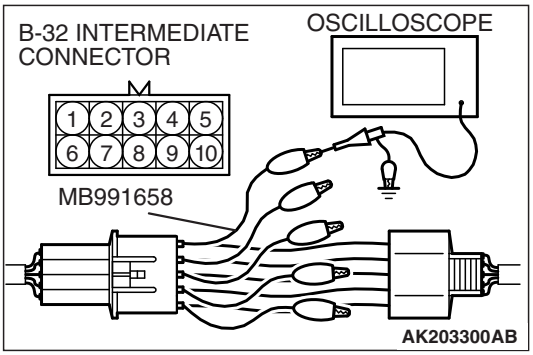
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



STEP 11. Using the oscilloscope, check the No. 1 cylinder injector.

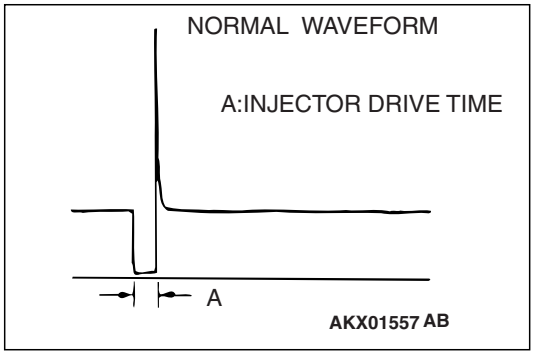
(1) Disconnect the intermediate connector B-32 and connect the test harness special tool (MB991658) between the separated connectors.



(2) Connect the oscilloscope probe to injector intermediate connector terminal No. 5.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No.153.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

Q: Is DTC P0201 set?

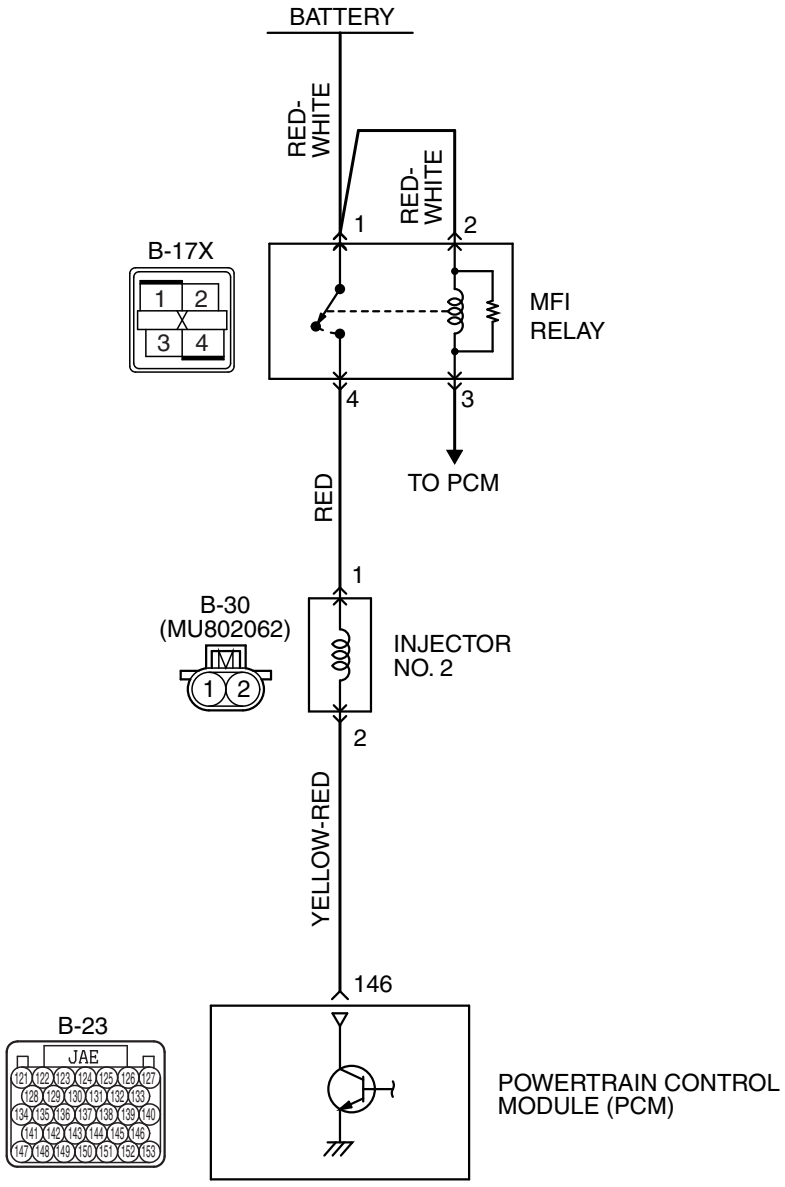
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0202: Injector Circuit - Cylinder 2

⚠ CAUTION
If DTC P0202 has been set, TCL related DTC U1120 is also set. After P0202 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 2



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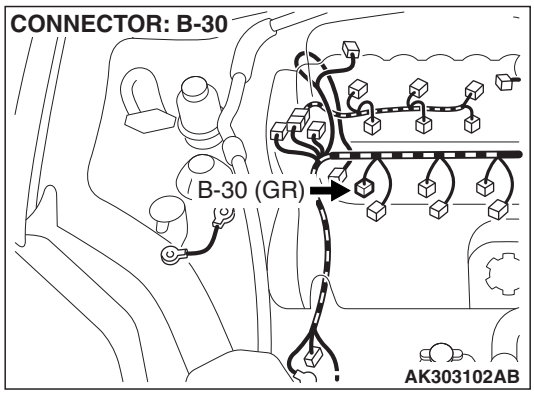
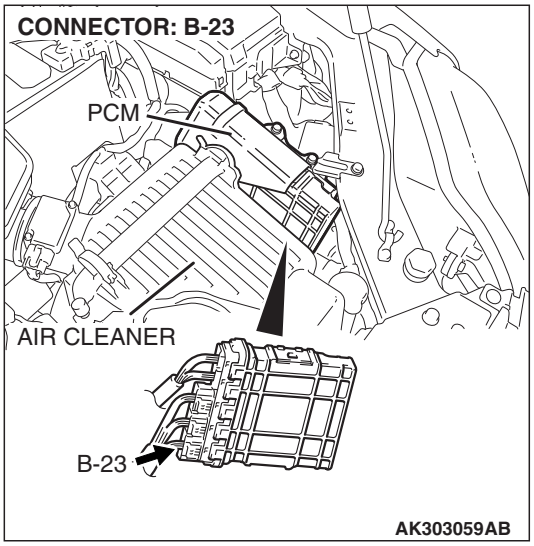
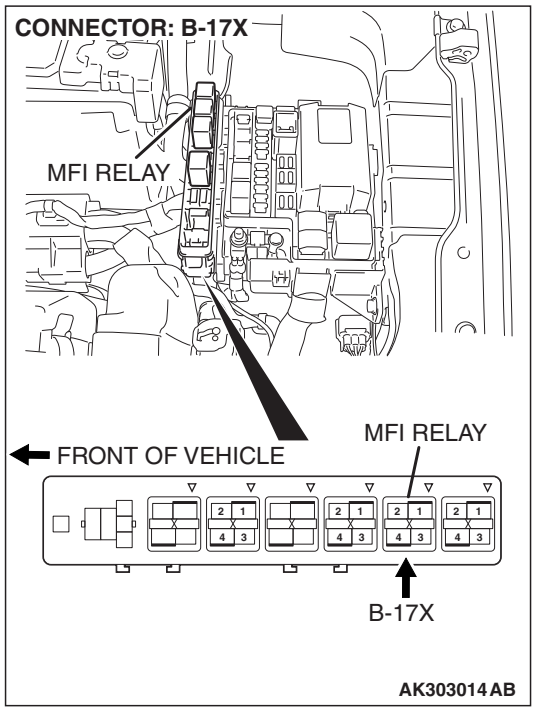






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

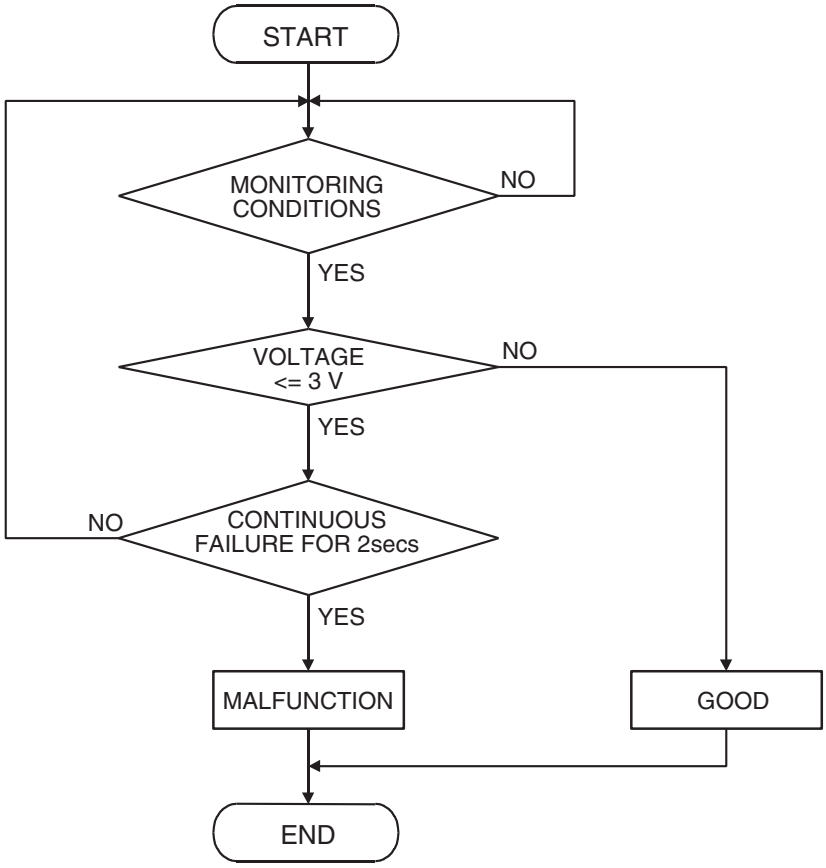
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



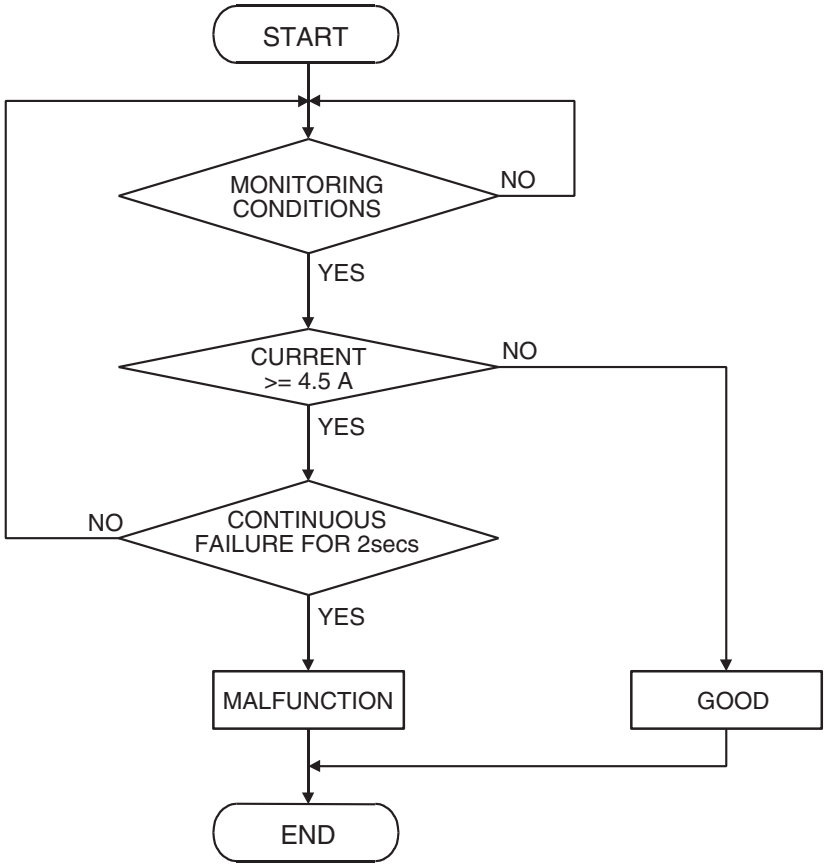
AK503627

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK700575

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

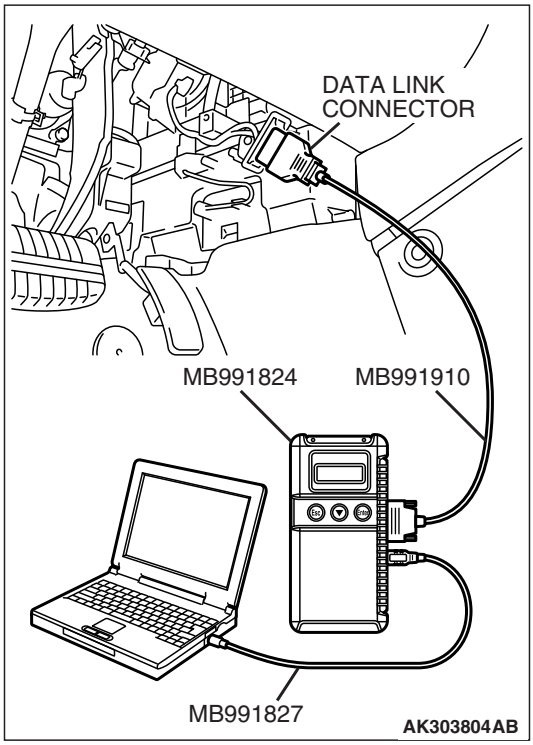
- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 2: No. 2 injector.



⚠ 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.

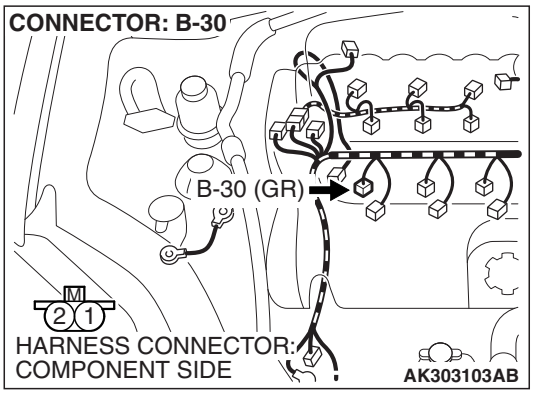
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 2, No. 2 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

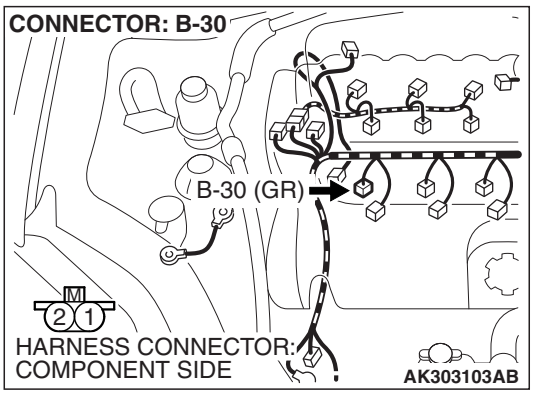
STEP 2. Check the harness connector B-30 at No. 2 cylinder injector for damage.



Q: Is the harness connector in good condition?

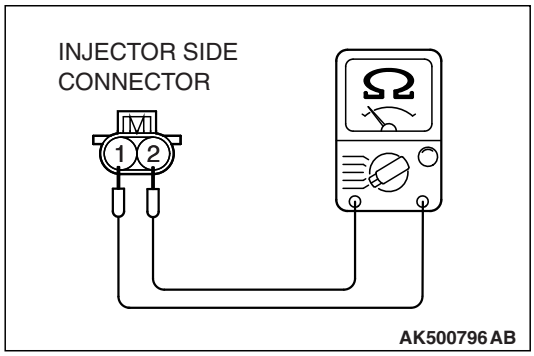
YES : Go to Step 3.

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



STEP 3. Check the No. 2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-30.



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

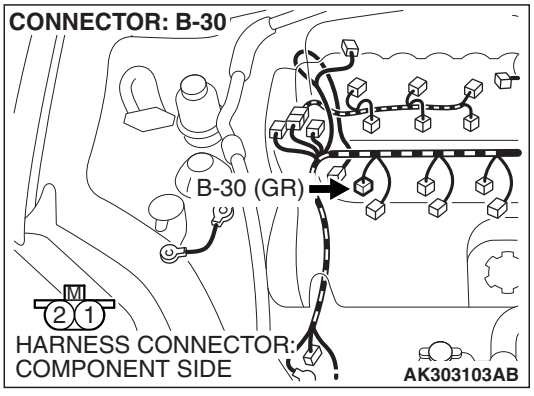
Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]

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

YES : Go to Step 4.

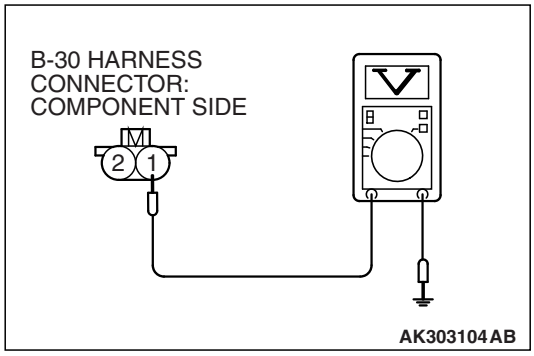
NO : Replace the No. 2 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 2 cylinder injector connector B-30.



(1) Disconnect connector B-30 and measure at the harness side.

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



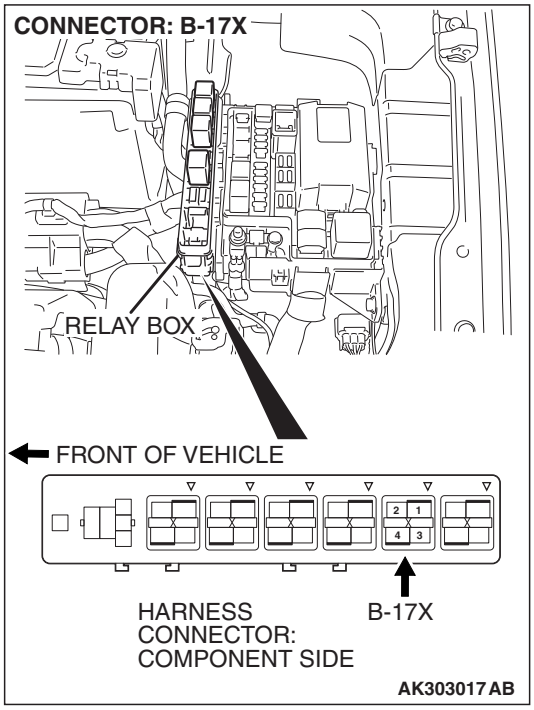
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

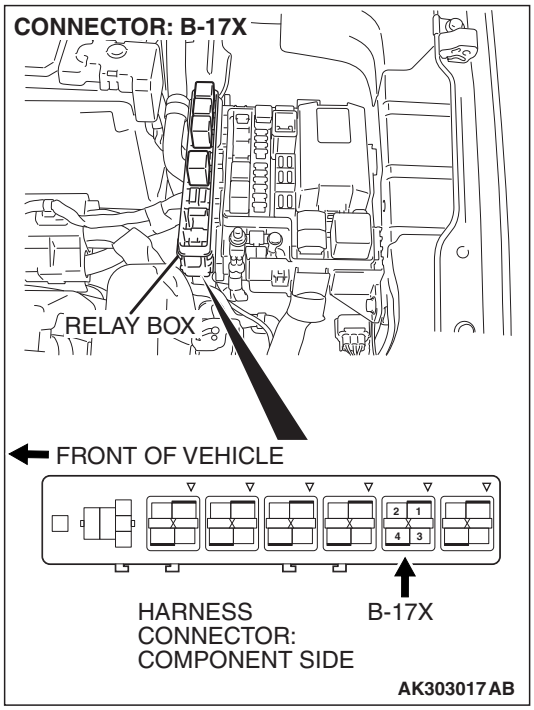


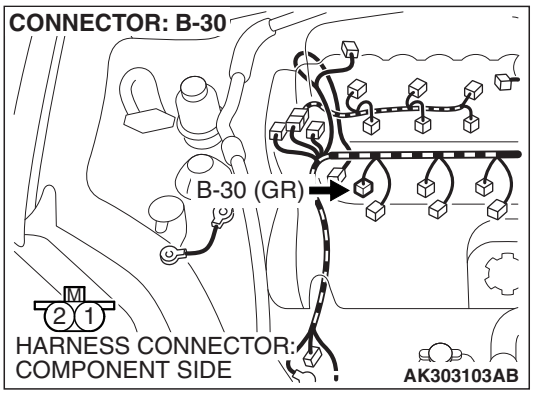
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 2 cylinder injector connector B-30 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 10.

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



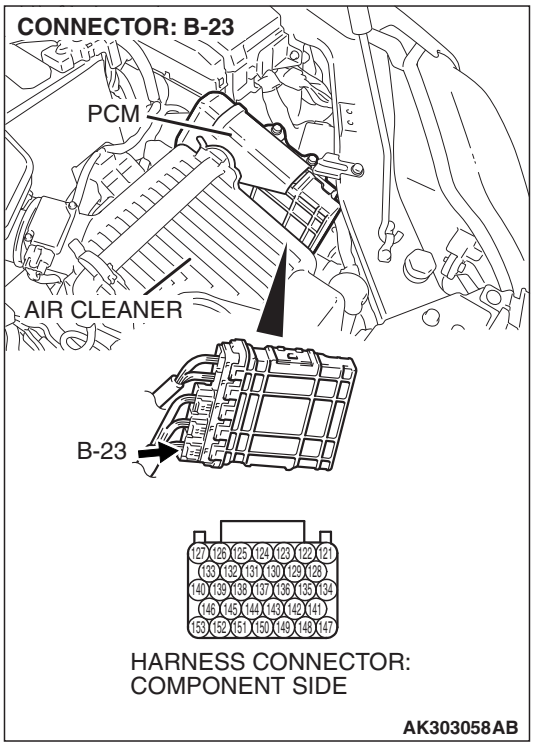


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 2 cylinder injector connector B-30 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

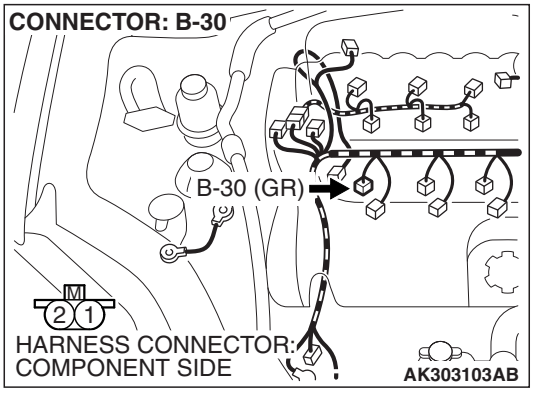


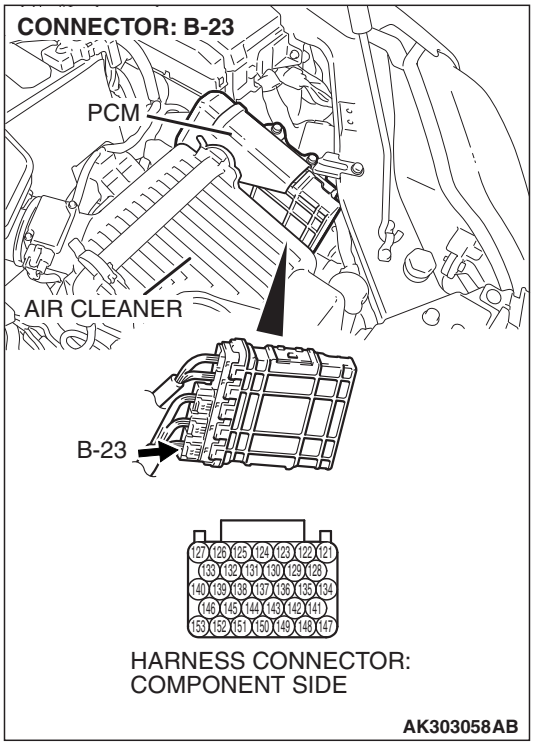
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

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



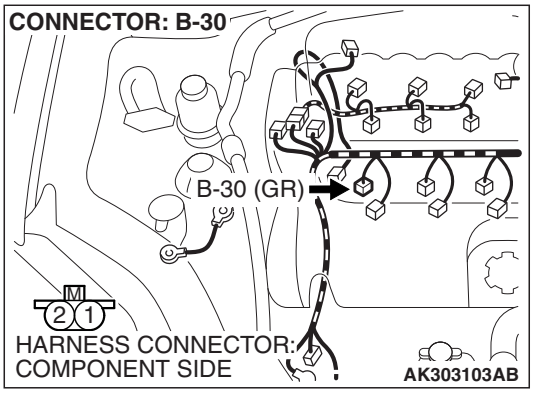


STEP 8. Check for open circuit and short circuit to ground and harness damage between No.2 cylinder injector connector B-30 (terminal No. 2) and PCM connector B-23 (terminal No. 146).

Q: Is the harness wire in good condition?

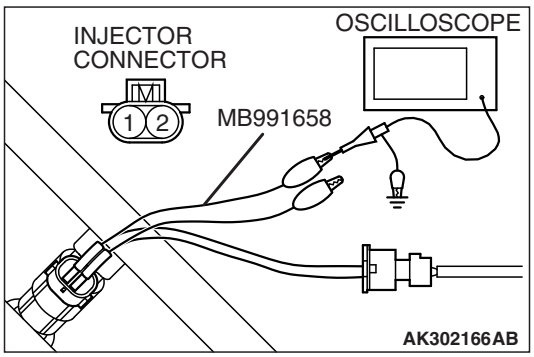
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 2 cylinder injector.

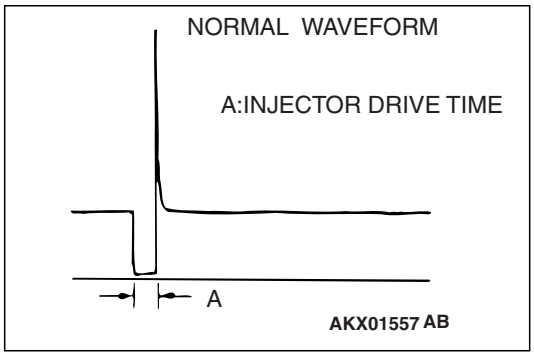
(1) Disconnect the No. 2 cylinder injector connector B-30 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 146.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

Q: Is DTC P0202 set?

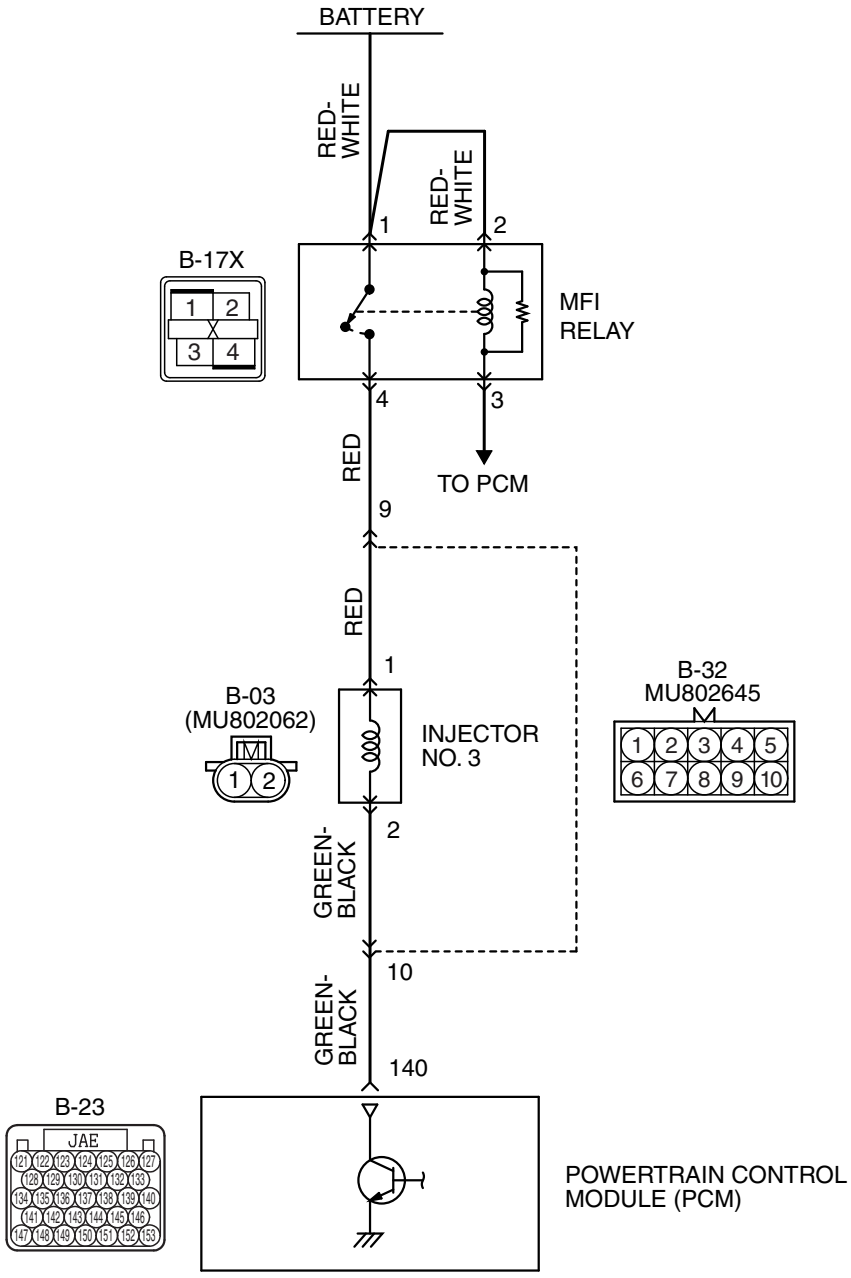
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0203: Injector Circuit - Cylinder 3

⚠ CAUTION
If DTC P0203 has been set, TCL related DTC U1120 is also set. After P0203 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 3



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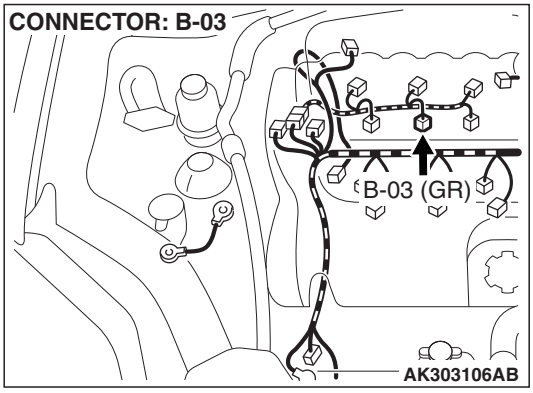
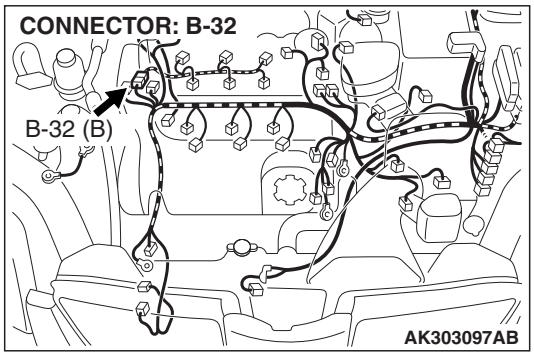
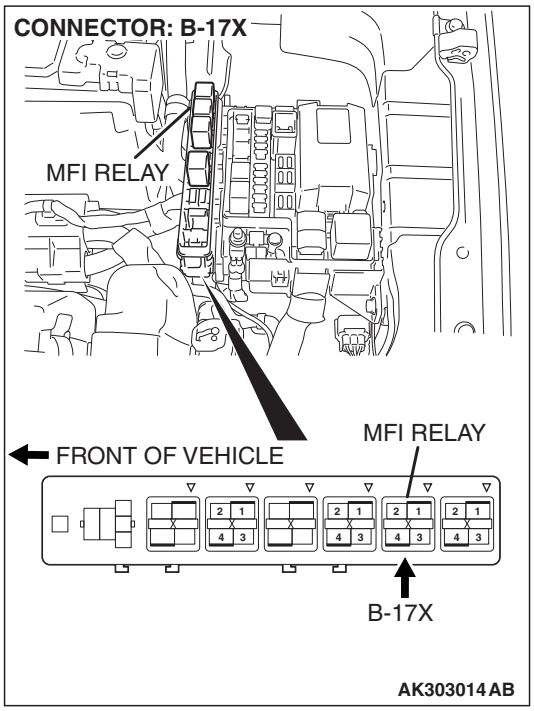
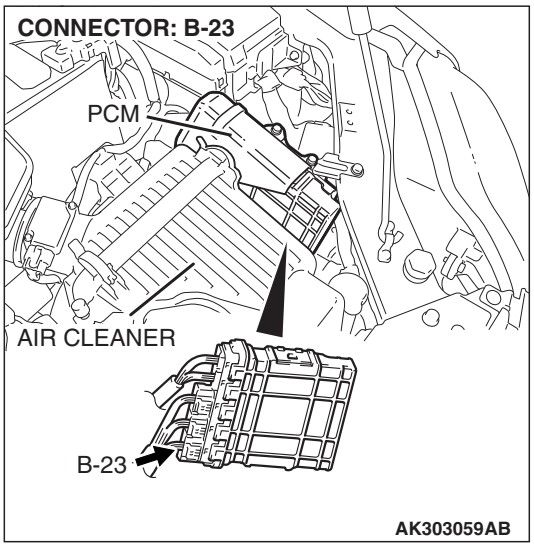
TSB Revision









CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

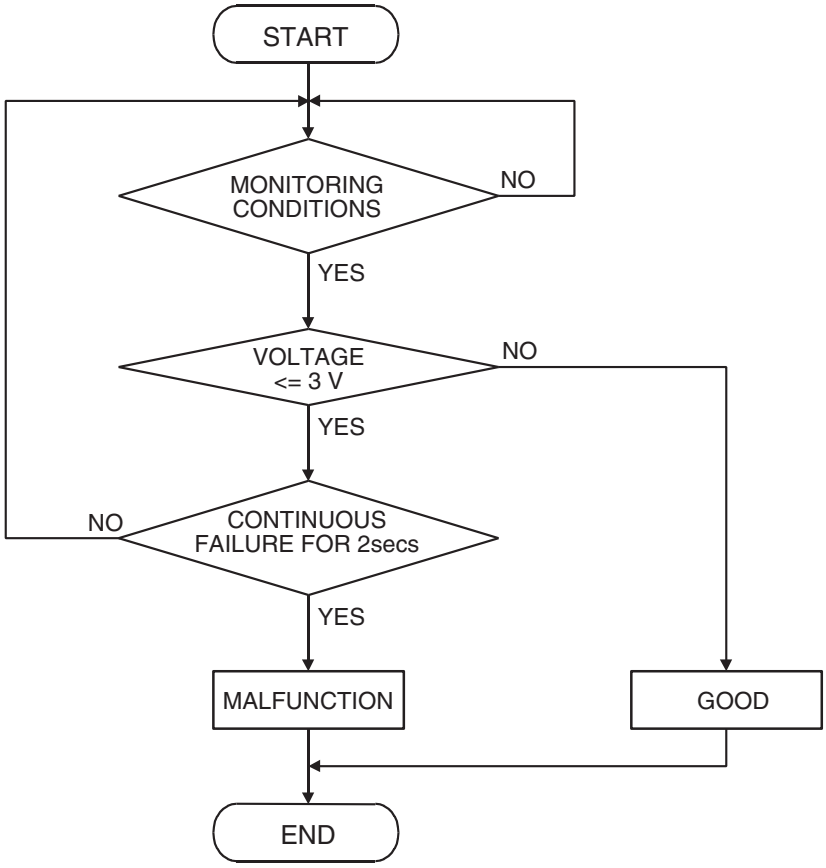
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



AK503627

Check Condition

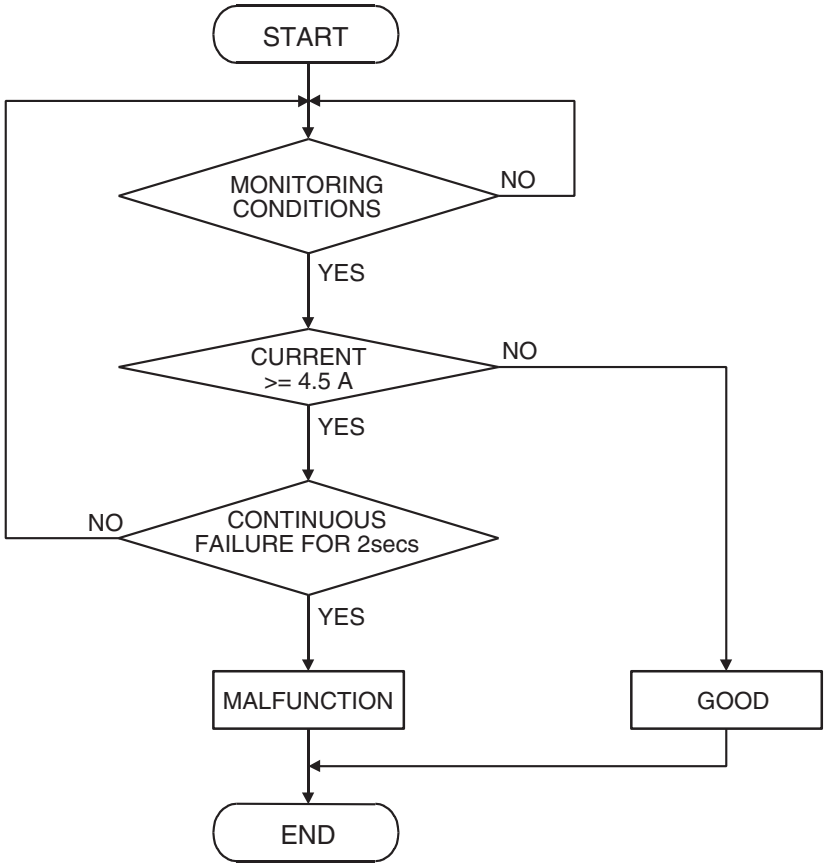
- Engine is running.

Judgement Criterion

- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK700575

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

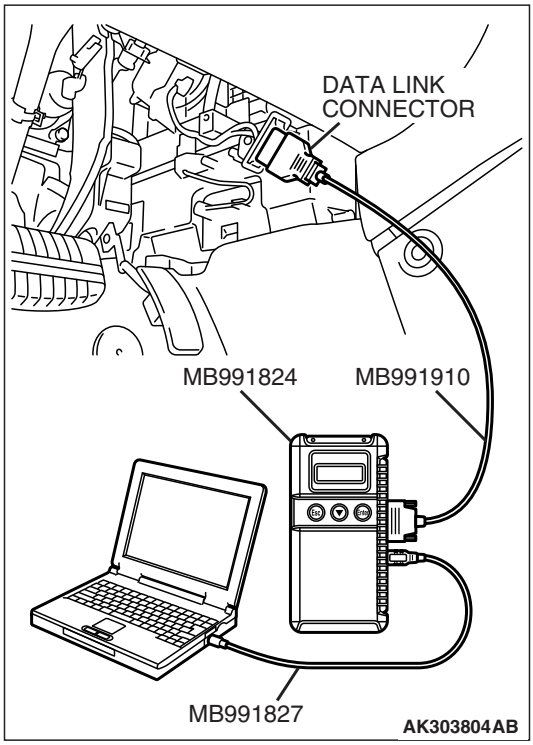
- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 3: No. 3 injector.



⚠ 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.

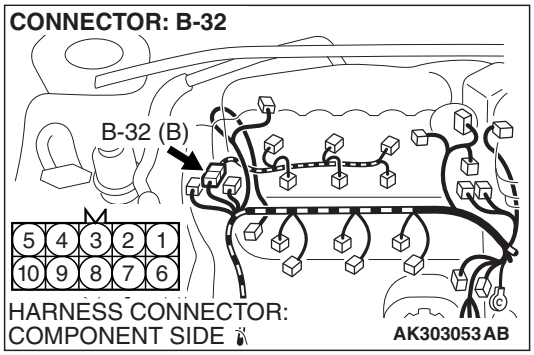
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 3, No. 3 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

STEP 2. Check harness connector B-32 at intermediate connector for damage.



Q: Is the harness connector in good condition?

YES : Go to Step 3.

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

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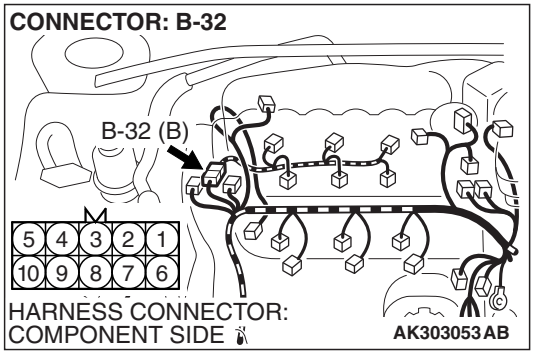
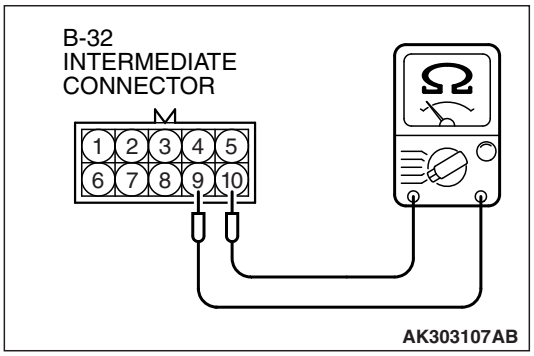
STEP 3. Check the No. 3 cylinder injector resistance at intermediate connector B-32.

(1) Disconnect the intermediate connector B-32.





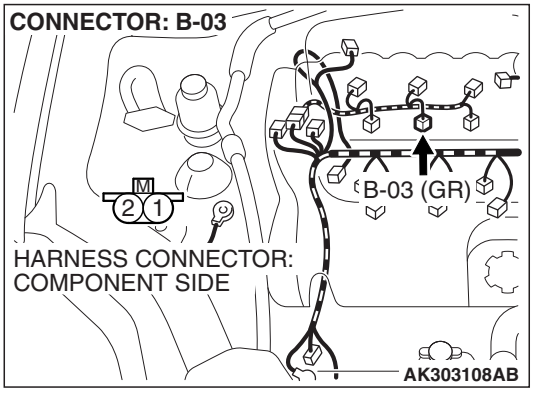
(2) Measure the resistance between terminal No. 9 and No. 10.
- Resistance should be between 10.5 and 13.5 ohms.

Q: Is the measured resistance between 10.5 and 13.5 ohms?

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

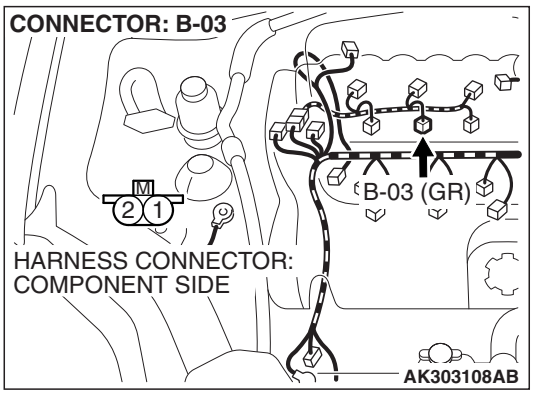
STEP 4. Check the harness connector B-03 at No. 3 cylinder injector for damage.

Remove the intake manifold.



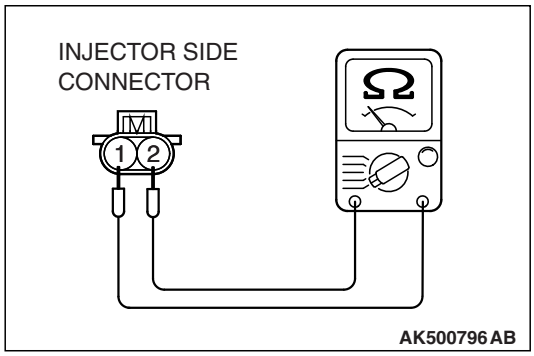
Q: Is the harness connector in good condition?

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 No. 3 cylinder injector.

(1) Disconnect the No. 3 cylinder injector connector B-03.



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

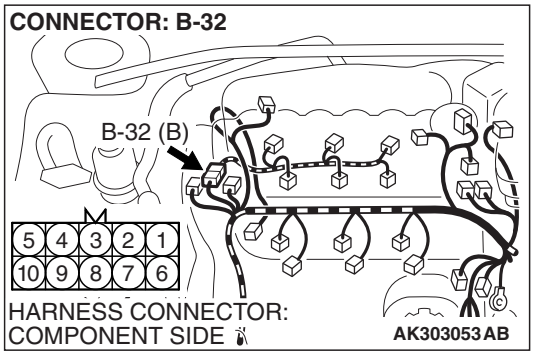
Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]

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

YES : Repair harness wire between intermediate connector B-32 (terminal No. 9) and No. 3 cylinder injector connector B-03 (terminal No. 1) and harness wire between No.3 cylinder injector connector B-03 (terminal No. 2) and intermediate connector B-32 (terminal No. 10) because of open circuit or short circuit to ground or harness damage. Then go to Step 12.

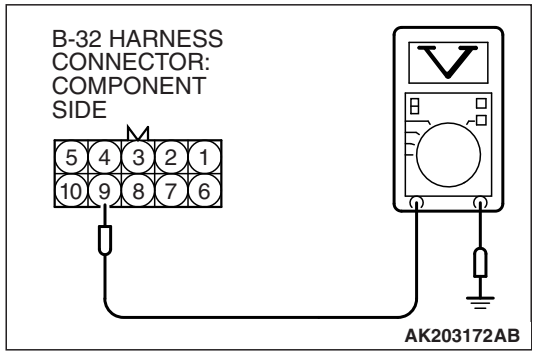
NO : Replace the No. 3 cylinder injector. Then go to Step 12.

STEP 6. Measure the power supply voltage at intermediate connector B-32.



(1) Disconnect the connector B-32 and measure at the female connector side.

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



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

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

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

YES : Go to Step 8.

NO : Go to Step 7.

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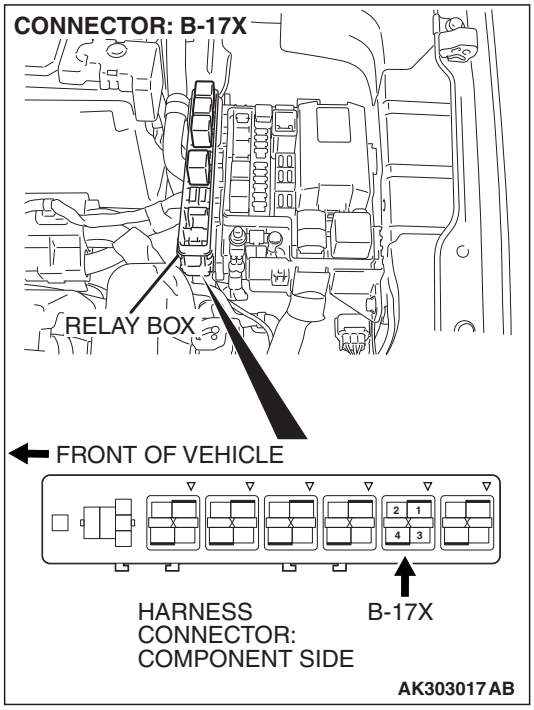
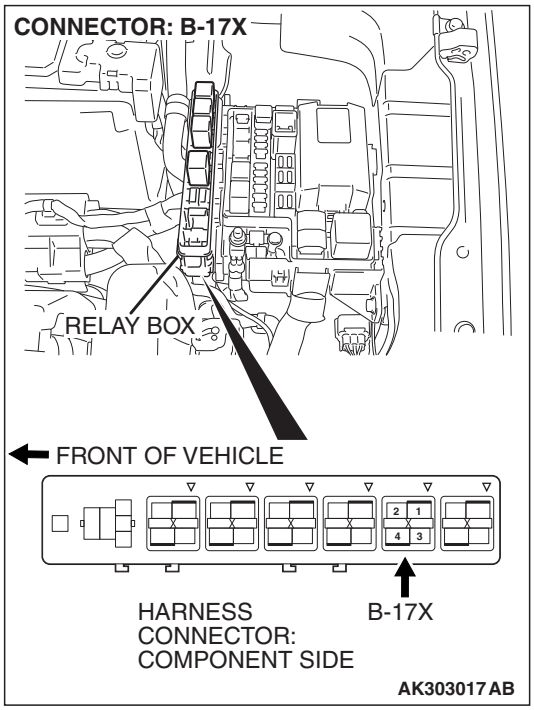


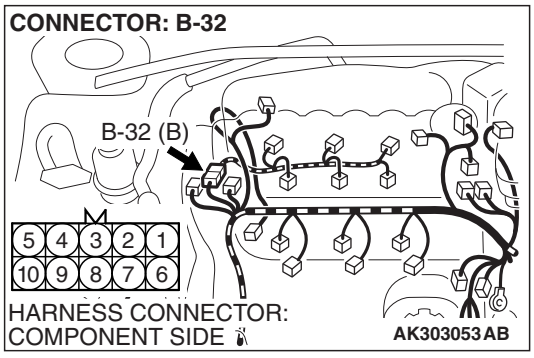
STEP 7. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.

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



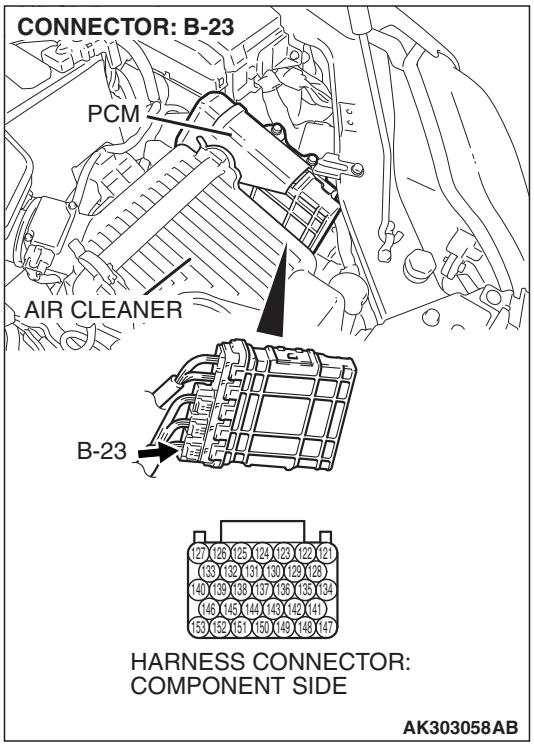


STEP 8. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

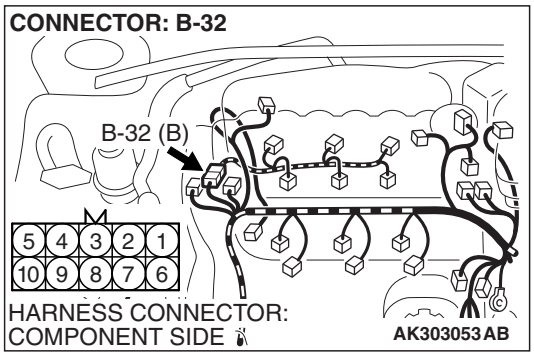


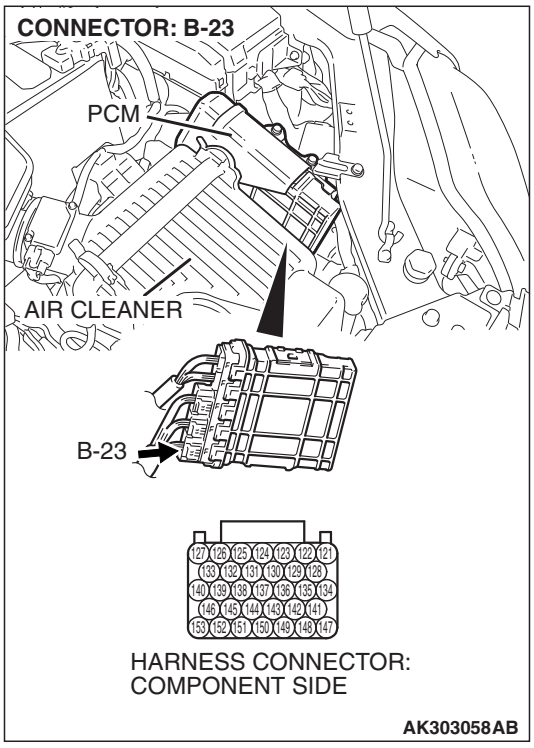
STEP 9. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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



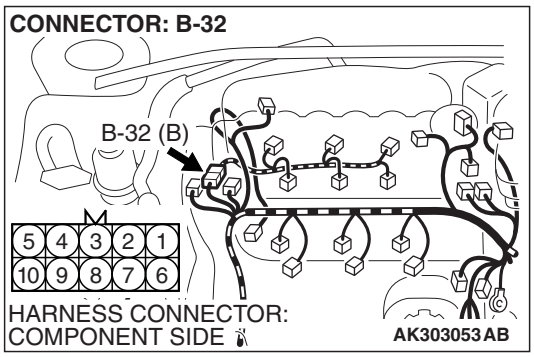


STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-32 (terminal No. 10) and PCM connector B-23 (terminal No. 140).

Q: Is the harness wire in good condition?

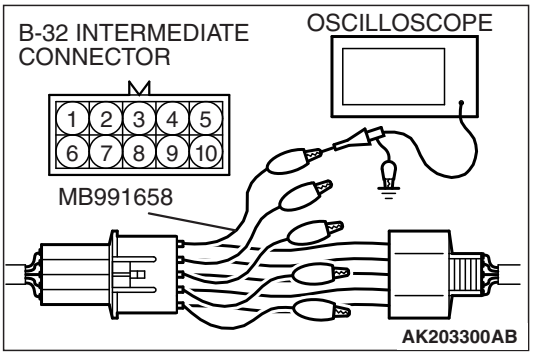
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



STEP 11. Using the oscilloscope, check the No. 3 cylinder injector.

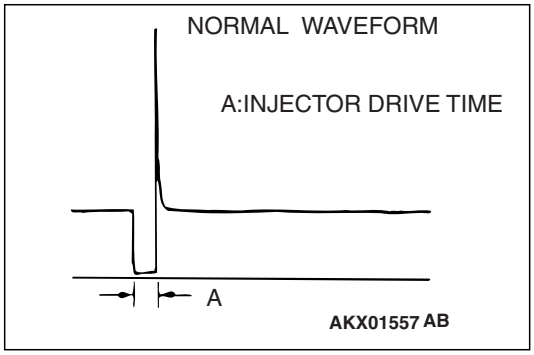
(1) Disconnect the intermediate connector B-32 and connect the test harness special tool (MB991658) between the separated connectors.



(2) Connect the oscilloscope probe to injector intermediate connector terminal No. 10.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 140.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

Q: Is DTC P0203 set?

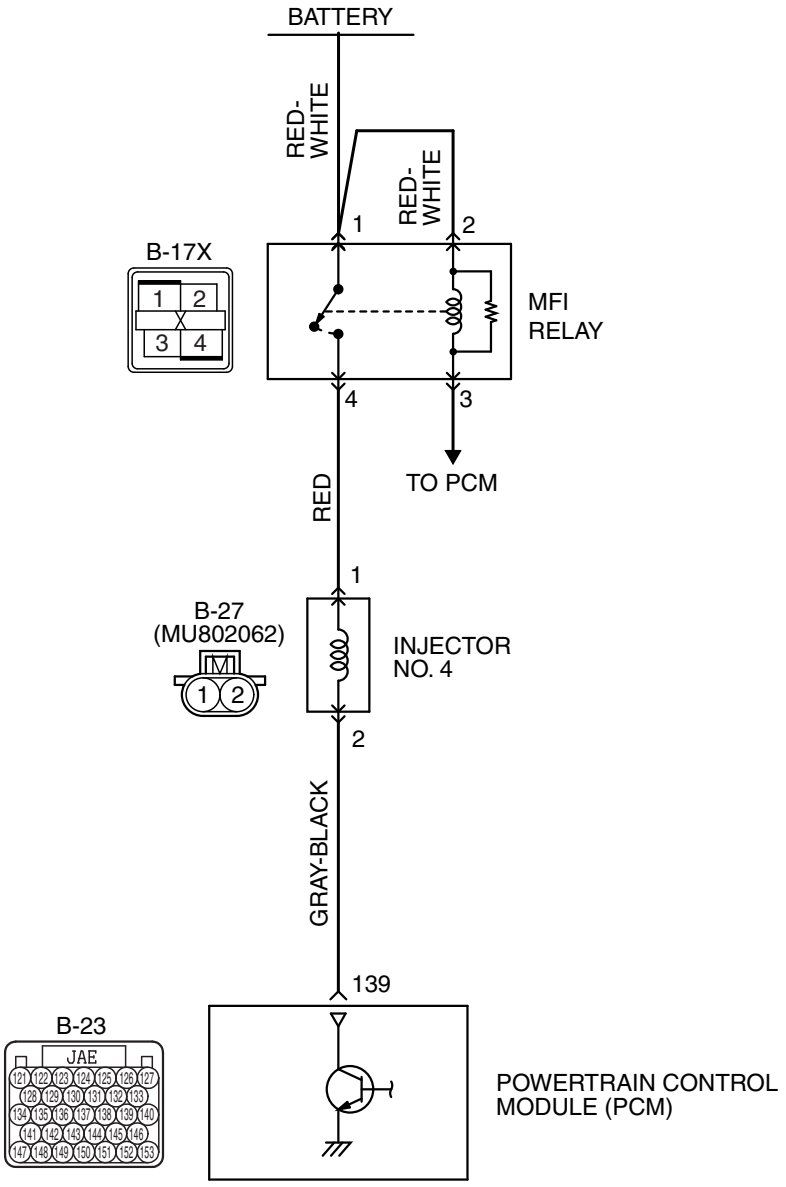
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0204: Injector Circuit - Cylinder 4

⚠ CAUTION
If DTC P0204 has been set, TCL related DTC U1120 is also set. After P0204 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 4



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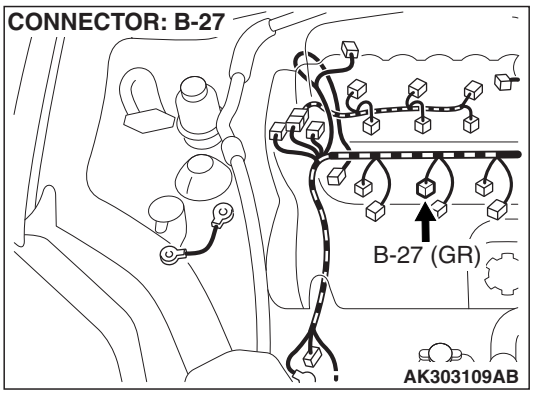

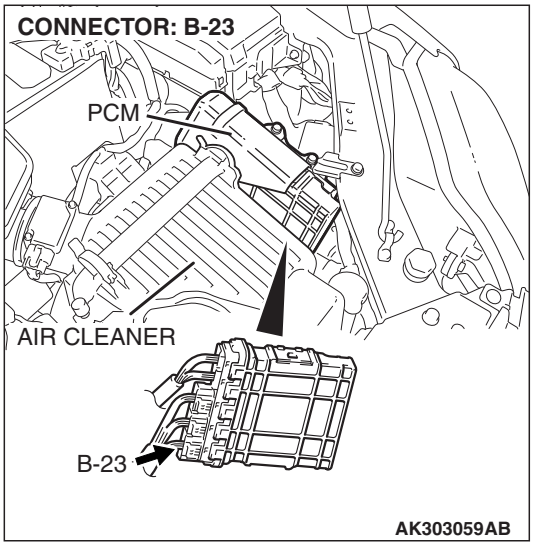

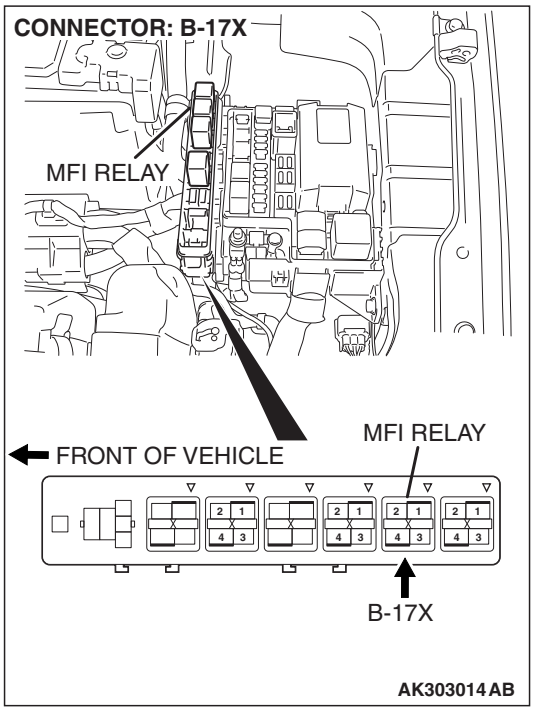

CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

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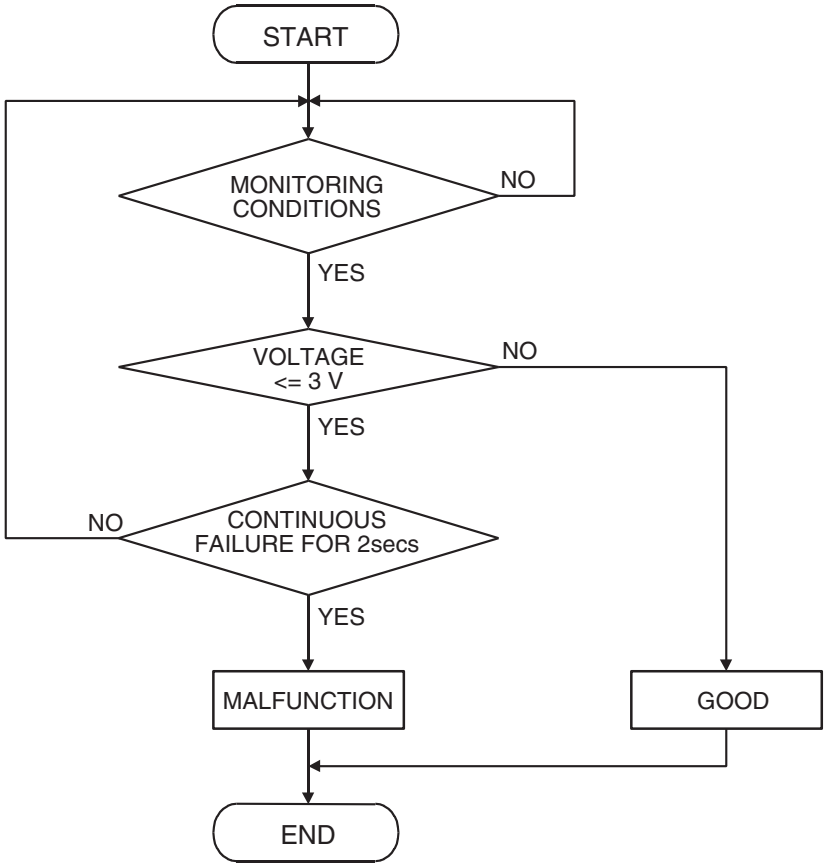
DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



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Check Condition

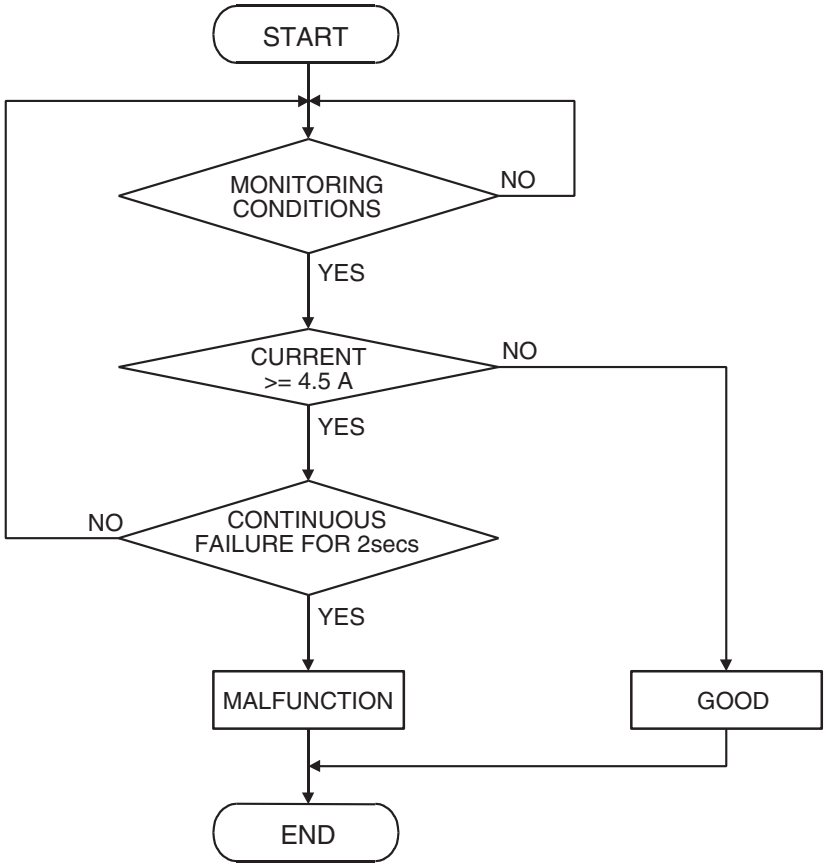
- Engine is running.

Judgement Criterion

- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

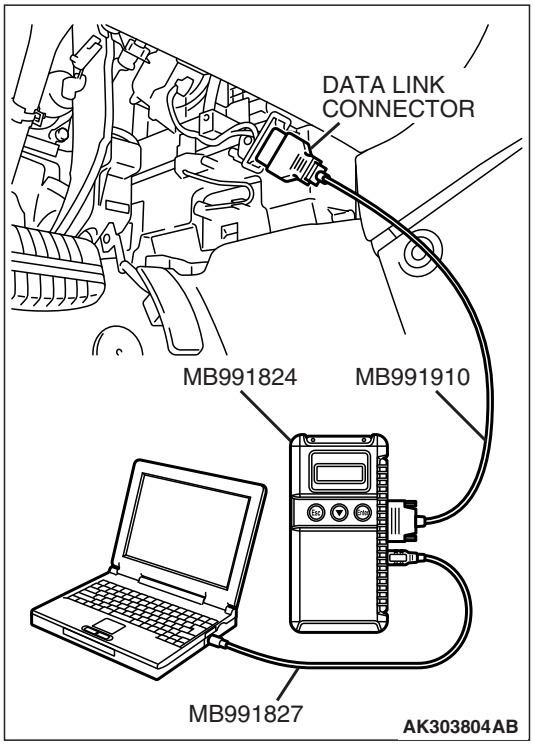
- No. 4 cylinder injector failed.
- Open or shorted No. 4 cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 4: No. 4 injector.



⚠ 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.

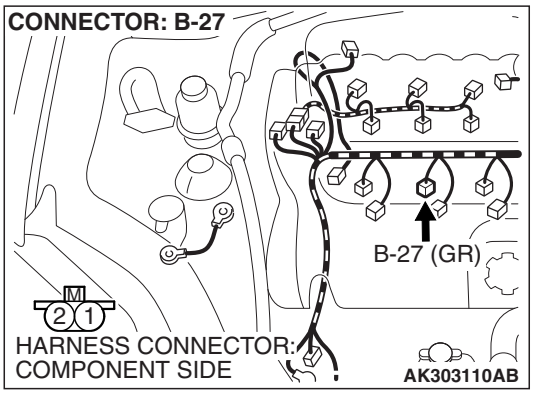
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 4, No. 4 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

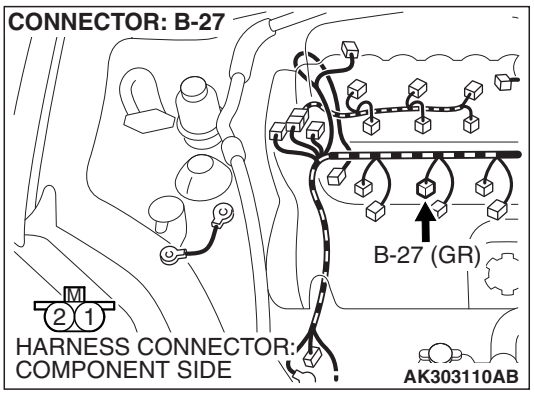
STEP 2. Check the harness connector B-27 at No. 4 cylinder injector for damage.



Q: Is the harness connector in good condition?

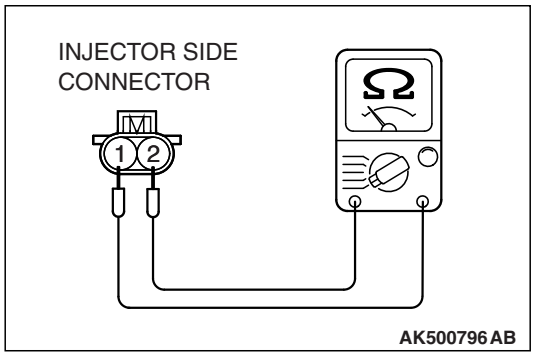
YES : Go to Step 3.

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



STEP 3. Check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-27.



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

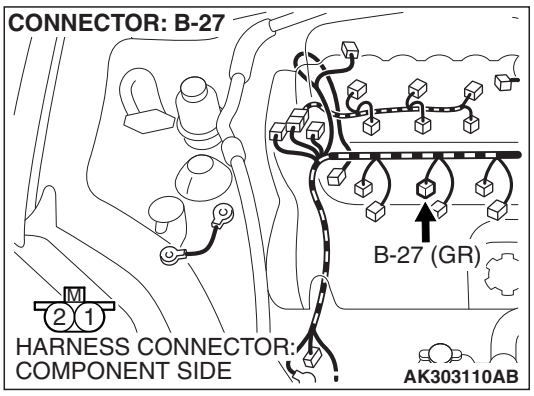
Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]

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

YES : Go to Step 4.

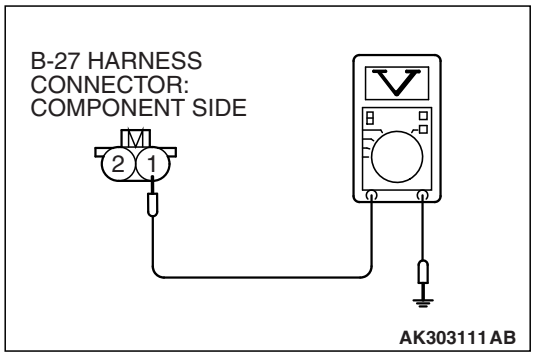
NO : Replace the No. 4 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 4 cylinder injector connector B-27.



(1) Disconnect connector B-27 and measure at the harness side.

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



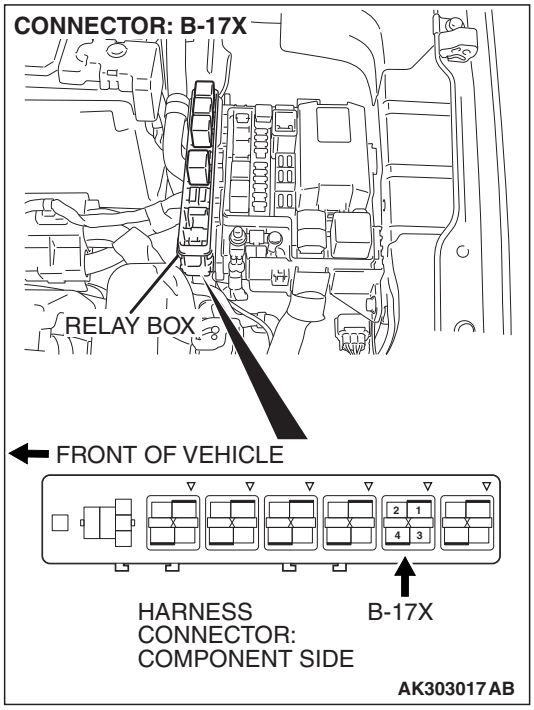
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

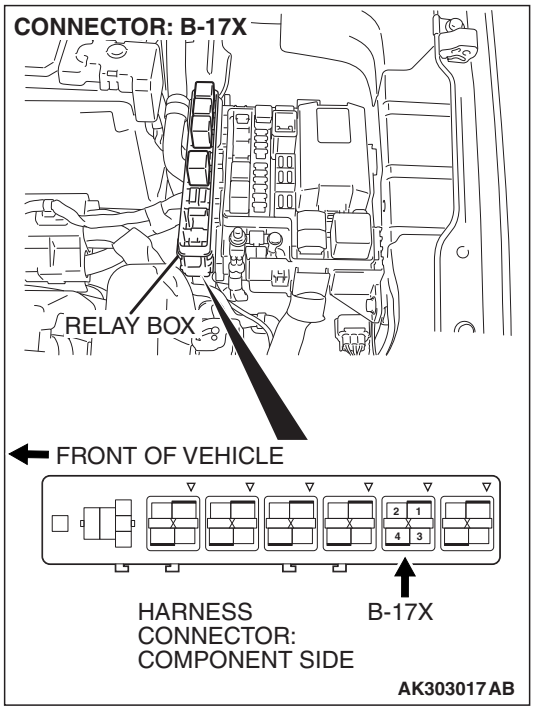


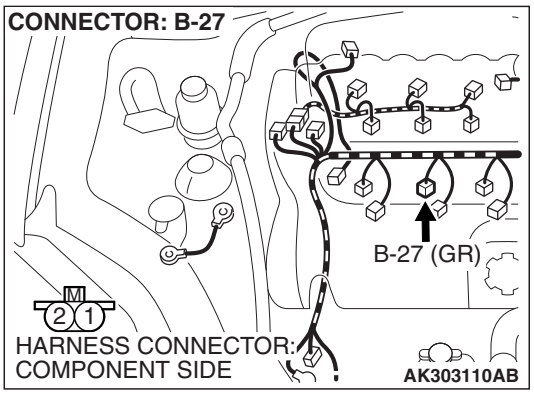
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 4 cylinder injector connector B-27 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 10.

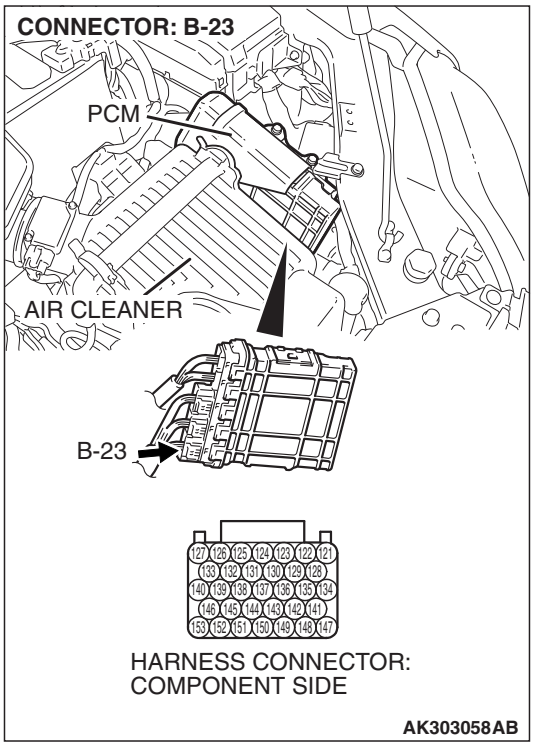
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 4 cylinder injector connector B-27 (terminal No. 1).
Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 10.

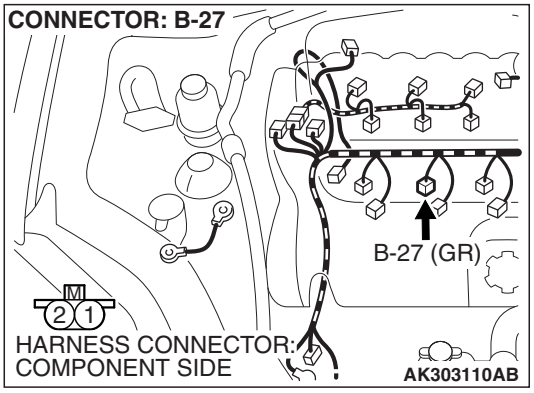


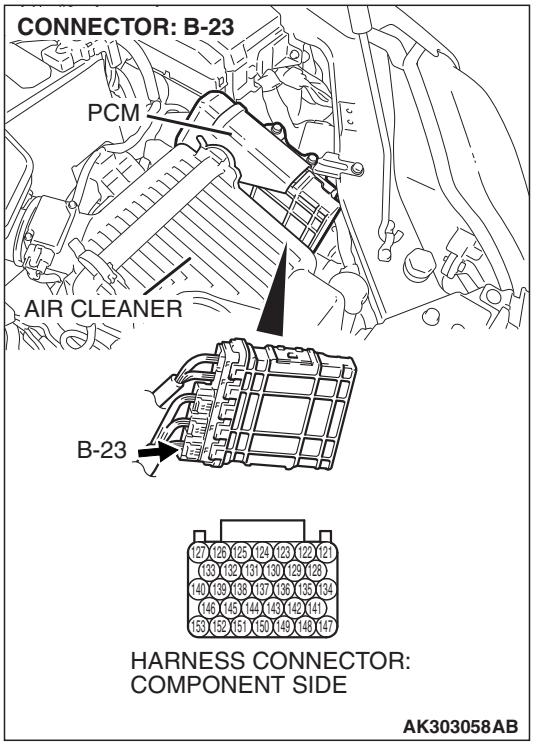
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

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



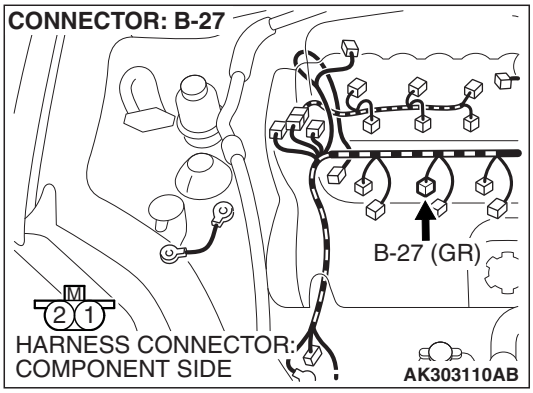


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 4 cylinder injector connector B-27 (terminal No. 2) and PCM connector B-23 (terminal No. 139).

Q: Is the harness wire in good condition?

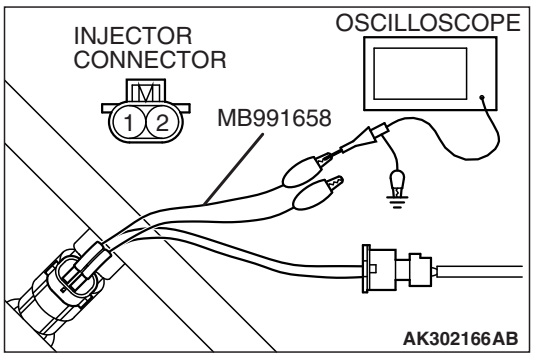
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 4 cylinder injector.

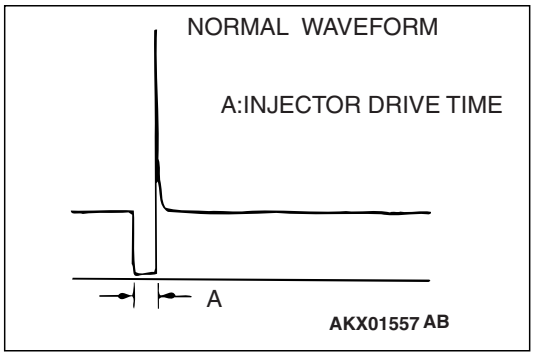
(1) Disconnect the No. 4 cylinder injector connector B-27 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 139.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

Q: Is DTC P0204 set?

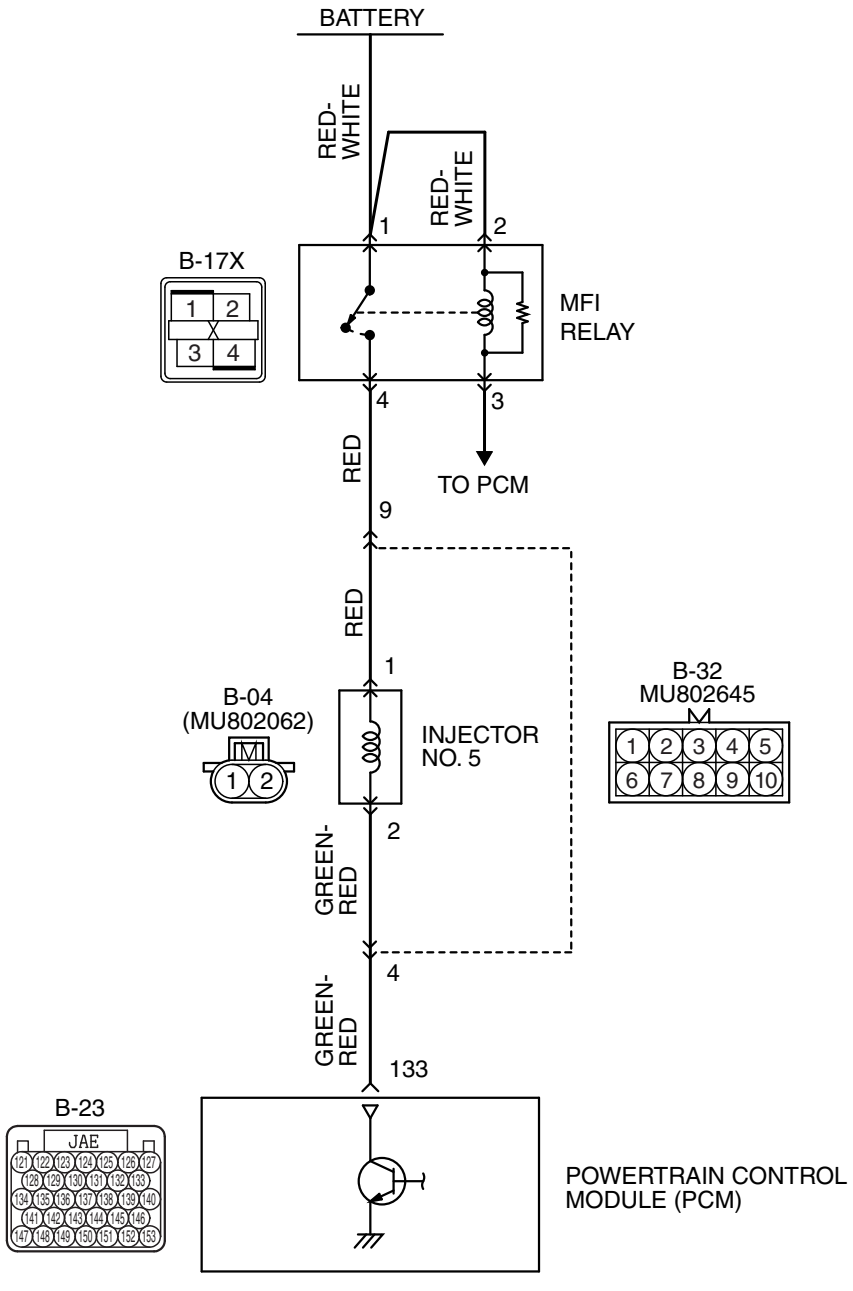
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0205: Injector Circuit - Cylinder 5

⚠ CAUTION
If DTC P0205 has been set, TCL related DTC U1120 is also set. After P0205 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 5



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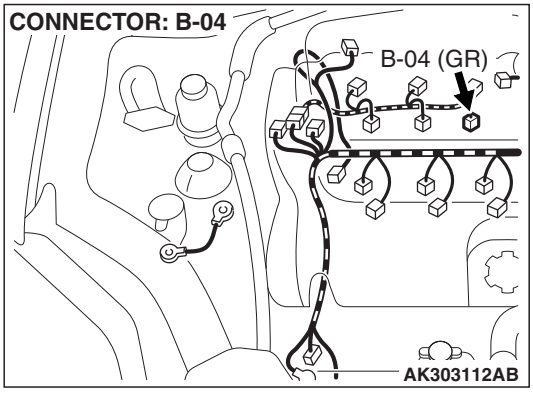

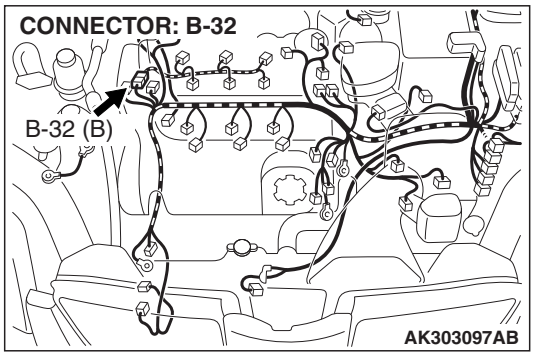

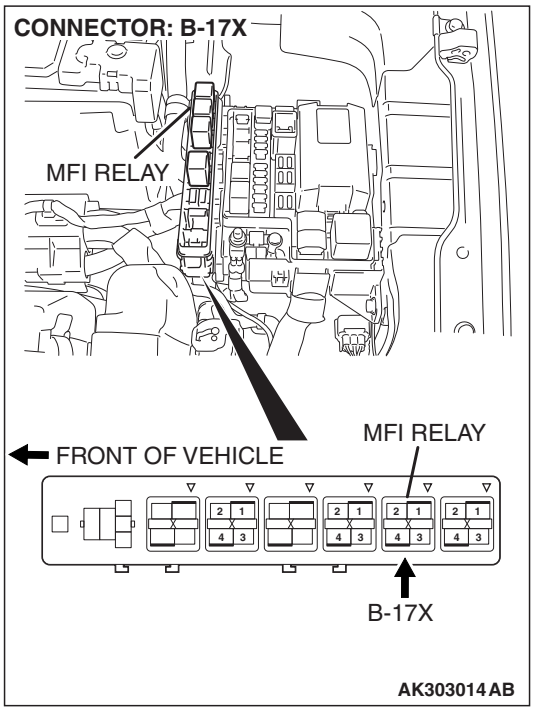

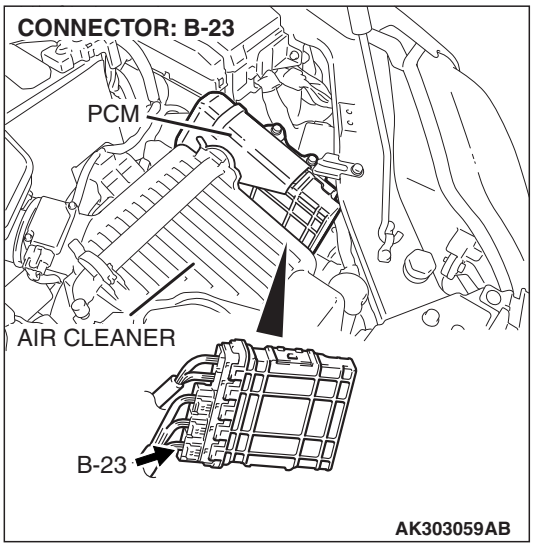

CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

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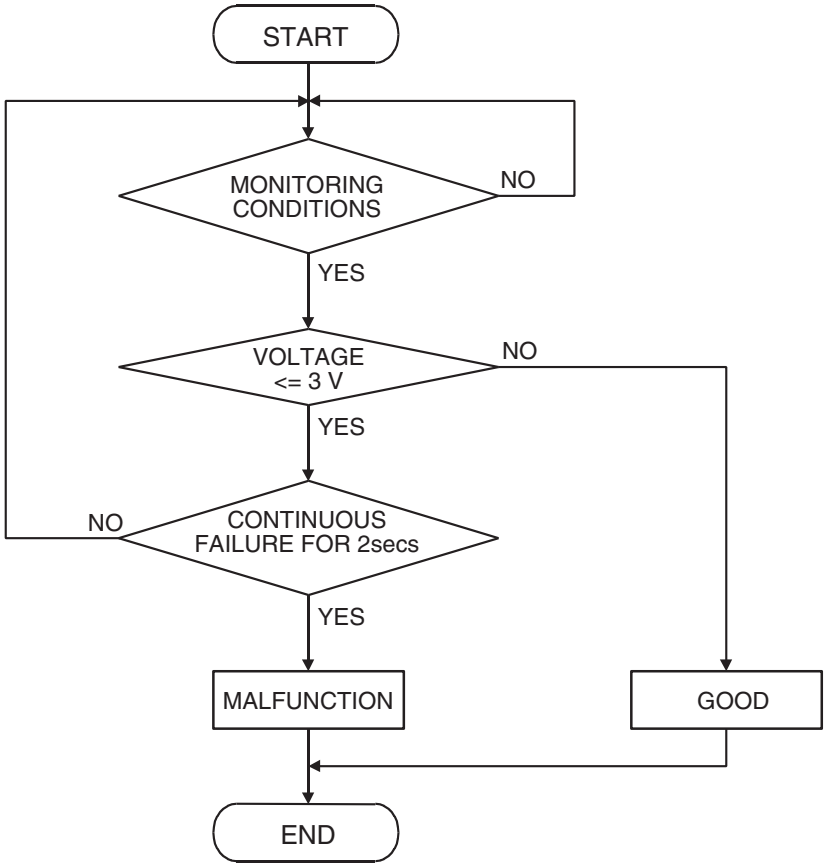
DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



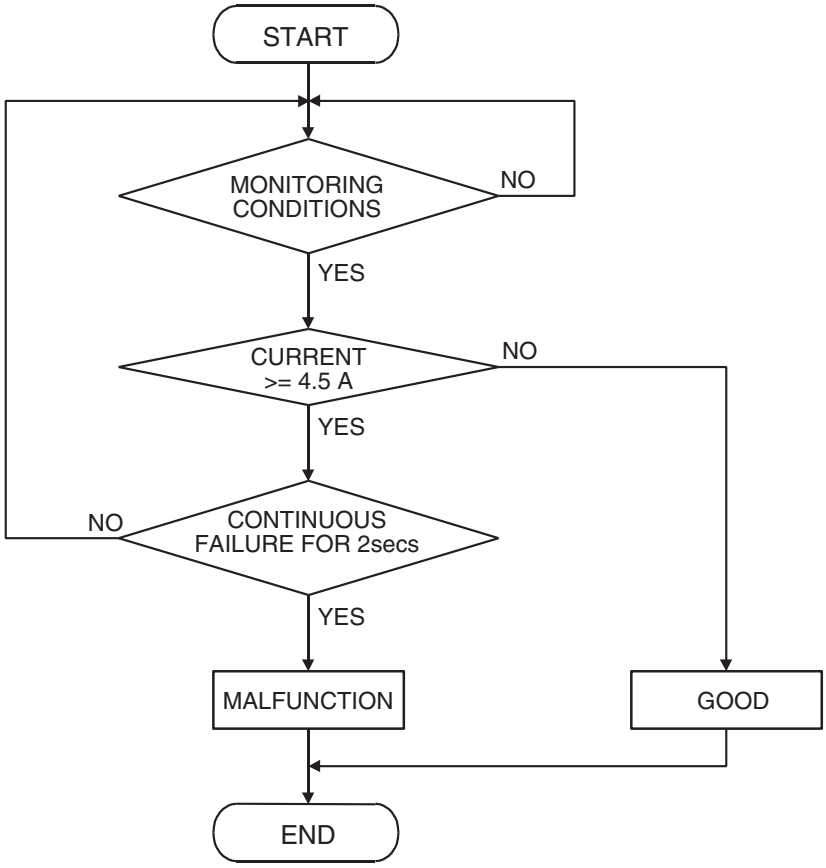
AK503627

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK700575

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

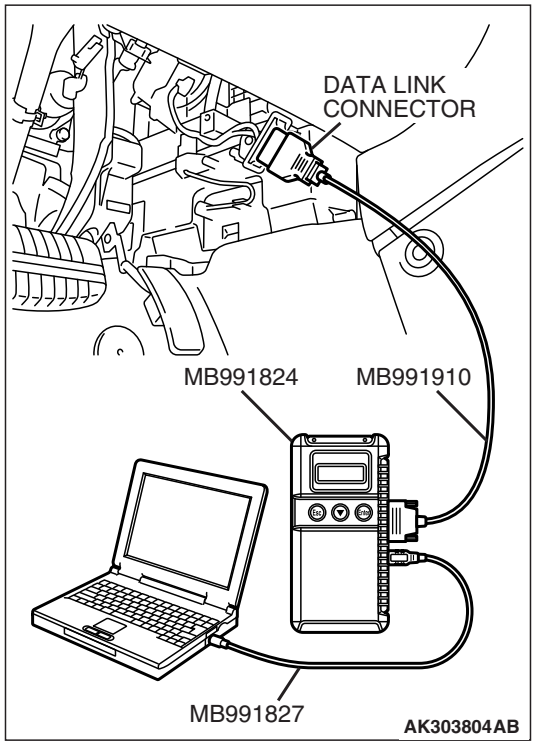
- No. 5 cylinder injector failed.
- Open or shorted No. 5 cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 5: No. 5 injector.



⚠ 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.

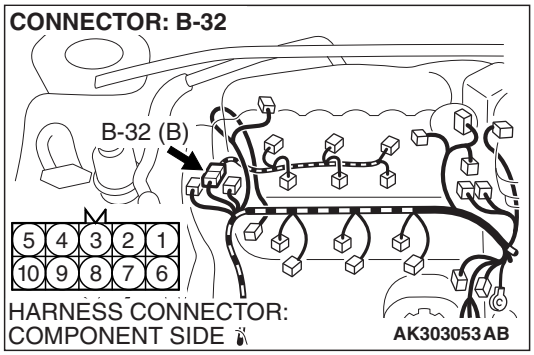
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 5 No. 5 cylinder injectors.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

STEP 2. Check harness connector B-32 at intermediate connector for damage.



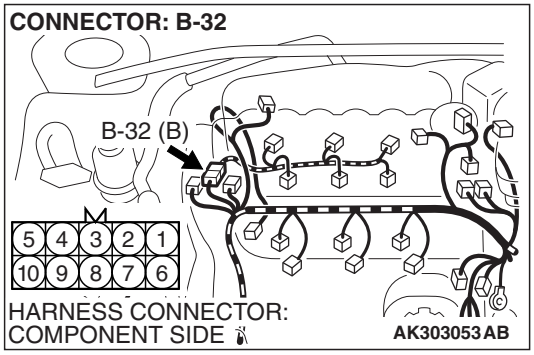
Q: Is the harness connector in good condition?

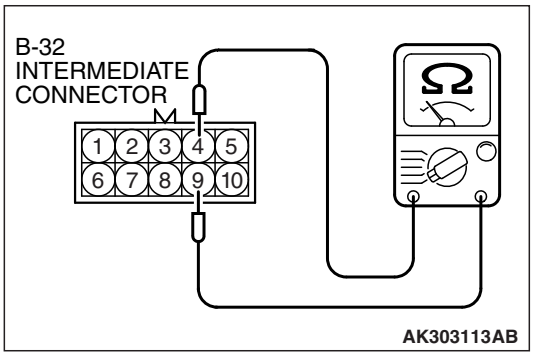
YES : Go to Step 3.

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

STEP 3. Check the No. 5 cylinder injector resistance at intermediate connector B-32.

(1) Disconnect the intermediate connector B-32.





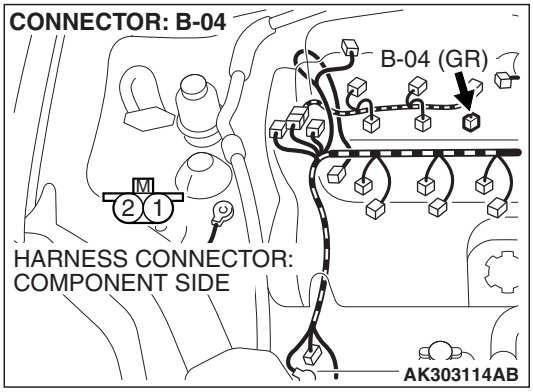
(2) Measure the resistance between terminal No. 4 and No. 9.
- Resistance should be between 10.5 and 13.5 ohms.

Q: Is the measured resistance between 10.5 and 13.5 ohms?

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

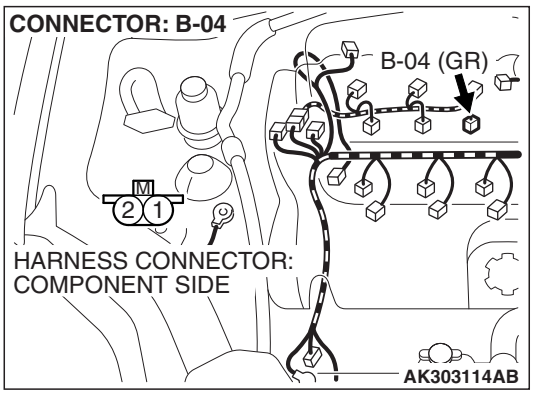
STEP 4. Check the harness connector B-04 at No. 5 cylinder injector for damage.

Remove the intake manifold.



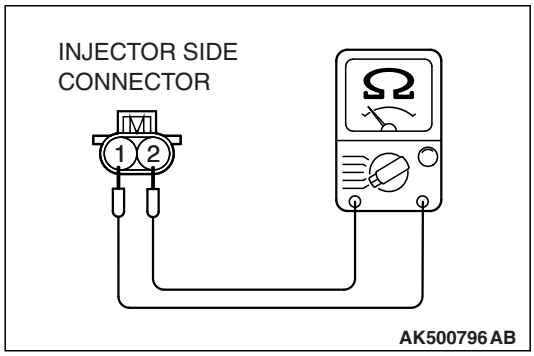
Q: Is the harness connector in good condition?

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 No.5 cylinder injector.

(1) Disconnect the No. 5 cylinder injector connector B-04.



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

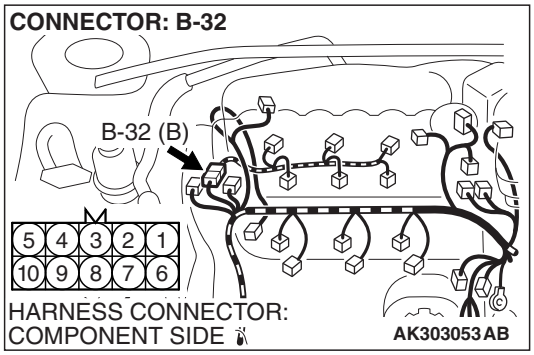
Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]

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

YES : Repair harness wire between intermediate connector B-32 (terminal No. 9) and No. 5 cylinder injector connector B-04 (terminal No. 1) and harness wire between No. 5 cylinder injector connector B-04 (terminal No. 2) and intermediate connector B-32 (terminal No. 4) because of open circuit or short circuit to ground or harness damage. Then go to Step 12.

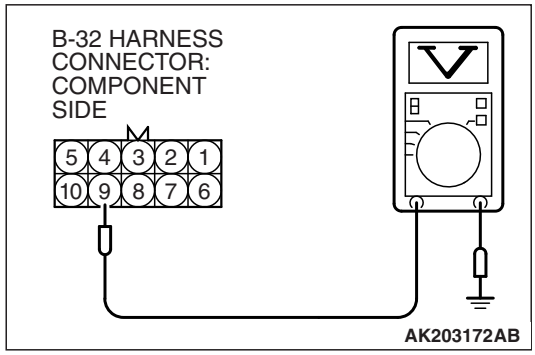
NO : Replace the No. 5 cylinder injector. Then go to Step 12.

STEP 6. Measure the power supply voltage at intermediate connector B-32.



(1) Disconnect the connector B-32 and measure at the female connector side.

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



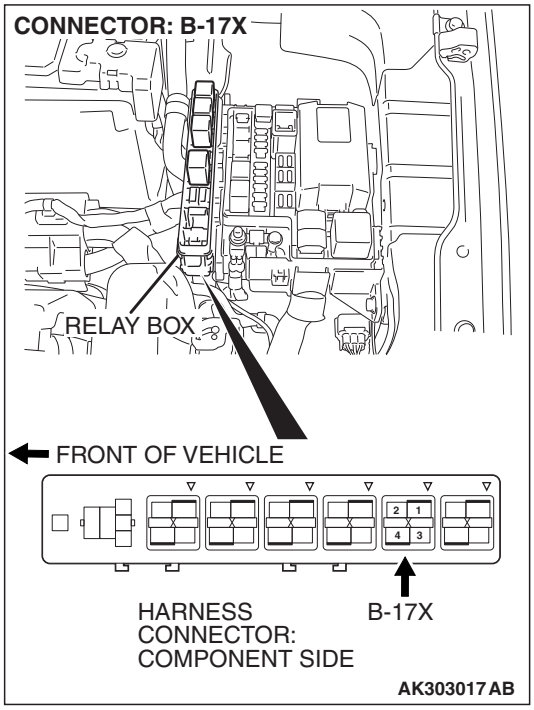
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 8.

NO : Go to Step 7.

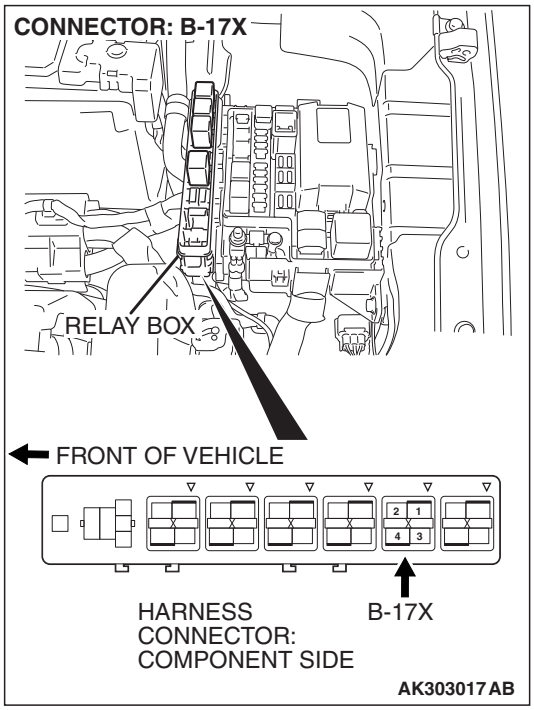


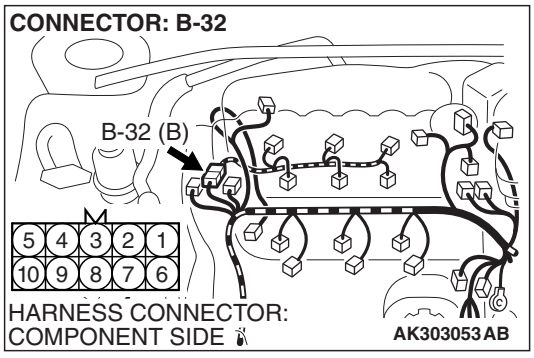
STEP 7. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.

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



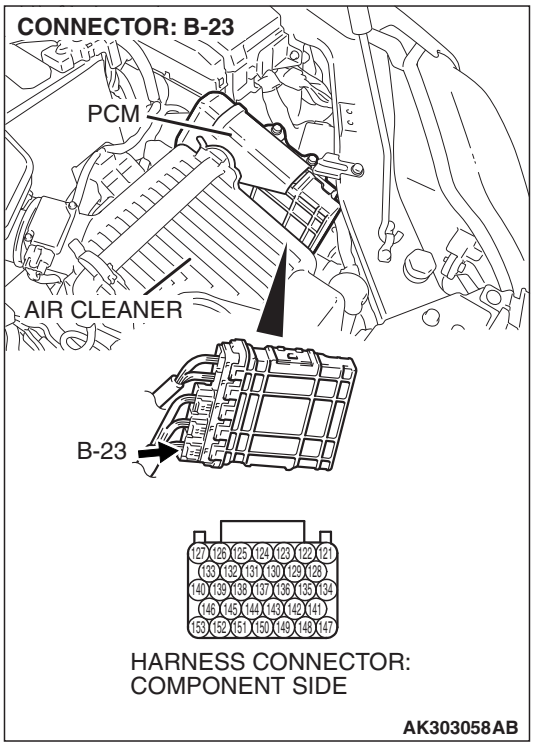


STEP 8. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and intermediate connector B-32 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

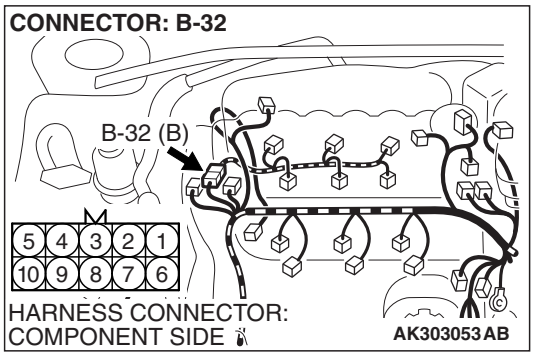


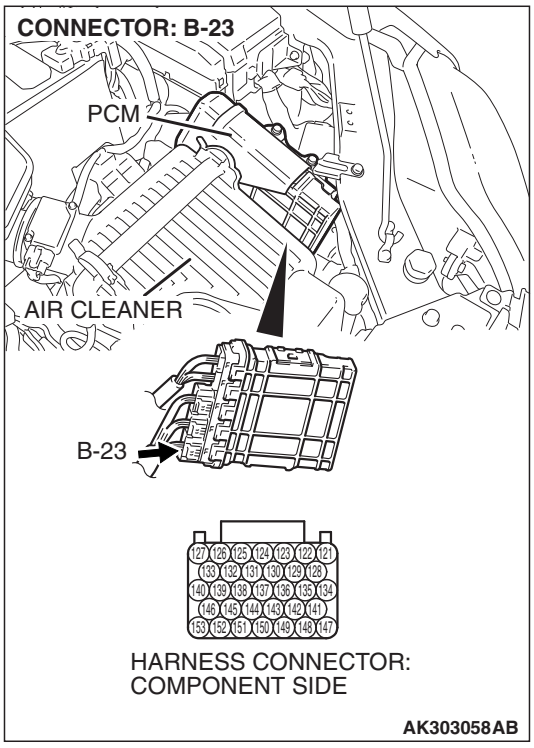
STEP 9. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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



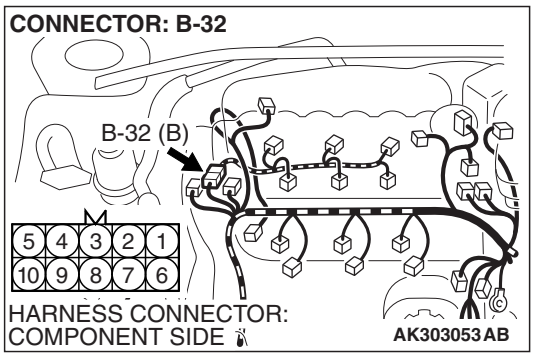


STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-32 (terminal No. 4) and PCM connector B-23 (terminal No. 133).

Q: Is the harness wire in good condition?

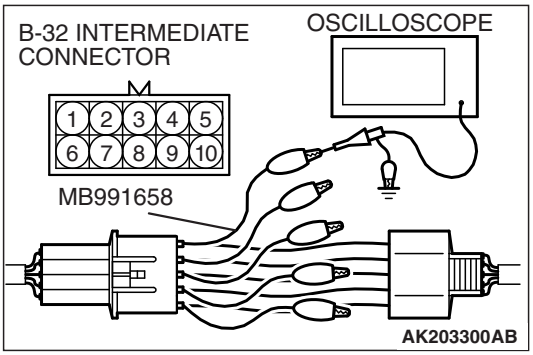
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



STEP 11. Using the oscilloscope, check the No. 5 cylinder injector.

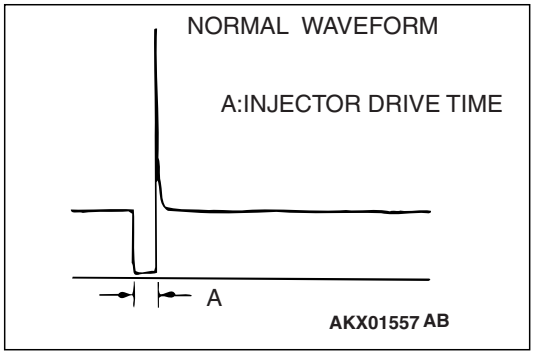
(1) Disconnect the intermediate connector B-32 and connect the test harness special tool (MB991658) between the separated connectors.



(2) Connect the oscilloscope probe to injector intermediate connector terminal No. 4.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 133.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.

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

Q: Is DTC P0205 set?

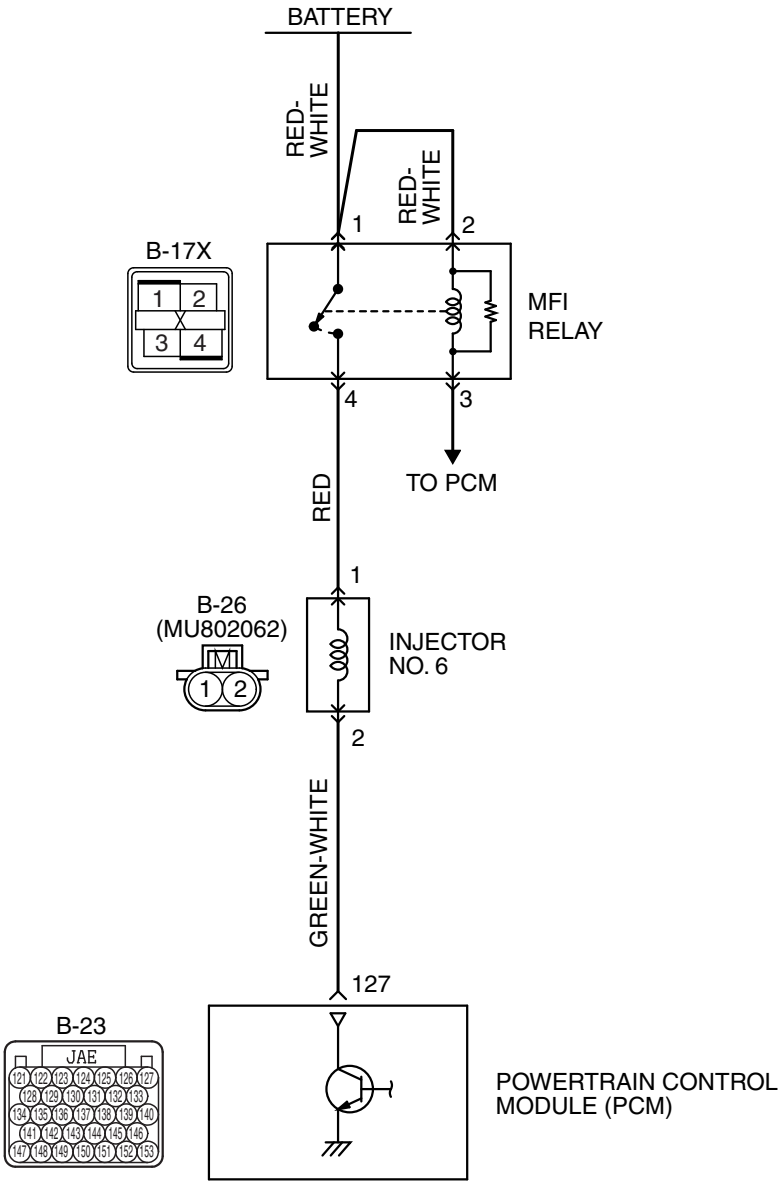
YES : Retry the troubleshooting.

NO : The inspection is complete.

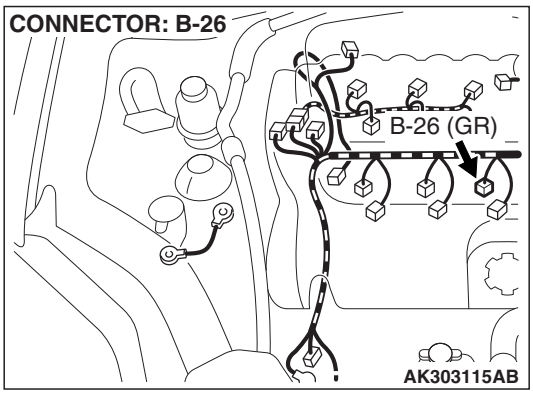
DTC P0206: Injector Circuit - Cylinder 6

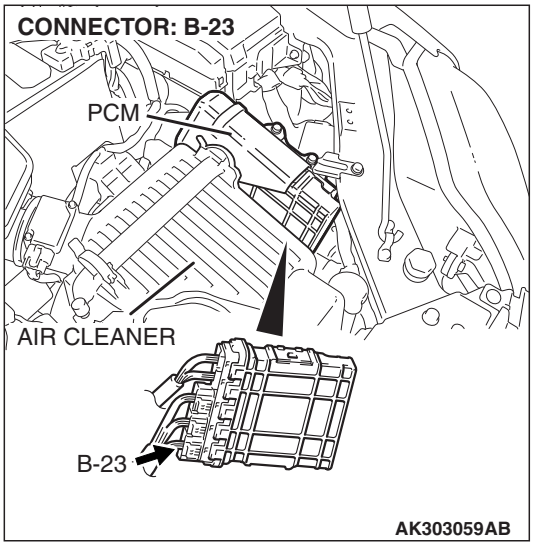
⚠ CAUTION
If DTC P0206 has been set, TCL related DTC U1120 is also set. After P0206 has been diagnosed, don't forget to erase DTC U1120.

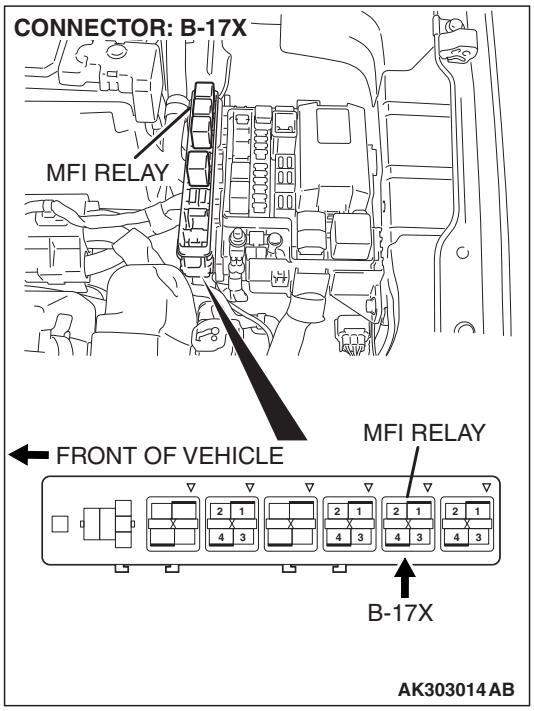
Injector Circuit - Cylinder 6



AK400912







CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The PCM controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.

DESCRIPTIONS OF MONITOR METHODS

The PCM detects open circuit and short malfunction.

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

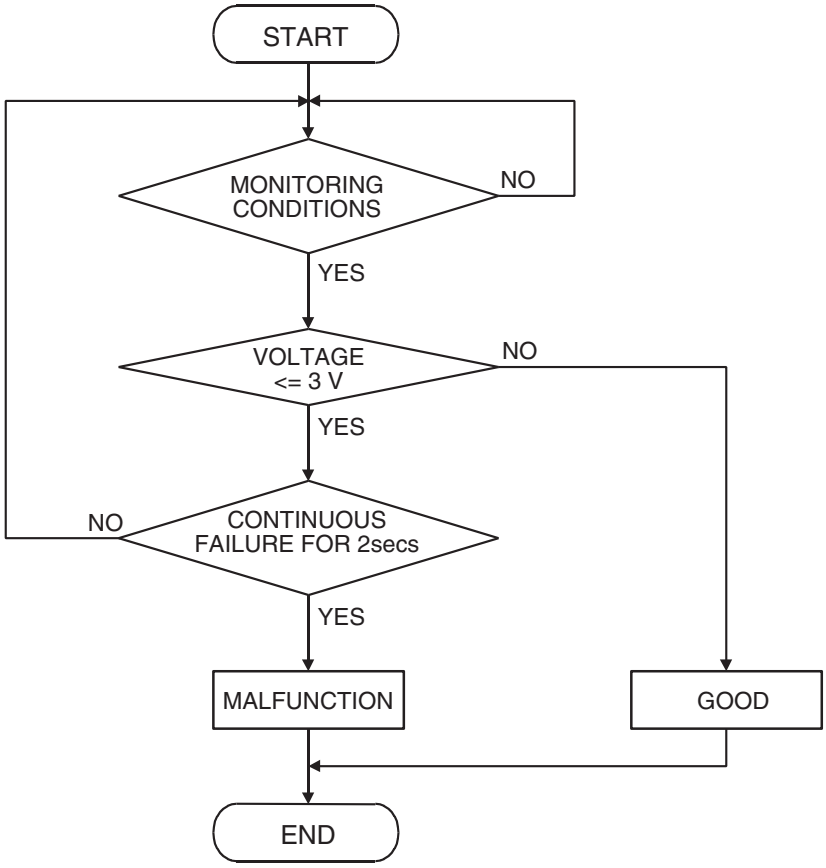
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



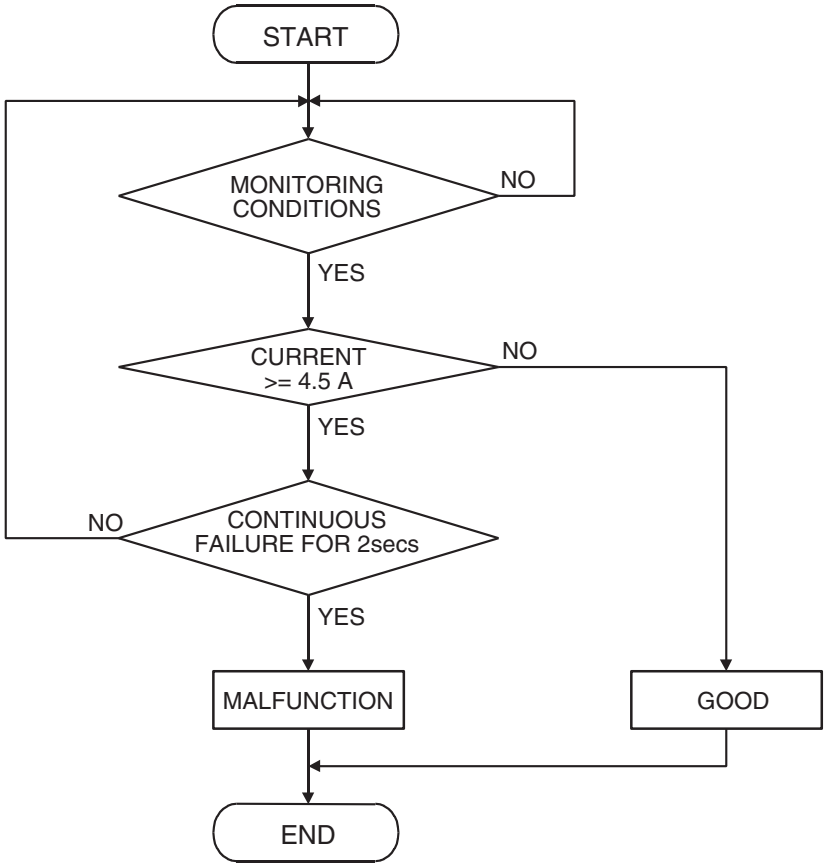
AK503627

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK700575

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

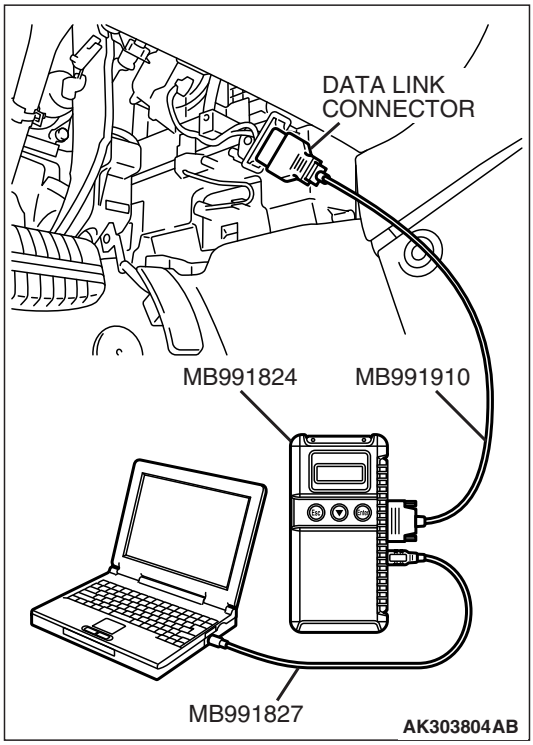
- No. 6 cylinder injector failed.
- Open or shorted No. 6 cylinder injector circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 6: No. 6 injector.



⚠ 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.

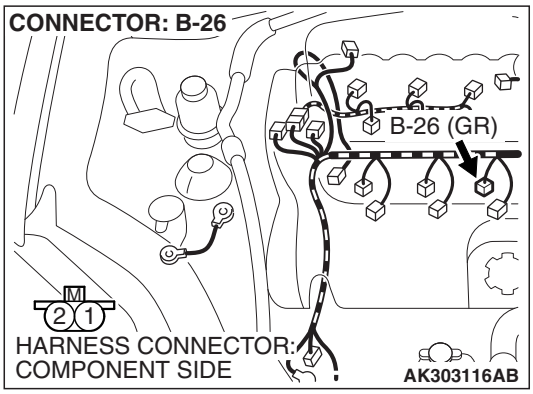
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 6, No. 6 Injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

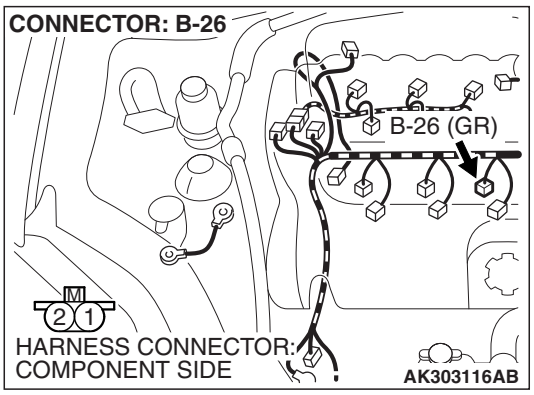
STEP 2. Check the harness connector B-26 at No. 6 cylinder injector for damage.



Q: Is the harness connector in good condition?

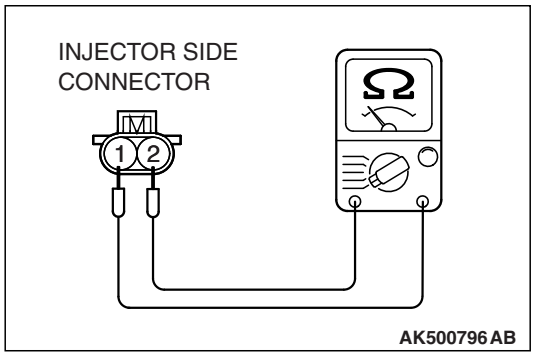
YES : Go to Step 3.

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



STEP 3. Check the No. 6 cylinder injector.

(1) Disconnect the No. 6 cylinder injector connector B-26.



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

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

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

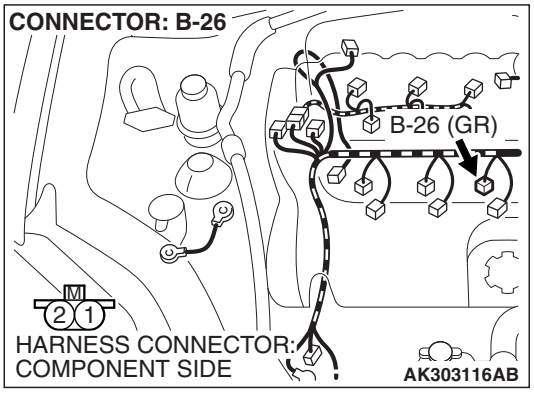
YES : Go to Step 4.

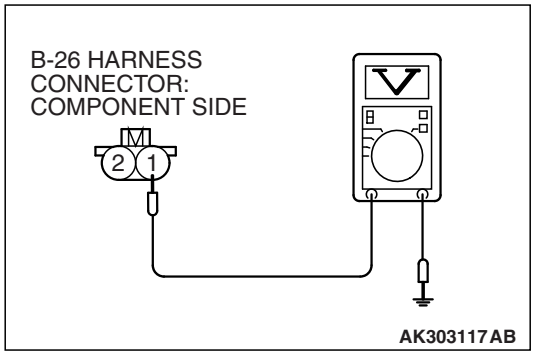
NO : Replace the No. 6 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 6 cylinder injector connector B-26.

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

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





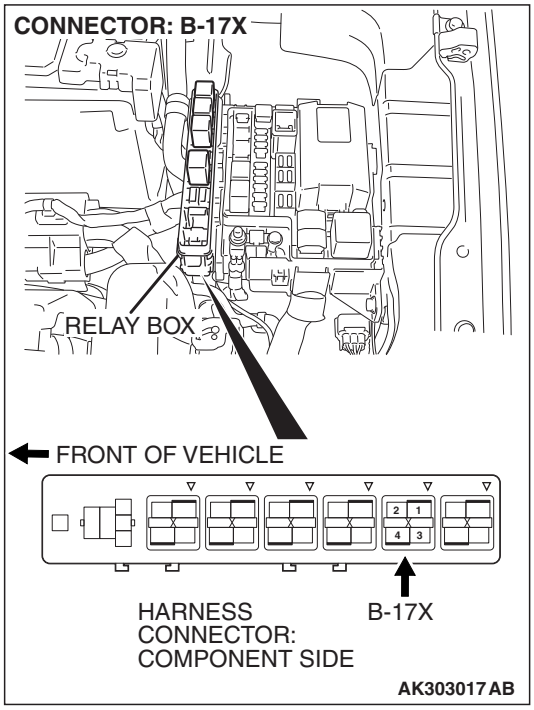
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

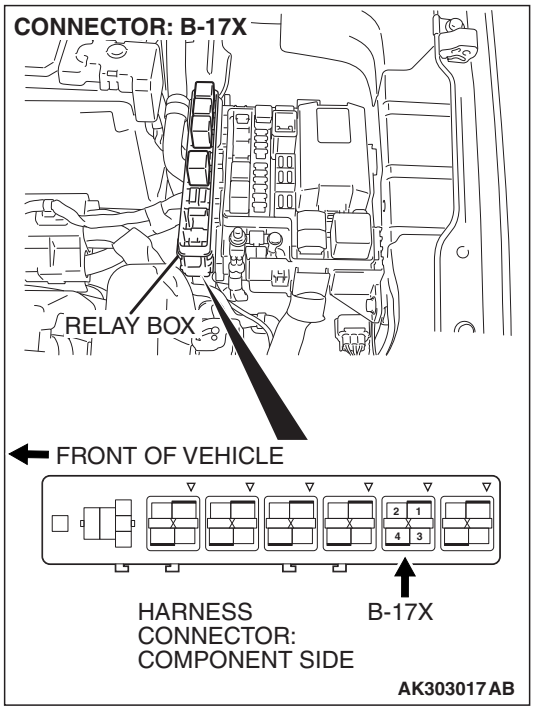


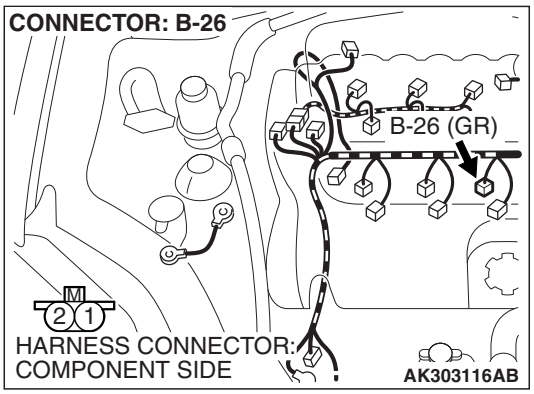
STEP 5. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and No. 6 cylinder injector connector B-26 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 10.

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



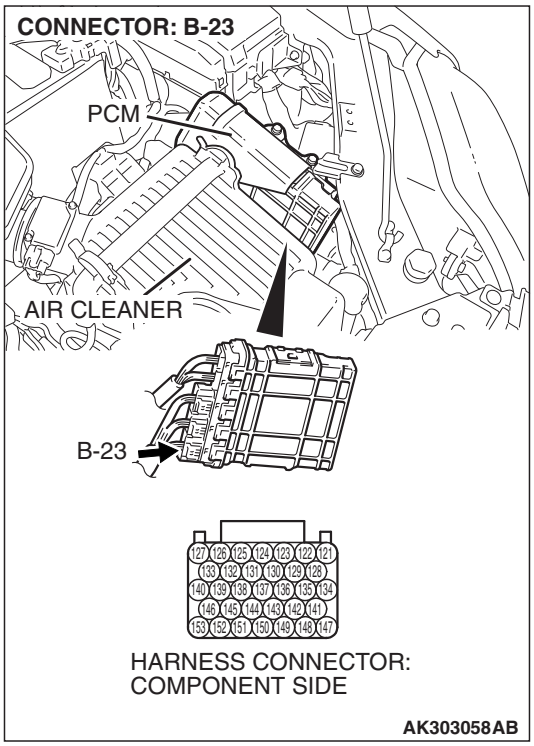


STEP 6. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and No. 6 cylinder injector connector B-26 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

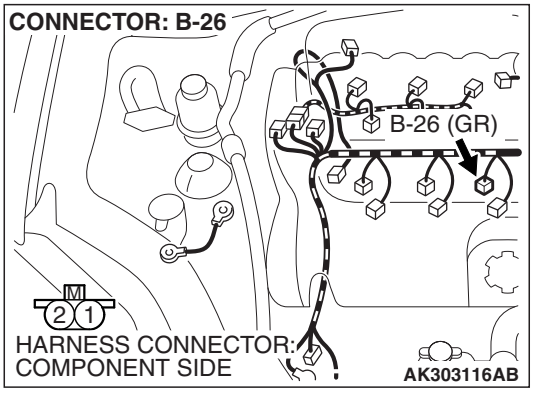


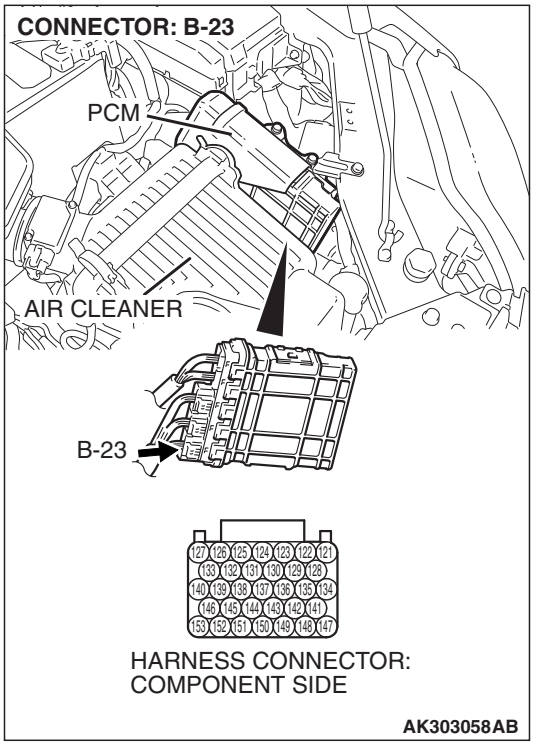
STEP 7. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

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



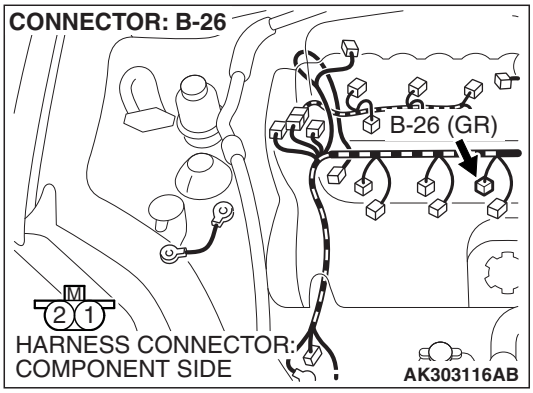


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 6 cylinder injector connector B-26 (terminal No. 2) and PCM connector B-23 (terminal No. 127).

Q: Is the harness wire in good condition?

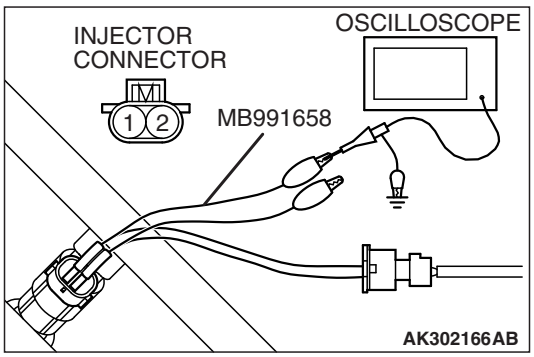
YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the No. 6 cylinder injector.

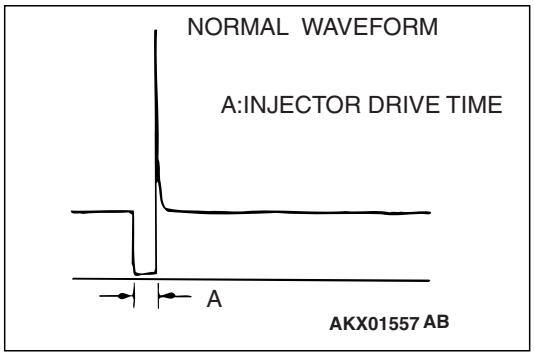
(1) Disconnect the No. 6 cylinder injector connector B-26 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 127.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

Q: Is DTC P0206 set?

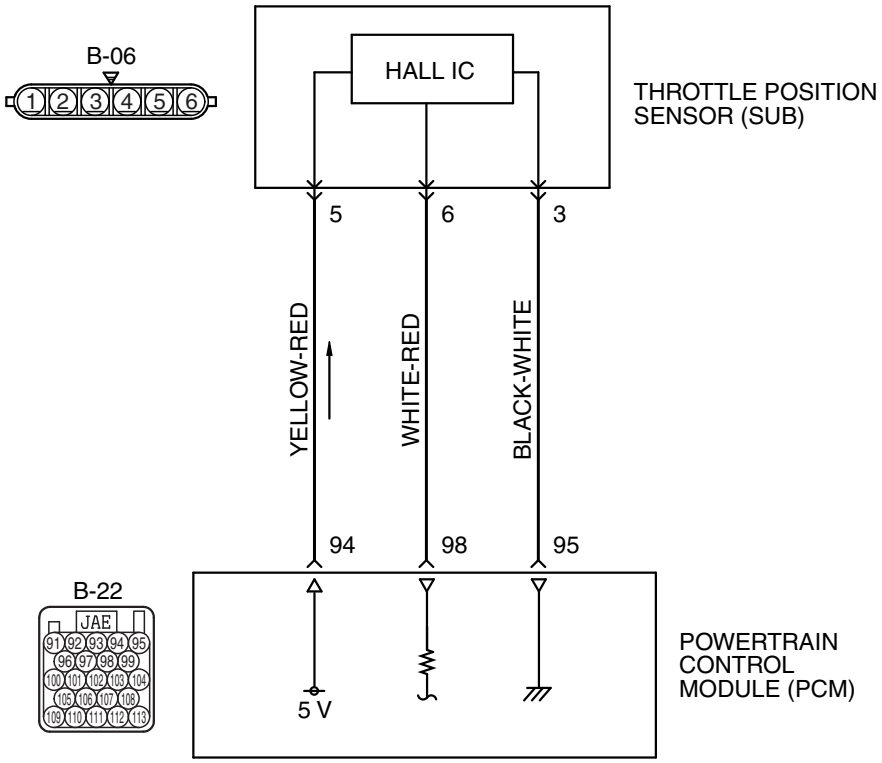
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0222: Throttle Position Sensor (Sub) Circuit Low Input

⚠ CAUTION
If DTC P0222 has been set, TCL related DTC U1120 is also set. After P0222 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (sub) Circuit



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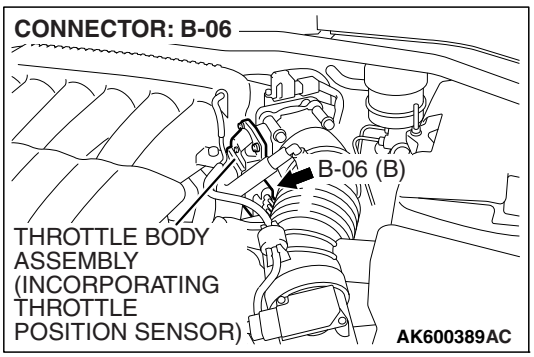
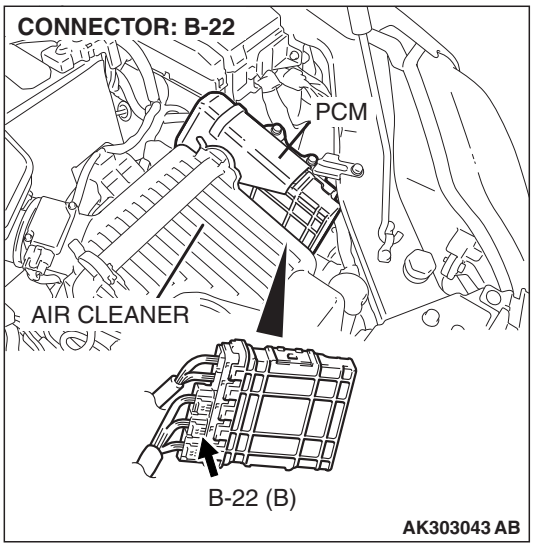




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the PCM (terminal No. 94).
- A voltage that is according to the throttle opening angle is sent to the PCM (terminal No. 98) from the throttle position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) 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)

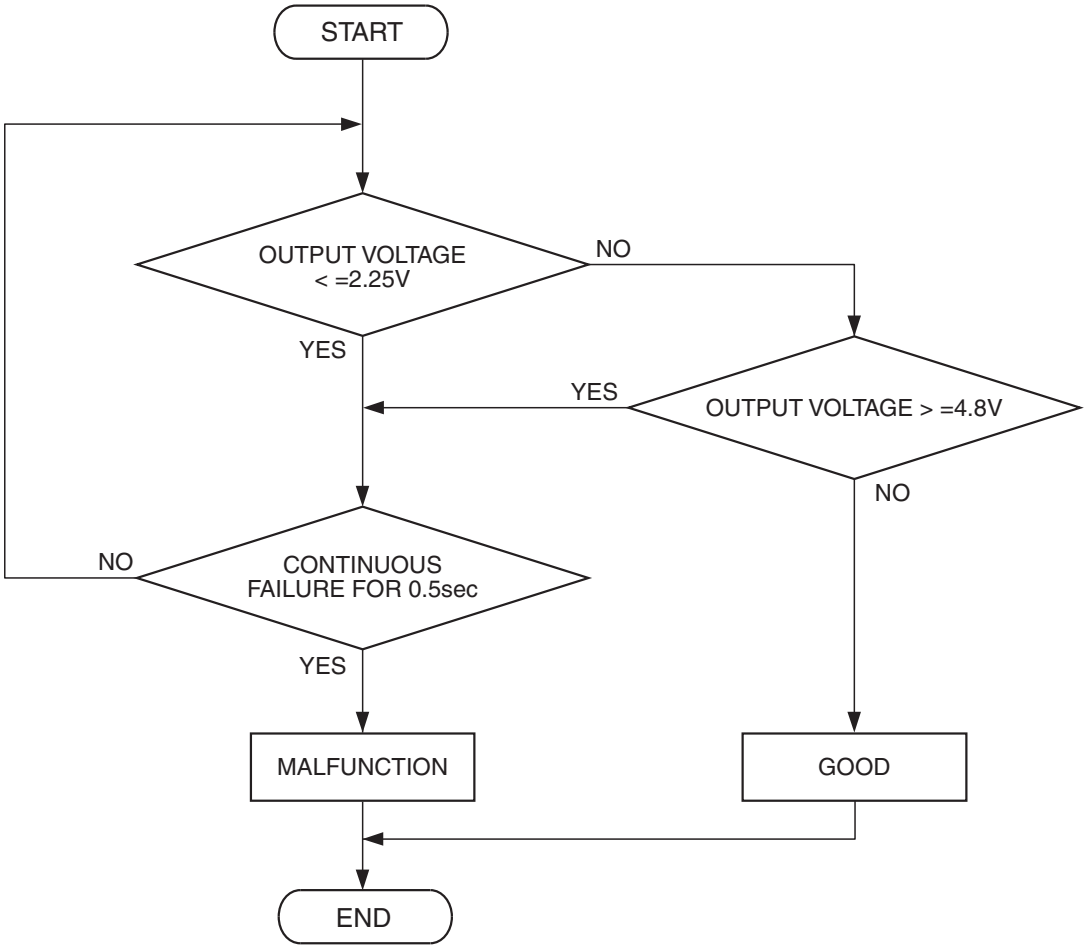
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (sub) output voltage should be 2.25 volts or less for 0.5 second.

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

- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

OBD-II DRIVE CYCLE PATTERN

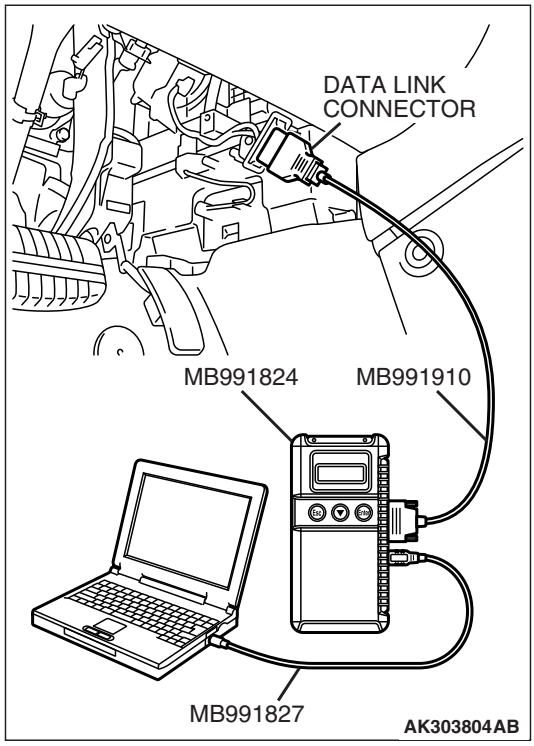
None.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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 15: Throttle Position Sensor (sub).



⚠ CAUTION

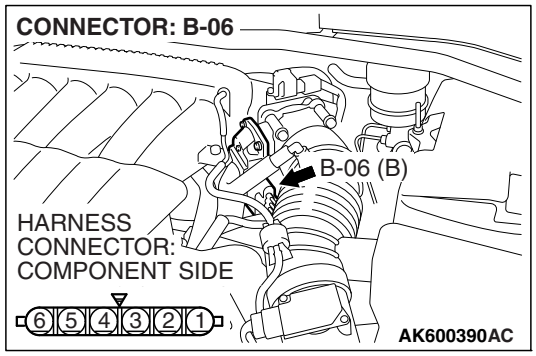
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 15, Throttle Position Sensor (sub).
  - Output voltage should be between 2,200 and 2,800 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be 4,000 millivolts 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?

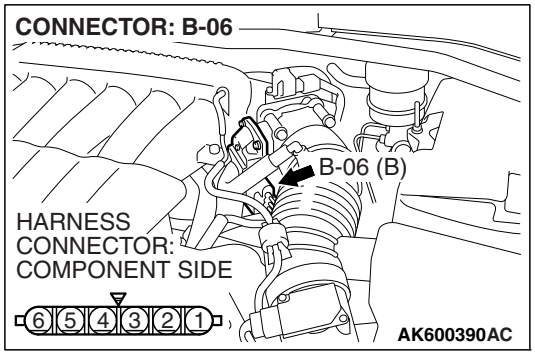
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.
NO : Go to Step 2.

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



Q: Is the harness connector in good condition?

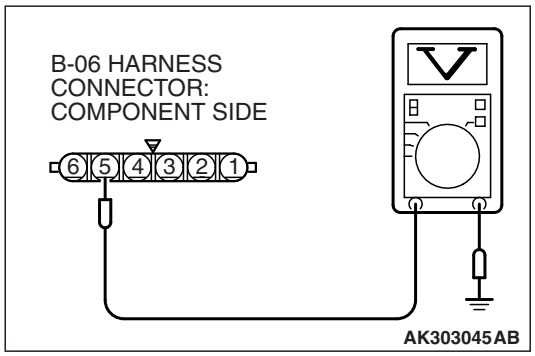
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



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.

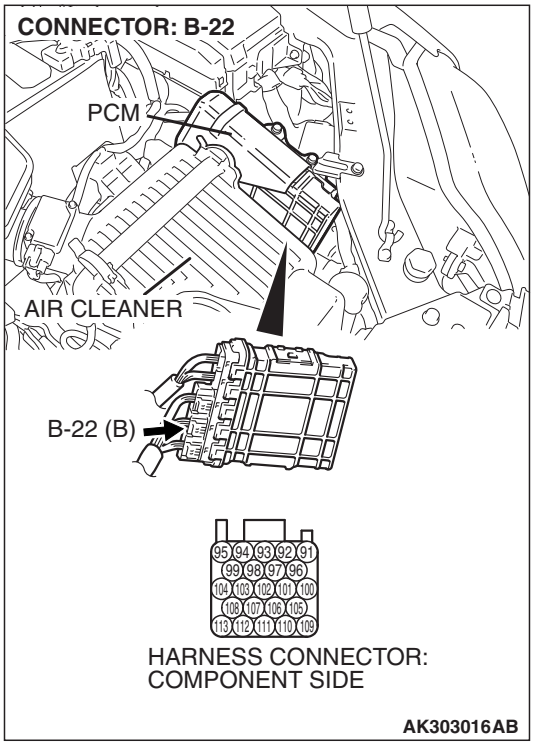
NO : Go to Step 4.

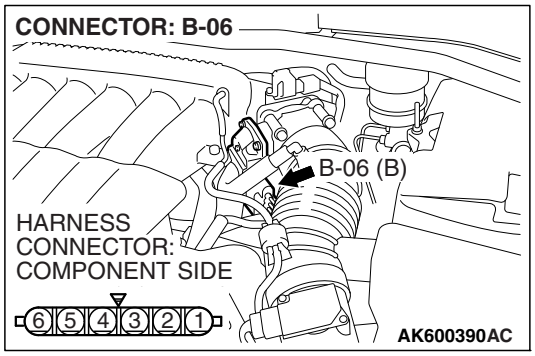
STEP 4. Check harness connector B-22 at PCM for damage.

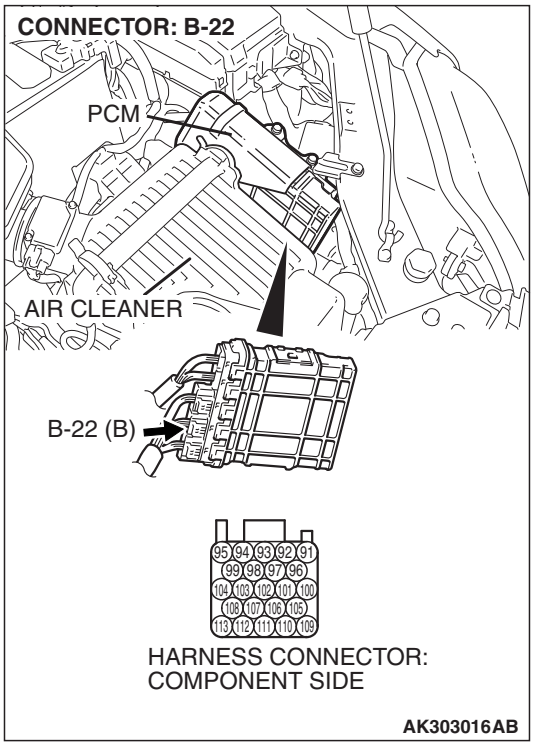
Q: Is the harness connector in good condition?

YES : Go to Step 5.

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





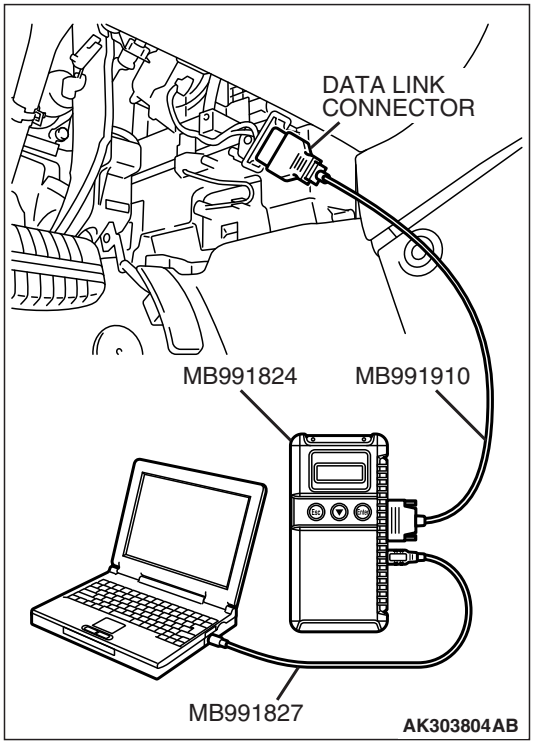


STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

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 15: Throttle Position Sensor (sub).

⚠ 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.

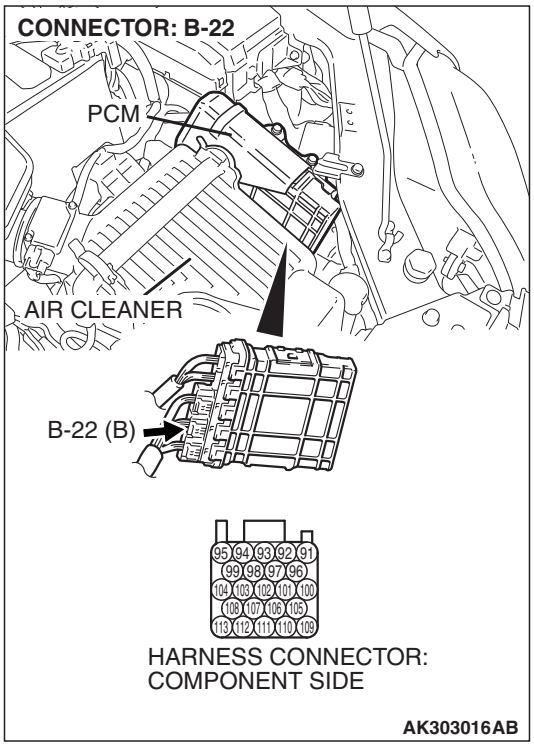
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2,200 and 2,800 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be 4,000 millivolts 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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 11.

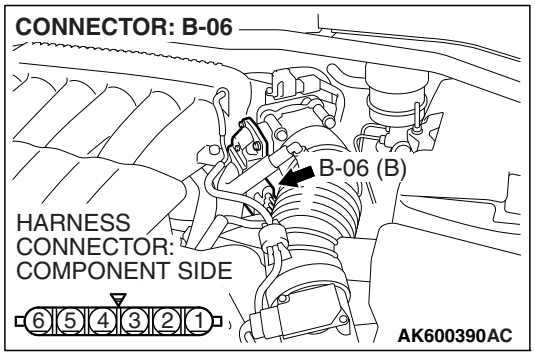


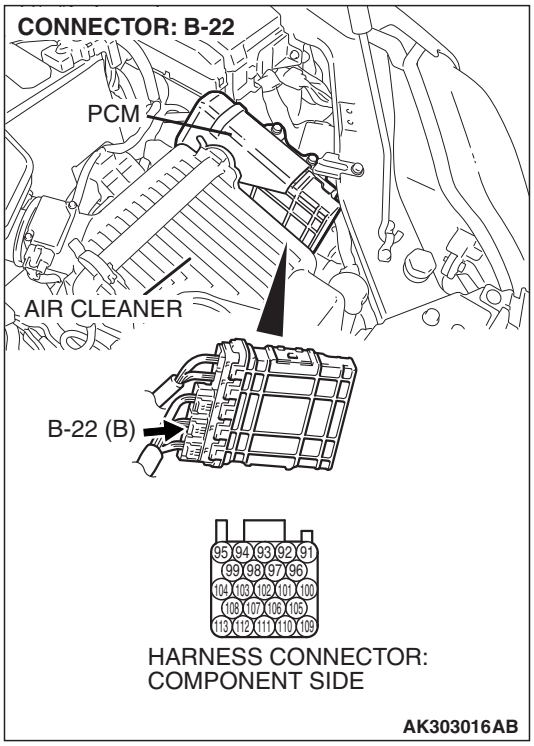
STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

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





STEP 8. Check for harness damage between throttle position sensor connector B-06 (terminal No. 5) and PCM connector B-22 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

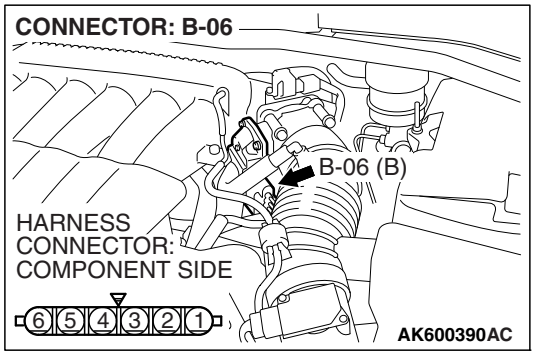
NO : Repair it. Then go to Step 11.

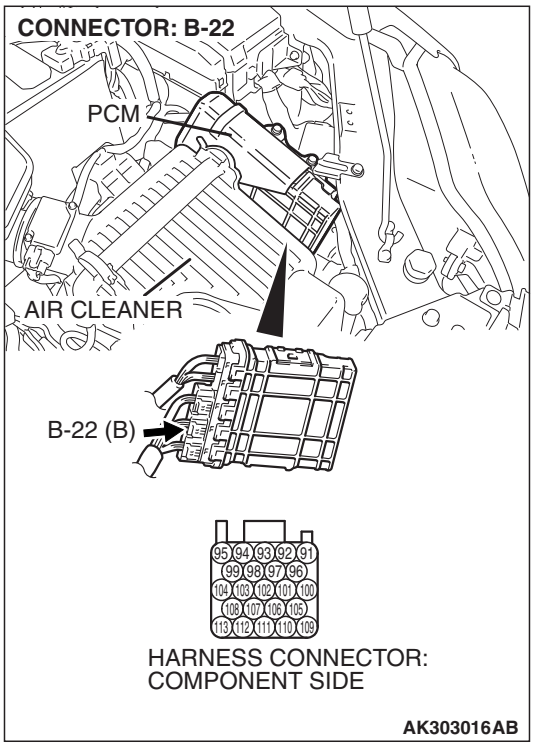
STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 6) and PCM connector B-22 (terminal No. 98).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





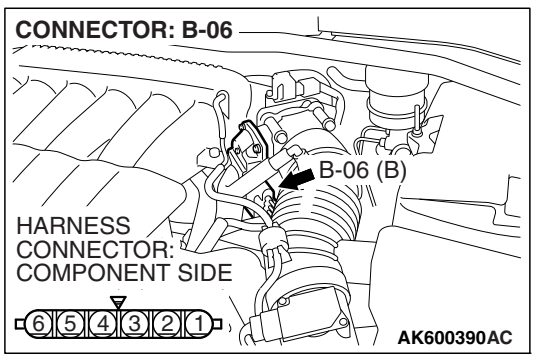
STEP 10. Replace the throttle body assembly.

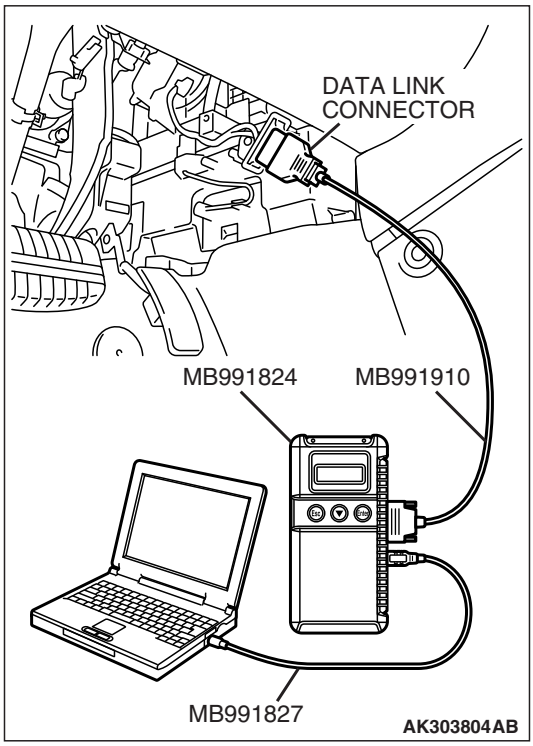
(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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.

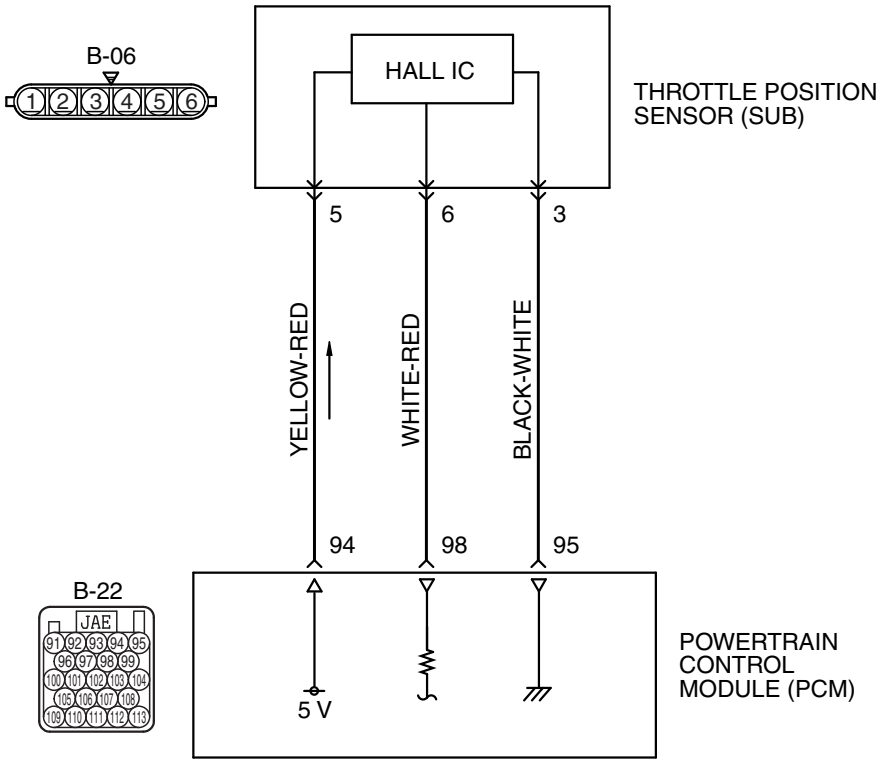
Q: Is DTC P0222 set?

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

DTC P0223: Throttle Position Sensor (Sub) Circuit High Input

⚠ CAUTION
If DTC P0223 has been set, TCL related DTC U1120 is also set. After P0223 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (sub) Circuit



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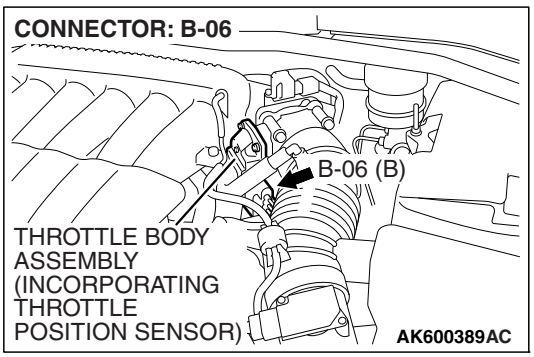
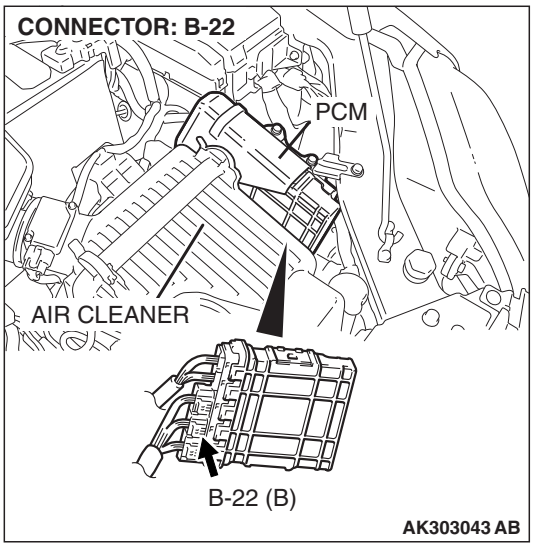




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the PCM (terminal No. 94).
- A voltage that is according to the throttle opening angle is sent to the PCM (terminal No. 98) from the throttle position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 3) is grounded with PCM (terminal No. 95).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The PCM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) 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)

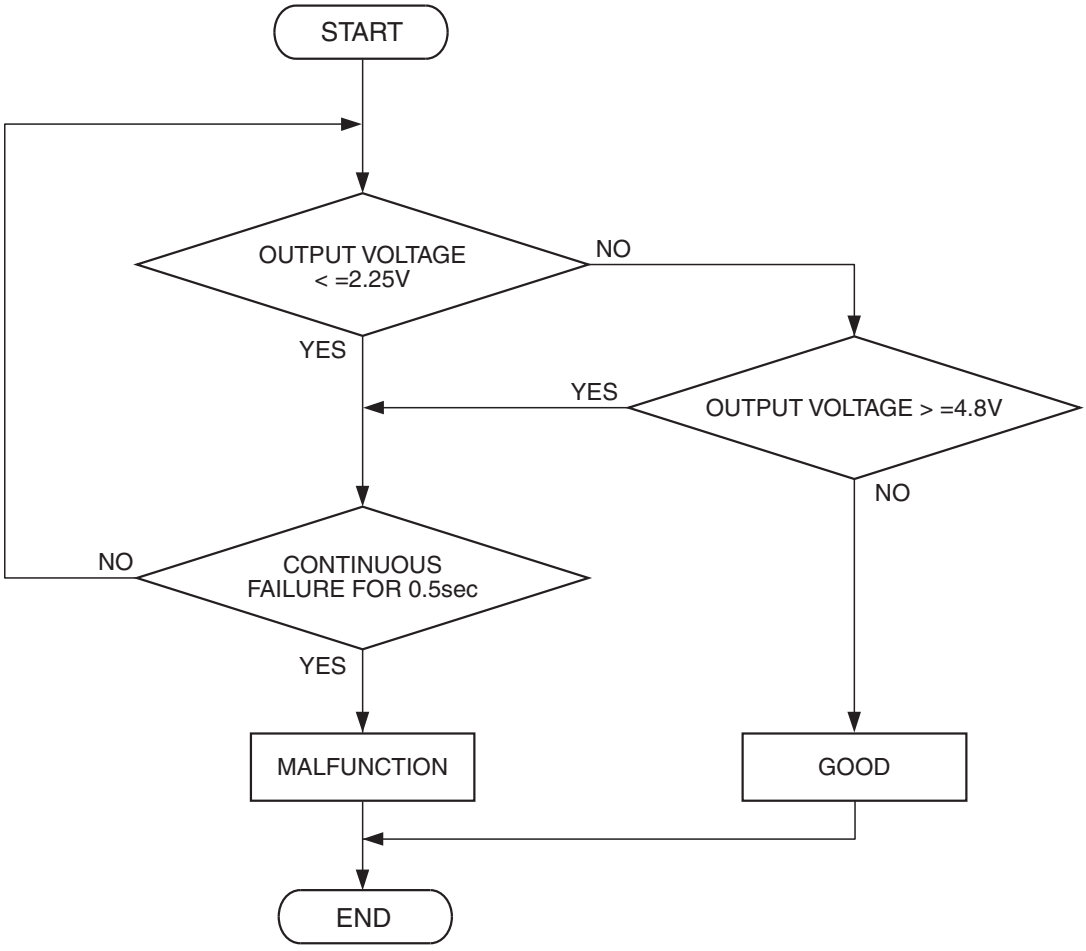
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

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

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

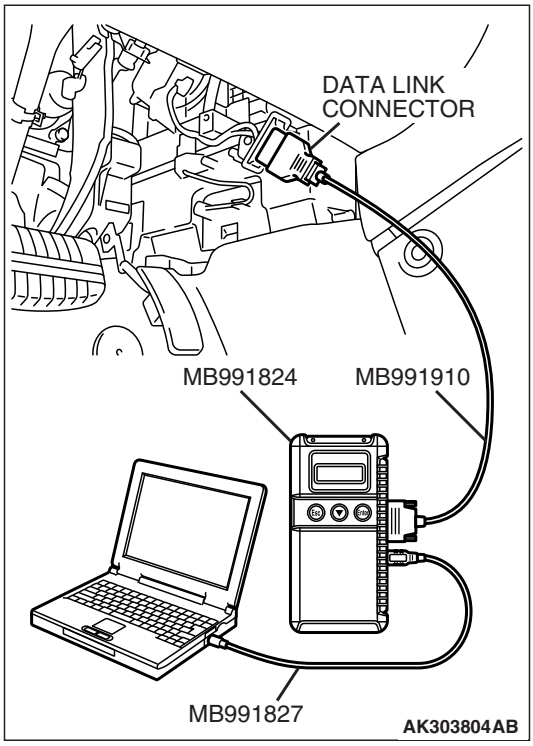
OBD-II DRIVE CYCLE PATTERN
None.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-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 15: Throttle Position Sensor (sub).



⚠ CAUTION

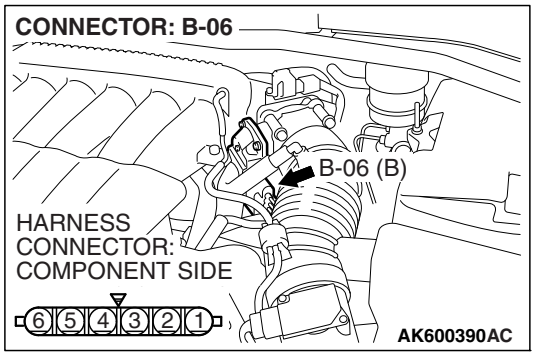
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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 15, Throttle Position Sensor (sub).
  - Output voltage should be between 2,200 and 2,800 millivolts when the throttle valve is fully closed with your finger.
  - Output voltage should be 4,000 millivolts 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.

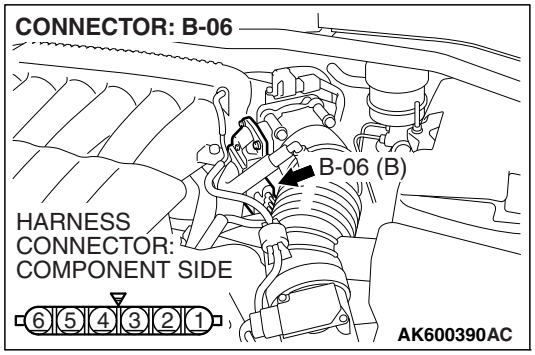
STEP 2. Check harness connector B-06 at throttle position sensor for damage.



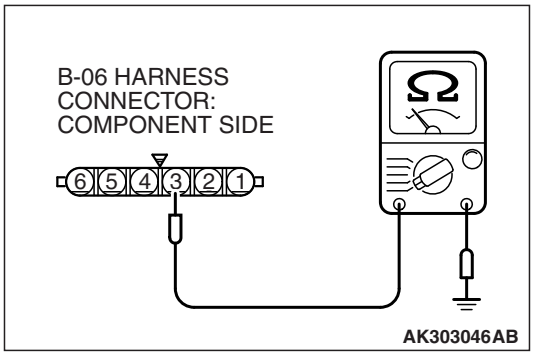
Q: Is the harness connector in good condition?

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.

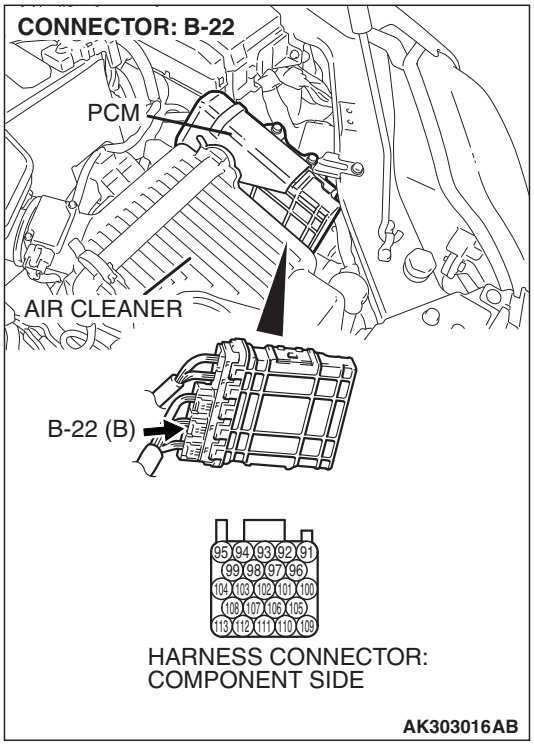


(2) Measure the continuity between terminal No. 3 and ground
- Continuity (2 Ω or less)

Q: Does continuity exist?

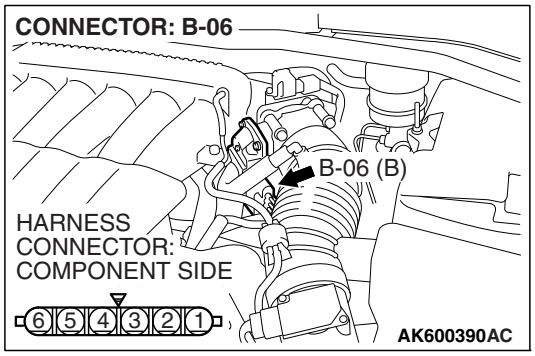
YES : Go to Step 7.
NO : Go to Step 4.

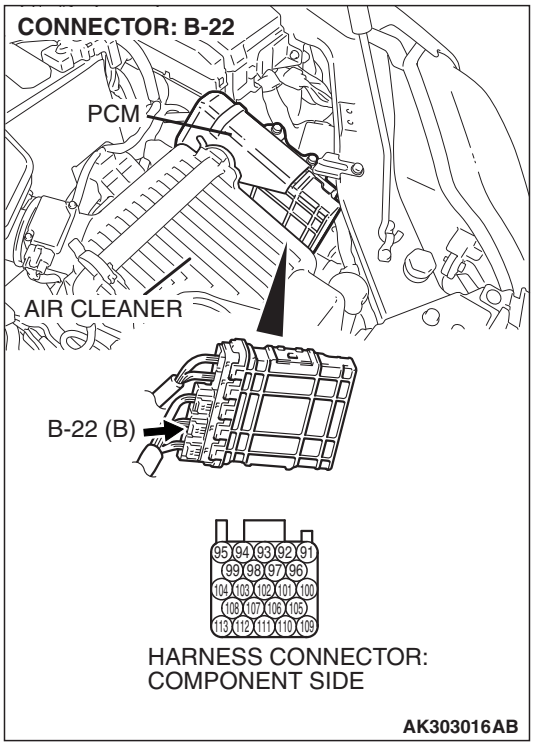
STEP 4. Check harness connector B-22 at PCM for damage.



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 8.



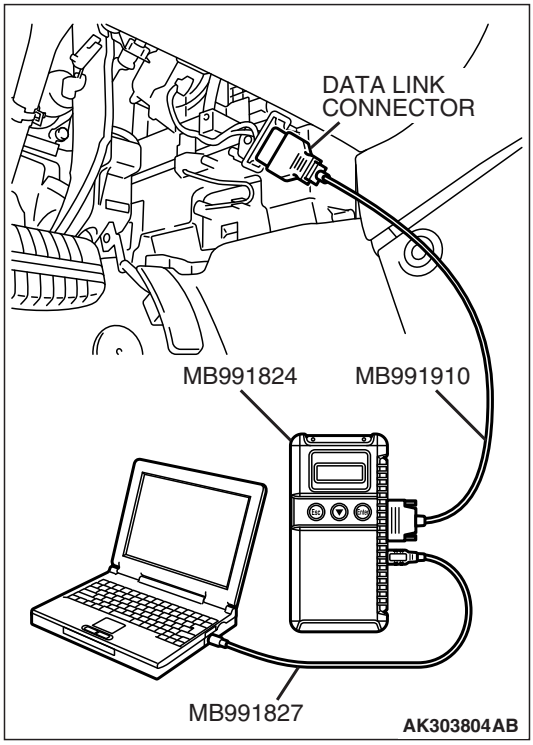


STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 3) and PCM connector B-22 (terminal No. 95).

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 15: Throttle Position Sensor (sub).

⚠ 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

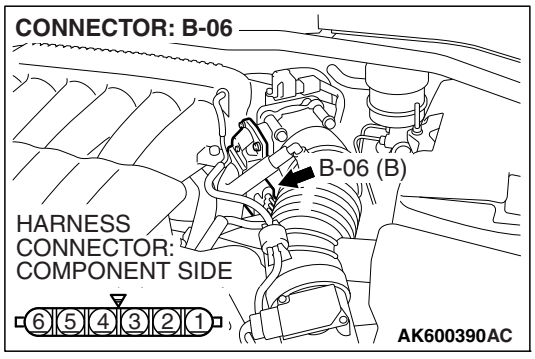
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2,200 and 2,800 millivolts when the throttle valve is fully closed with your finger.
- Output voltage should be 4,000 millivolts 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 PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 8.



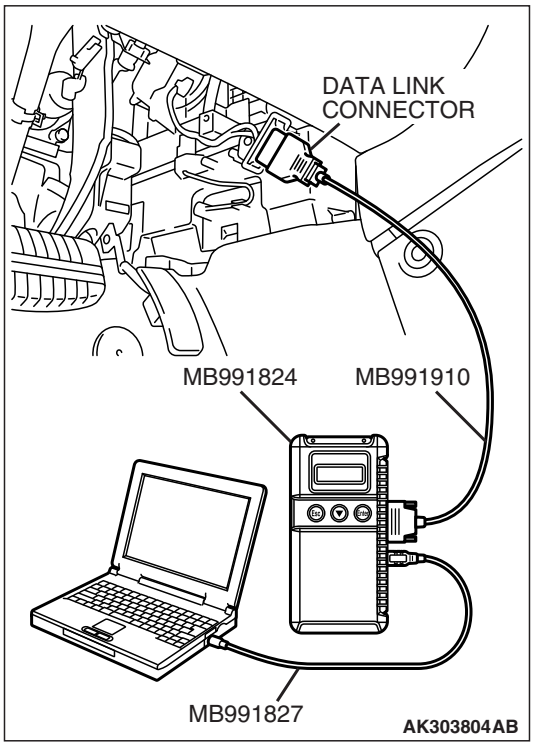
STEP 7. Replace the throttle body assembly.

(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 P0223 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 8.

NO : The inspection 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 P0223 set?

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

DTC P0300: Random/Multiple Cylinder Misfire Detected

⚠ CAUTION
If DTC P0300 has been set, TCL related DTC U1120 is also set. After P0300 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

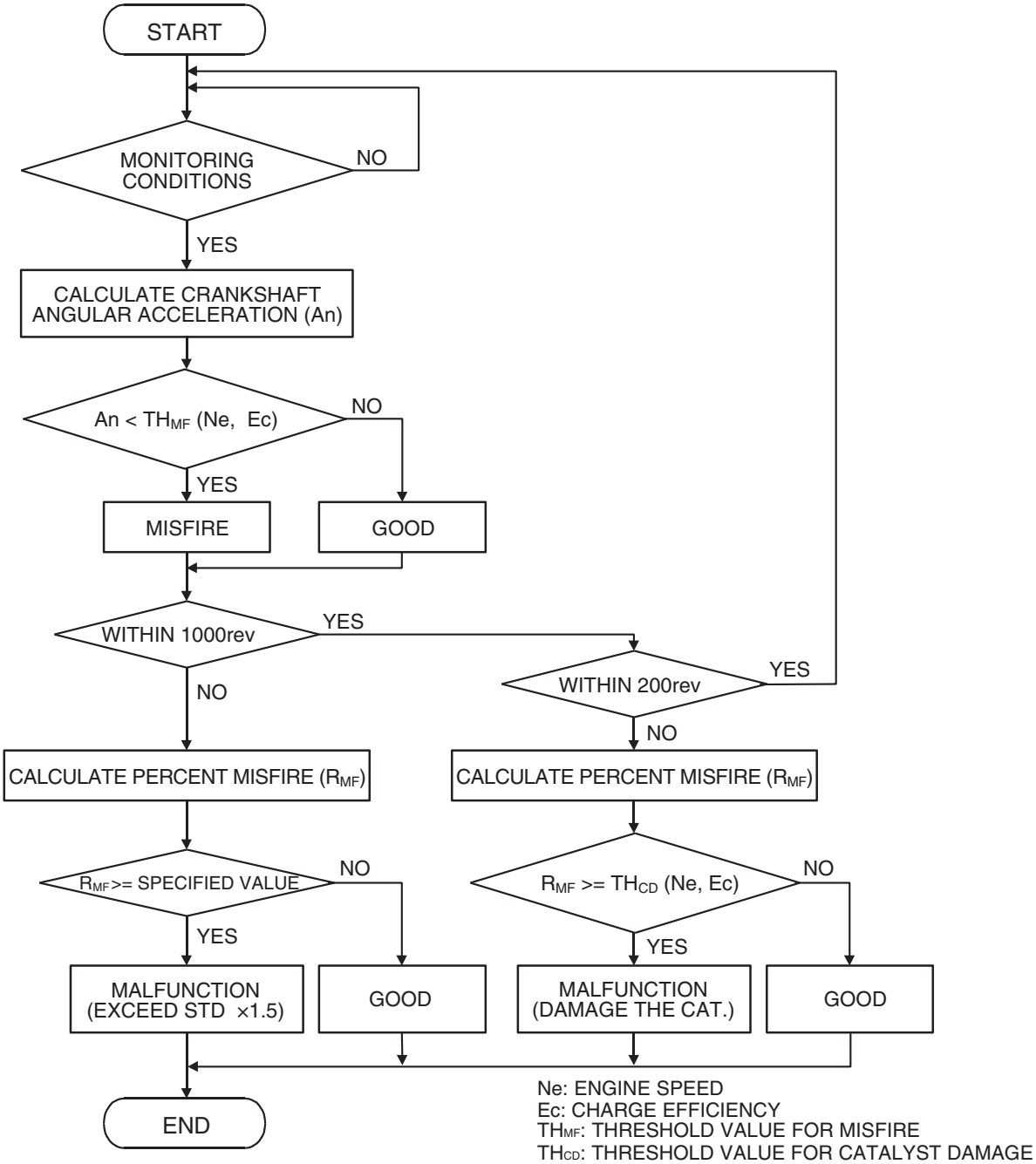
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

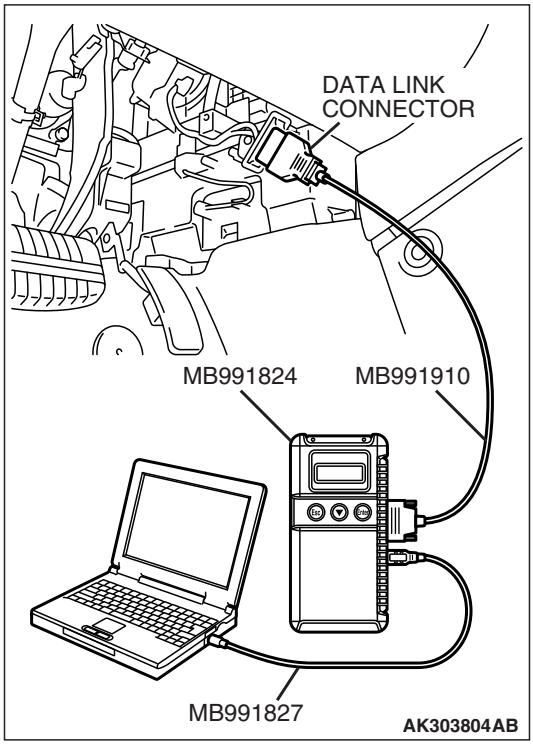
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

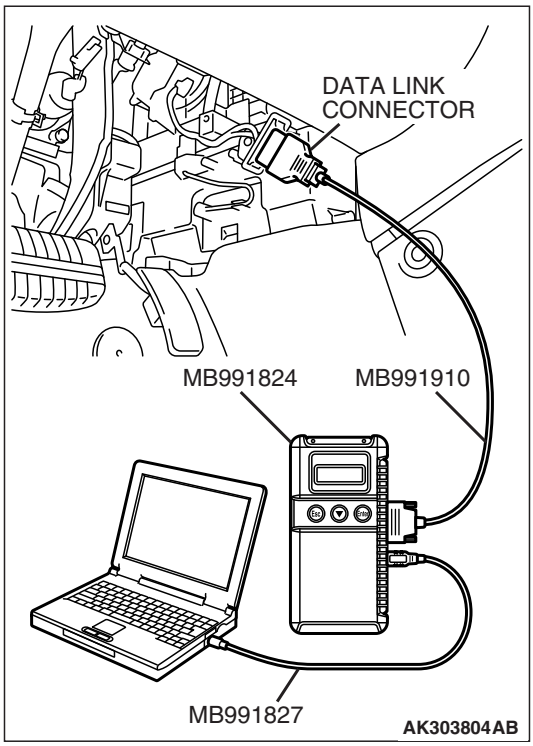
⚠ CAUTION

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 2, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 –Crankshaft Position Sensor Circuit. P.13B-610

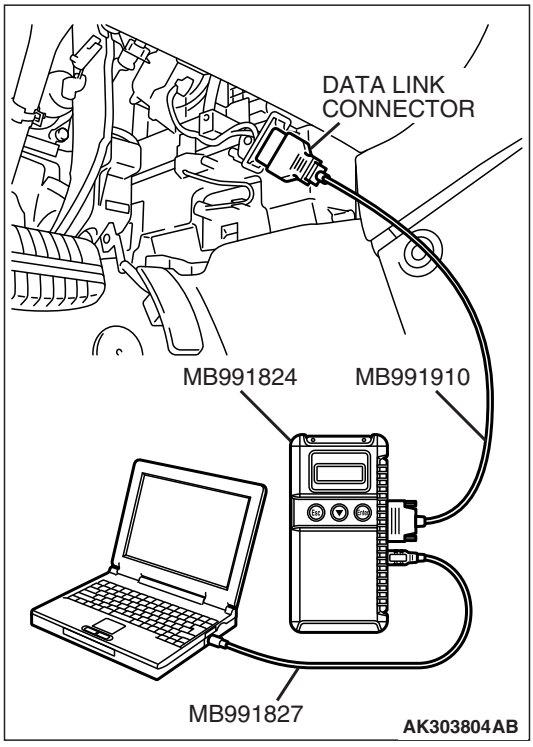


STEP 2. Using scan tool MB991958, check data list item 26 <bank 1> and 27 <bank2>: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 26<bank 1> and 27 <bank2>, Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to, DTC P0171 –System too Lean (bank 1) P.13B-439, DTC P0172 –System too Rich (bank 1) P.13B-448, DTC P0174 –System too Lean (bank 2) P.13B-454, DTC P0175 –System too Rich (bank 2) P.13B-462.

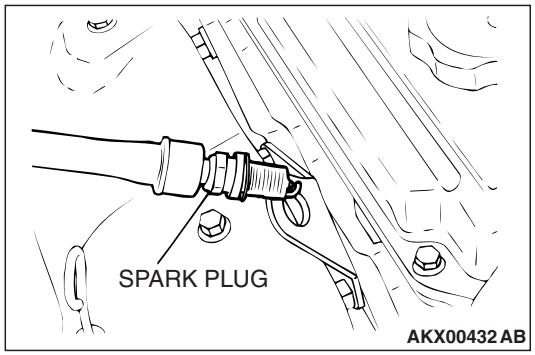


STEP 3. Using scan tool MB991958, check data list item 28 <bank 1> and 29 <bank2>: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28<bank 1> and 29 <bank2>, Short-Term Fuel Trim.
- The fuel trim should be between –30 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 –System too Lean (bank 1) P.13B-439, DTC P0172 –System too Rich (bank 1) P.13B-448, DTC P0174 –System too Lean (bank 2) P.13B-454, DTC P0175 –System too Rich (bank 2) P.13B-462.



STEP 4. Visual check of ignition spark.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check each spark plug produces a spark.

Q: Did it spark?

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

STEP 5. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the faulty spark plug. Then go to Step 8.

STEP 6. Check the following items.

(1) Check the following items, and repair or replace the defective component.
  a. Check for skipped timing belt teeth.
  b. Check compression.
  c. EGR valve failed.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 8.
NO : Go to Step 7.

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

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 15 P.13B-5.

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

Q: Is DTC P0300 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected

⚠ CAUTION

If DTC P0301 has been set, TCL related DTC U1120 is also set. After P0301 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

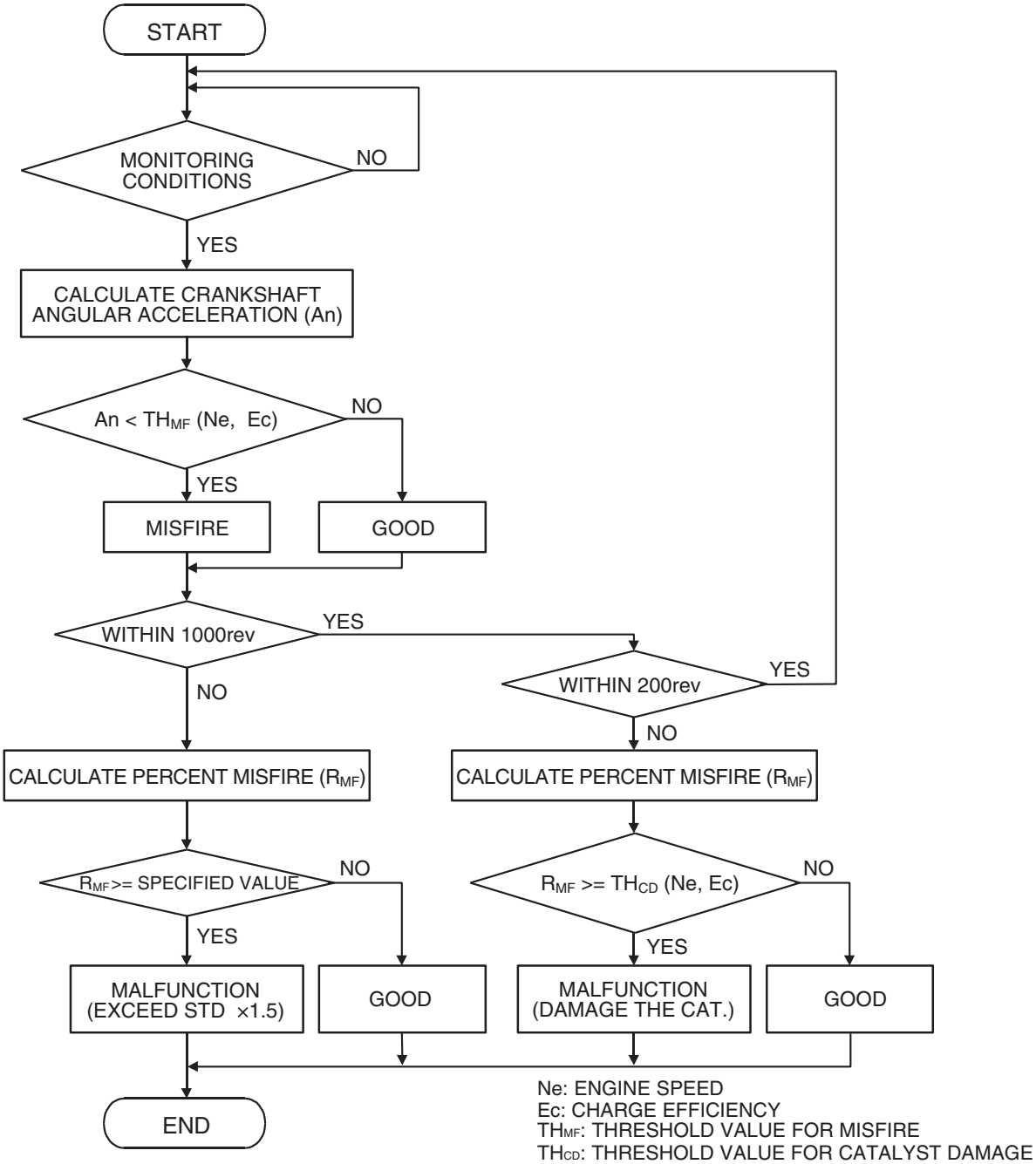
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

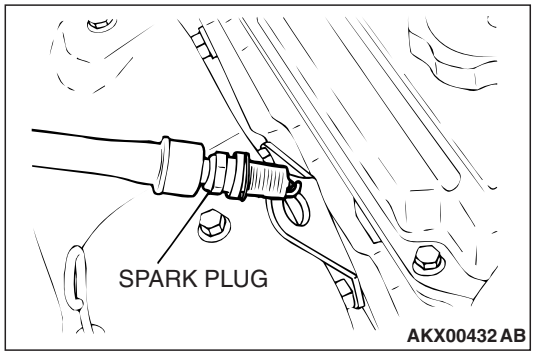
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 1 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 1 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0301 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0301 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0302: Cylinder 2 Misfire Detected

⚠ CAUTION

If DTC P0302 has been set, TCL related DTC U1120 is also set. After P0302 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

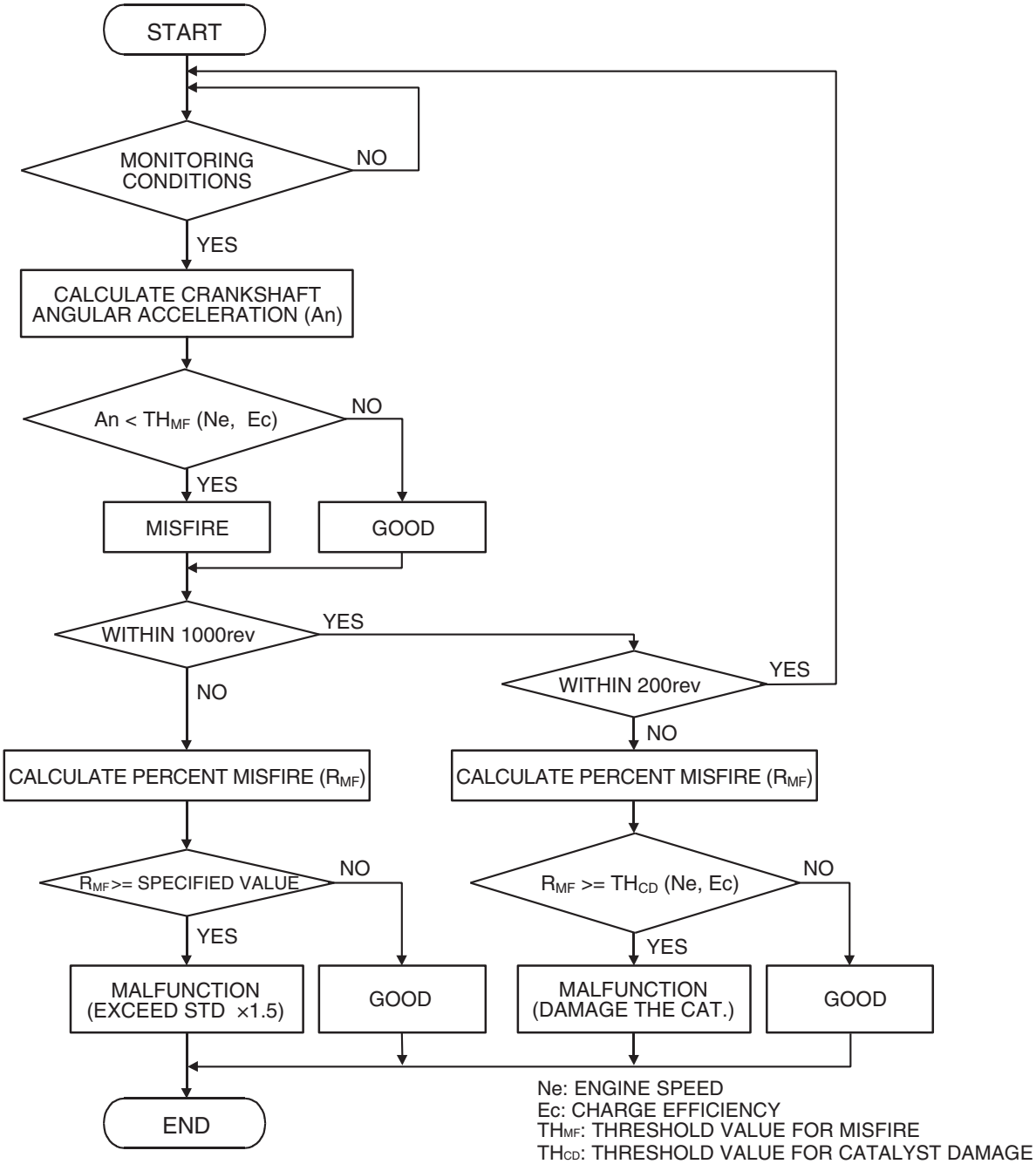
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

- Misfire has occurred in1.5 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

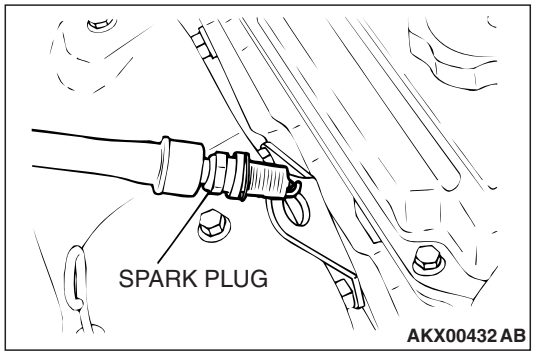
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 2 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 2 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0302 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0302 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0303: Cylinder 3 Misfire Detected

⚠ CAUTION

If DTC P0303 has been set, TCL related DTC U1120 is also set. After P0303 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

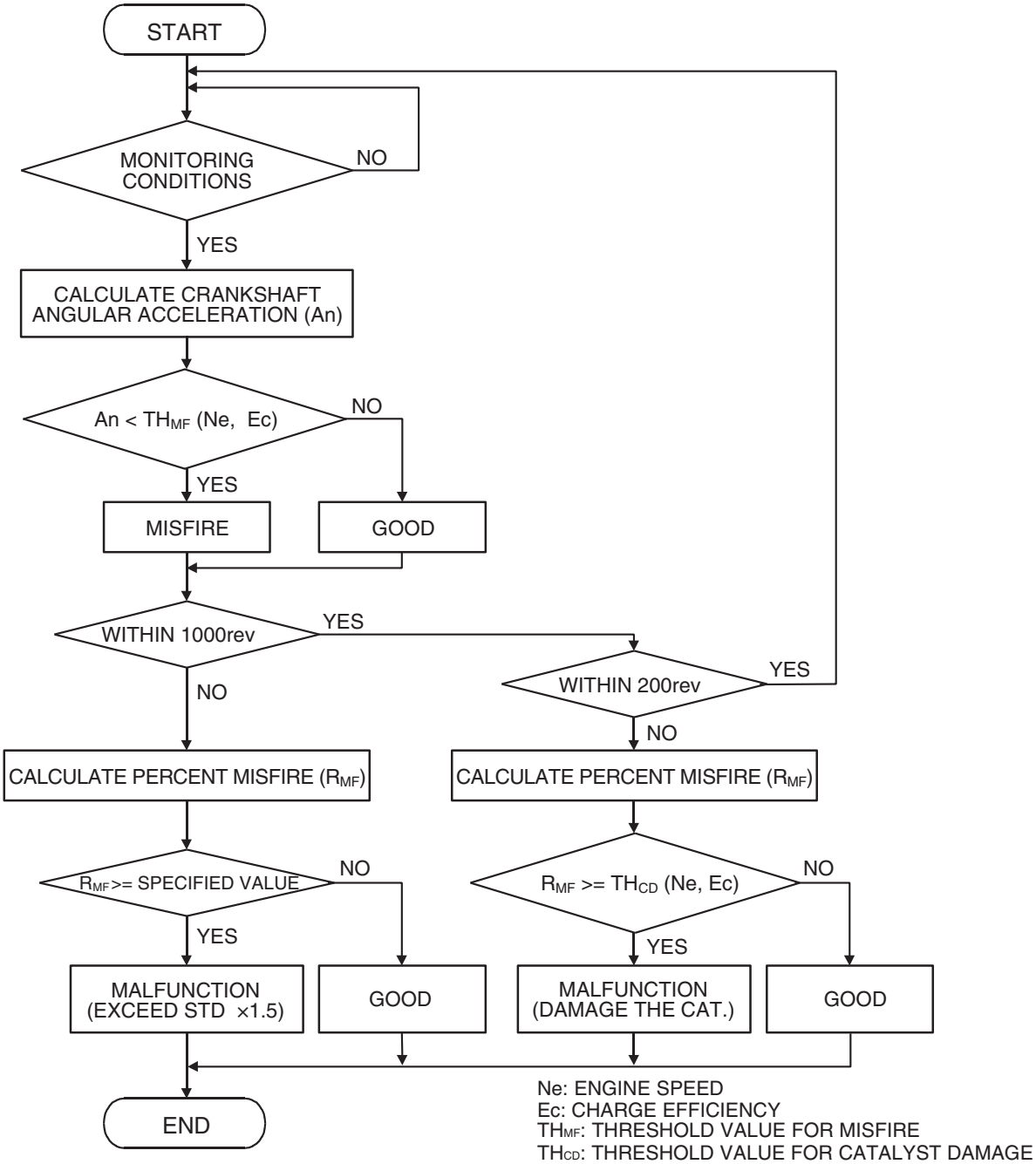
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

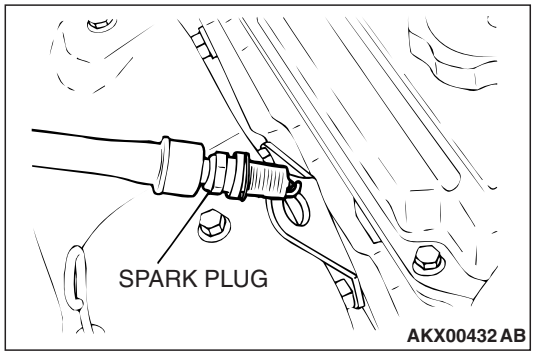
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 3 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 3 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0303 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0303 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0304: Cylinder 4 Misfire Detected

⚠ CAUTION

If DTC P0304 has been set, TCL related DTC U1120 is also set. After P0304 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

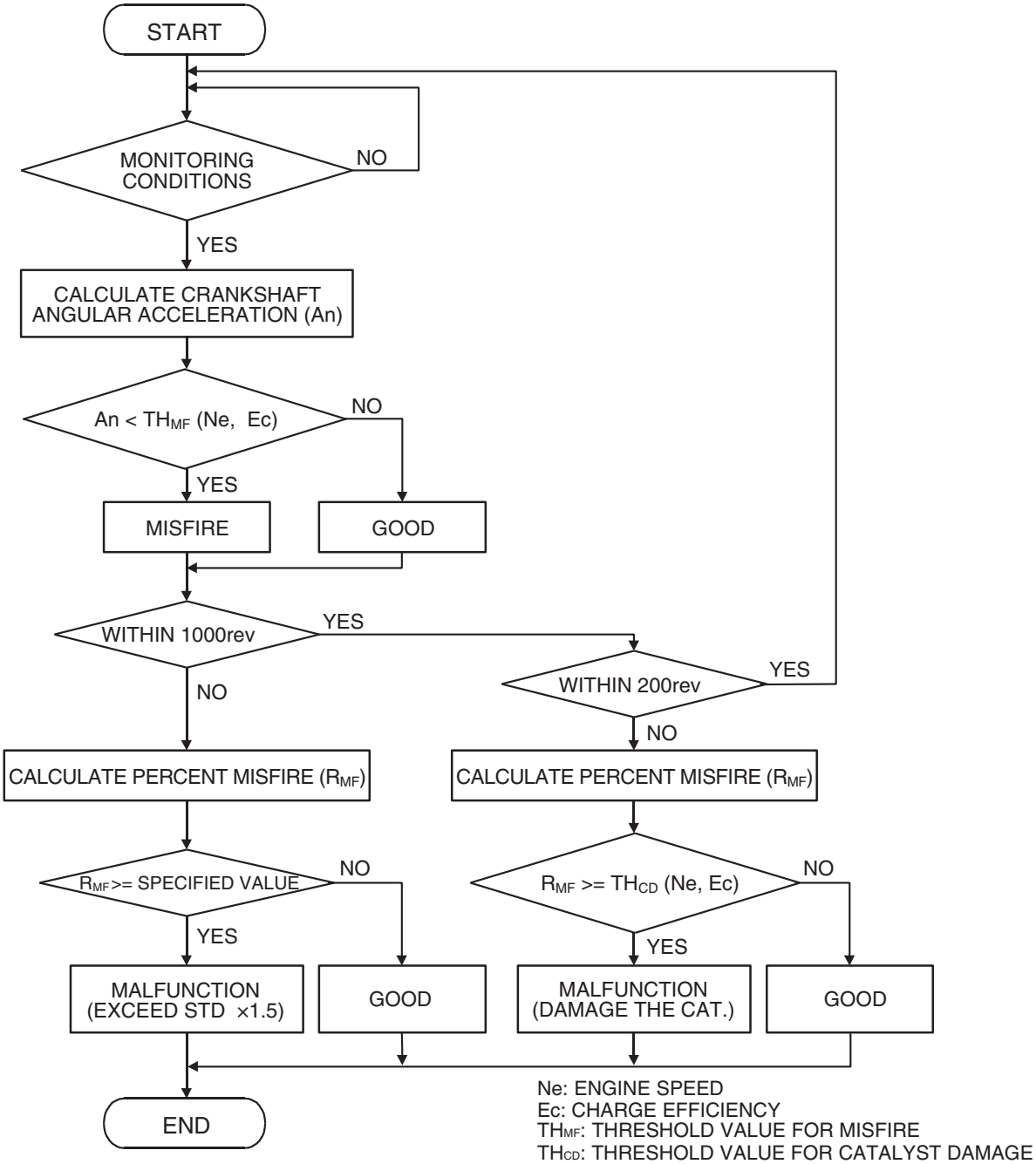
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

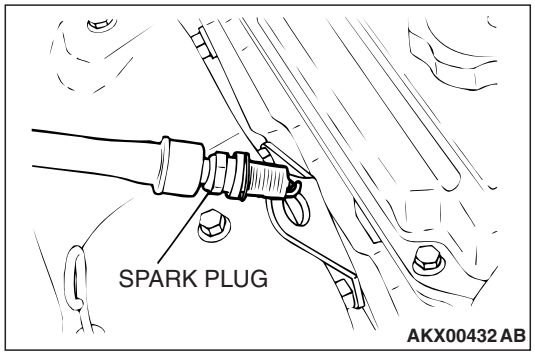
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 4 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 4 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0304 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0304 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0305: Cylinder 5 Misfire Detected

⚠ CAUTION

If DTC P0305 has been set, TCL related DTC U1120 is also set. After P0305 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

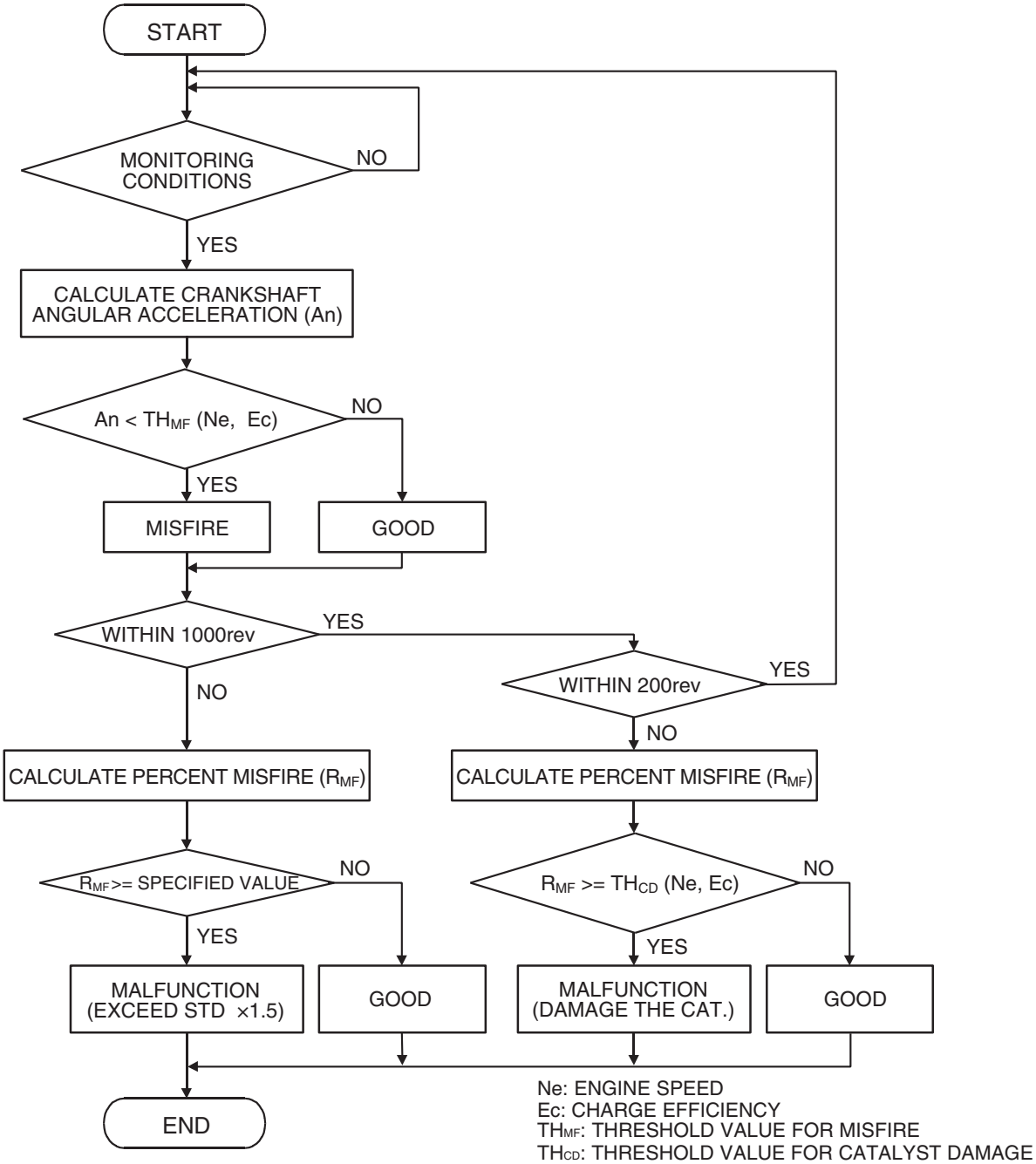
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

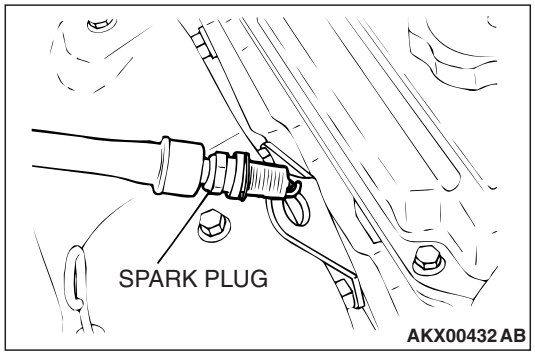
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 5 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 5 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 5 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0305 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0305 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0306: Cylinder 6 Misfire Detected

⚠ CAUTION

If DTC P0306 has been set, TCL related DTC U1120 is also set. After P0306 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

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)

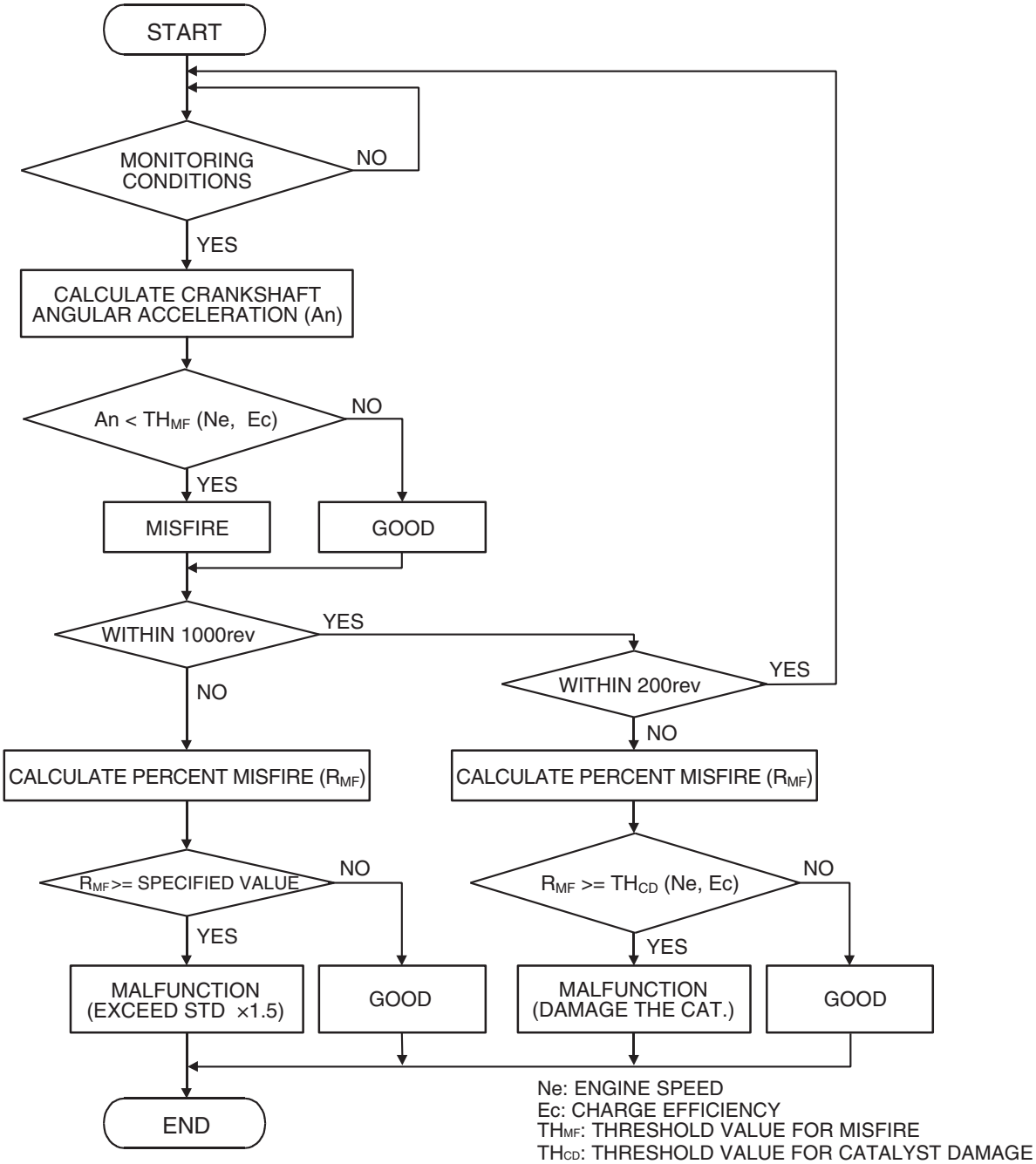
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900277

Check Conditions

- Engine speed is between 440 and 6,500 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is more than 30 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration and sudden acceleration/deceleration.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

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

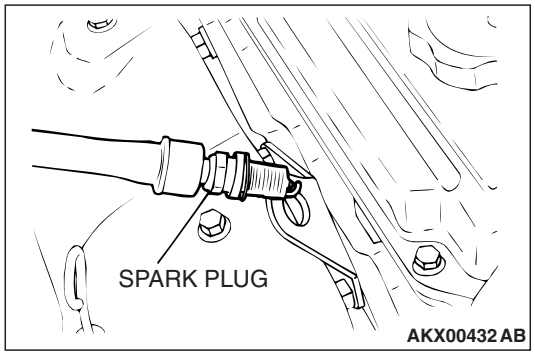
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-5.

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

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

DIAGNOSIS



STEP 1. Visual check on ignition spark of No. 6 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Disconnect all injector connectors.
(4) At the engine start, check spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 6 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-38.

Q: Is the spark plug normal?

YES : Refer to INSPECTION PROCEDURE 30 –Ignition Circuit System P.13B-1187.
NO : Replace the No. 6 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11E, On-vehicle Service –Compression Pressure Check P.11E-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

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 15 P.13B-5.

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

Q: Is DTC P0306 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 5.

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. 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 15 P.13B-5.

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

Q: Is DTC P0306 set?

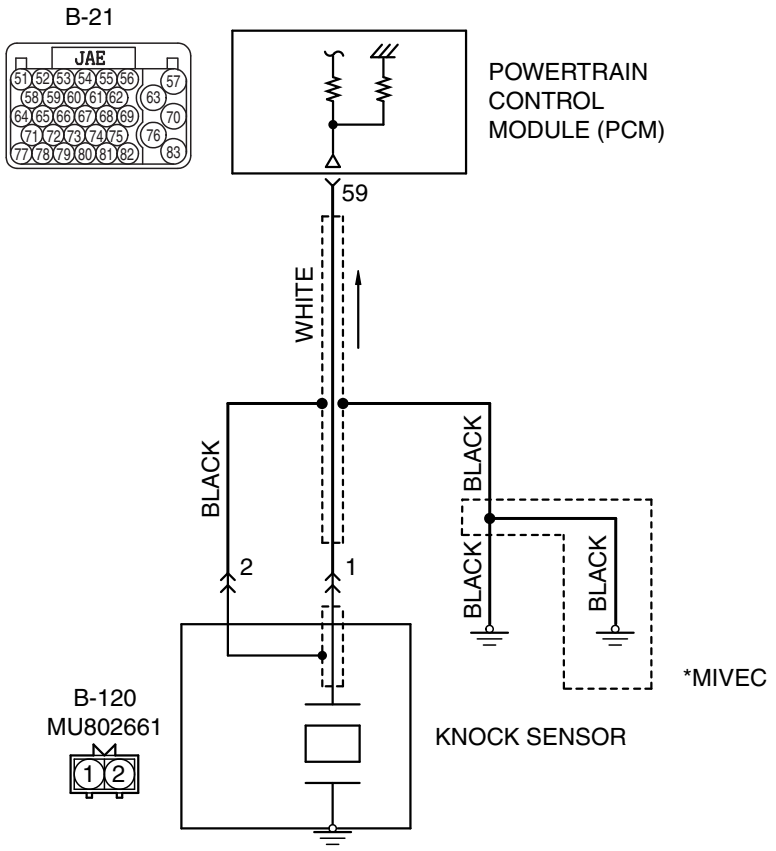
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0325: Knock Sensor Circuit

⚠ CAUTION
If DTC P0325 has been set, TCL related DTC U1120 is also set. After P0325 has been diagnosed, don't forget to erase DTC U1120.

Knock Sensor Circuit



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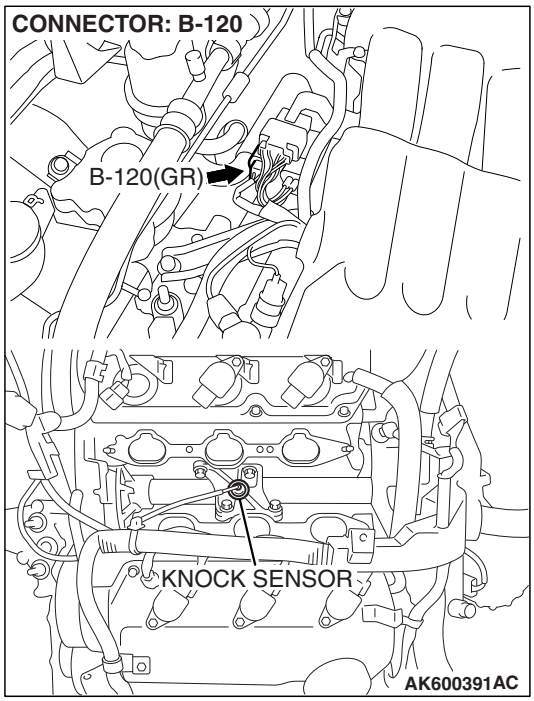
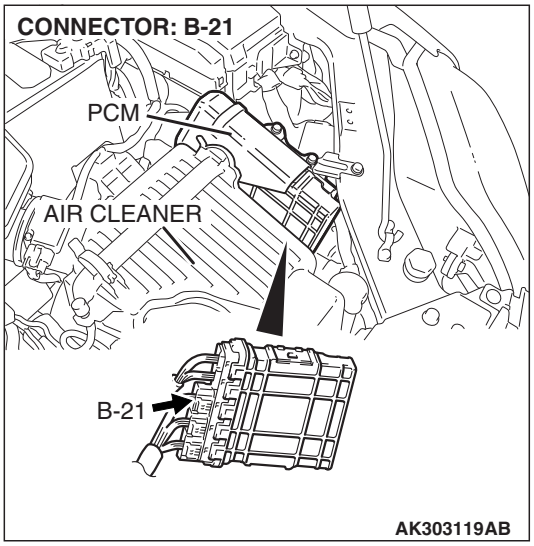




CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the PCM (terminal No. 59).

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

- Knock sensor signal does not change.

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)

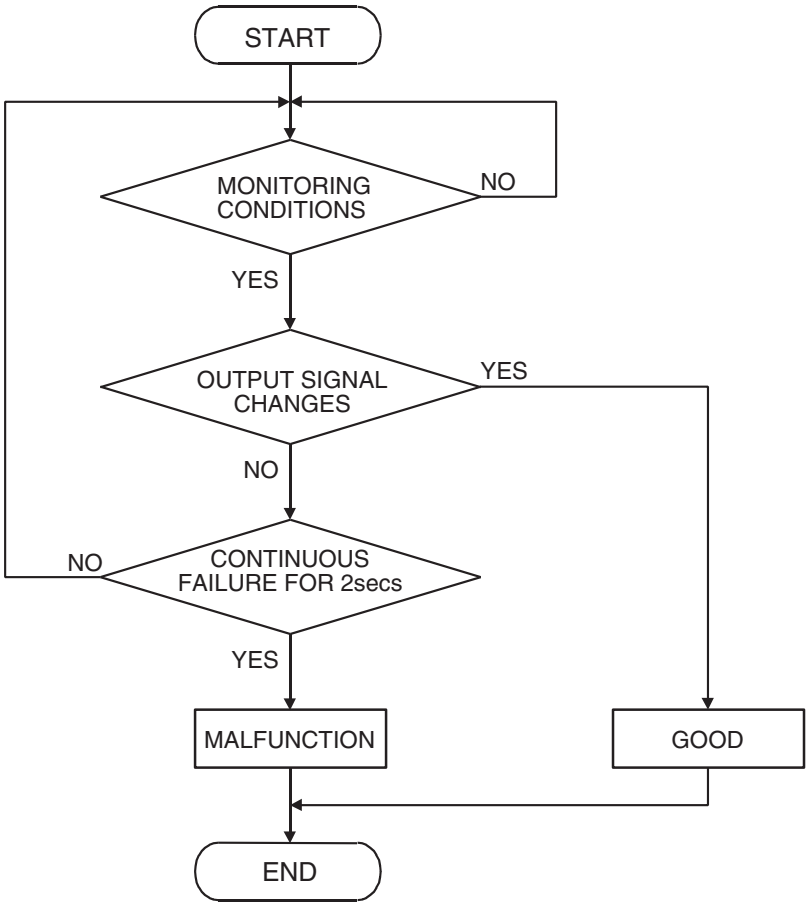
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK302034

Check Conditions

- Engine speed is higher than 2,500 r/min.
- Volumetric efficiency is 40 percent or higher.
- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Knock sensor output voltage (knock sensor peak voltage in each 1/3 turn of the crankshaft) has not changed for 2 seconds.

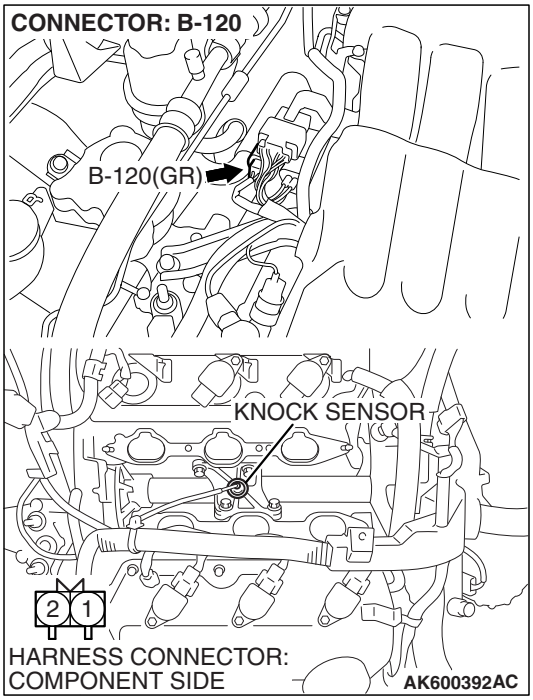
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13B-5.

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

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

DIAGNOSIS

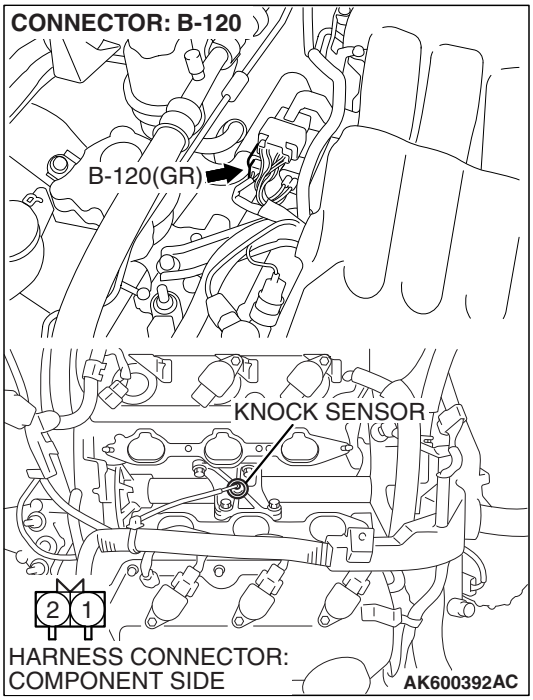


STEP 1. Check harness connector B-120 at the knock sensor for damage.

Q: Is the harness connector in good condition?

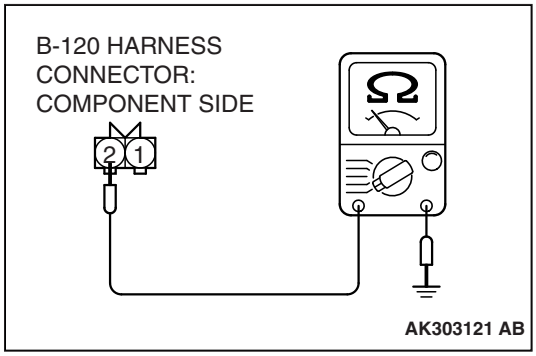
YES : Go to Step 2.

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



STEP 2. Check the continuity at knock sensor harness side connector B-120.

(1) Disconnect the connector B-120 and measure at the harness side.



(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

YES : Go to Step 3.

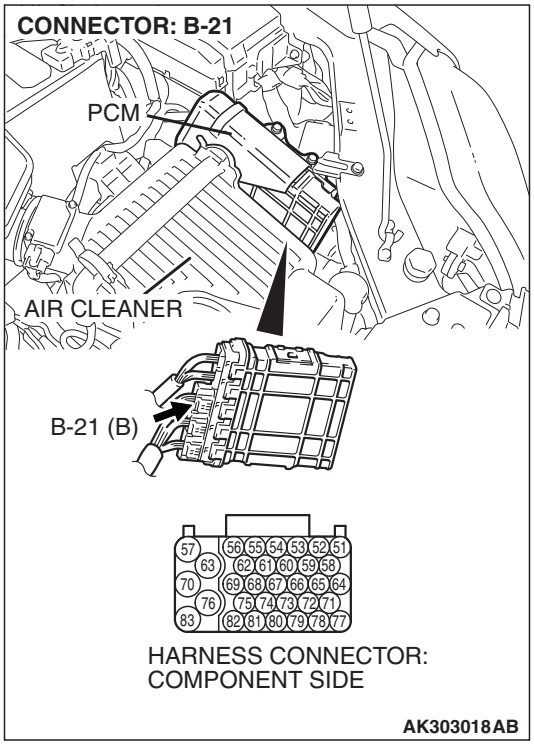
NO : Repair an open circuit or harness damage between knock sensor connector B-120 (terminal No. 2) and ground. Then go to Step 6.

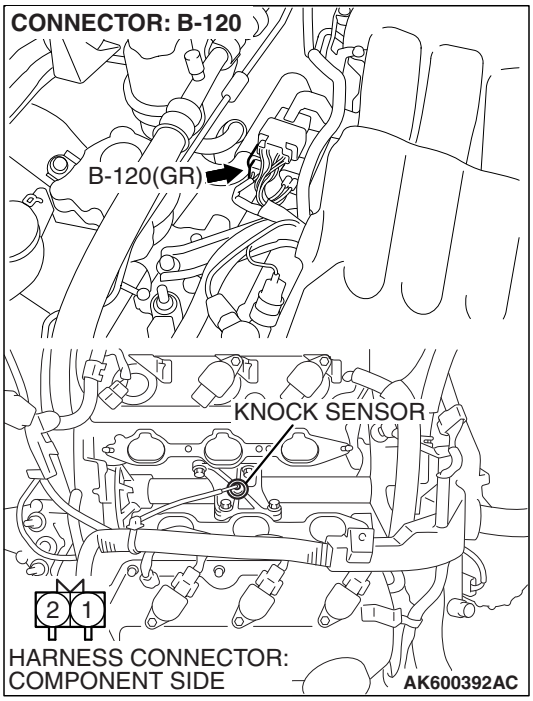
STEP 3. Check harness connector B-21 at PCM for damage.

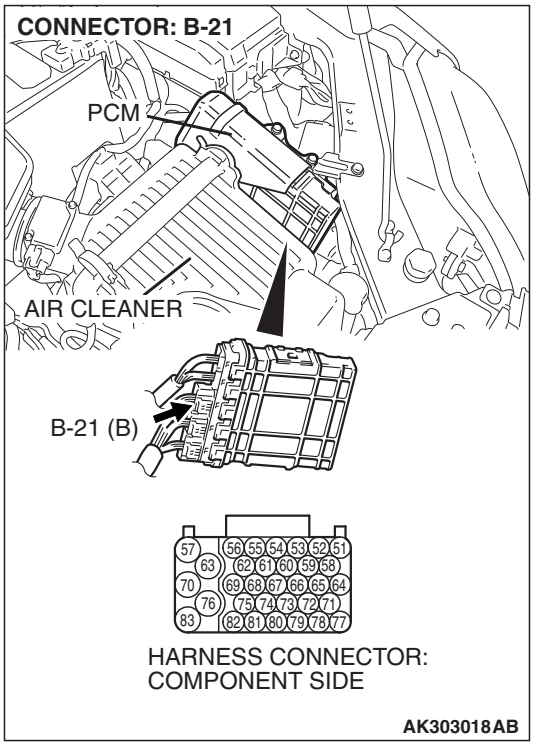
Q: Is the harness connector in good condition?

YES : Go to Step 4.

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

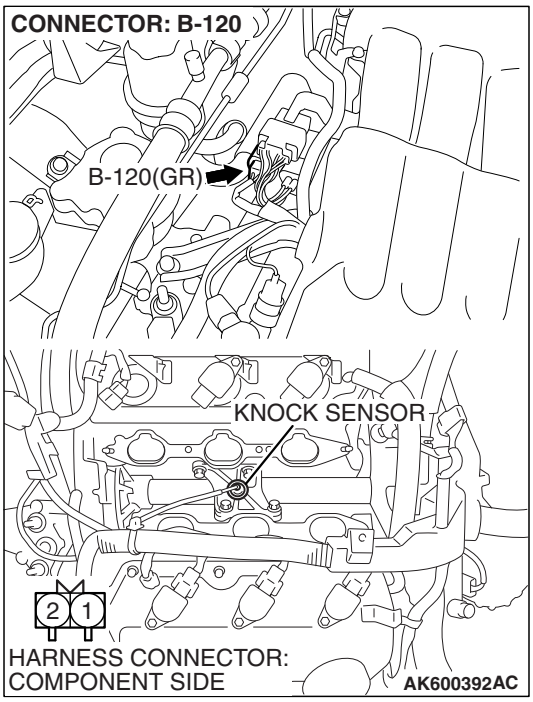






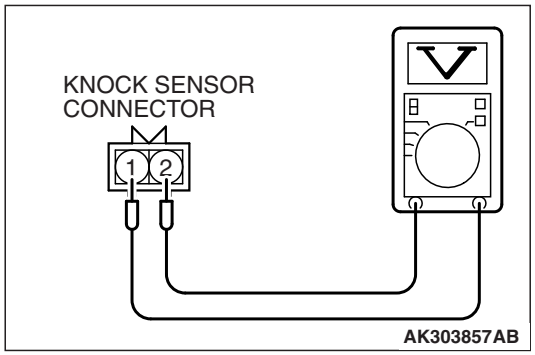
STEP 4. Check for open circuit, short circuit to ground and harness damage between knock sensor connector B-120 (terminal No. 1) and PCM connector B-21 (terminal No. 59).
Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.



STEP 5. Check the knock sensor.

(1) Disconnect the knock sensor connector B-120.
(2) Start the engine and run at idle.



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

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

Q: Is the sensor operating properly?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 6.
NO : Replace the knock 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 7 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

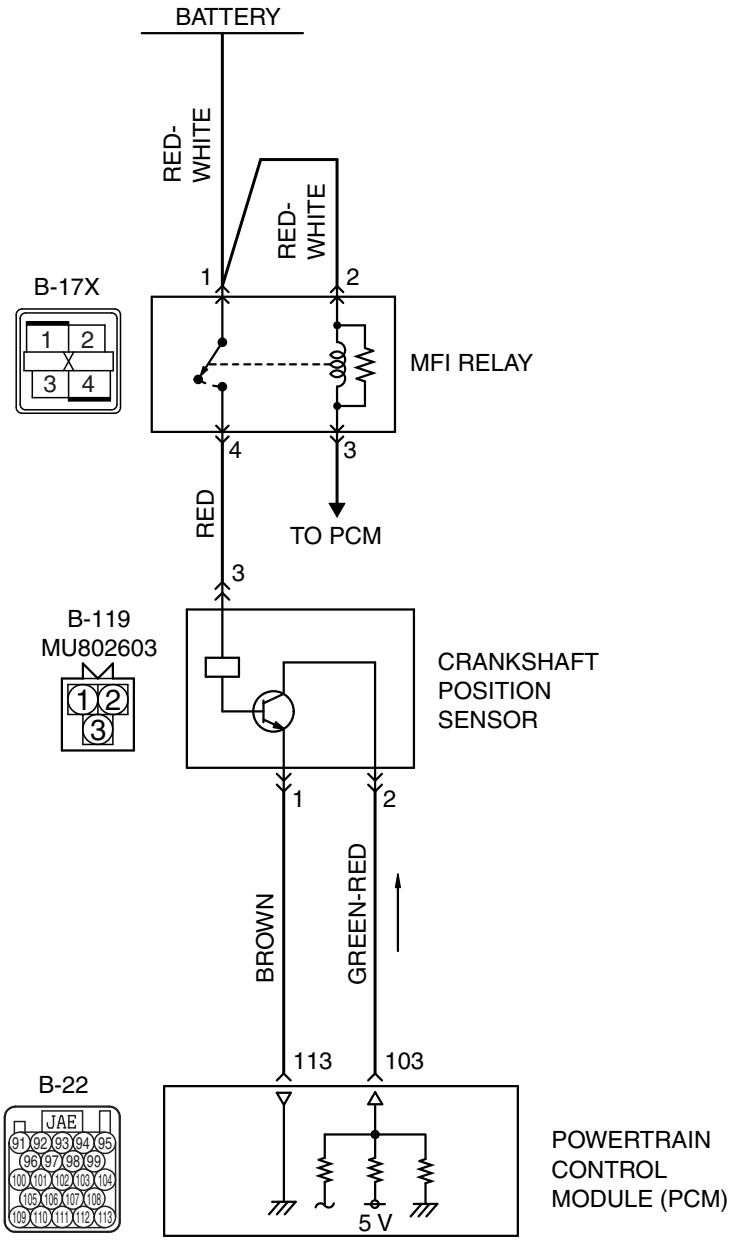
Q: Is DTC P0325 set?

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

DTC P0335: Crankshaft Position Sensor Circuit

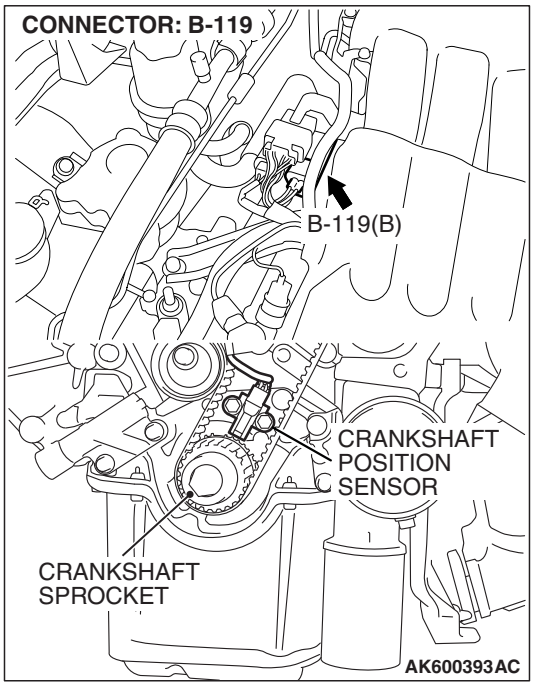
⚠ CAUTION
If DTC P0335 has been set, TCL related DTC U1120 is also set. After P0335 has been diagnosed, don't forget to erase DTC U1120.

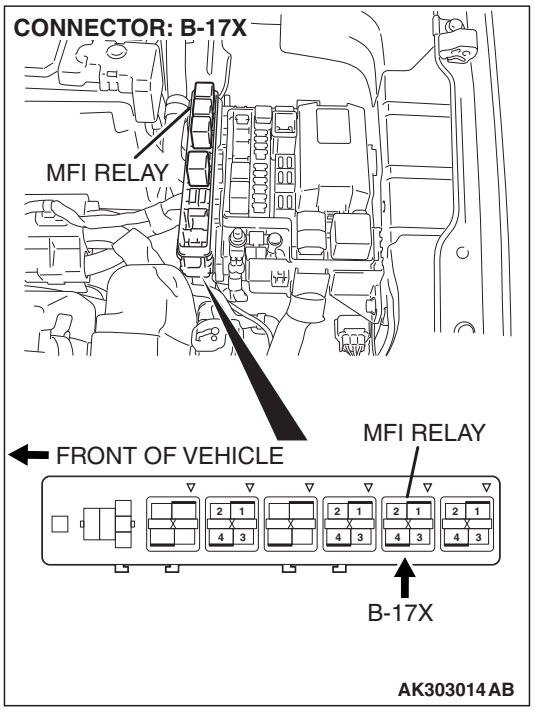
Crankshaft Position Sensor Circuit

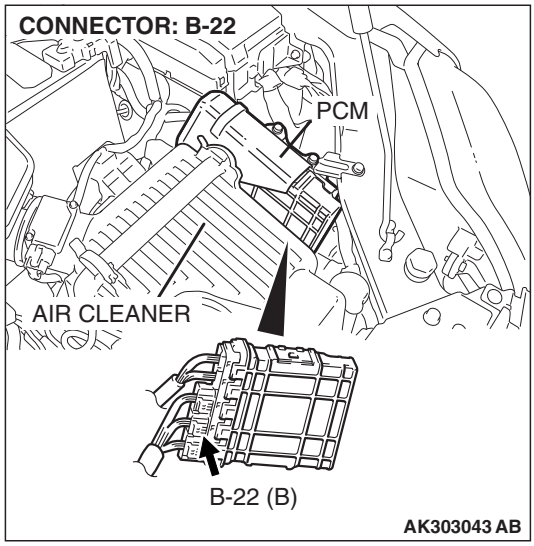


AK400914

TSB Revision







CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the crankshaft position sensor is grounded with PCM (terminal No. 113).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 103). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, then which are input to the PCM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Crankshaft position sensor signal does not change.
- Crankshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

TSB Revision

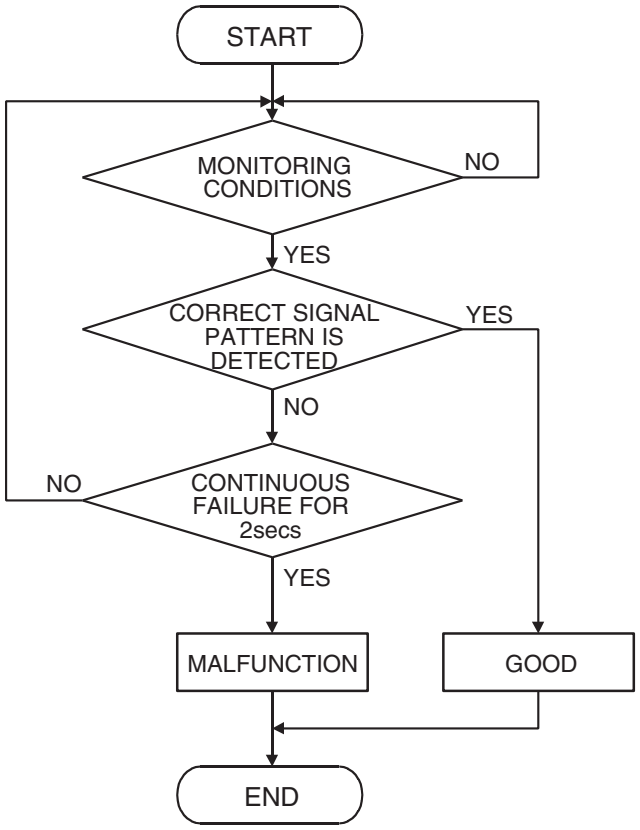
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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 <Range/Performance problem - Alignment>

Logic Flow Chart



AK700576

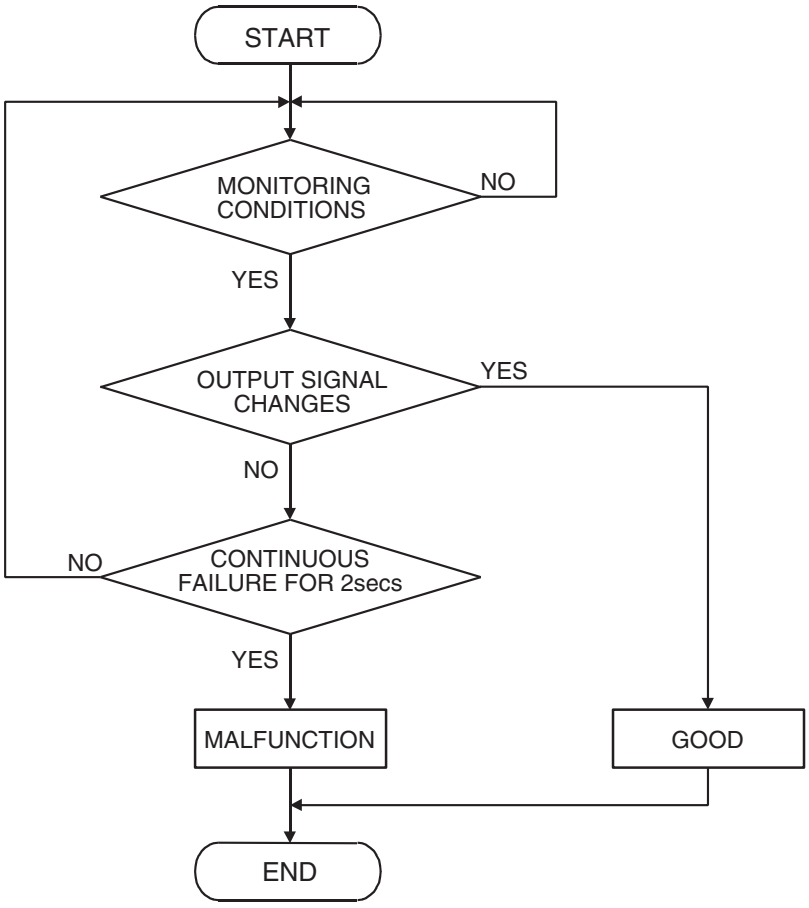
Check Condition
- Engine is being cranked.

or
- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion
- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



AK302034

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

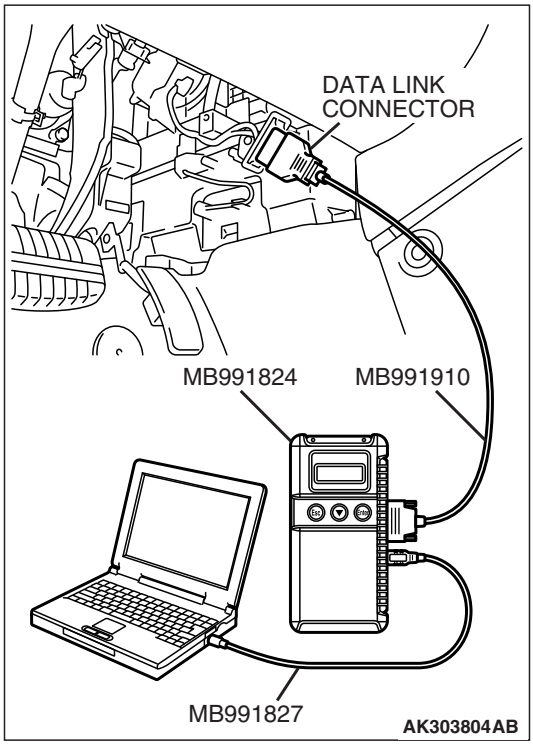
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998478: Test Harness (3pin, triangle)
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position 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.

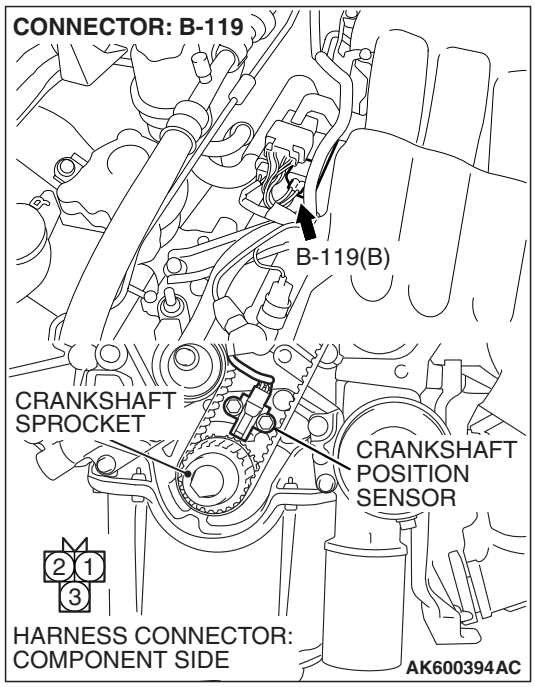
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should match.
(4) Turn the ignition switch to the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

Q: Is the sensor operating properly?

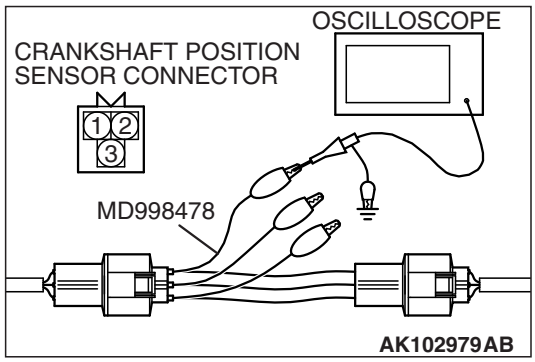
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

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



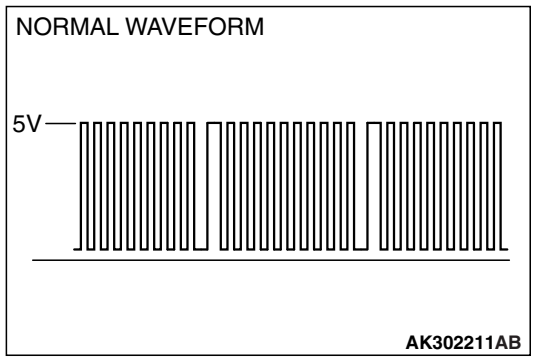
(1) Disconnect the crankshaft position sensor connector B-119, and connect the test harness special tool (MD998478) between the separated connectors.



(2) Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2 (black clip of special tool).

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 103.

(3) Start the engine and run at idle.

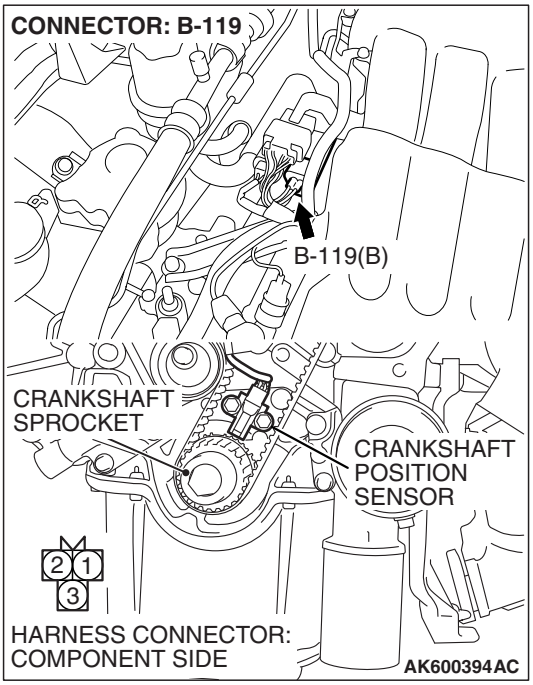


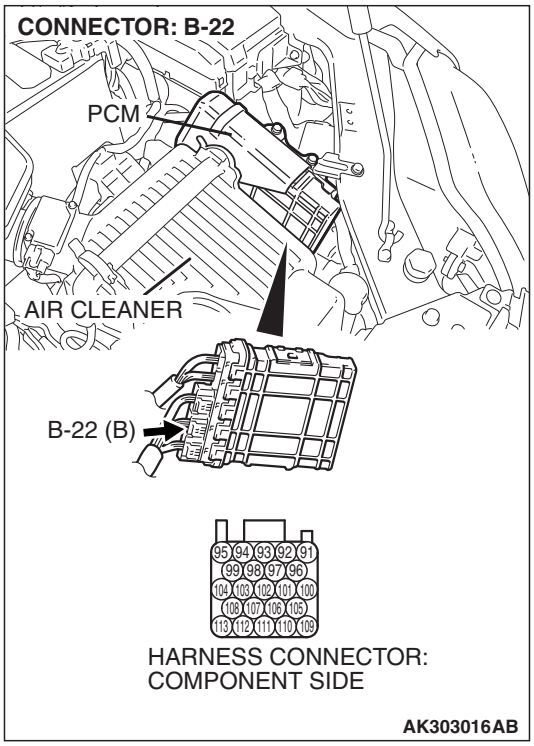
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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



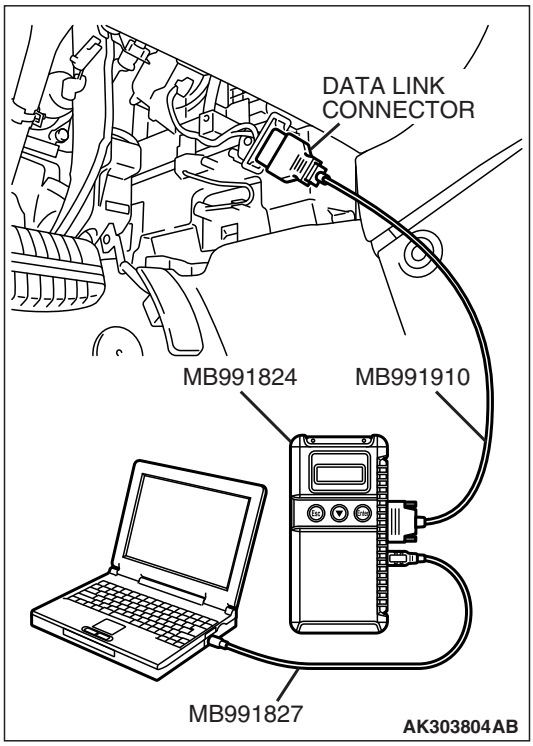


STEP 3. Check harness connector B-119 at the crankshaft position sensor and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

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



STEP 4. Using scan tool MB991958, check data list item 2: Crankshaft Position 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.

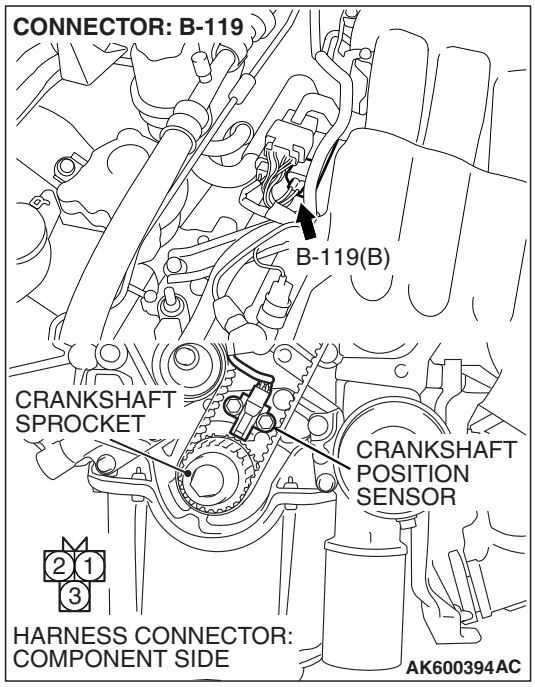
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

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

Q: Is the sensor operating properly?

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

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 21.

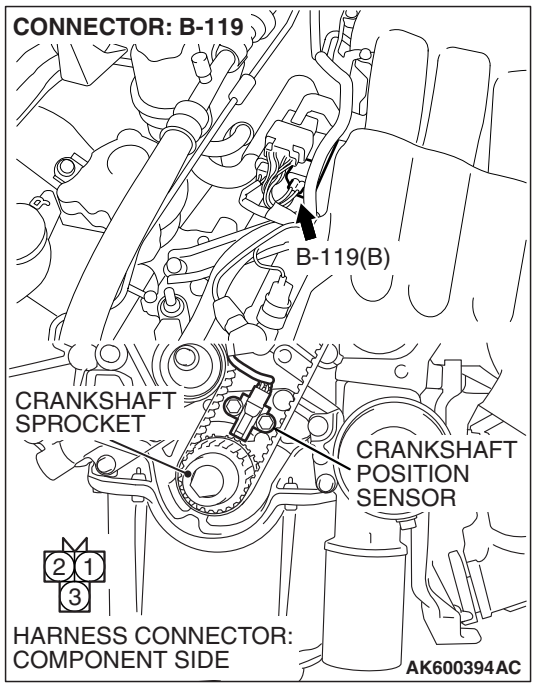


STEP 5. Check harness connector B-119 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

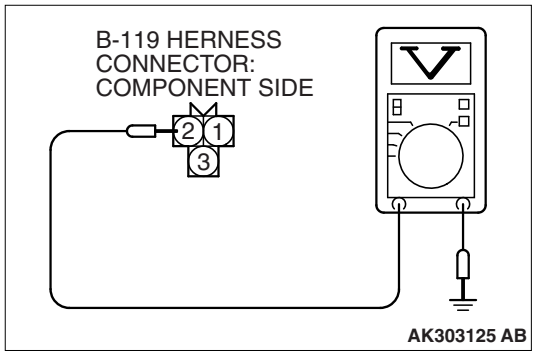
YES : Go to Step 6.

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



STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-119.

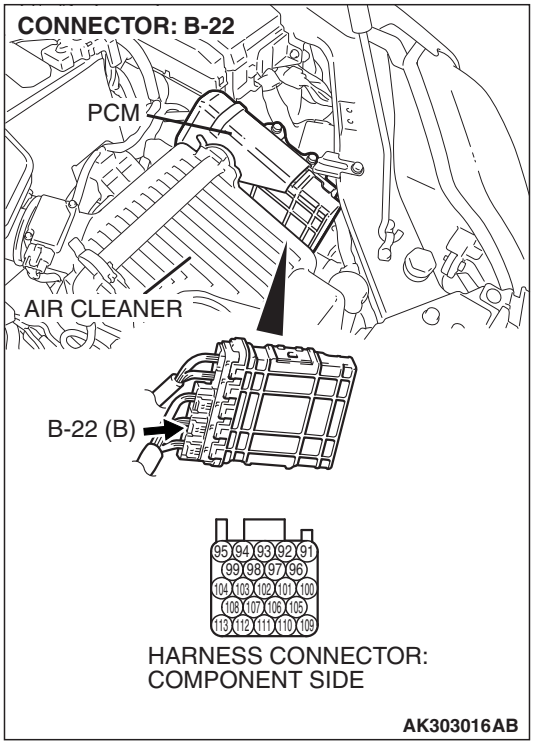
(1) Disconnect the connector B-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

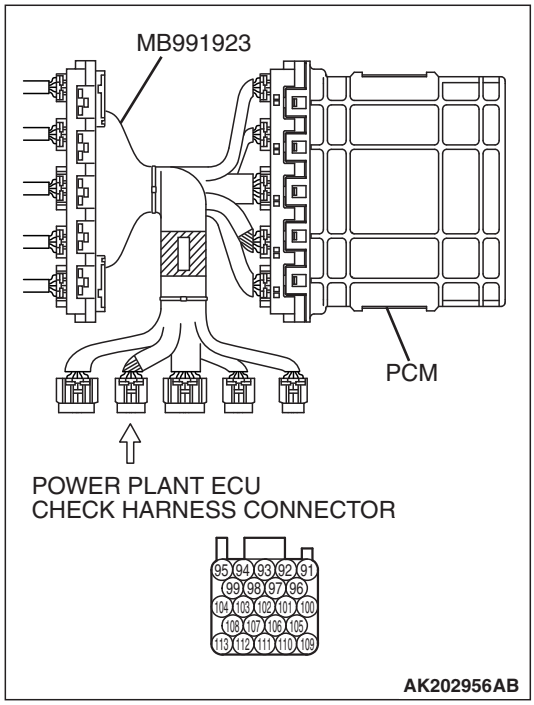


(3) Measure the voltage between terminal No. 2 and ground.
    • Voltage should be between 4.9 and 5.1 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

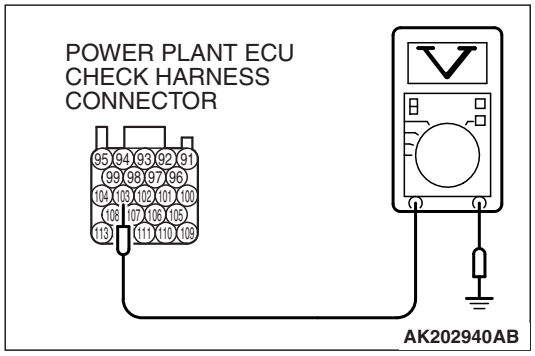
YES : Go to Step 11.
NO : Go to Step 7.





STEP 7. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the crankshaft position sensor connector B-119.
(3) Turn the ignition switch to the "ON" position.

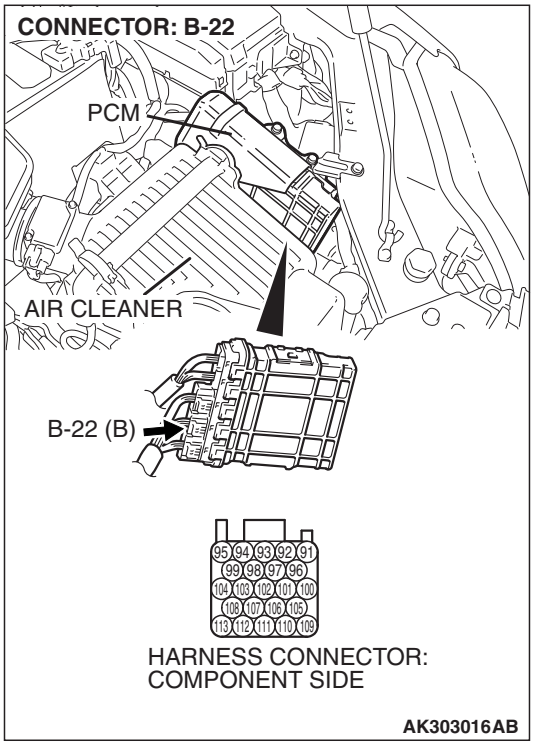


(4) Measure the voltage between terminal No. 103 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

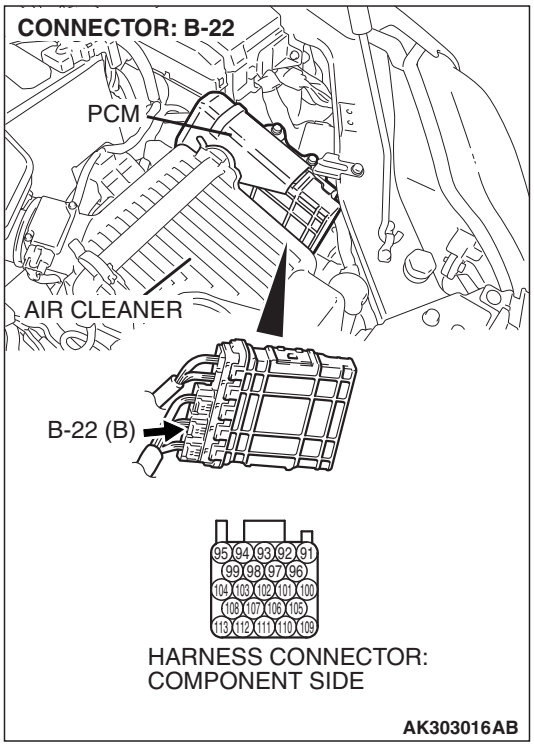
YES : Go to Step 8.
NO : Go to Step 9.



STEP 8. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103) because of open circuit. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

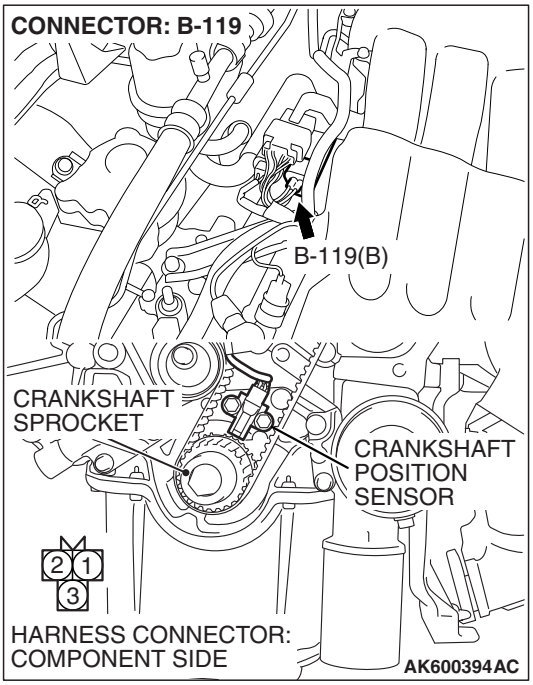


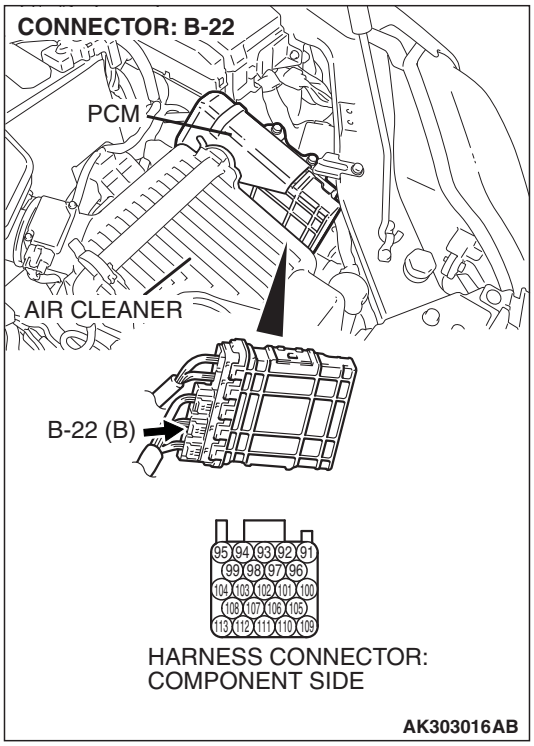
STEP 9. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103).
Q: Is the harness wire in good condition?

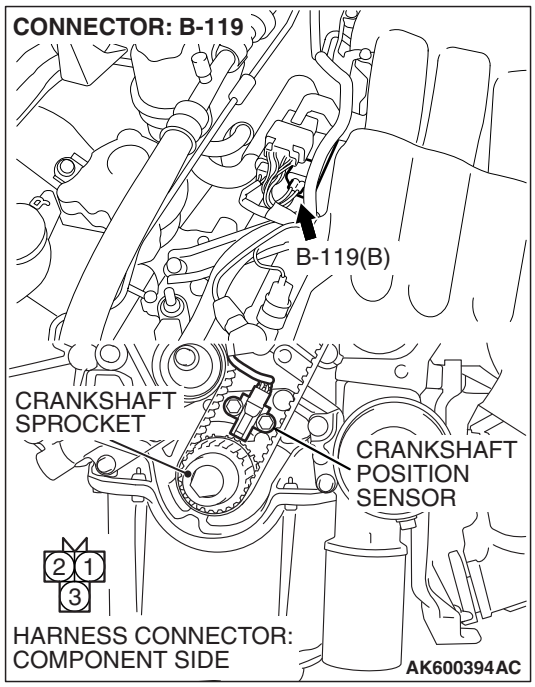
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 21.

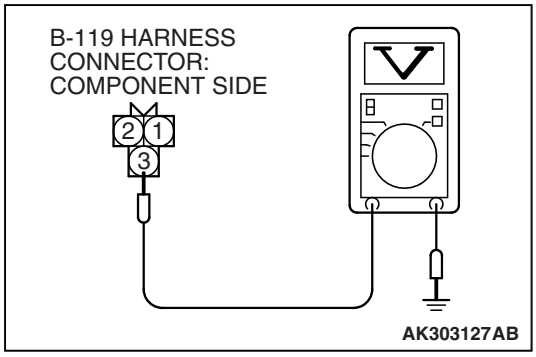
NO : Repair it. Then go to Step 21.

STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-119.

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

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





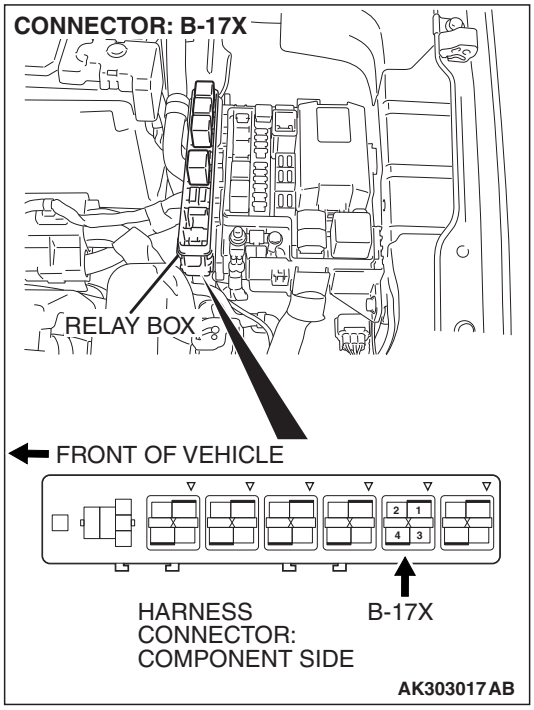
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 13.

NO : Go to Step 12.



STEP 12. Check harness connector B-17X at MFI relay for damage.

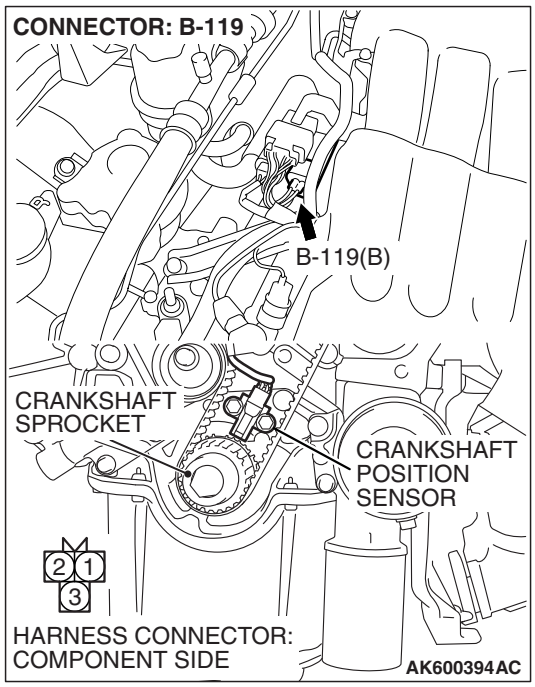
Q: Is the harness connector in good condition?

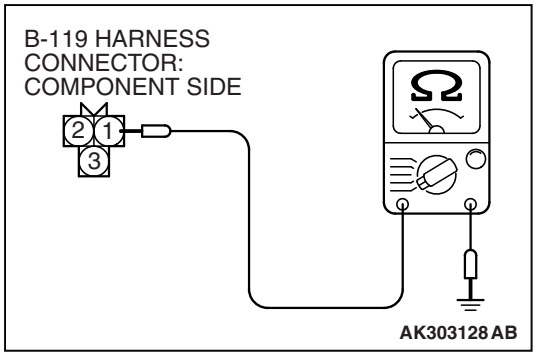
YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and crankshaft position sensor connector B-119 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 21.

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

STEP 13. Check for continuity at crankshaft position sensor harness side connector B-119.

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

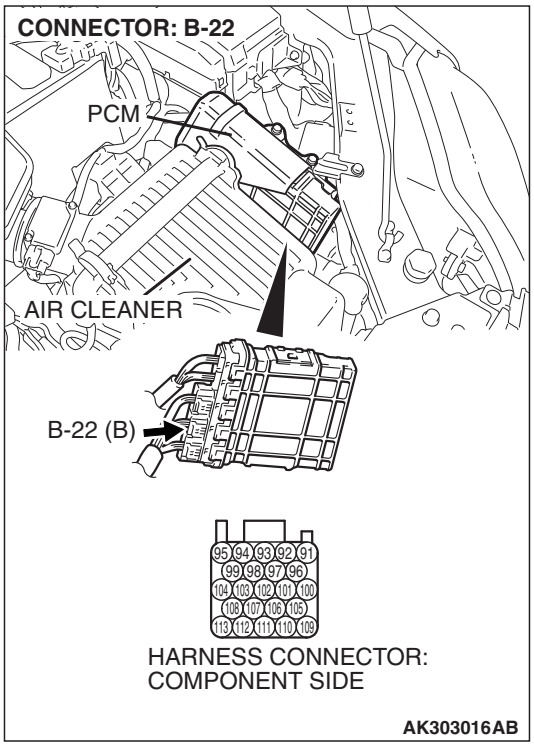




(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

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

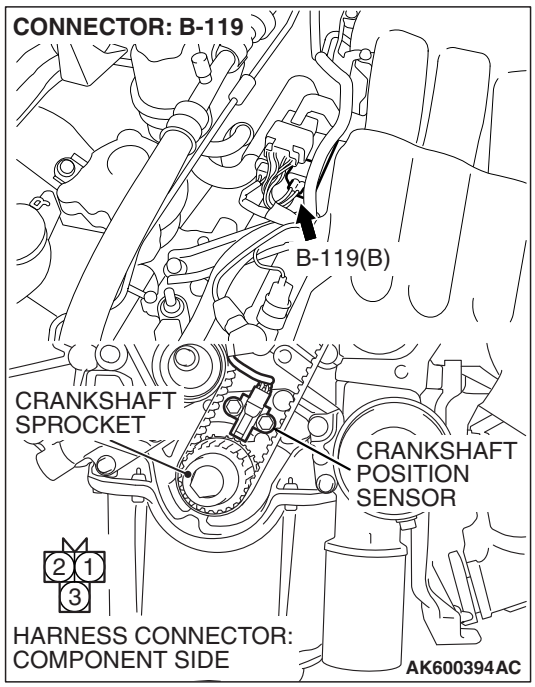


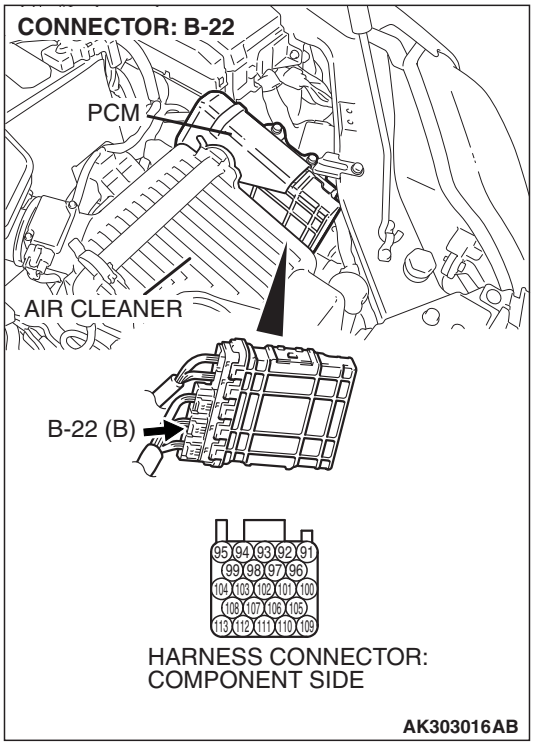
STEP 14. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.

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



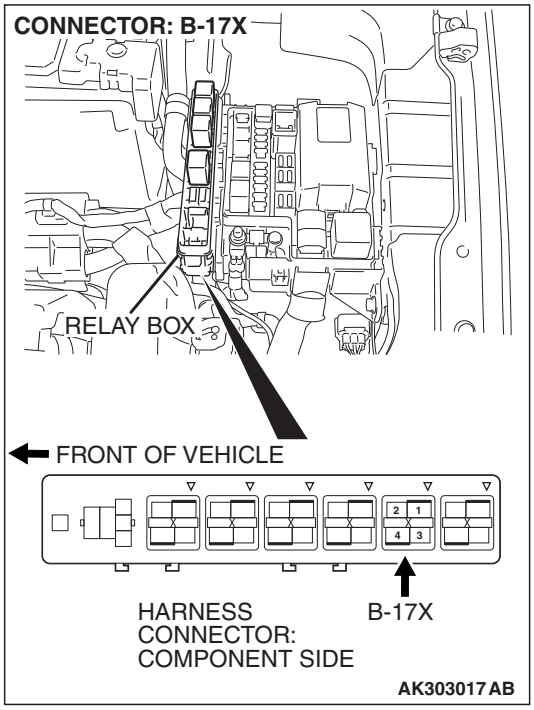


STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-119 (terminal No. 1) and PCM connector B-22 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 21.

NO : Repair it. Then go to Step 21.

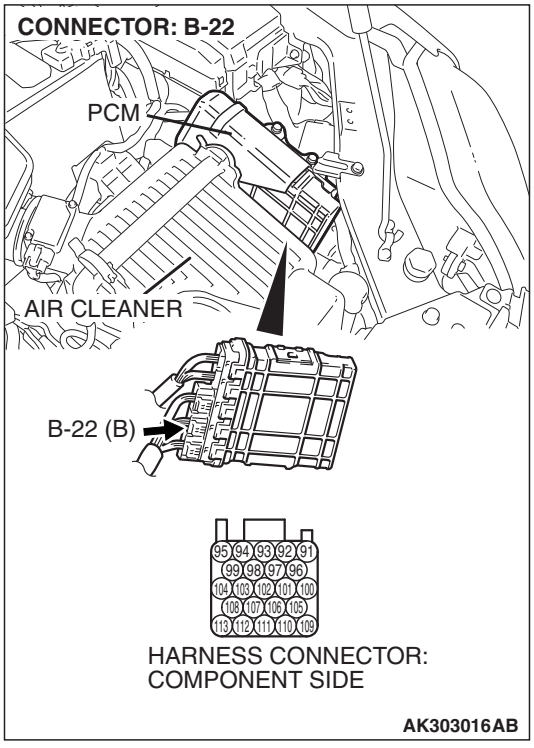


STEP 16. Check harness connector B-17X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

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

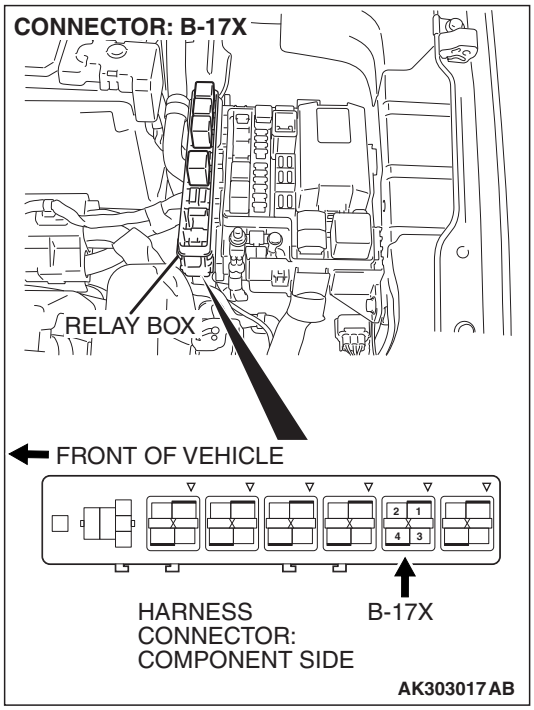


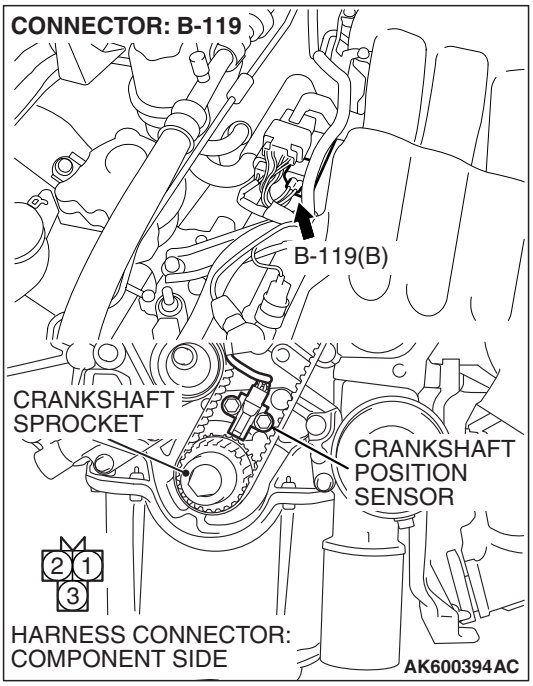
STEP 17. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 18.

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



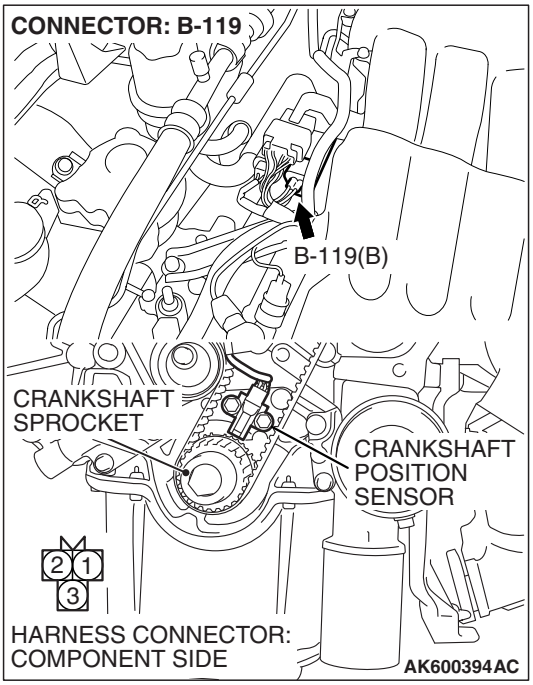


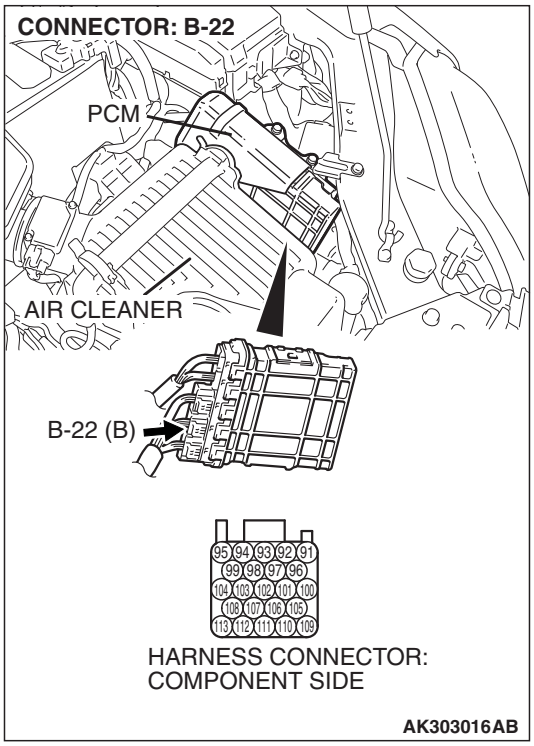
STEP 18. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and crankshaft position sensor connector B-119 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 21.





STEP 19. Check for harness damage between crankshaft position sensor connector B-119 (terminal No. 2) and PCM connector B-22 (terminal No. 103).

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 21.

STEP 20. Check the crankshaft position sensing blade.

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

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

NO : Replace the crankshaft sensing blade. Then go to Step 21.

STEP 21. 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 23 P.13B-5.

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

Q: Is DTC P0335 set?

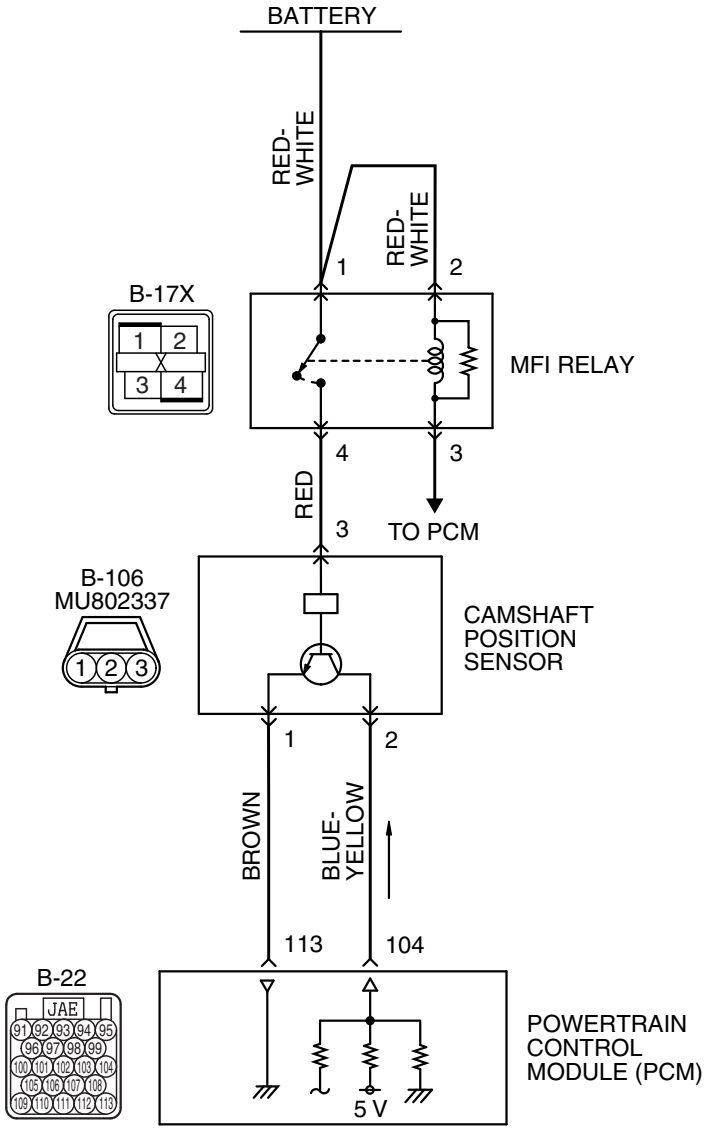
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0340: Camshaft Position Sensor Circuit

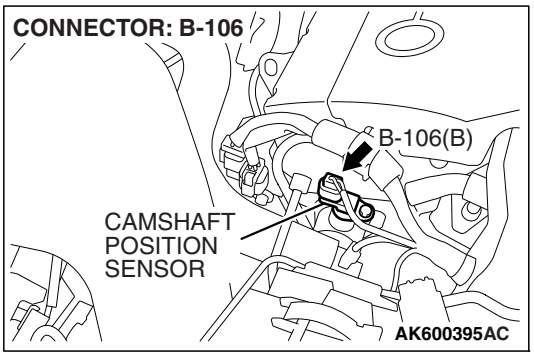
⚠ CAUTION
If DTC P0340 has been set, TCL related DTC U1120 is also set. After P0340 has been diagnosed, don't forget to erase DTC U1120.

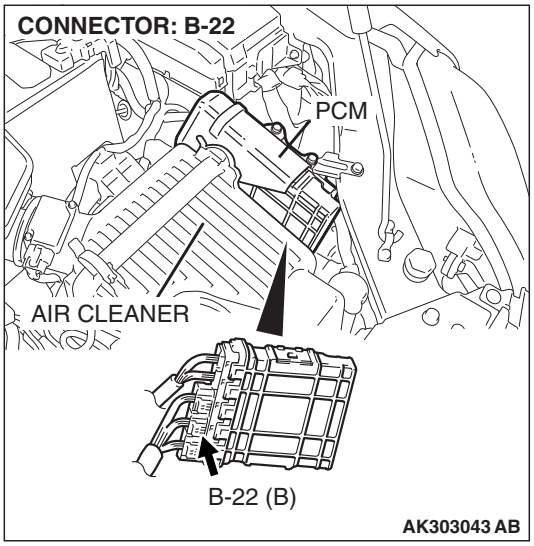
Camshaft Position Sensor Circuit

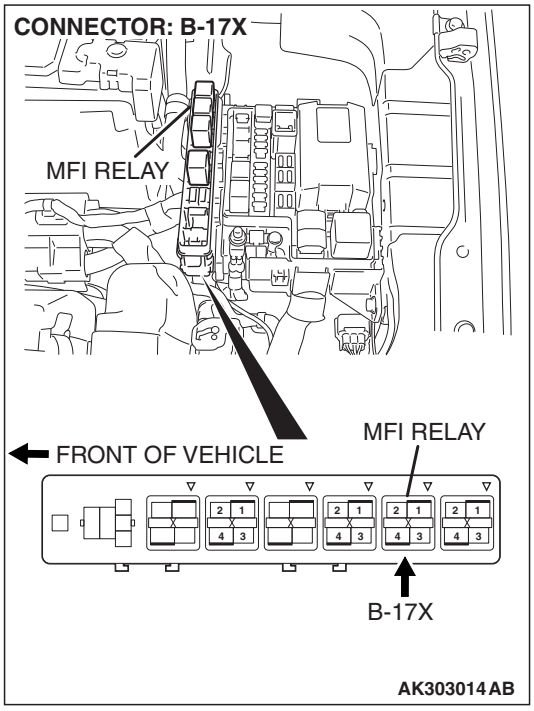


AK400890

TSB Revision







CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the camshaft position sensor is grounded with PCM (terminal No. 113).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 104). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the PCM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Camshaft position sensor signal does not change.
- Camshaft position sensor signal is not normal pattern.

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

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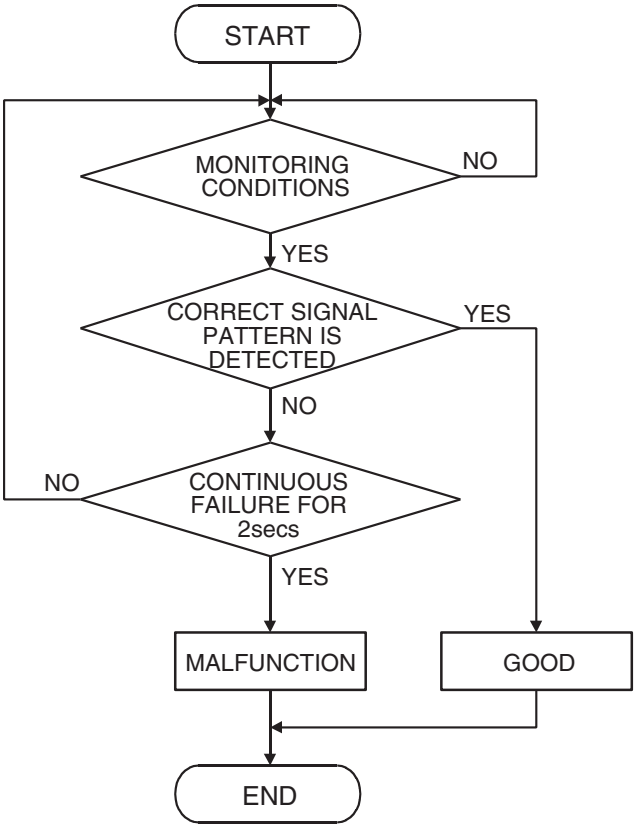
DTC SET CONDITIONS <Range/Performance problem - Alignment>

Logic Flow Chart



AK700576

Check Condition

- Engine is being cranked.

or

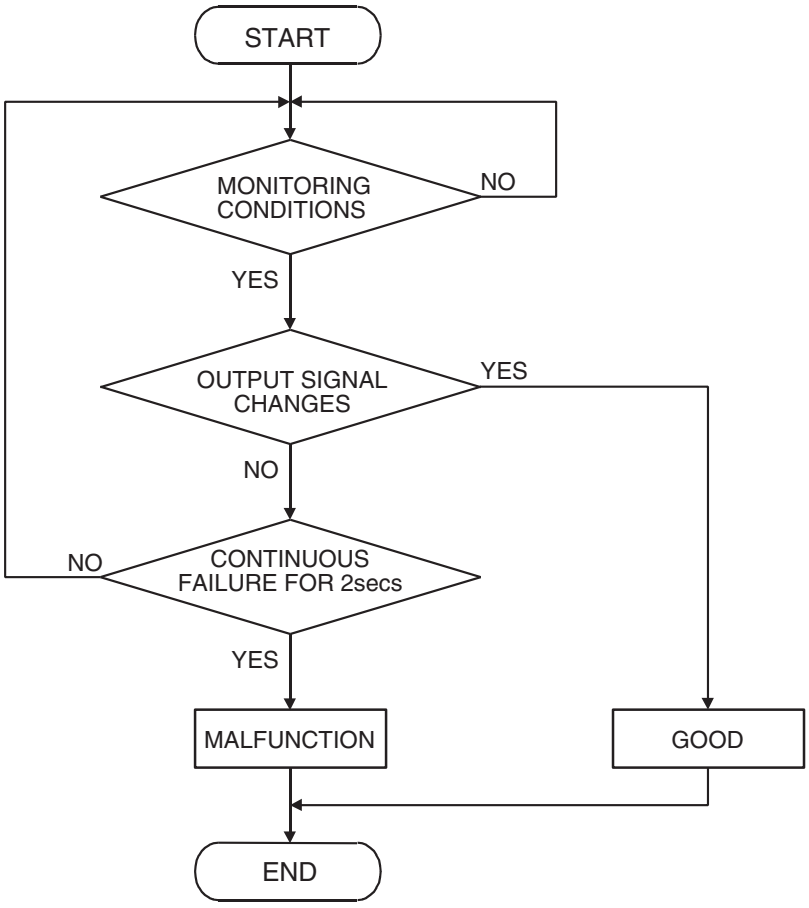
- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



AK302034

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

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

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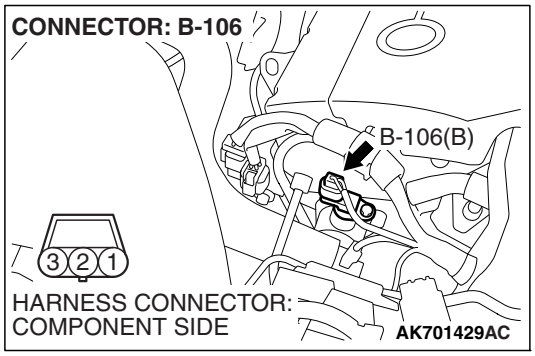
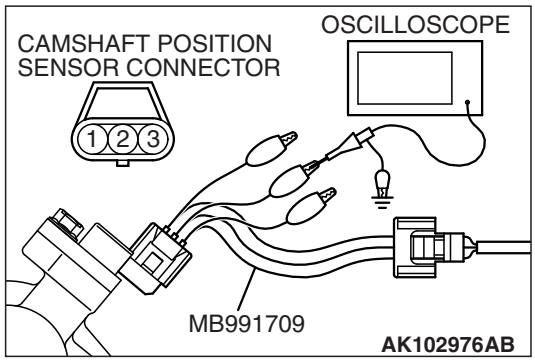
DIAGNOSIS

Required Special Tools:
- MB991709: Test Harness Set
- MB991923: Power Plant ECU Check Harness

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



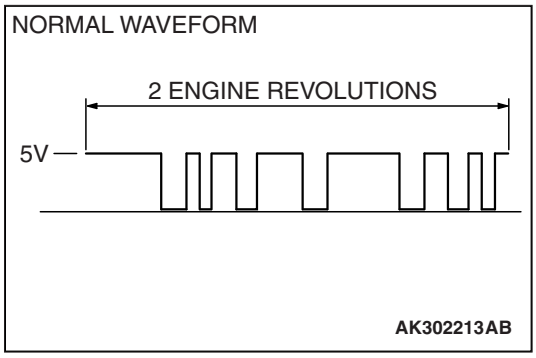
(1) Disconnect the camshaft position sensor connector B-106, and connect test harness special tool (MB991709) between the separated connectors (All terminals should be connected).



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

NOTE: When measuring with the PCM side connector, disconnect all PCM connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 104.

(3) Start the engine and run at idle.

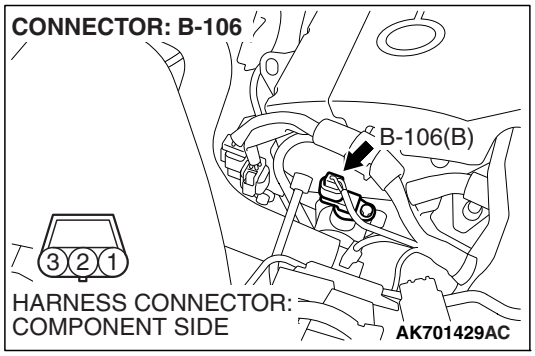


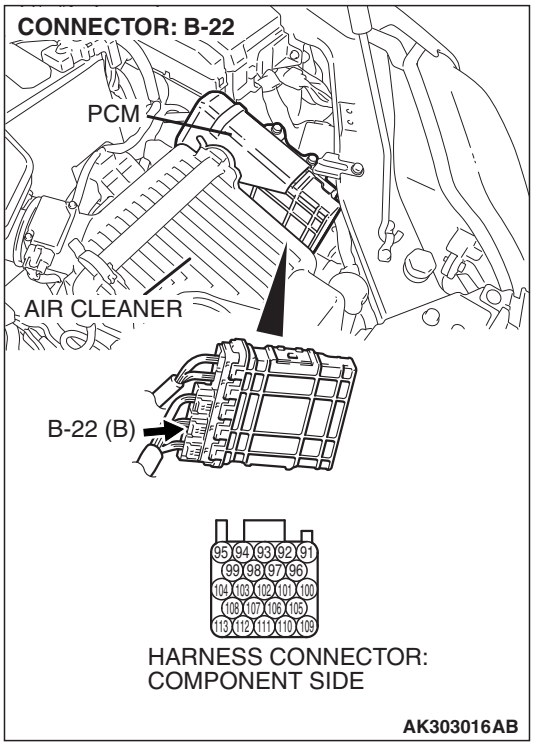
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

YES : Go to Step 2..
NO : Go to Step 4.





STEP 2. Check harness connector B-106 at camshaft position sensor and harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

Q: Is DTC P0340 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 20.

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

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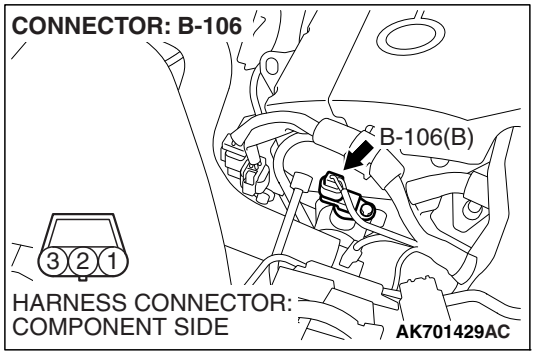
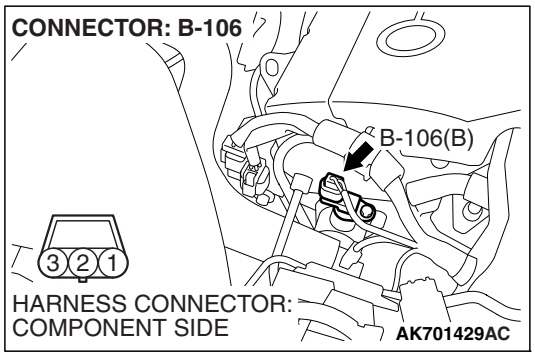


STEP 4. Check harness connector B-106 at camshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

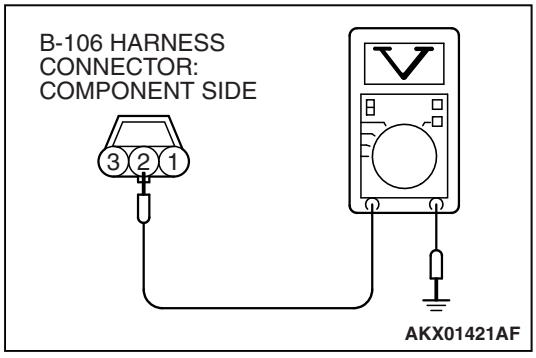
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



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

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

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



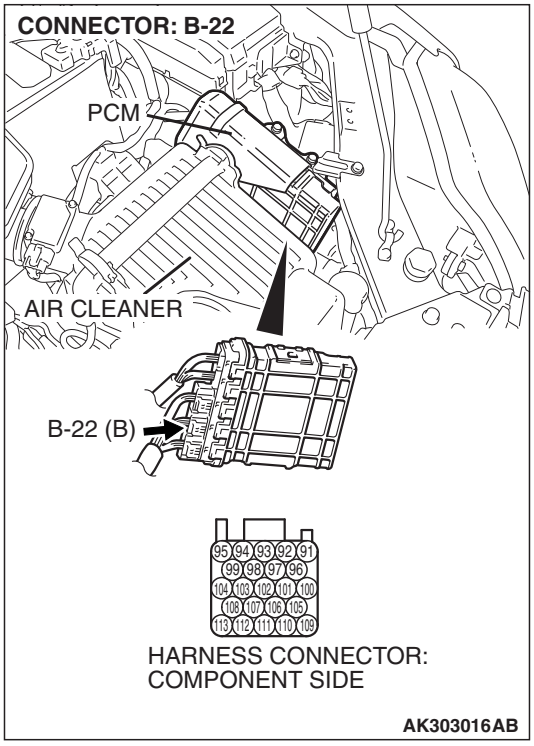
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

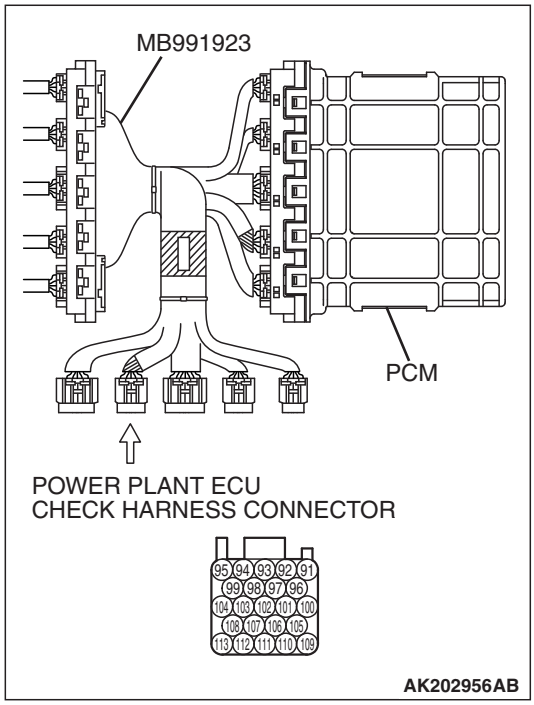
YES : Go to Step 10.

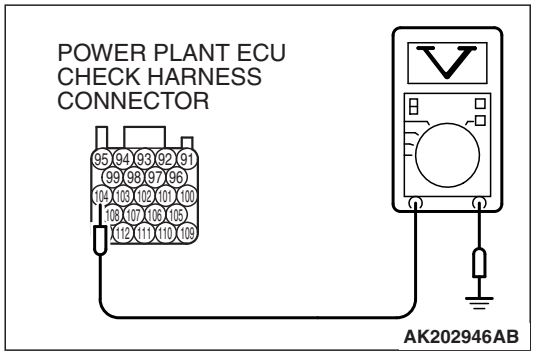
NO : Go to Step 6.



STEP 6. Measure the sensor supply voltage at PCM connector B-22 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the camshaft position sensor connector B-106.
(3) Turn the ignition switch to the "ON" position.



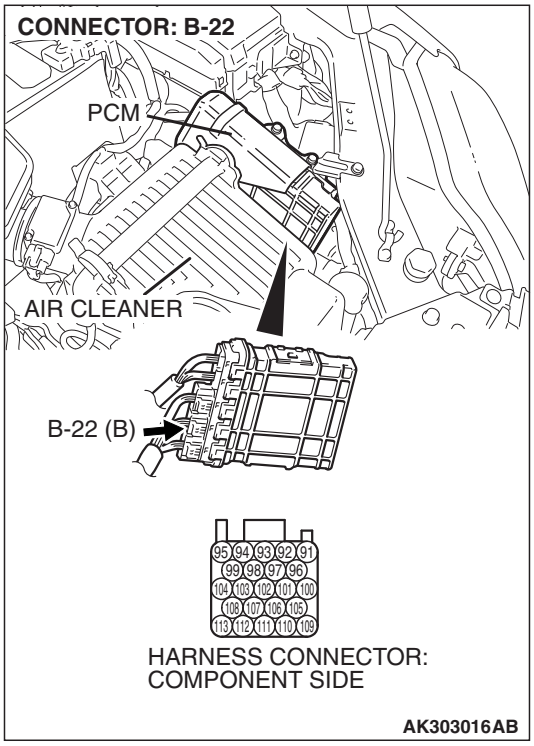


(4) Measure the voltage between terminal No. 104 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

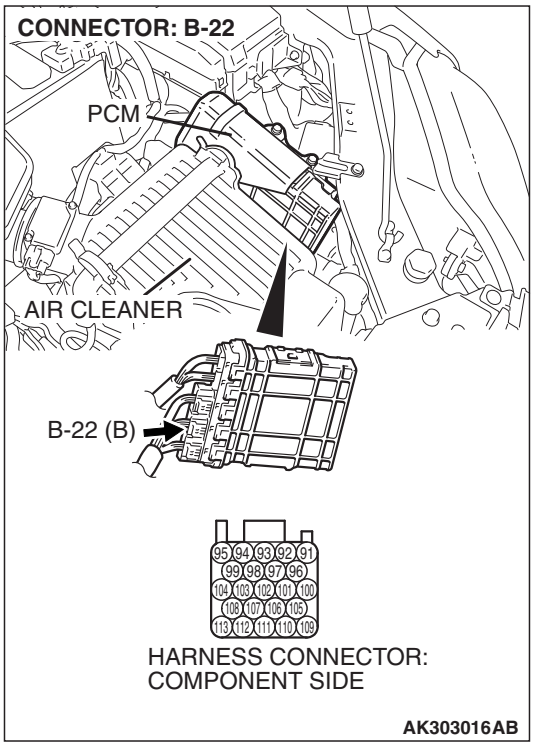
YES : Go to Step 7.
NO : Go to Step 8.



STEP 7. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104) because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

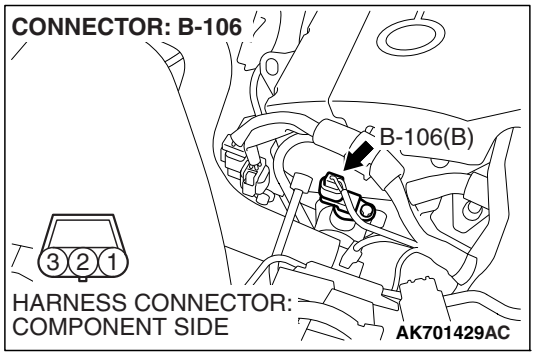


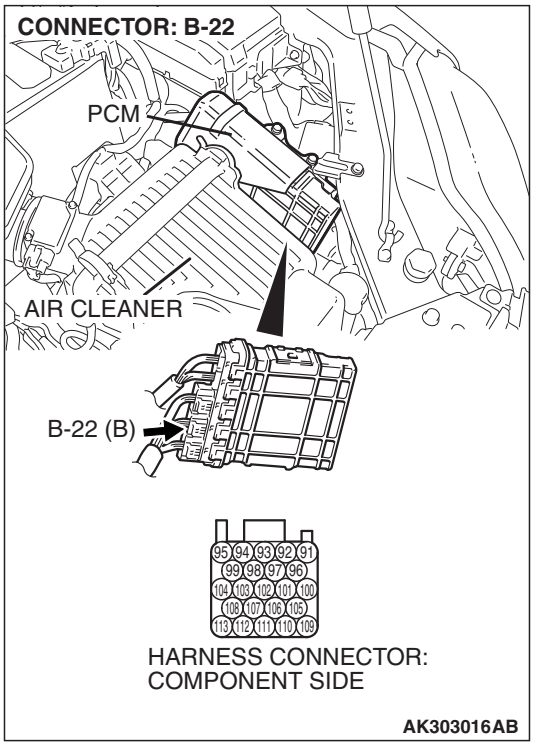
STEP 8. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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

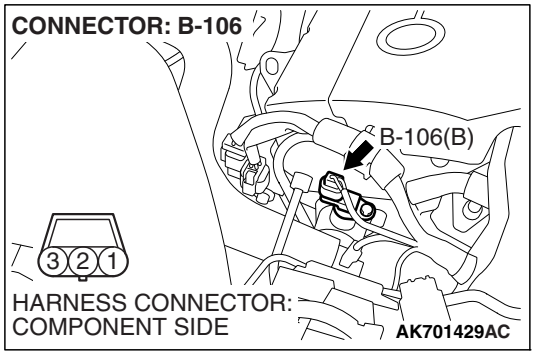




STEP 9. Check for short circuit to ground between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104).
Q: Is the harness wire in good condition?

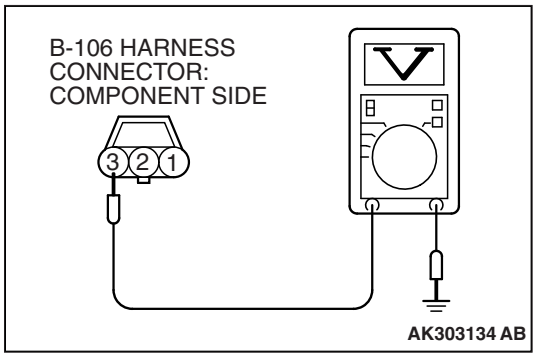
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 20.

NO : Repair it. Then go to Step 20.



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

(1) Disconnect 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. 3 and ground.
- Voltage should be battery positive voltage.

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

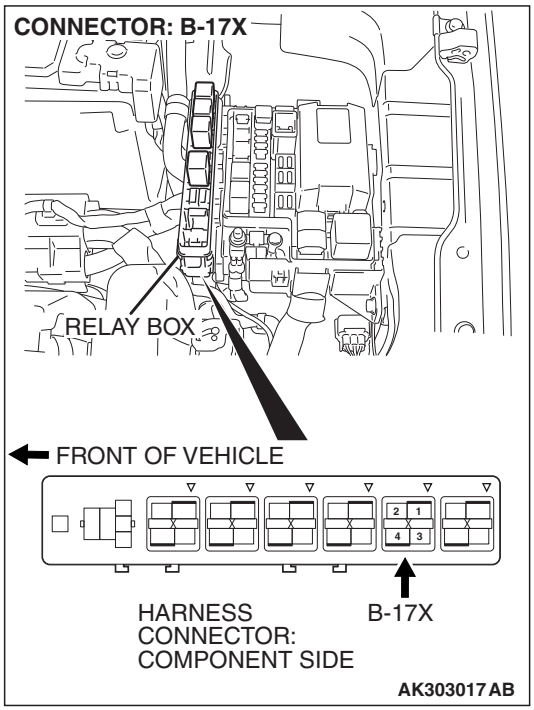
Q: Is battery positive voltage (approximately 12 volts) present?

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

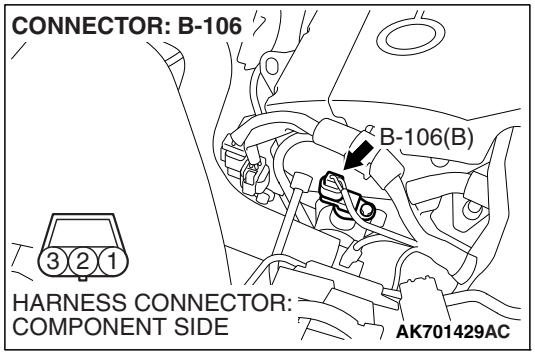
STEP 11. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

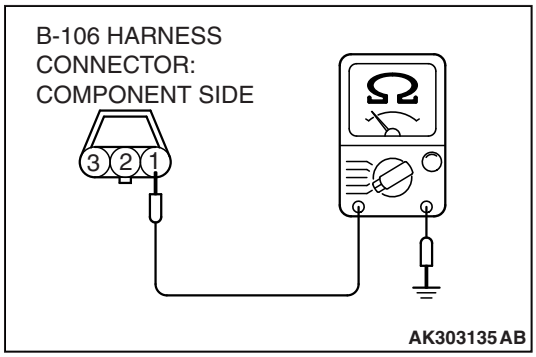
YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 12. Check the continuity at camshaft position sensor connector B-106.



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

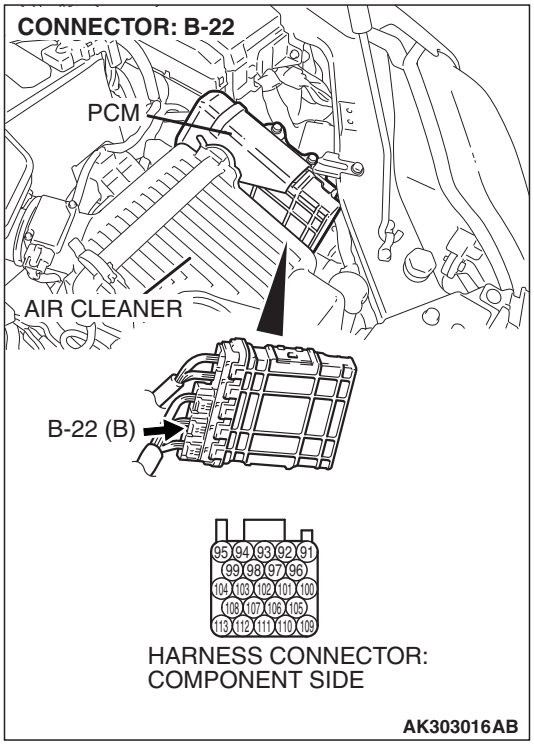


(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 Ω or less)

Q: Does continuity exist?

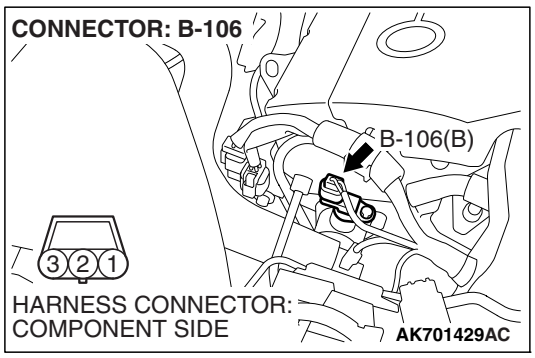
YES : Go to Step 15.
NO : Go to Step 13.

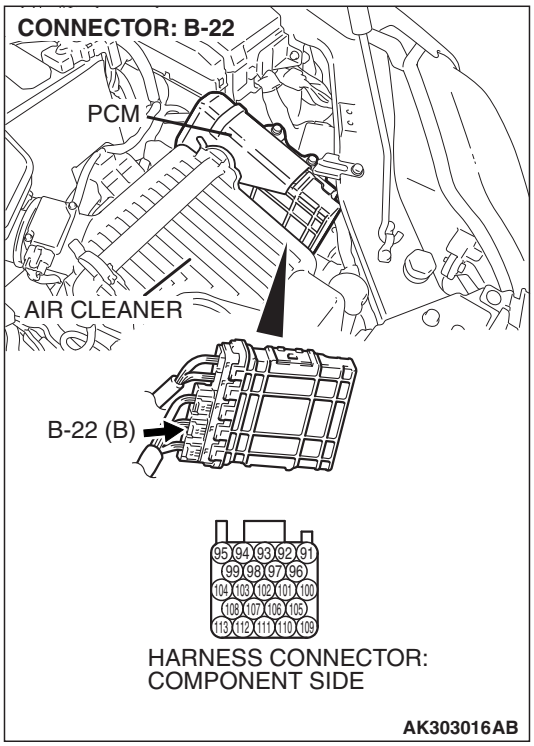
STEP 13. Check harness connector B-22 at PCM for damage.



Q: Is the harness connector in good condition?

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



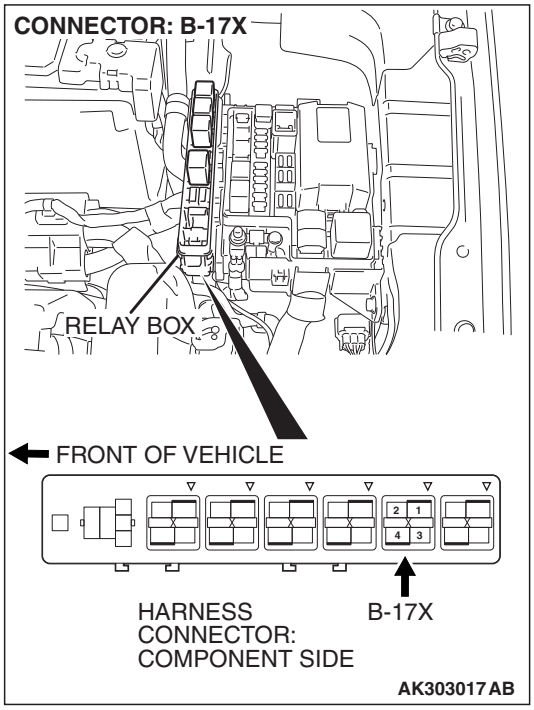


STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-106 (terminal No. 1) and PCM connector B-22 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 20.

NO : Repair it. Then go to Step 20.

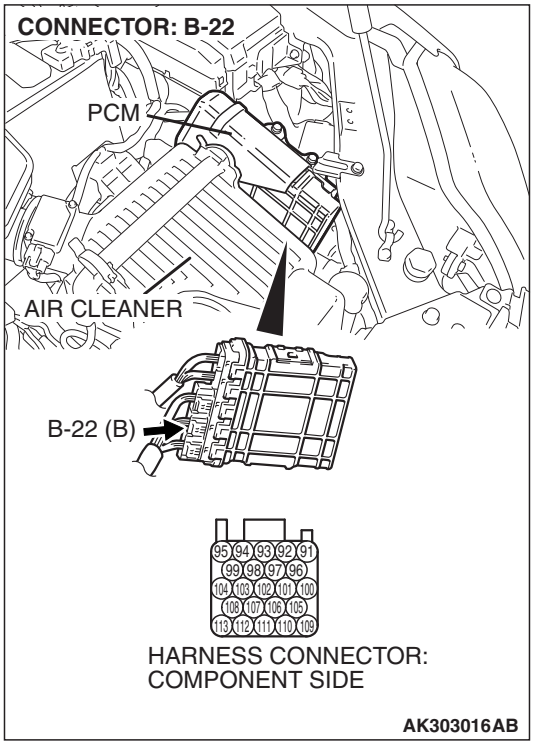


STEP 15. Check harness connector B-17X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.

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

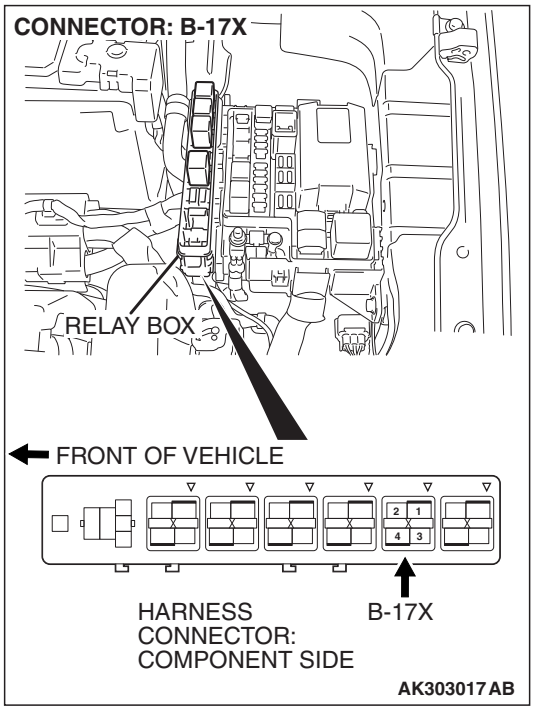


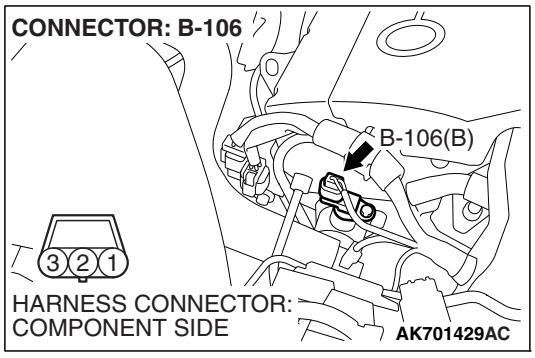
STEP 16. Check harness connector B-22 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

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



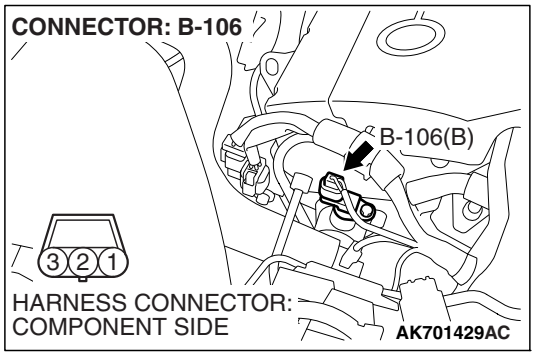


STEP 17. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.

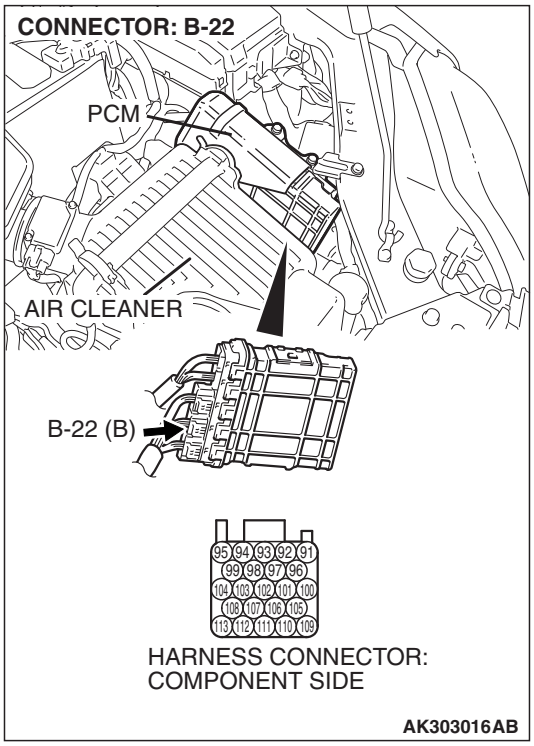


STEP 18. Check for harness damage between camshaft position sensor connector B-106 (terminal No. 2) and PCM connector B-22 (terminal No. 104).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 20.



STEP 19. Check the camshaft position sensing cylinder.

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

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

NO : Replace the camshaft position sensing cylinder. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13B-5.

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

Q: Is DTC P0340 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR valve (stepper motor) is actuated from the fully closed position toward the open position while the engine is running, EGR gas flows.
- The PCM checks how the EGR gas flow signal changes.

DESCRIPTIONS OF MONITOR METHODS

Small manifold pressure change during exhaust gas recirculation (EGR) operation from closed to open.

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)

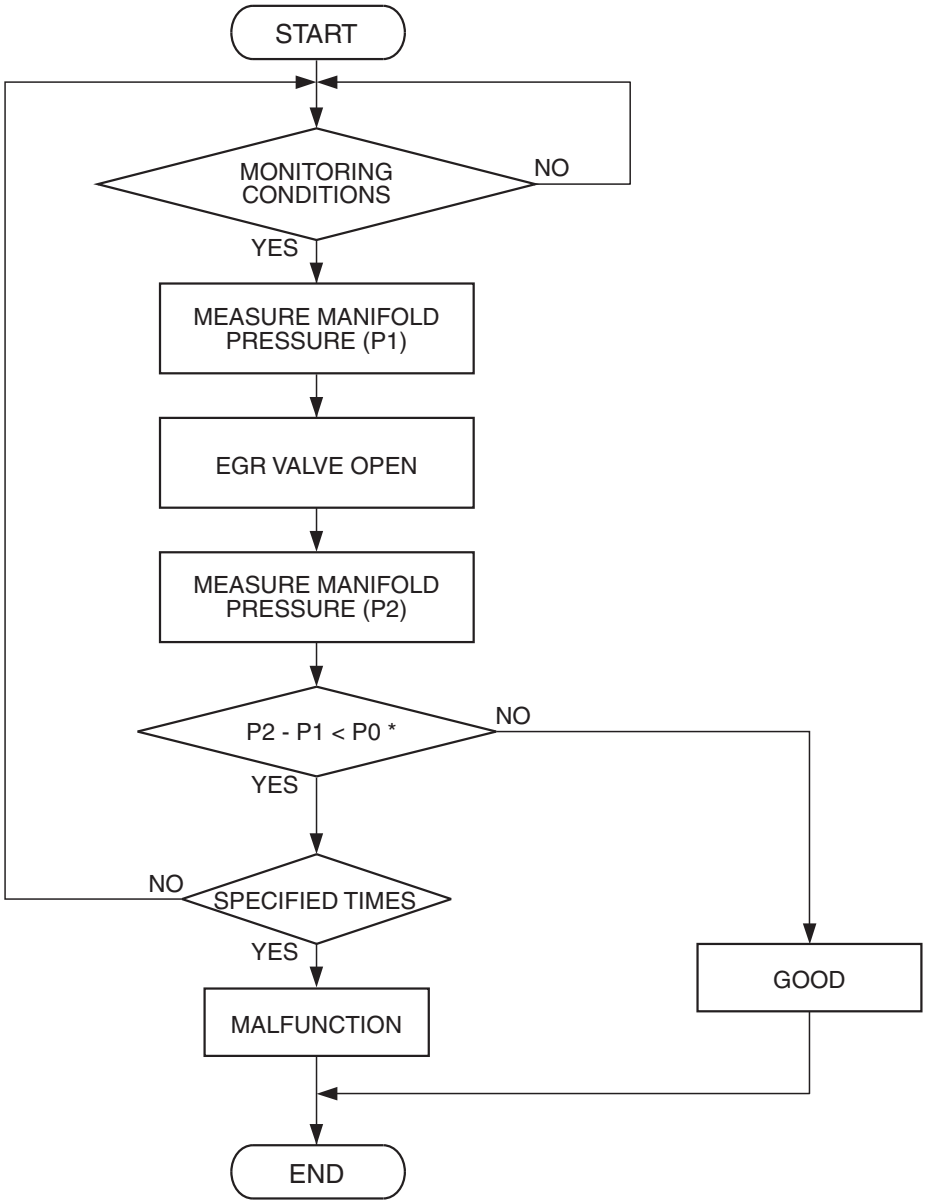
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



P0 : THRESHOLD VALUE

AK204016

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76° C (169° F).
- Engine speed is between 940 and 2,500 r/min.
- Intake air temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Vehicle speed is 30 km/h (19 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- The throttle valve is closed.
- Volumetric efficiency is lower than 29 percent.
- The PCM monitors for this condition for 3 cycles of 1.6 seconds each during the drive cycle.

TSB Revision

Judgement Criterion

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.0 kPa (0.59 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13B-5.

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

- Contaminated EGR valve and EGR passage.
- EGR valve (stopper motor) failed.
- Open or shorted EGR valve (stopper motor) circuit, or connector damage.
- Manifold absolute pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control –Exhaust Gas Recirculation (EGR) System –General Description (exhaust gas recirculation system) P.17-93.

Q: Are there any abnormalities?

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

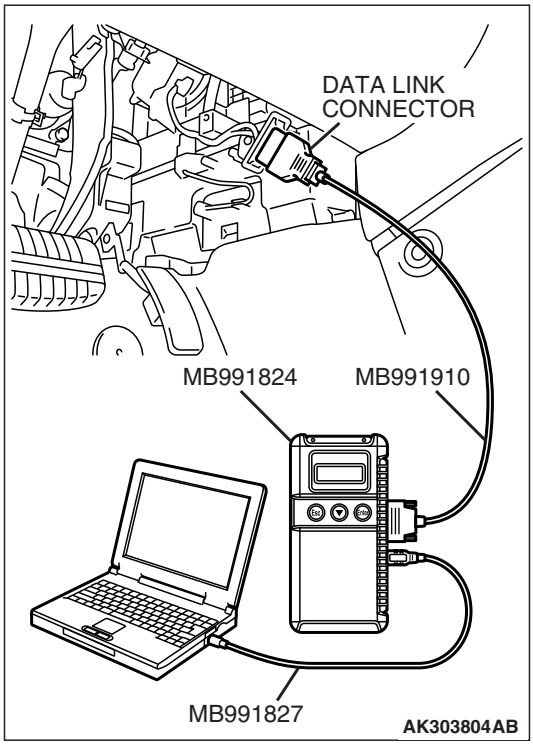
STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

⚠ 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) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - Should be between 16 –36 kPa (4.7 –10.6 in.Hg) at engine idling.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range/Performance Problem P.13B-182, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-196, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13B-208.



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 3 P.13B-5.

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

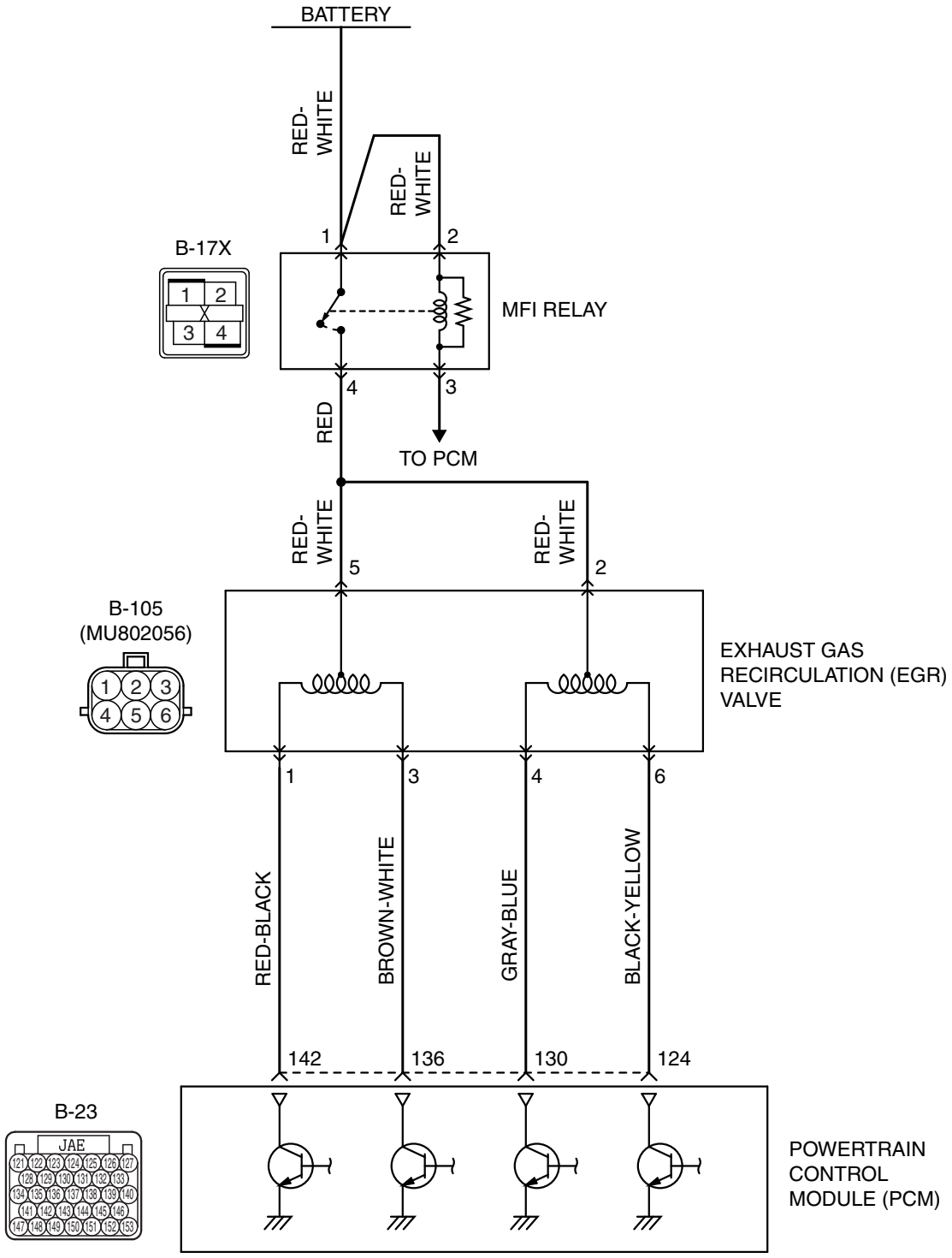
Q: Is DTC P0401 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

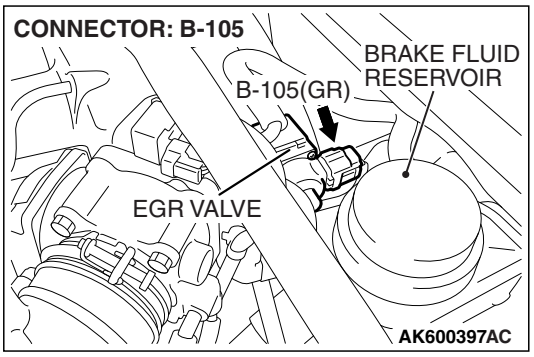
DTC P0403: Exhaust Gas Recirculation Control Circuit

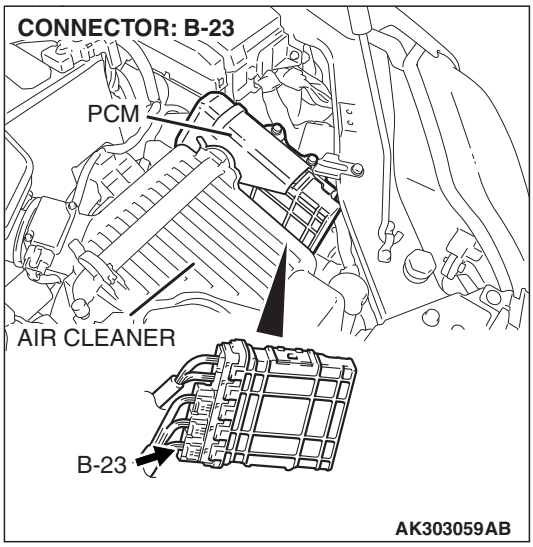
EGR Valve Circuit

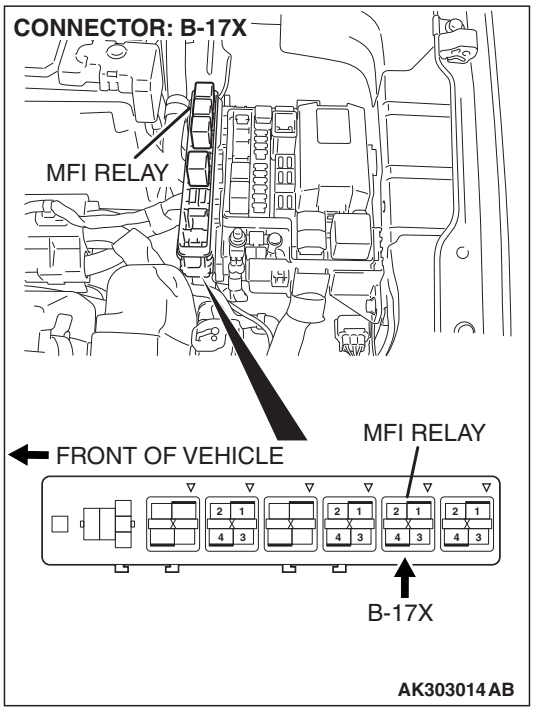


AK400915

TSB Revision







CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 4).
- The PCM (terminals No. 124, No. 130, No. 136, No. 142) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the EGR valve (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR valve (stepper motor) drive circuit, PCM measure the surge voltage of the EGR valve motor coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after stepper motor is operated on to off.

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)

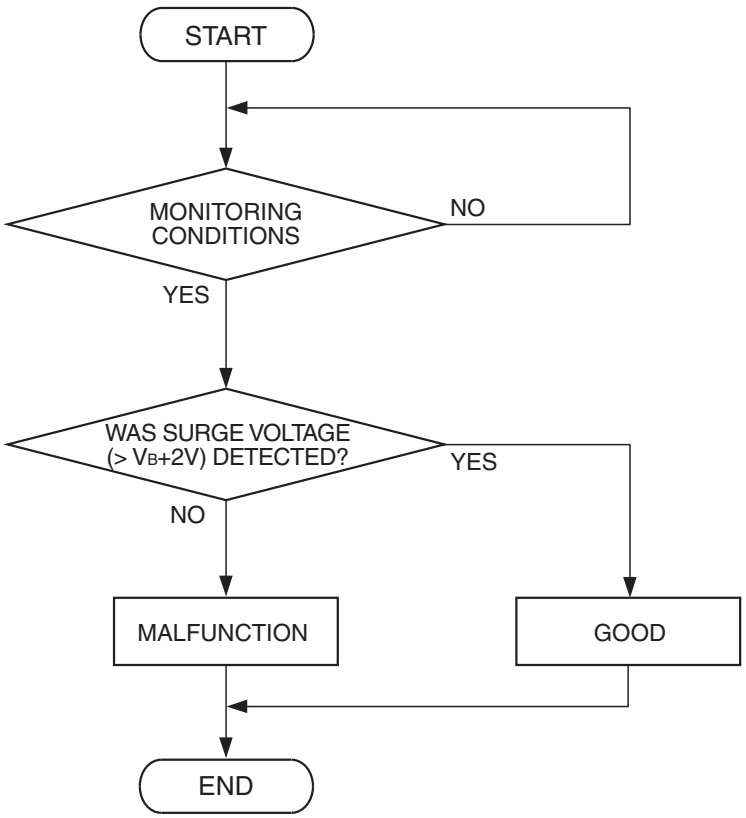
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK204017

Check Conditions
- Battery positive voltage is higher than 10.3 volts.
- In a few seconds, just after ignition switch is turned to the "ON" position from the "LOCK" (OFF) position. (While EGR valve is initialized.)

Judgement Criterion
- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 3 seconds.

Check Condition
- Battery positive voltage is higher than 10.3 volts.

Judgement Criterion
- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 30 seconds when the EGR valve is turned to "OFF" from "ON".

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13B-5.

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

- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, harness damage or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

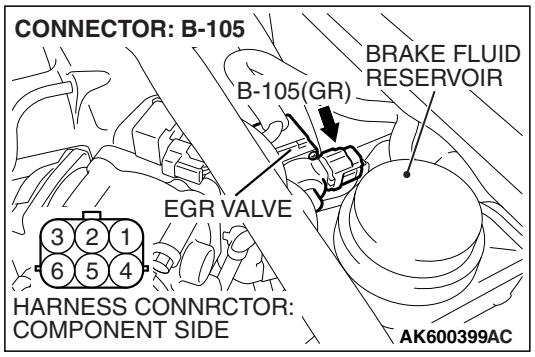
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness Set
- MB991923: Power Plant ECU Check Harness

STEP 1. Check harness connector B-105 at EGR valve for damage.

Q: Is the harness connector in good condition?

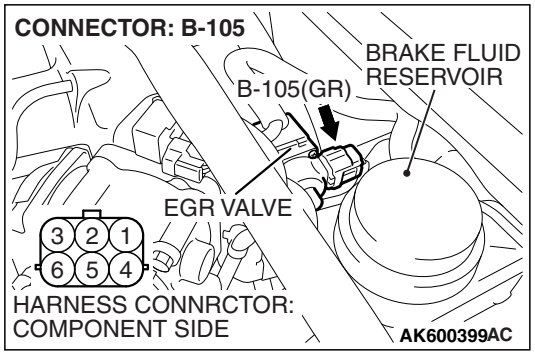
YES : Go to Step 2.

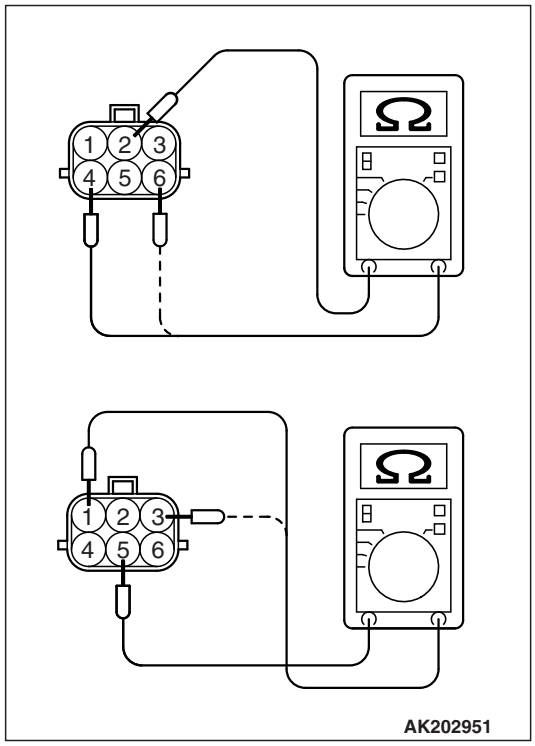
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-105.





(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 4 or terminal No. 6.

Standard value: 20 – 24 Ω [at 20° C (68° F)]

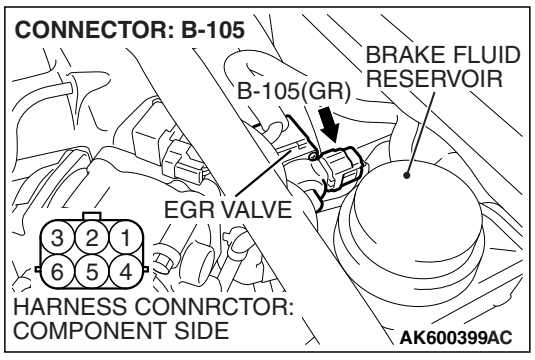
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 1 or terminal No. 3.

Standard value: 20 – 24 Ω [at 20° C (68° F)]

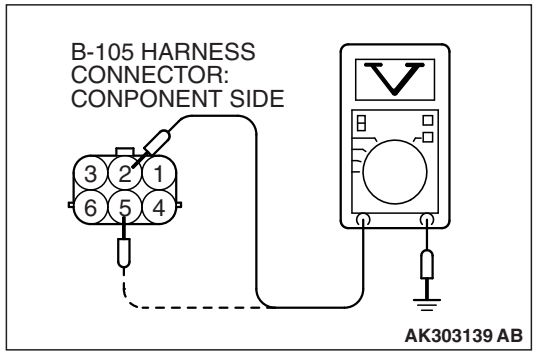
Q: Is the measured resistance between 20 and 24 ohms [at 20° C (68° F)]?

YES : Go to Step 3.
NO : Replace the EGR valve. Then go to Step 12.

STEP 3. Measure the power supply voltage at EGR valve motor harness side connector B-105.



(1) Disconnect the connector B-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

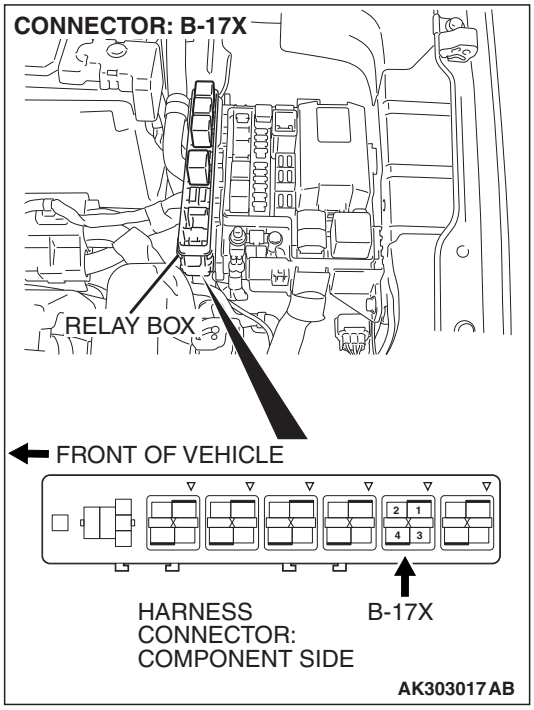


(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

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

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

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



STEP 4. Check harness connector B-17X at MFI relay for damage.

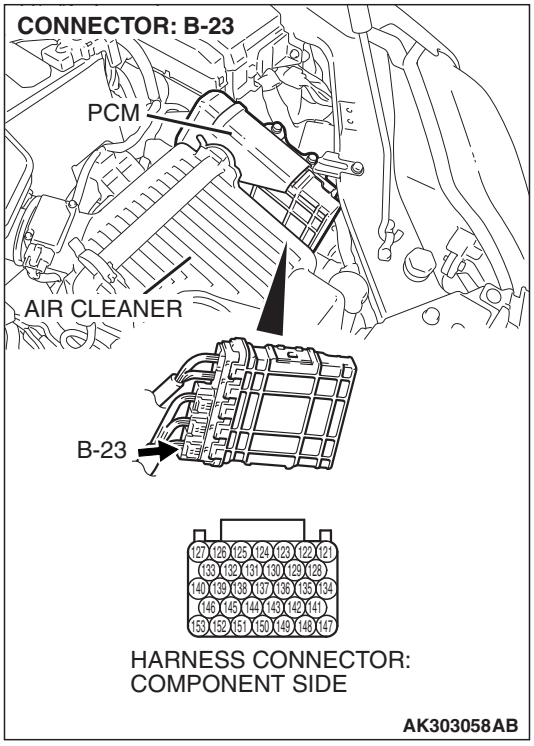
Q: Is the harness connector in good condition?

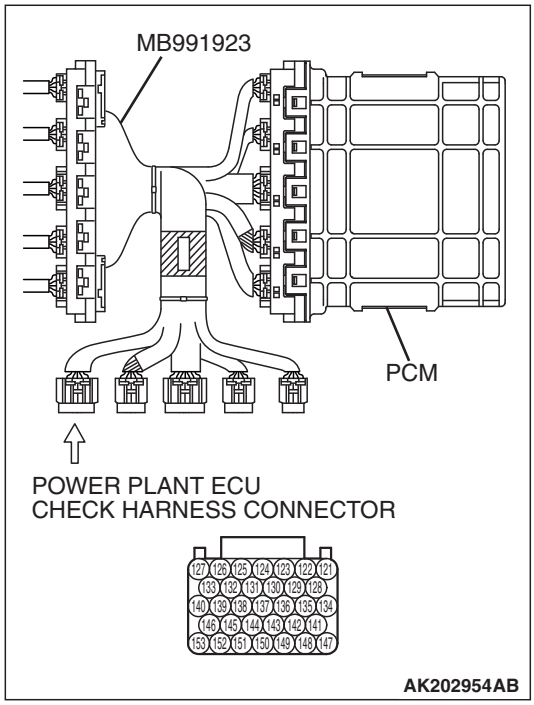
YES : Repair harness wire between MFI relay connector B-17X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 12.

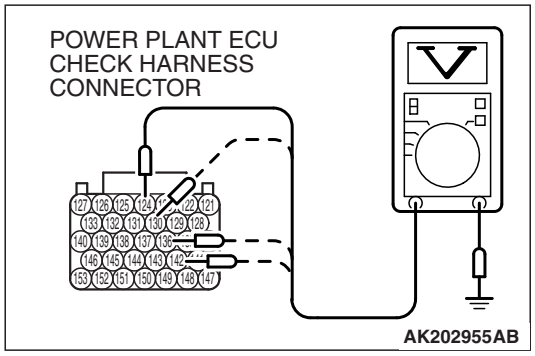
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at PCM connector B-23 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all PCM connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.





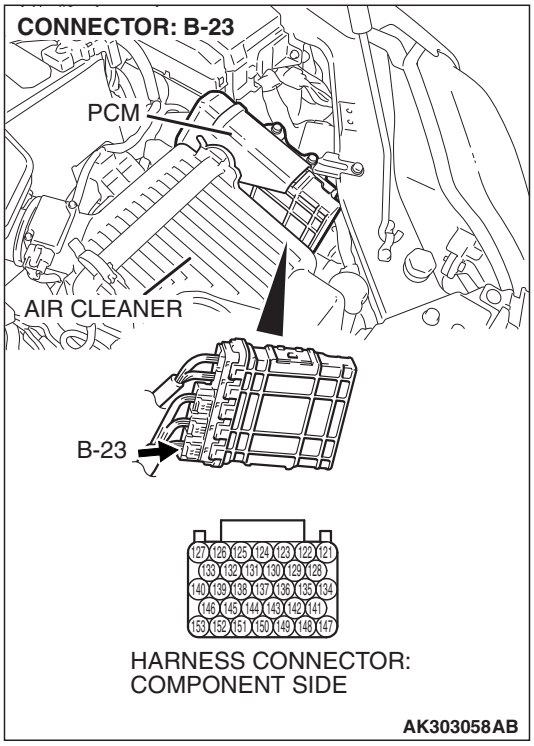


(2) Measure the voltage between terminal (No. 124, No. 130, No. 136, No. 142) and ground.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

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

Q: Is the voltage normal?

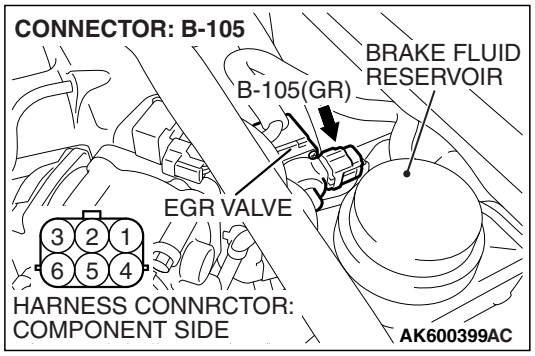
YES : Go to Step 8.
NO : Go to Step 6.

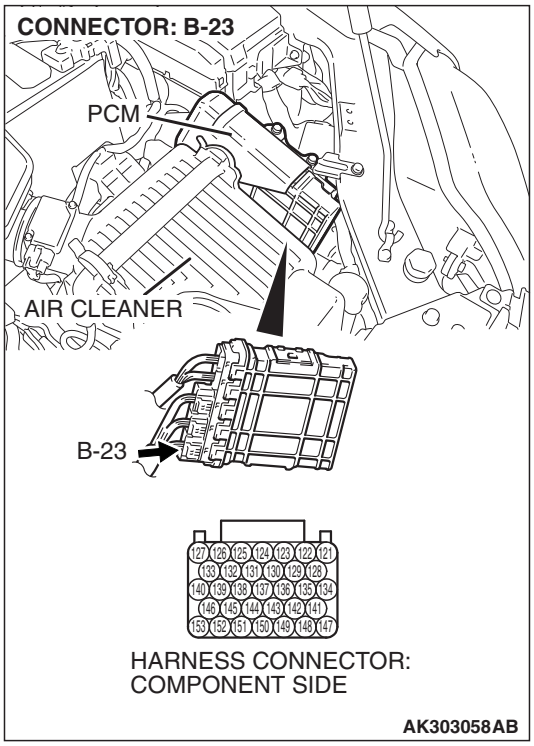


STEP 6. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

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





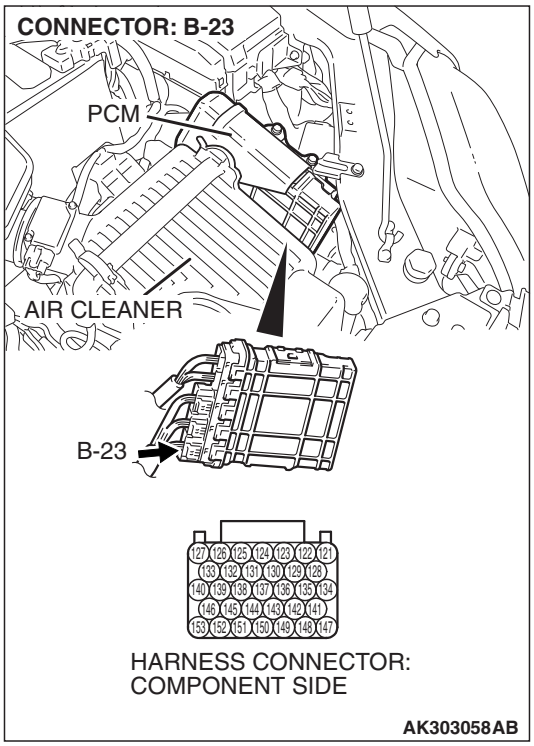
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-105 and PCM connector B-23.

a. EGR valve connector B-105 (terminal No. 1) and PCM connector B-23 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and PCM connector B-23 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and PCM connector B-23 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and PCM connector B-23 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. Then go to Step 12.

NO : Repair it. Then go to Step 12.

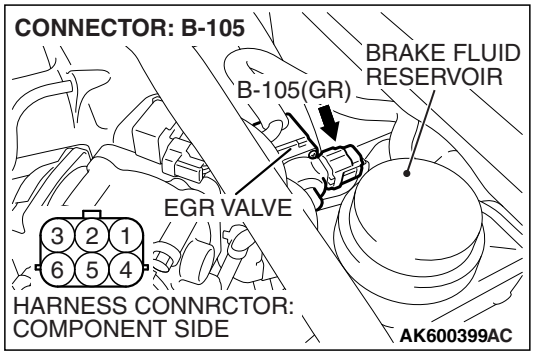


STEP 8. Check harness connector B-23 at PCM for damage.

Q: Is the harness connector in good condition?

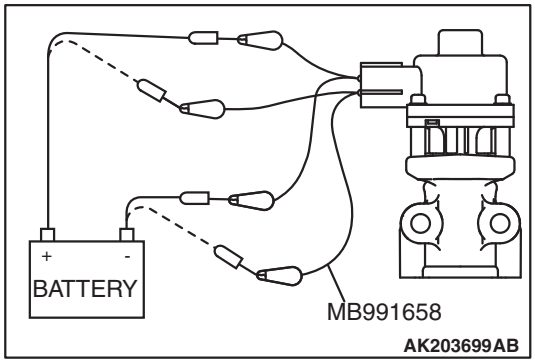
YES : Go to Step 9.

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



STEP 9. Check the EGR valve operation using special tool MB991658.

(1) Remove the EGR valve.



(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 5 of the EGR valve connector to the positive battery terminal.
(4) Check to ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(5) Then, use jumper wires to connect the terminal No. 2 of the EGR valve connector to the positive battery terminal.

(6) Check to ensure that the motor operates when terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque: 24 ±3 N· m [17 ±2 ft· lb]

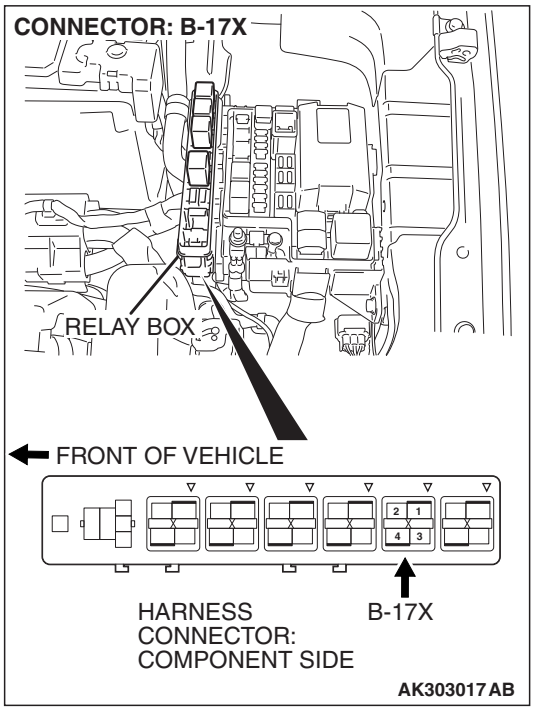
Q: Is the EGR valve operating properly?

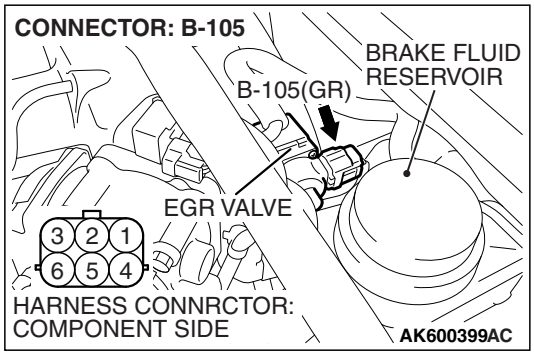
YES : Go to Step 10.
NO : Replace the EGR valve. Then go to Step 12.

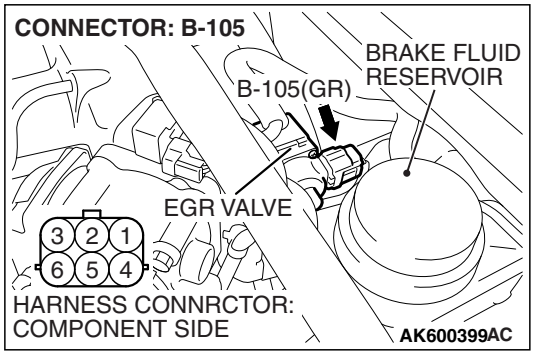
STEP 10. Check for harness damage between MFI relay connector B-17X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5).

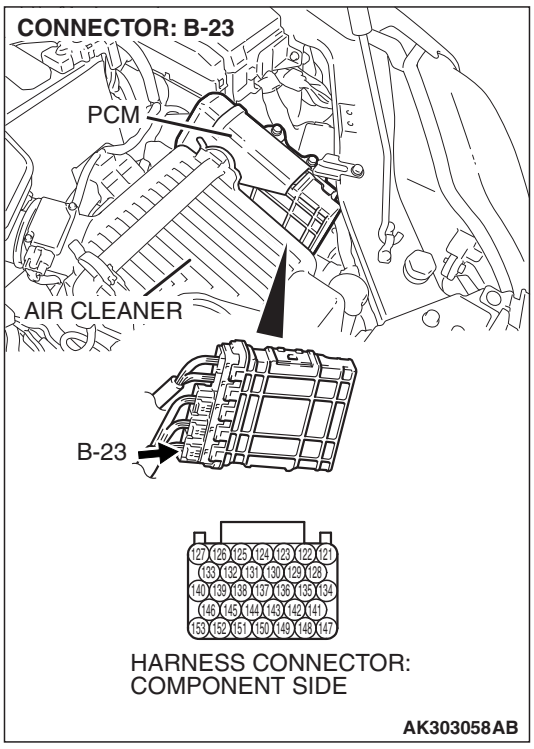
Q: Is the harness wire in good condition?

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









STEP 11. Check for harness damage between EGR valve connector B-105 and PCM connector B-23.

a. EGR valve connector B-105 (terminal No. 1) and PCM connector B-23 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and PCM connector B-23 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and PCM connector B-23 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and PCM connector B-23 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10. 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 23 P.13B-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

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

DTC P0421: Warm Up Catalyst Efficiency Below Threshold (bank 1)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

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)

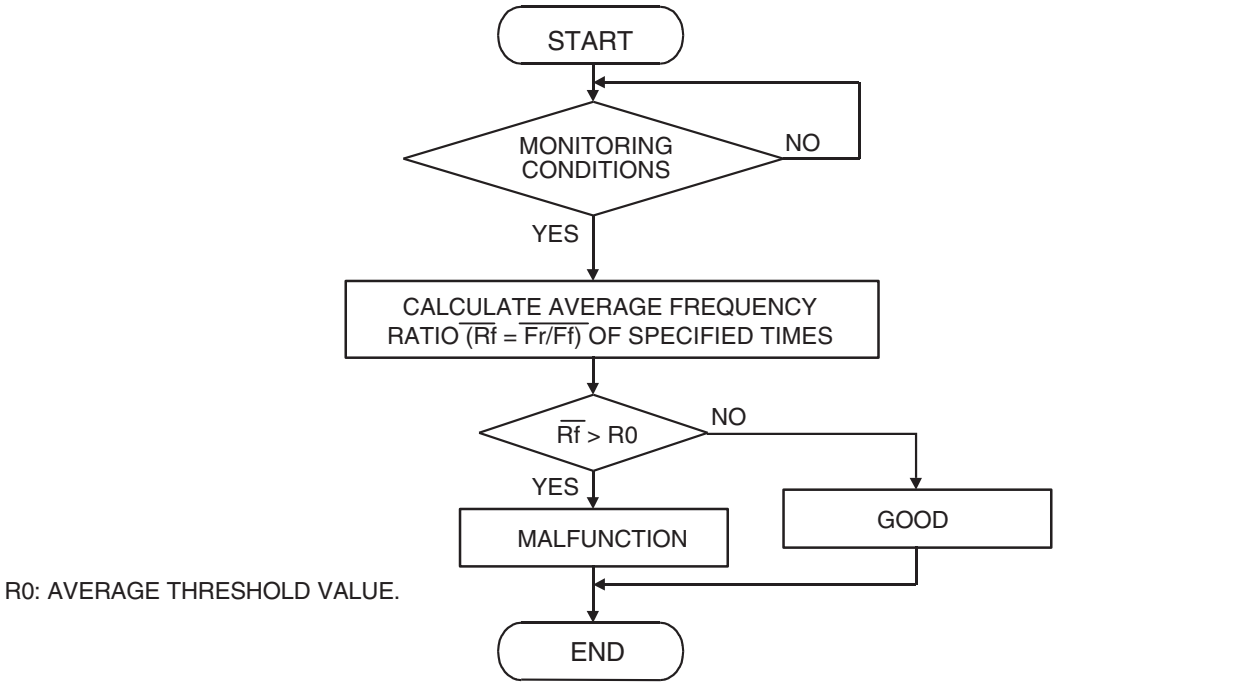
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- 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
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK303028

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is depressed.
- Mass airflow is between 10 and 35 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 5 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than −30 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criteria

- When the right bank heated oxygen sensor (rear) signal frequency is divided by the right bank heated oxygen sensor (front) signal frequency, the average is more than 0.7.
- The right bank heated oxygen sensor (rear) signal frequency divided by the right bank heated oxygen sensor (front) signal frequency is more than 0.2.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function −OBD-II Drive Cycle − Pattern 4 P.13B-5.

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

- Right bank side catalytic converter deteriorated.
- Right bank heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

STEP 1. Replace the right bank side catalytic converter.

(1) Replace the right bank side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10.
NO : The inspection is complete.

DTC P0431: Warm Up Catalyst Efficiency Below Threshold (bank 2)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

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)

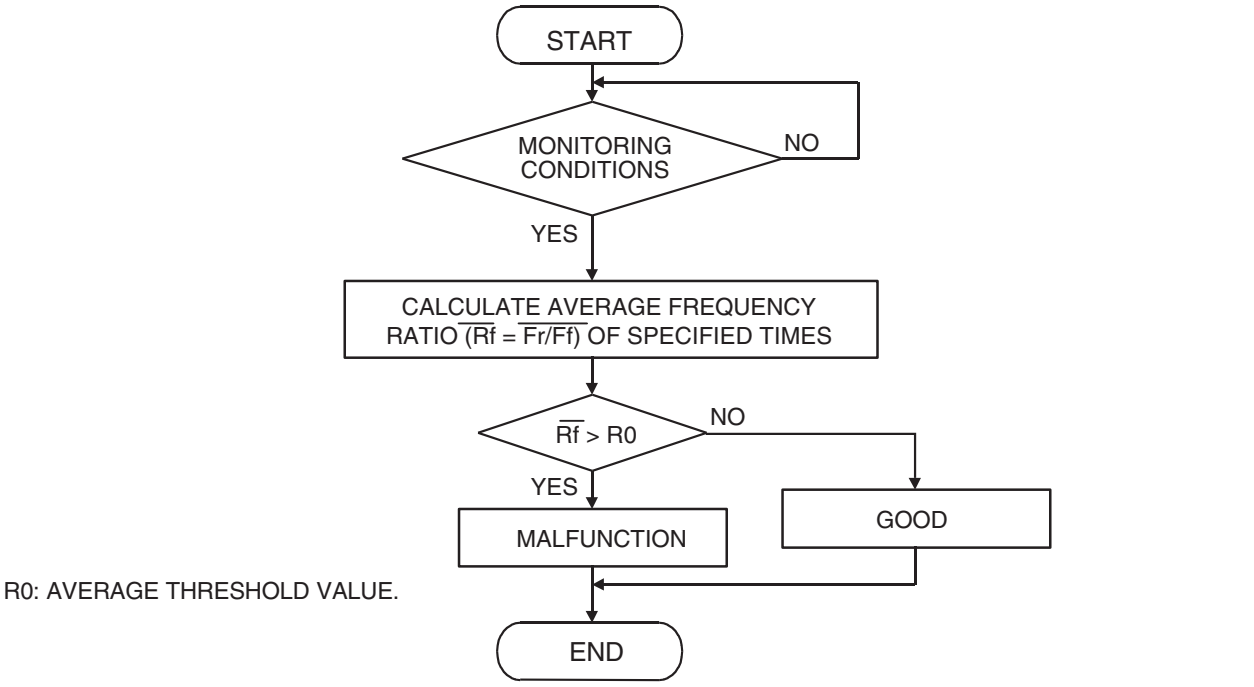
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- 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
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK303028

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is depressed.
- Mass airflow is between 10 and 35 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 5 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than −30 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criteria

- When the left bank heated oxygen sensor (rear) signal frequency is divided by the left bank heated oxygen sensor (front) signal frequency, the average is more than 0.7.
- The left bank heated oxygen sensor (rear) signal frequency divided by the left bank heated oxygen sensor (front) signal frequency is more than 0.2.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function −OBD-II Drive Cycle − Pattern 4 P.13B-5.

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

- Left bank side catalytic converter deteriorated.
- Left bank heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Replace the left bank side catalytic converter.

(1) Replace the left bank side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13B-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0431 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch –Encrypted Code Registration Criteria Table P.54A-10.

NO : The inspection is complete.