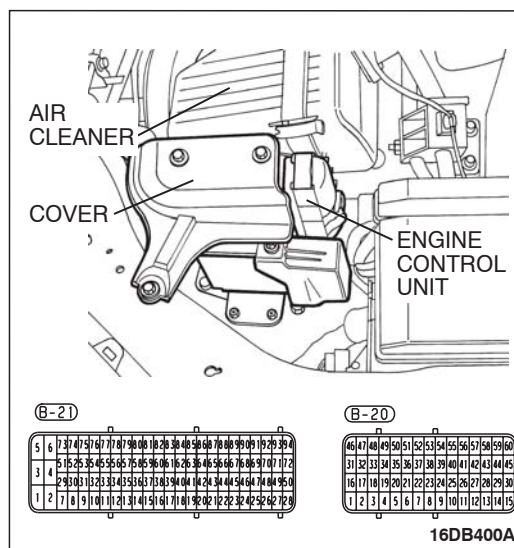
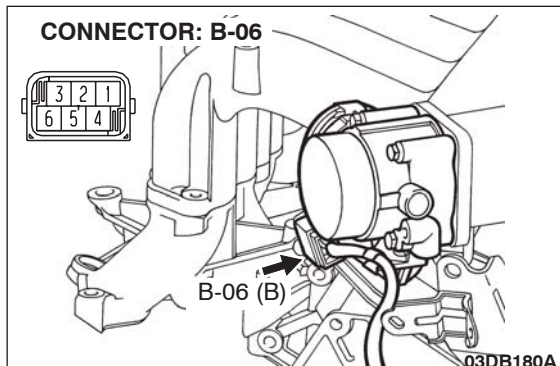


DTC P0122: Throttle Position Sensor (Main) Circuit Low Input.**⚠ CAUTION**

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

**CIRCUIT OPERATION**

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 3) from the ENGINE-ECU connector B-20 (terminal No. 10).
The ground terminal (terminal No. 2) is grounded with ENGINE-ECU connector B-20 (terminal No. 27).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ENGINE-ECU checks whether the voltage is within a specified range.

DTC SET CONDITIONS**Check Condition**

- Ignition switch is "ON" position.

Judgement Criteria

- Throttle position sensor (main) output voltage is low.
- MIL activated immediately
- Engine speed limited to 1500rpm.

EOBD DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Open or shorted throttle position sensor (main) circuit, harness damage, or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

⚠ WARNING

If the air intake duct is removed from the throttle body take great care to keep fingers away from the throttle plate. The drive motor has very high torque and is capable of random movement at any time. Do not under any circumstances activate the throttle plate by hand. When removing the throttle body from the intake manifold disconnect the wiring first. During replacement connect the wiring last. Do not activate the throttle body using a DC supply to test the motor, as permanent damage to the throttle body will result.

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

⚠ CAUTION

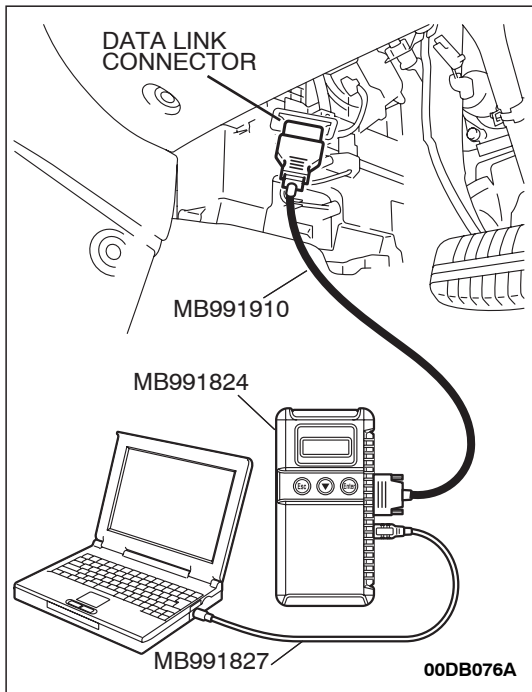
To prevent damage to diagnostic tool , always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set diagnostic tool to the data reading mode for item 13, Throttle Position Sensor (main).
- (4) Apply the accelerator pedal as required to check the following:
 - Output voltage should be between 1035 and 1250 mV when the throttle valve is fully close.
 - Output voltage should be approximately 4000 and 4824 mV when the throttle valve is fully open.
- (5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

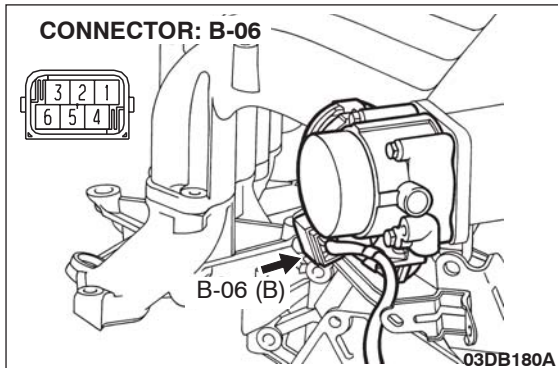


STEP 2. Check harness connector B-06 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

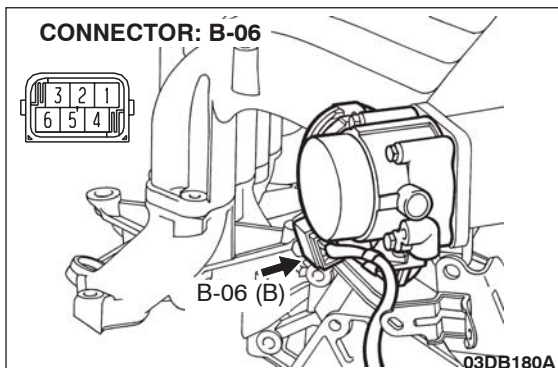
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.



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. 3 and ground.

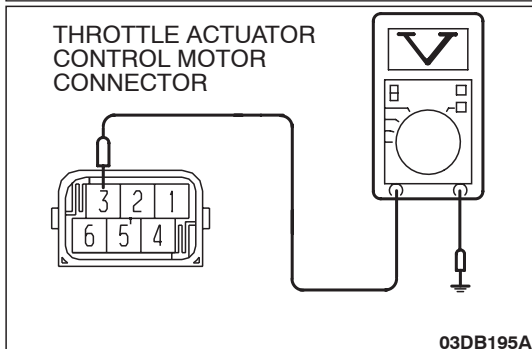
- Voltage should be between 4.9 and 5.1 volts.

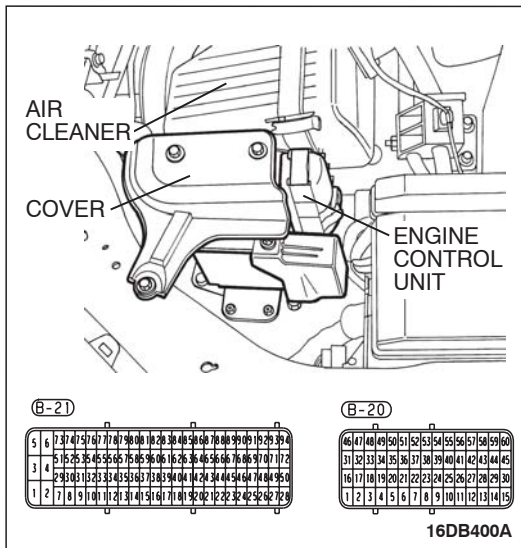
(4) Turn the ignition switch to the "LOCK"(OFF) position.

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

YES : Go to Step 6.

NO : Go to Step 4.



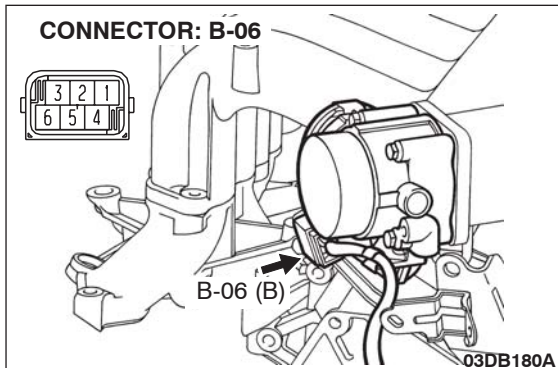


STEP 4. Check harness connector B-20 at ENGINE-ECU for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

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

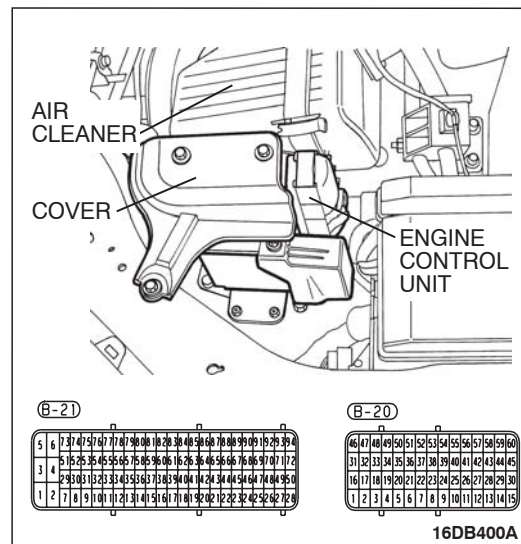


STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 3) and ENGINE-ECU connector B-20 (terminal No. 10).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

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

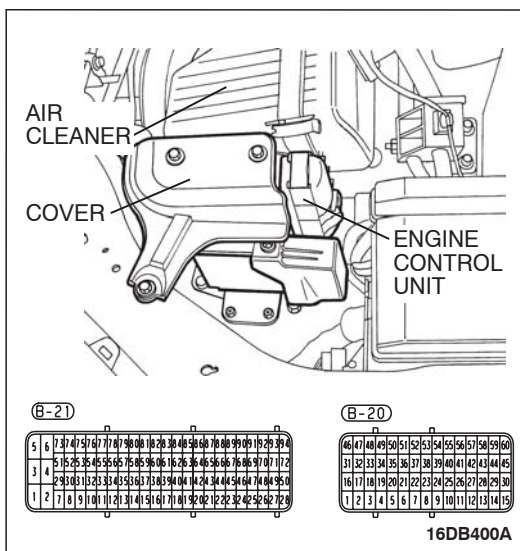
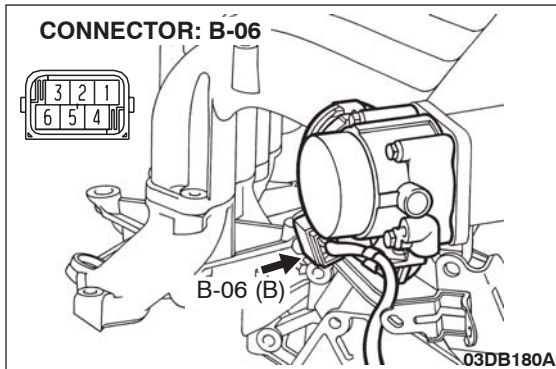


STEP 6. Check for harness damage between throttle position sensor connector B-06 (terminal No. 3) and ENGINE-ECU connector B-20 (terminal No. 10).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

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

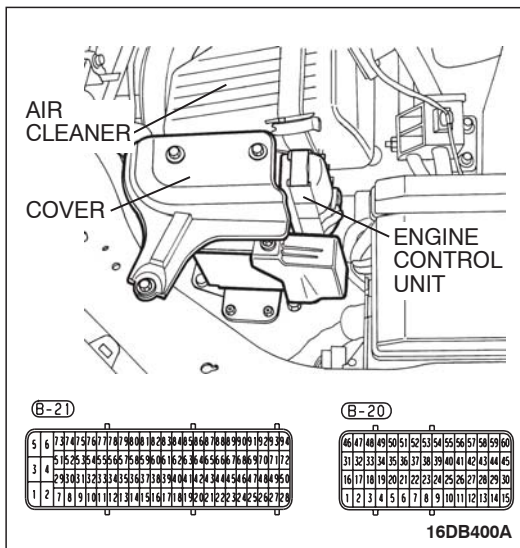
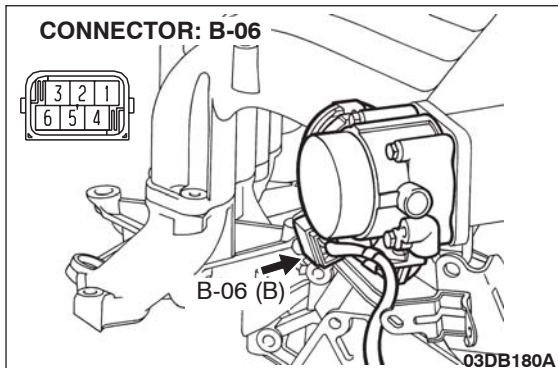


STEP 7. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 6) and ENGINE-ECU connector B-20 (terminal No. 42).

Q: Is the harness wire in good condition?

YES : Go to Step 8.

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



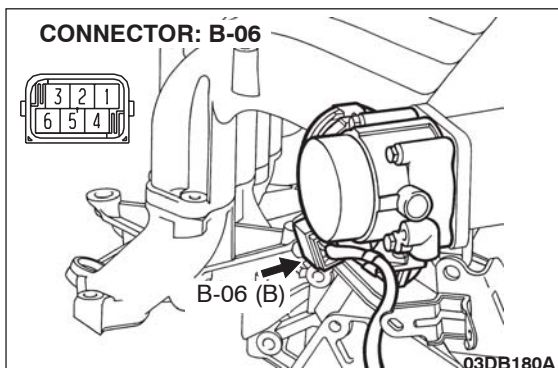
STEP 8. Replace the throttle body assembly.

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

Q: Is DTC P0122 set?

YES : Then go to Step 9.

NO : The inspection is complete.



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

⚠ CAUTION

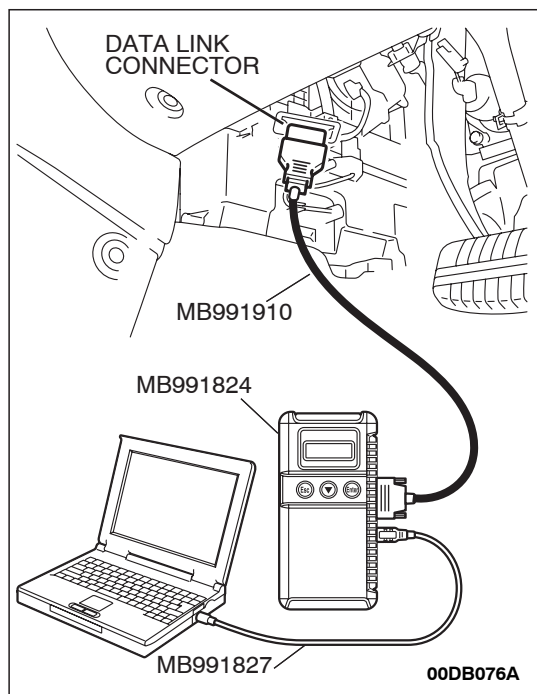
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting diagnostic tool .

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

Q: Is DTC P0122 set?

YES : Retry the troubleshooting.

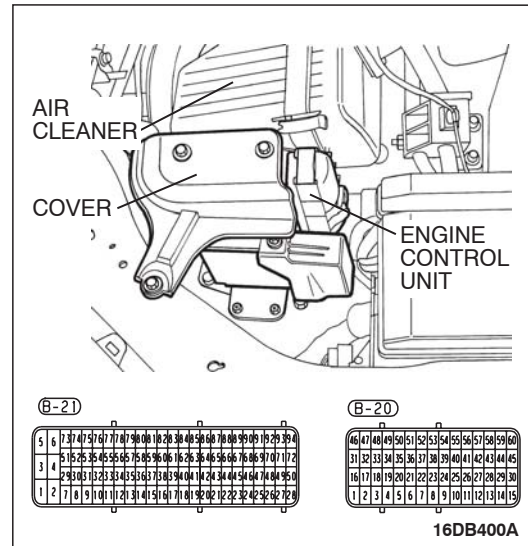
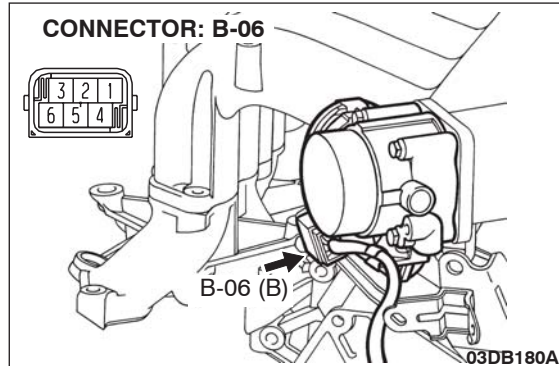
NO : The inspection is complete.



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

⚠ CAUTION

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



CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 3) from the ENGINE-ECU (terminal No. 10). The ground terminal (terminal No. 2) is grounded with ENGINE-ECU (terminal No. 27).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ENGINE-ECU checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Ignition switch is "ON" position.

Judgement Criteria

- Throttle position sensor (main) output voltage is above range.
- MIL activated immediately
- Engine speed limited to 1500rpm.

EOBD DRIVE CYCLE PATTERN

None.

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

- Refer to component locations GROUP-70
- Refer to configuration diagrams GROUP-80
- Refer to circuit diagrams GROUP-90
- Throttle position sensor failed.
- Open throttle position sensor (main) circuit, or harness damage or connector damage.
- Short circuit to 5 volt.

DIAGNOSIS

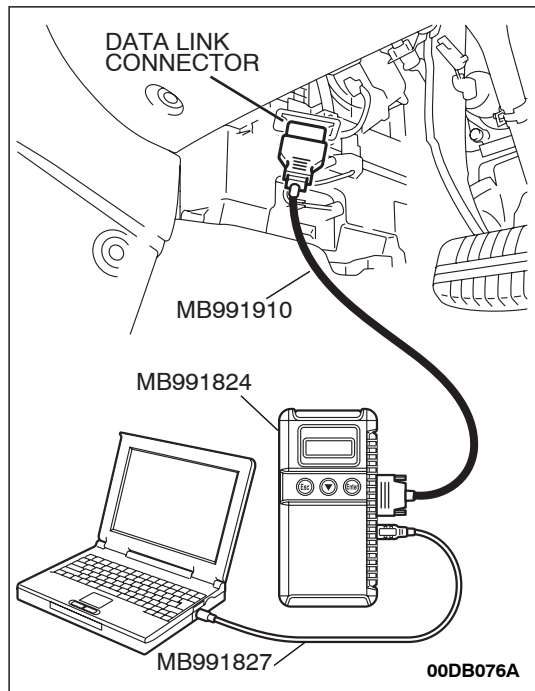
Required Special Tools:

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

⚠ WARNING

If the air intake duct is removed from the throttle body take great care to keep fingers away from the throttle plate. The drive motor has very high torque and is capable of random movement at any time. Do not under any circumstances activate the throttle plate by hand. When removing the throttle body from the intake manifold disconnect the wiring first. During replacement connect the wiring last.

Do not activate the throttle body using a DC supply to test the motor, as permanent damage to the throttle body will result.



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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set diagnostic tool to the data reading mode for item 13, Throttle Position Sensor (main).
- (4) Apply the accelerator pedal as required to check the following:
 - Output voltage should be between 1035 and 1250 mV when the throttle valve is fully close.
 - Output voltage should be between 4000 and 4824 mV when the throttle valve is fully open.
- (5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

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

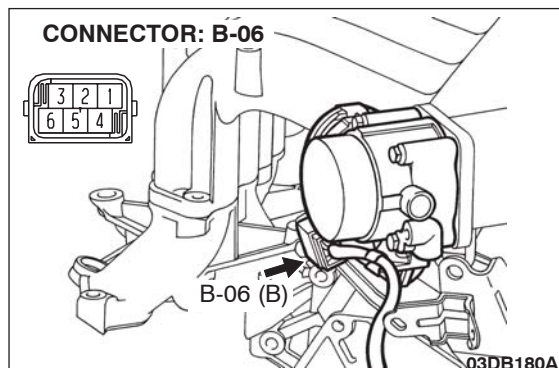
NO : Go to Step 2.

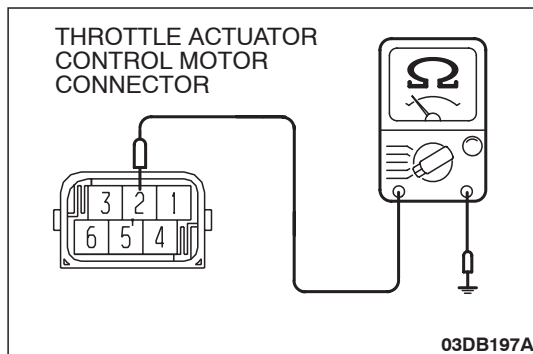
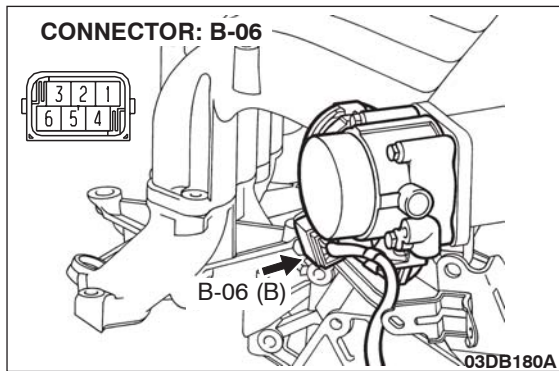
STEP 2. Check harness connector B-06 at throttle position sensor for damage.

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.

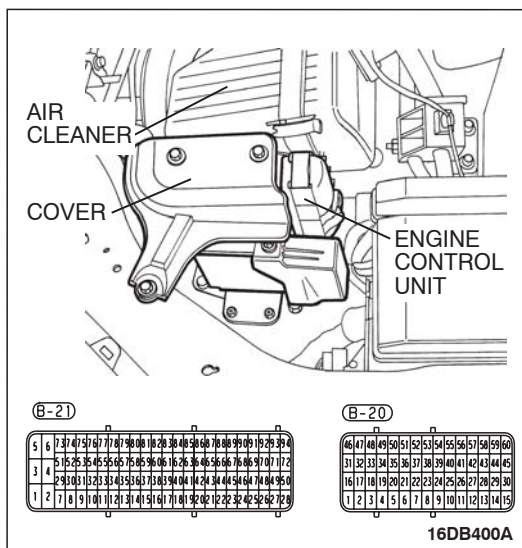
(1) Disconnect the connector B-06 and measure at the harness side.

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

Q: Does continuity exist?

YES : Go to Step 6.

NO : Go to Step 4.



STEP 4. Check harness connector B-20 at ENGINE-ECU for damage.

Q: Is the harness connector in good condition?

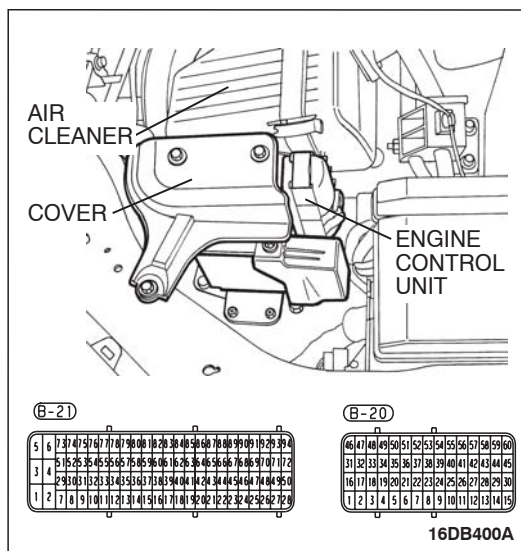
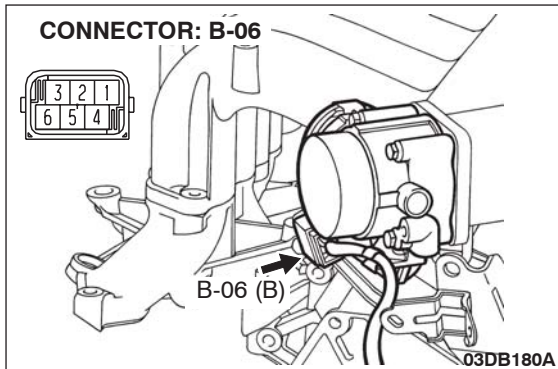
YES : Go to Step 5.

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

STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 2) and ENGINE-ECU connector B-20 (terminal No. 27).
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Then go to Step 7.



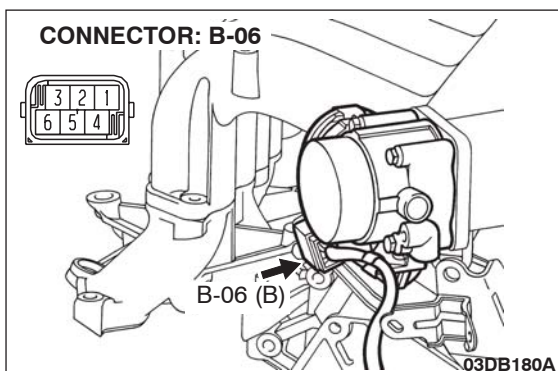
STEP 6. Replace the throttle body assembly.

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

Q: Is DTC P0123 set?

YES : Then go to Step 7.

NO : The procedure is complete.



STEP 7. Using diagnostic tool, read the diagnostic trouble code (DTC).

⚠ CAUTION

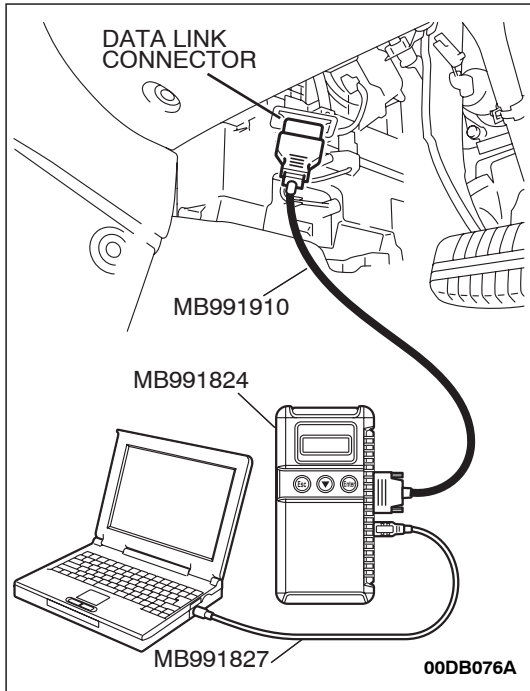
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting diagnostic tool .

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

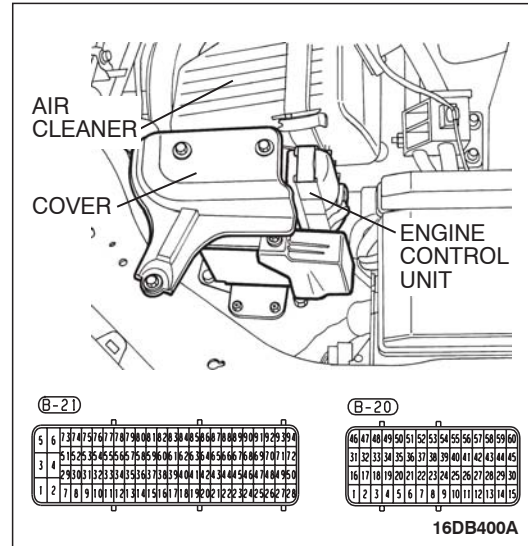
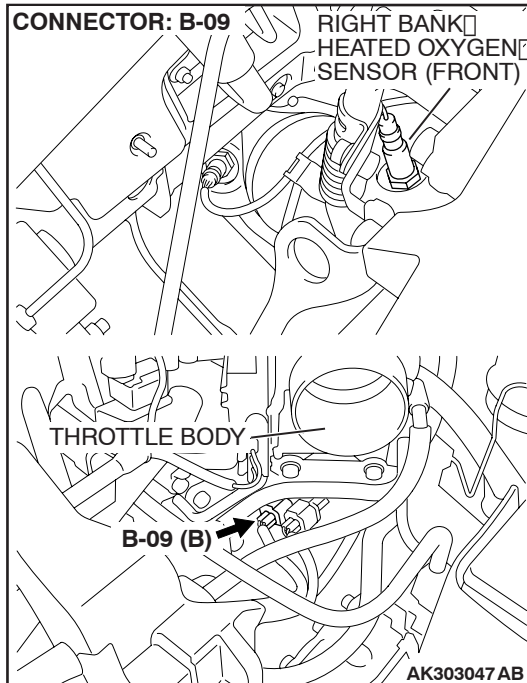
Q: Is DTC P0123 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.



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



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 45) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 44).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Idling.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Right bank heated oxygen sensor (front) failed.
- Short circuit in right bank heated oxygen sensor (front) output line to heater circuit ground line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

NOTE: To assist in diagnosis check the Freeze Frame Data on diagnostic tool for records of engine conditions when the DTC was detected.

DIAGNOSIS

Required Special Tools:

- Diagnostic tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

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

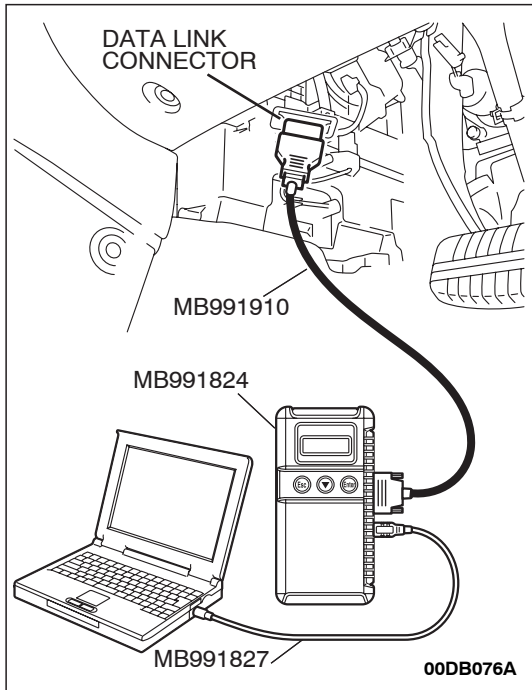
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 1.0 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 -1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

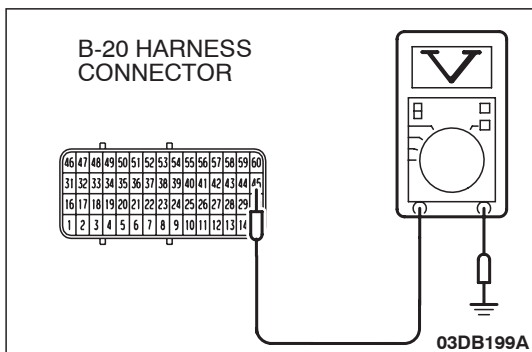
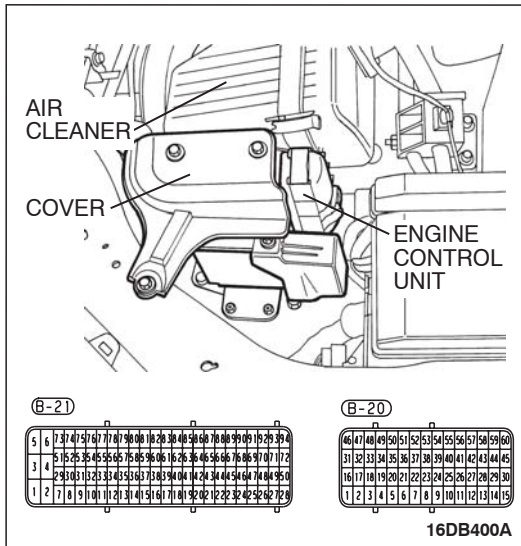
NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 45 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

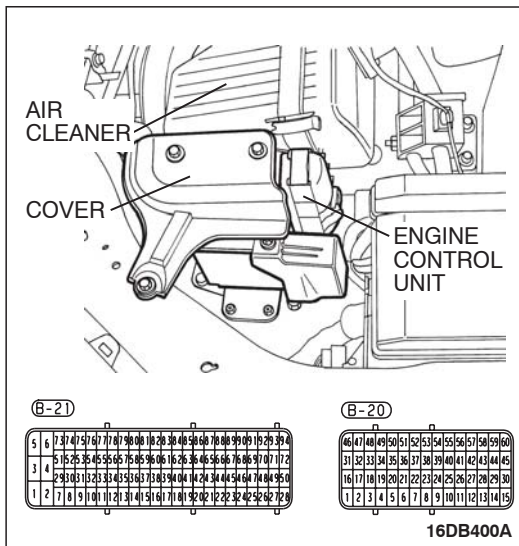
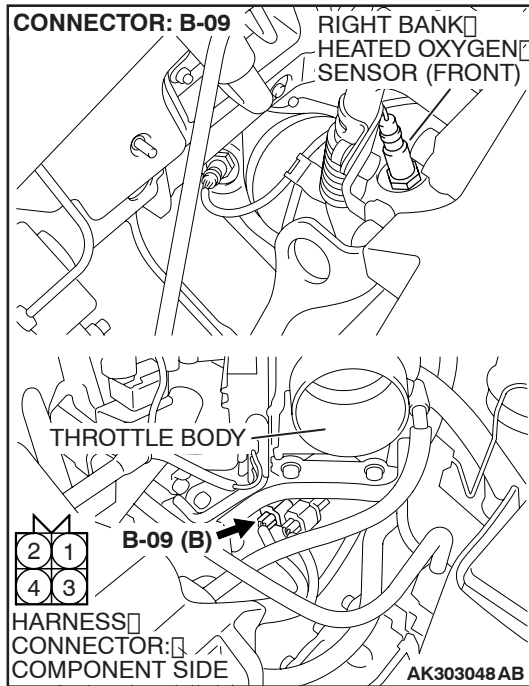
NO : Go to Step 3.

STEP 3. Check harness connector B-09 at right bank heated oxygen sensor (front) and harness connector B-20 at ENGINE-ECU for damage or loose terminals.

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.

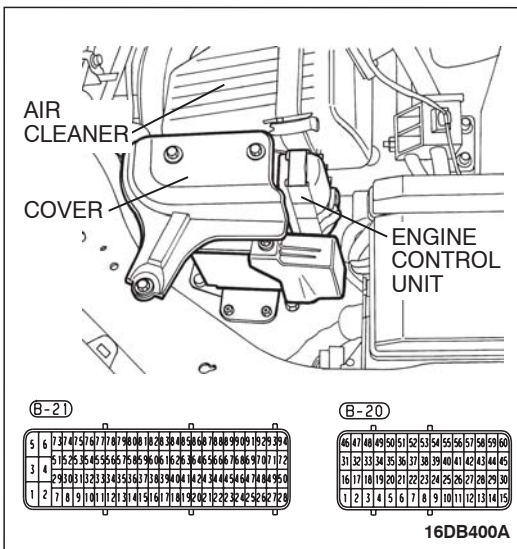
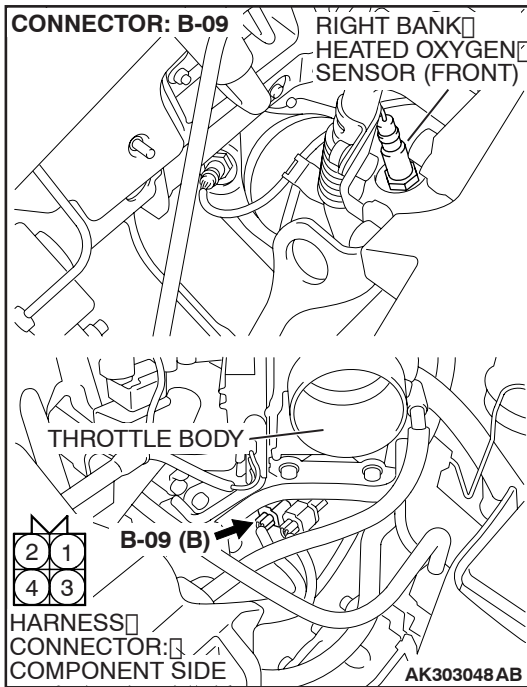


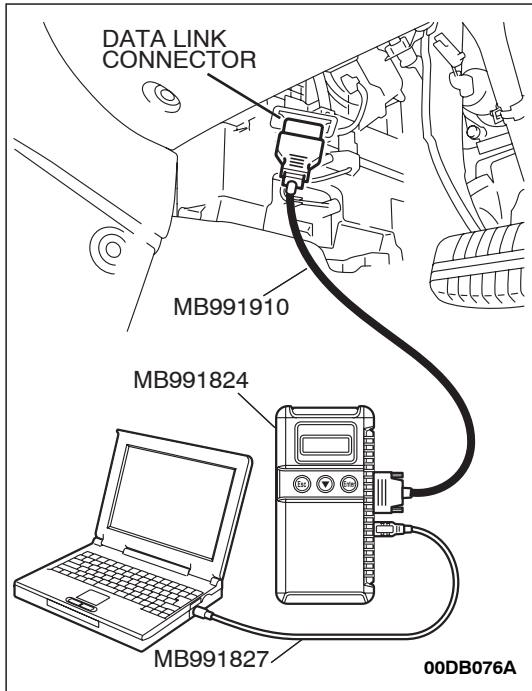
STEP 4. Check for short to heater circuit ground harness wire between right bank heated oxygen sensor (front) connector B-09 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 45).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the faulty oxygen sensor. Then go to Step 6.

STEP 6. Test the EOBD drive cycle.

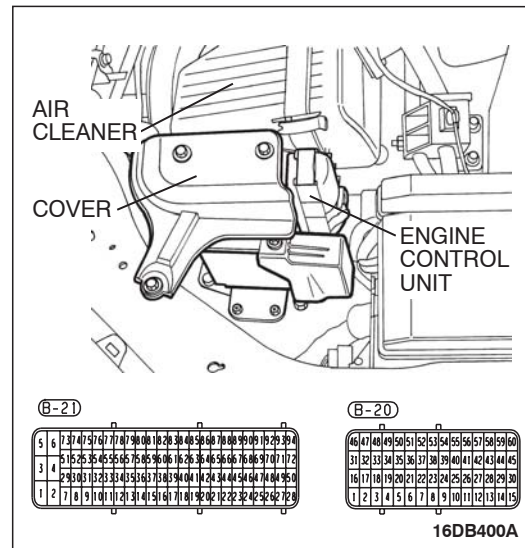
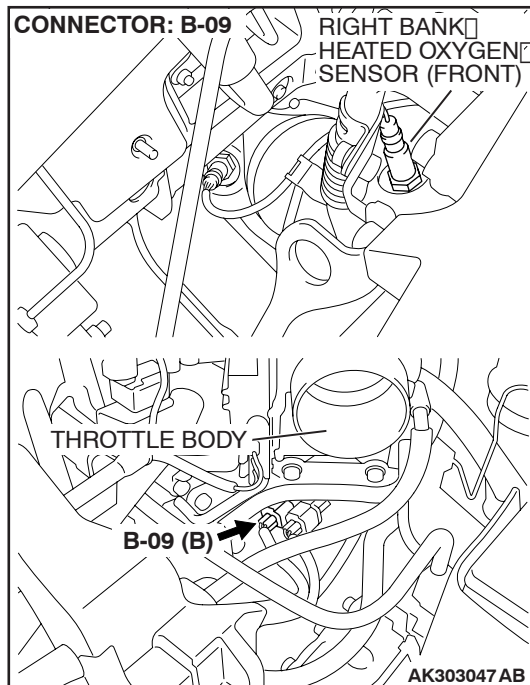
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0130 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 45) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 44).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgement Criteria

- Internal Resistance of the Nernst - cell is equal or greater than a modelled resistance based on the heating output of the O₂-sensor and the modelled exhasused gas temperature
- Idling.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Right bank heated oxygen sensor (front) failed.
- Short circuit to ground in right bank heated oxygen sensor (front) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- Diagnostic tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

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

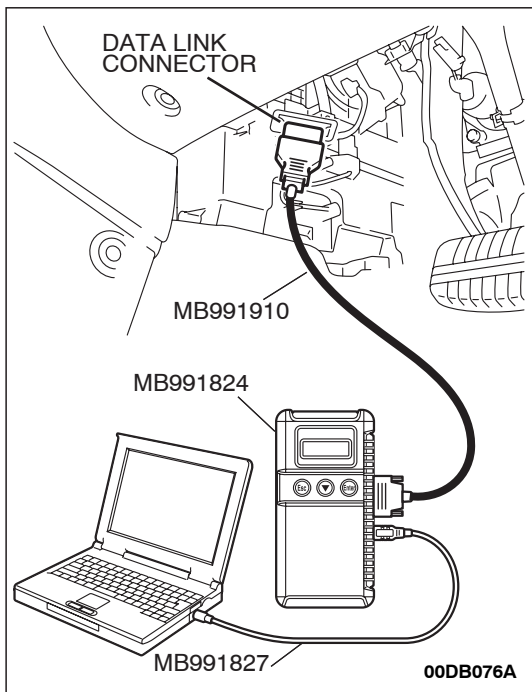
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 1.0 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 -1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

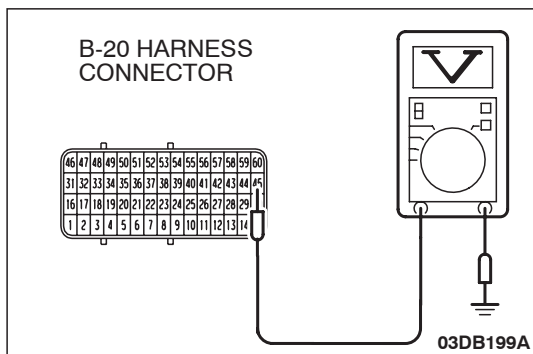
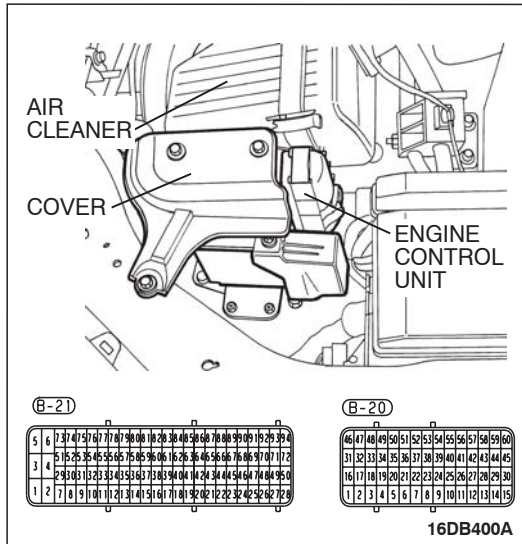
NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 45 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

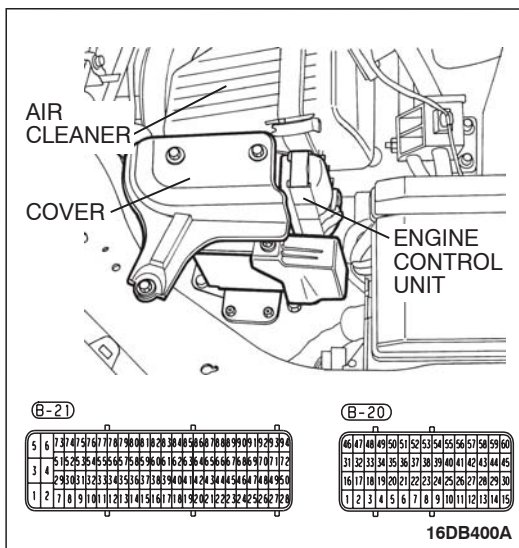
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

Q: Is the harness connector in good condition?

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

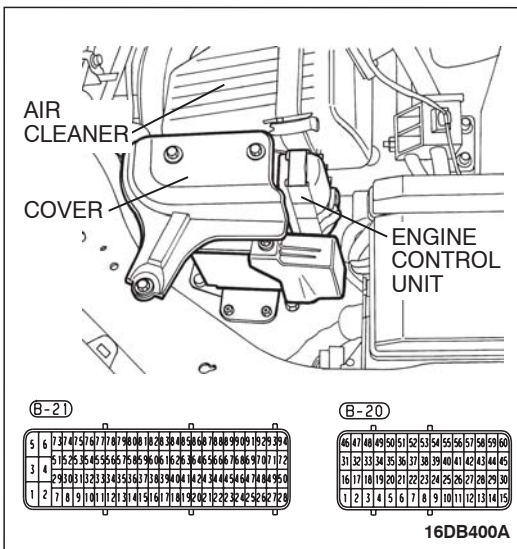
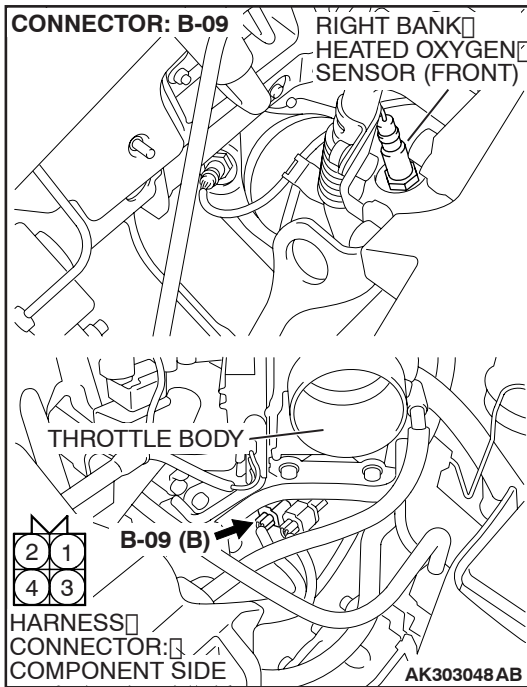


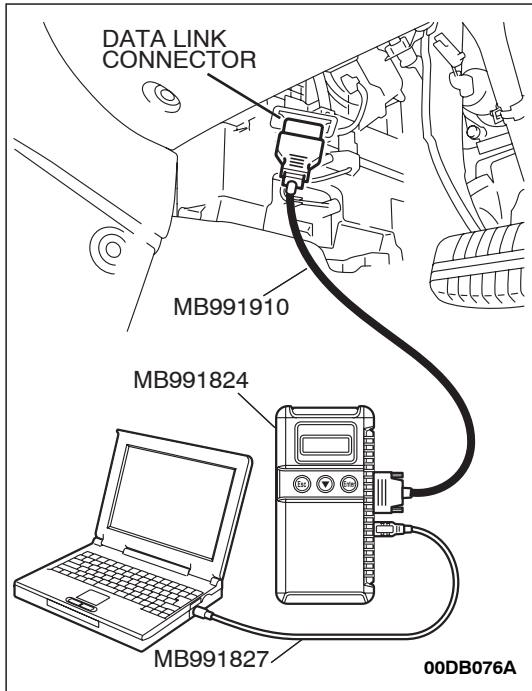
STEP 4. Check for short circuit to ground in the harness between right bank heated oxygen sensor (front) connector B-09 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 45).

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the faulty oxygen sensor. Then go to Step 6.

STEP 6. Test the EOBD drive cycle.

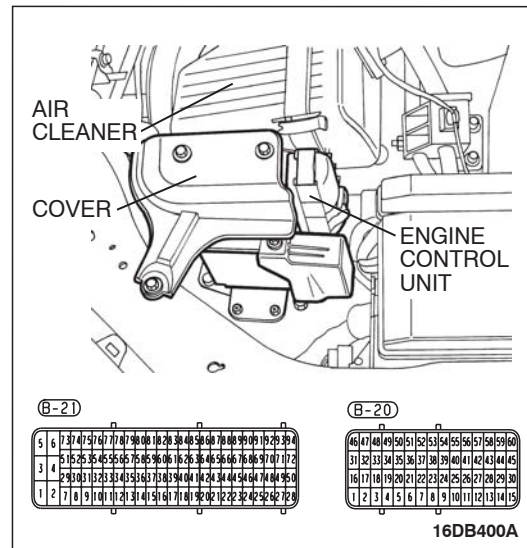
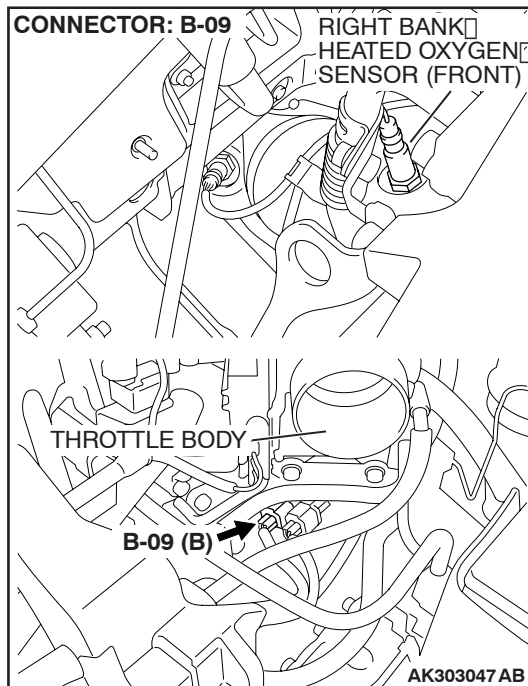
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 45) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 44).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Internal Resistance of the Nernst - cell is equal or greater than a modelled resistance based on the heating output of the O₂-sensor and the modelled exhasused gas temperature.
- Idling.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnosis Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Short circuit to battery voltage in right bank heated oxygen sensor (front) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

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

CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- (5) Warm up the engine, hold at 2,500 r/min.
 - Output voltage alternates between 0.1 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning.

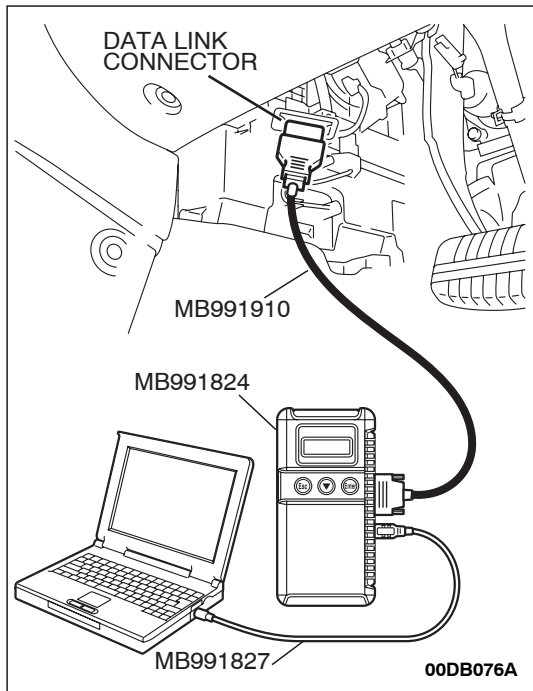
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent.

Refer to GROUP 00, How to Use

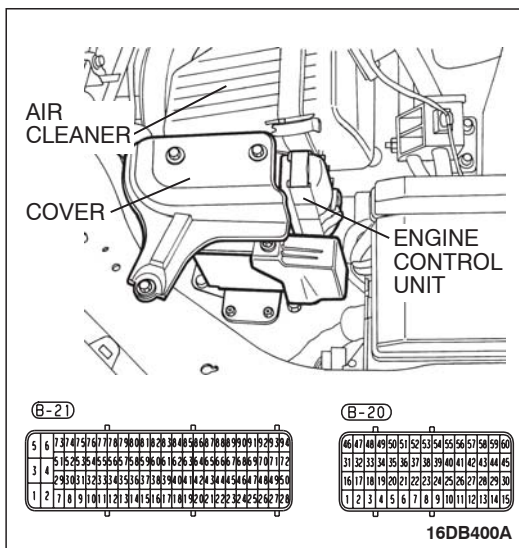
Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

NO : Then go to Step 2.



Q: Is the harness connector in good condition?

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

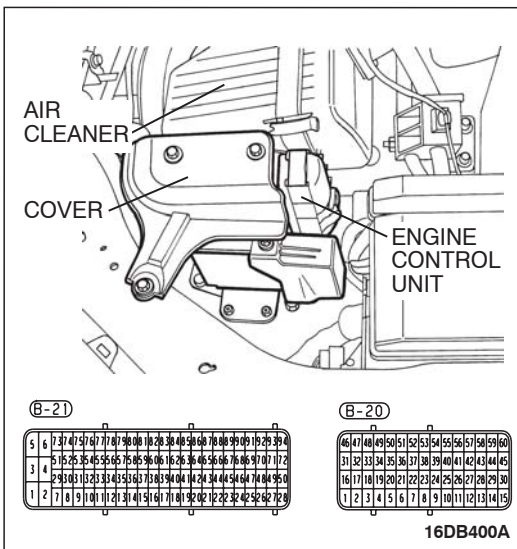
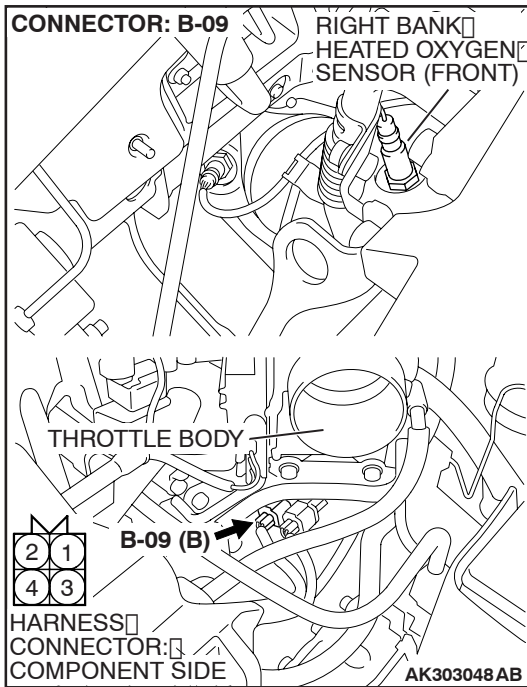


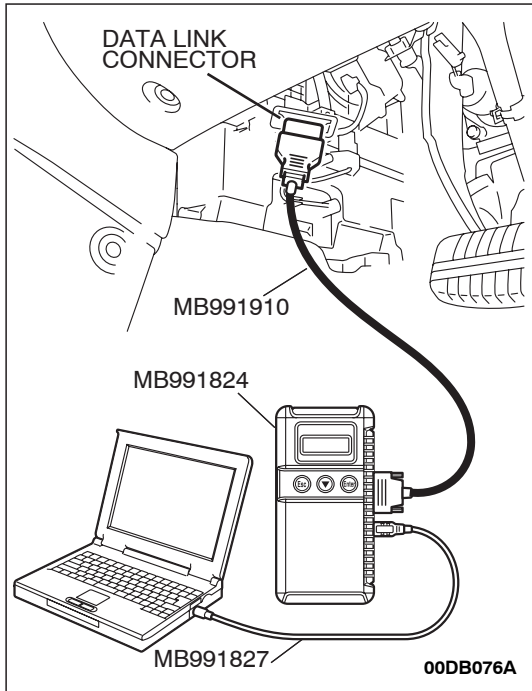
STEP 3. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-09 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 45).

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Then go to Step 5.





STEP 4. Using diagnostic tool, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- (5) Warm up the engine, hold at 2,500 r/min.
 - Output voltage alternates between 0.1 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning.

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 sensor. Then go to Step 5.

STEP 5. Test the EOBD drive cycle.

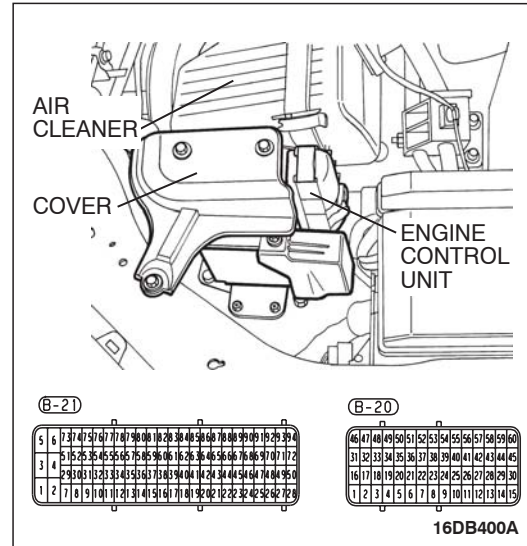
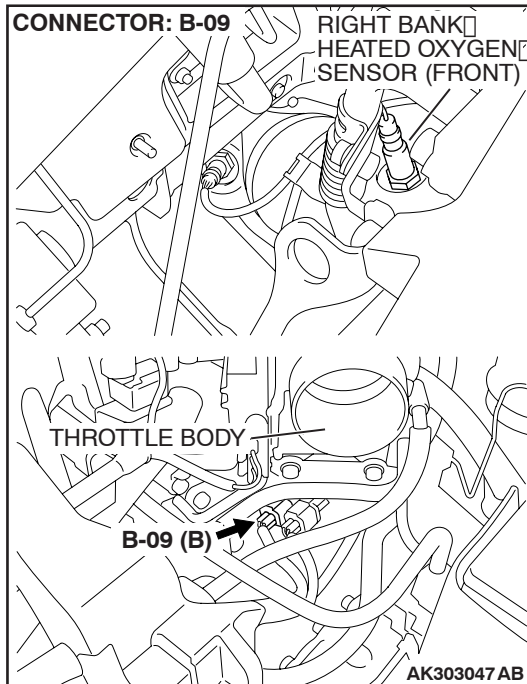
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 45) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 44).

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

DTC SET CONDITIONS

Check Conditions

- Engine speed between 1320 and 3200rpm.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

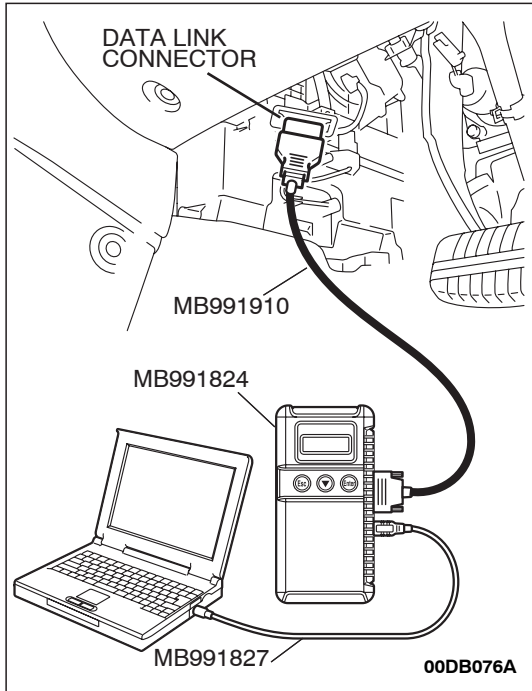
- Right bank heated oxygen sensor (front) deteriorated.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)
- MB991824: V.C.I.

- MB991827: USB Cable
- MB991910: Main Harness A



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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- (5) Warm up the engine, hold at 2,500 r/min.
 - Output voltage alternates between 0.1 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning.

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 sensor. Then go to Step 2.

STEP 2. Test the EOBD drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (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.

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 45) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (front).
- Terminal No. 2 of the right bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 44).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

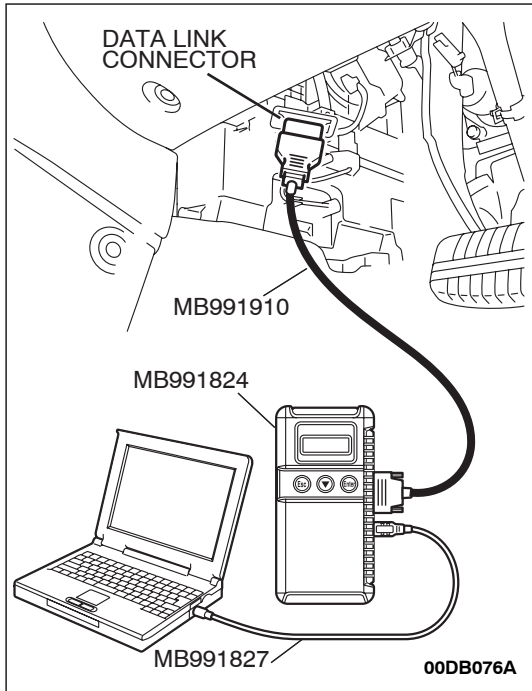
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor failed.
- Open circuit in right bank heated oxygen sensor (front) output line.
- Open circuit in right bank heated oxygen sensor (front) sensor ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness



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

⚠ CAUTION

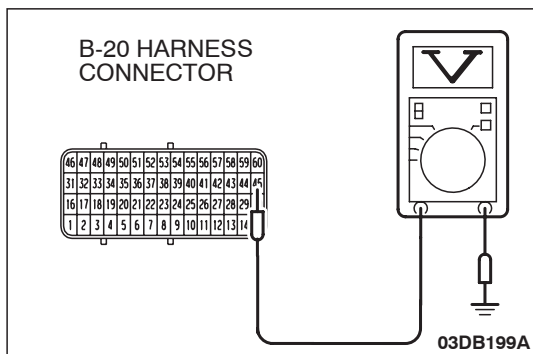
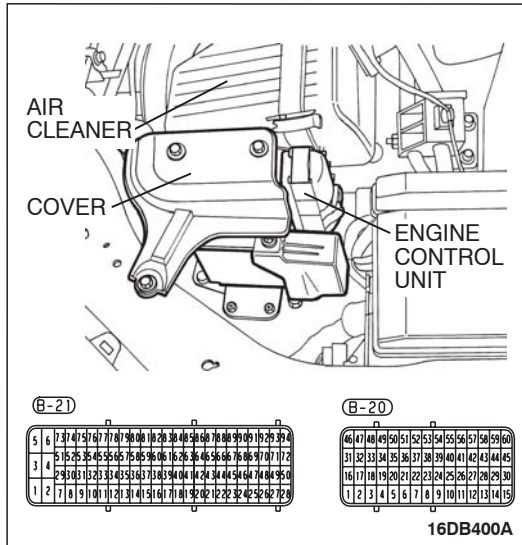
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool 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 alternate between 0 and 0.6 to 1.0 volts.
- (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 : Then go to Step 2.



STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the all ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 45 and ground.
 - Warm engine. When the engine is revved, the output voltage should alternate between 0 and 0.6-1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

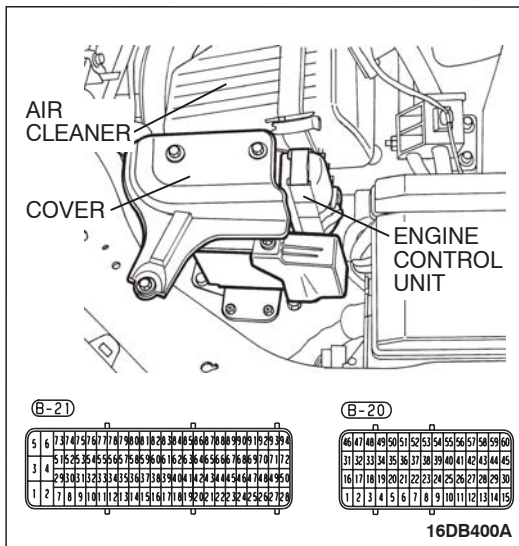
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

Q: Is the harness connector in good condition?

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

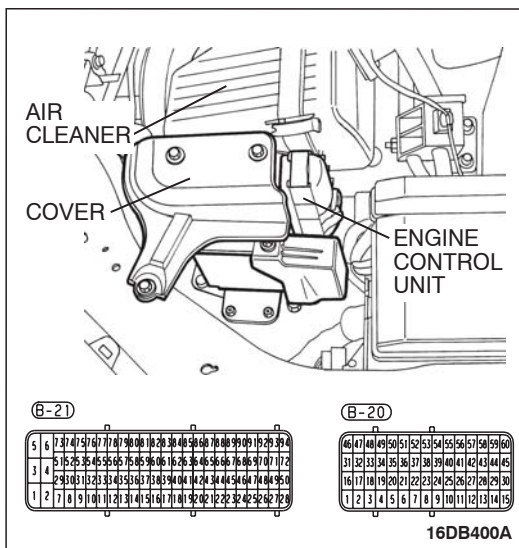
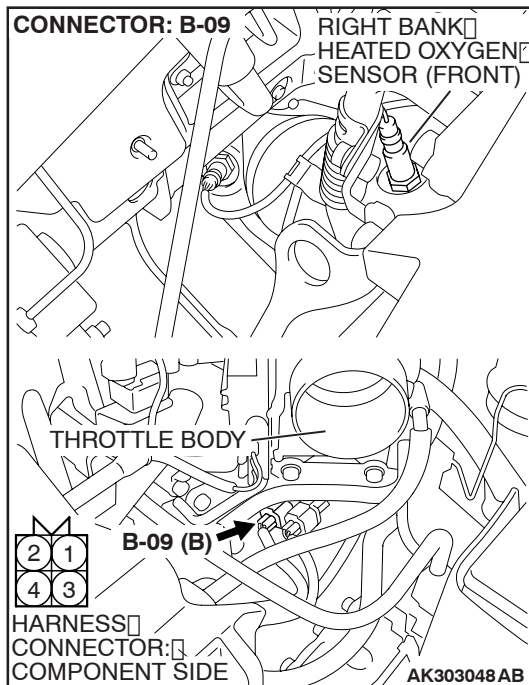


STEP 4. Check for open circuit between right bank heated oxygen sensor (front) connector B-09 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 45).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 7.

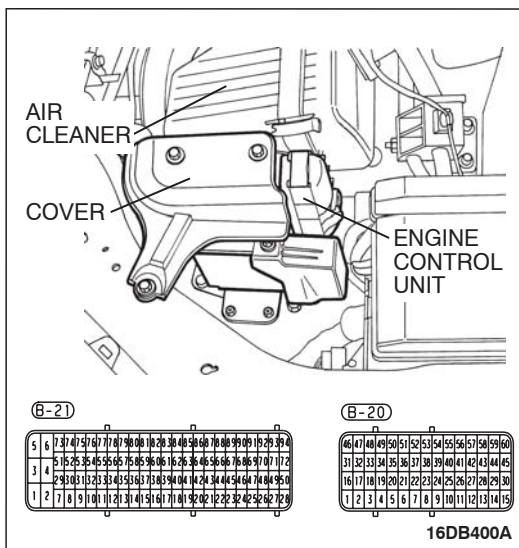
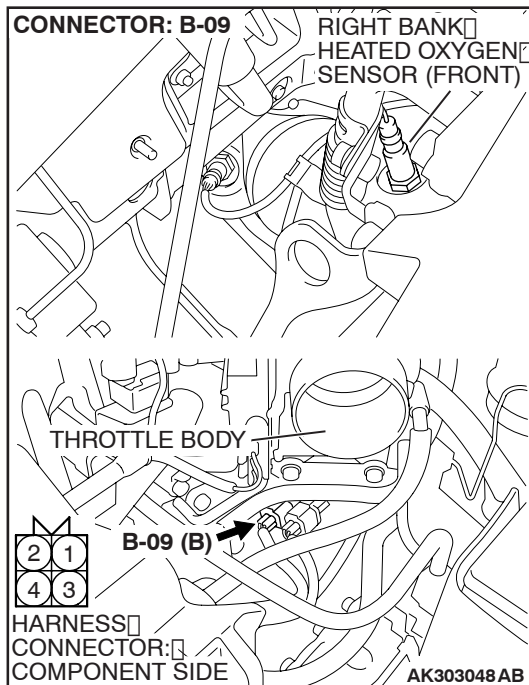


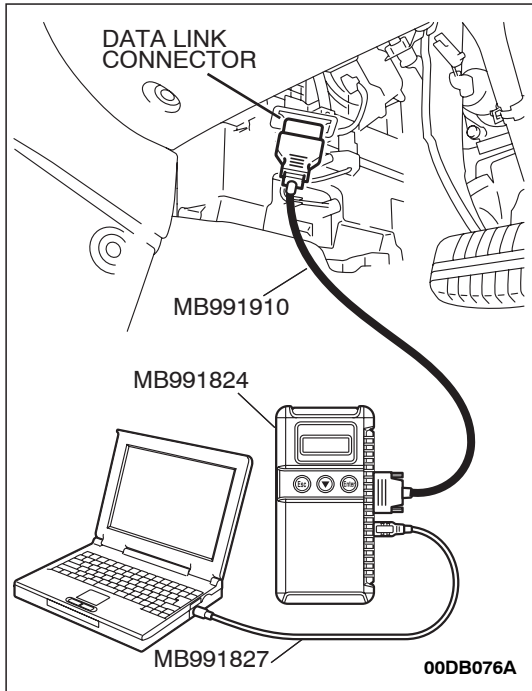
STEP 5. Check for open circuit between right bank heated oxygen sensor (front) connector B-09 (terminal No. 2) and ENGINE-ECU connector B-20 (terminal No. 44).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Then go to Step 7.





STEP 6. Using diagnostic tool, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 (front). Then go to Step 7.

STEP 7. Test the EOBD drive cycle.

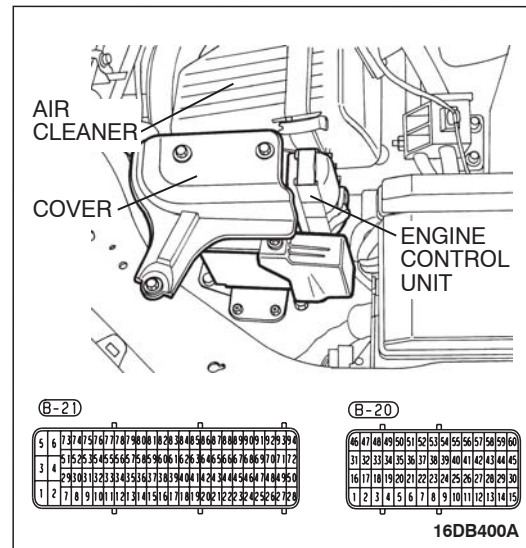
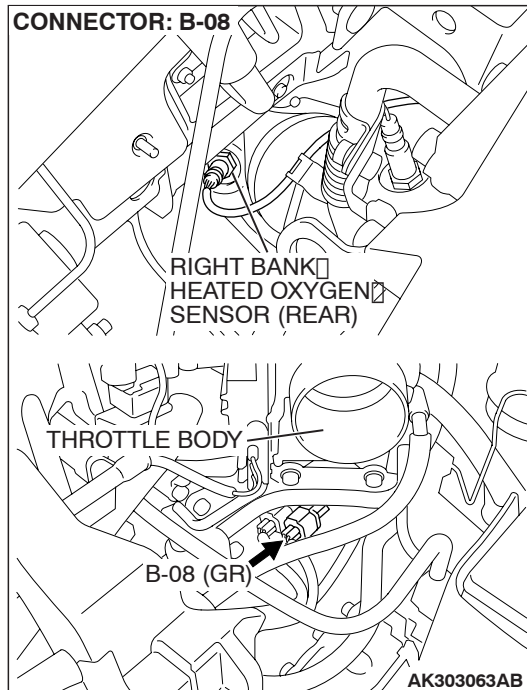
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 60) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 59).

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 ENGINE-ECU checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts

- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Right bank heated oxygen sensor (rear) failed.
- Short circuit in right bank heated oxygen sensor (rear) output line to heater circuit ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

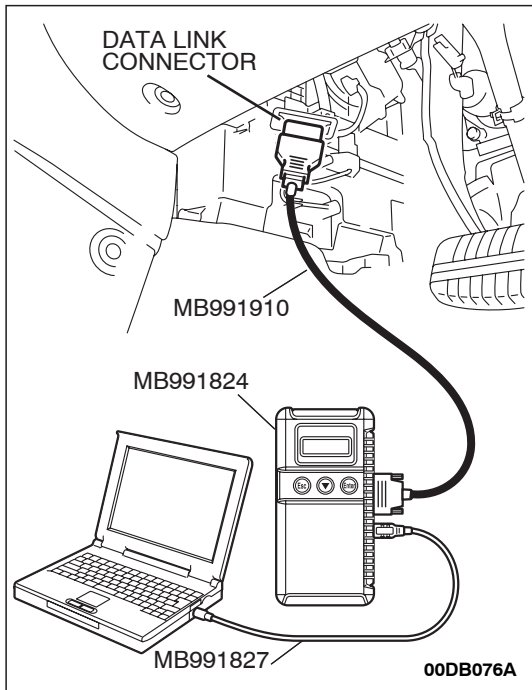
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

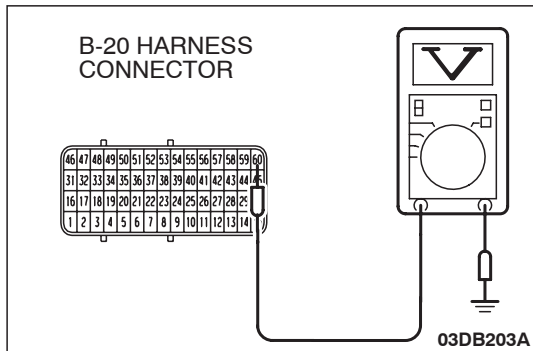
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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.





- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 60 and ground.
 - Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

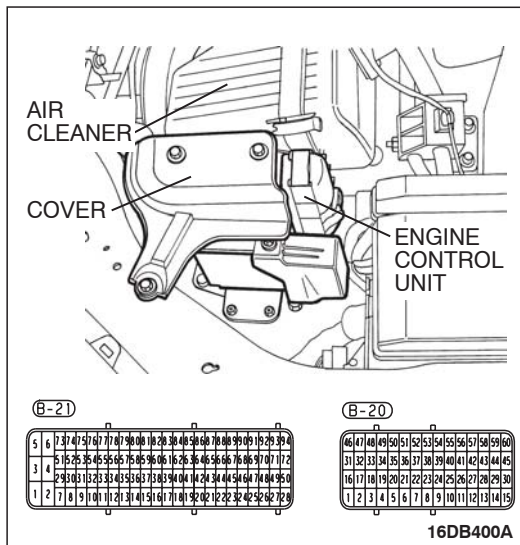
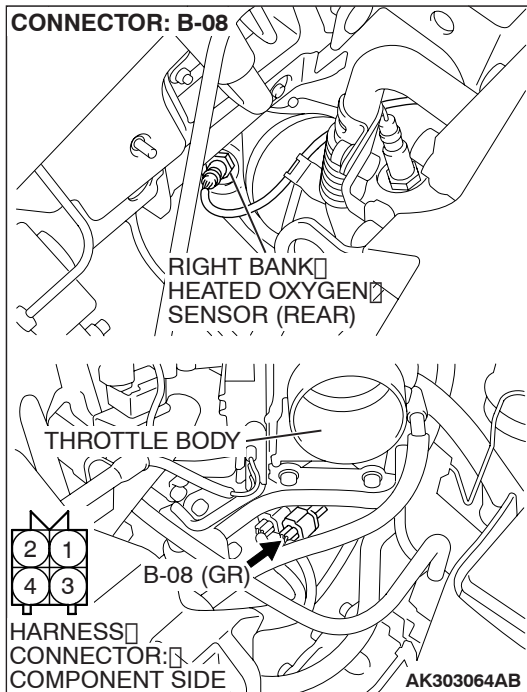
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Check harness connector B-08 at right bank heated oxygen sensor (rear) and harness connector B-20 at ENGINE-ECU 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.

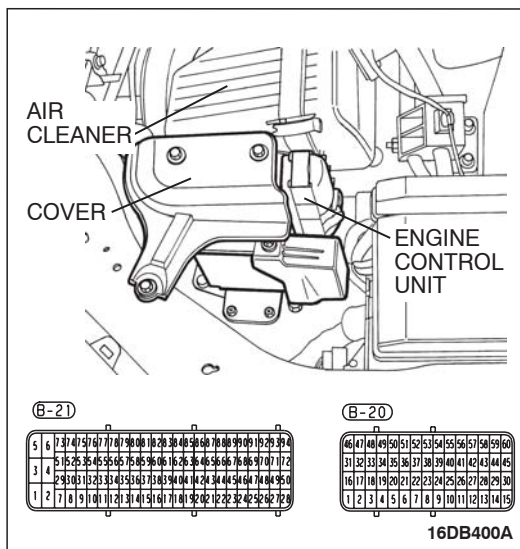
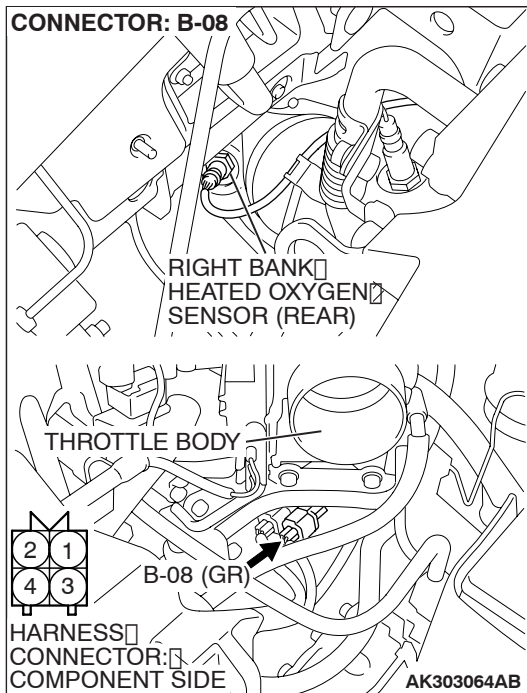


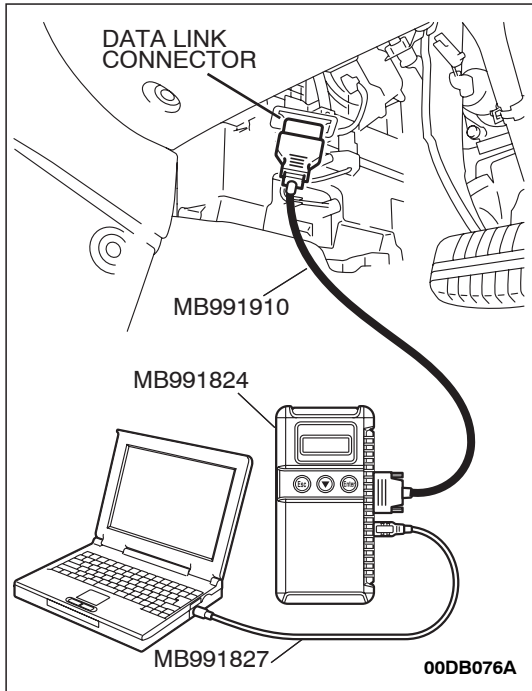
STEP 4. Check for short to heater circuit ground harness wire between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 60).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 faulty oxygen sensor. Then go to Step 6.

STEP 6. Test the EOBD drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0136 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

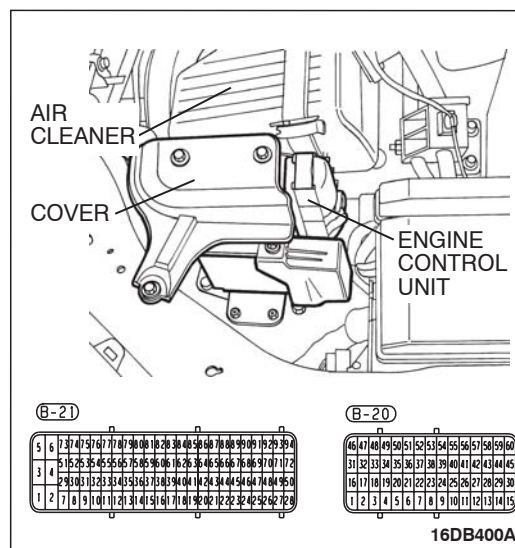
CONNECTOR: B-08

**RIGHT BANK
HEATED OXYGEN
SENSOR (REAR)**

THROTTLE BODY

B-08 (GR)

AK303063AB



- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 60) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 59).

- 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 ENGINE-ECU checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

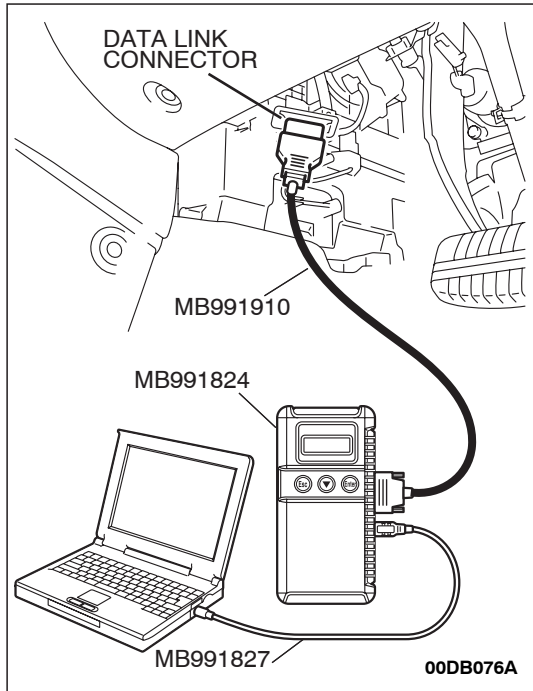
- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

Refer to Diagnostic Function – EOBD Drive Cycle –
P.13A-11.

- Right bank heated oxygen sensor (rear) failed.
- Short circuit to ground in right bank heated oxygen sensor (rear) output line.
- Wiring harness or connector damage.
- Refer to component locations GROUP-70
- Refer to configuration diagrams GROUP-80
- Refer to circuit diagrams GROUP-90

Required Special Tools:

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



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

⚠ CAUTION

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

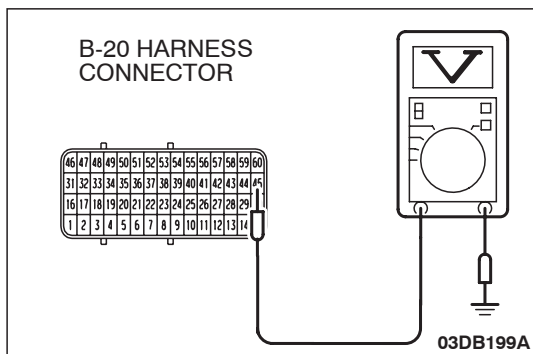
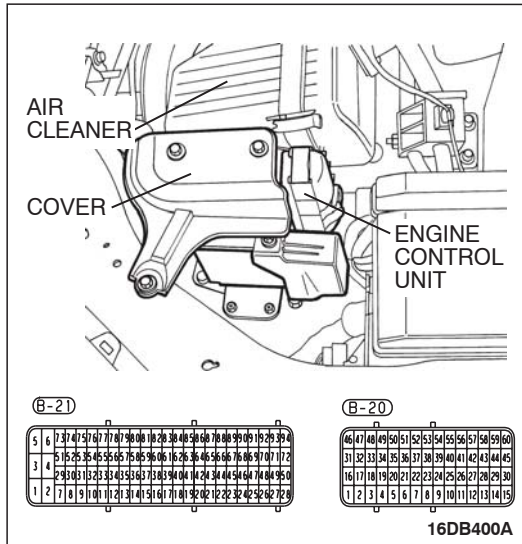
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 60 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

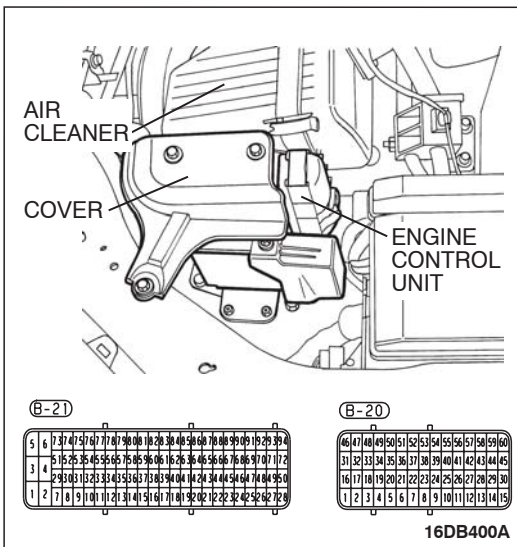
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 3.

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

Q: Is the harness connector in good condition?

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

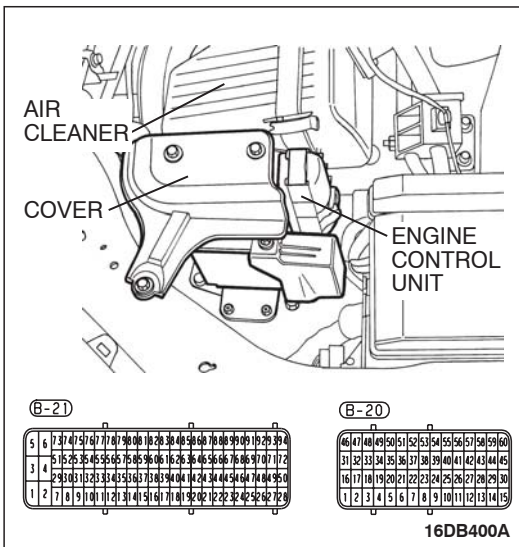
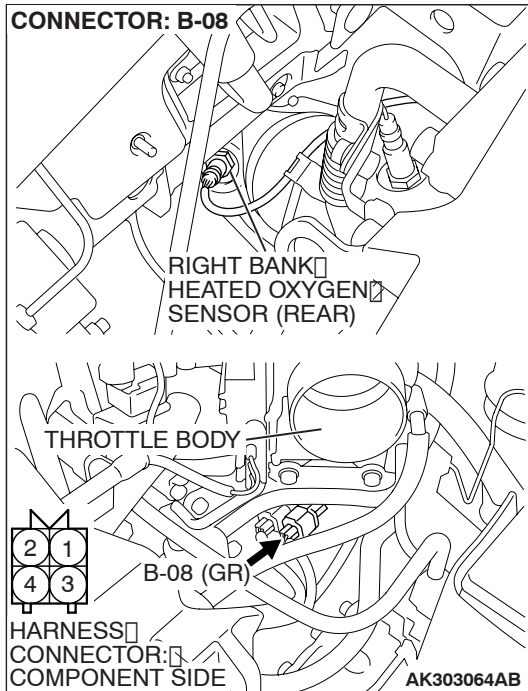


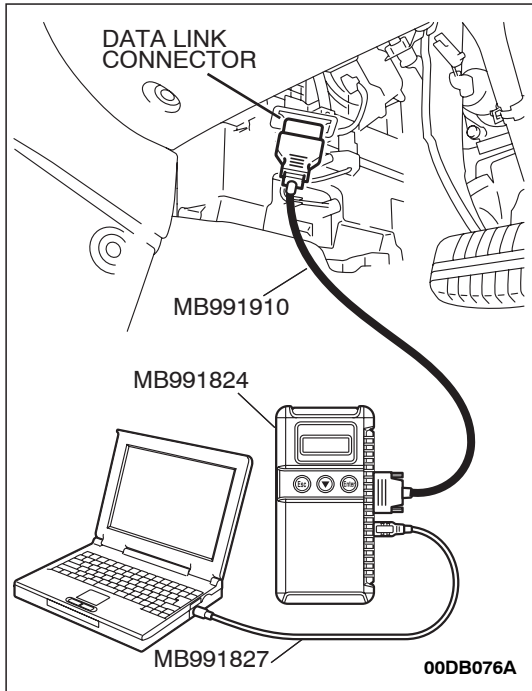
STEP 4. Check for short circuit to ground between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 60).

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent.

Refer to GROUP 00, How to Use

Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

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

STEP 6. Test the EOBD drive cycle.

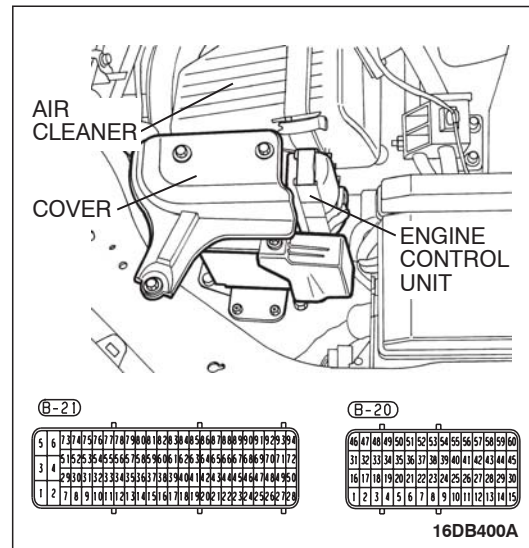
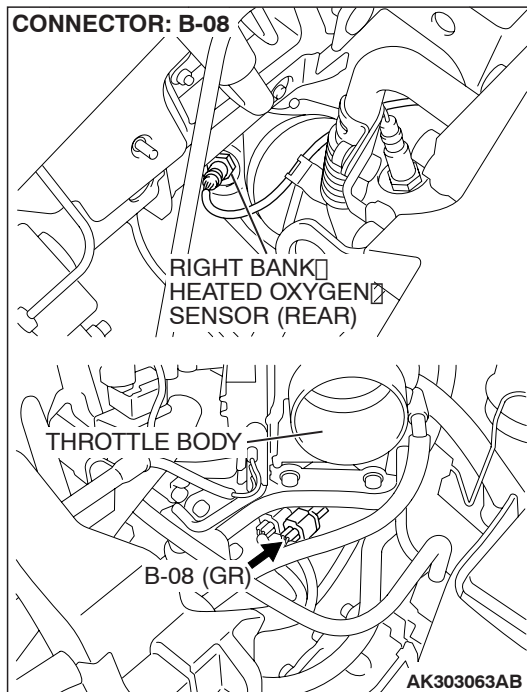
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 60) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 59).

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 ENGINE-ECU checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Short circuit to battery voltage in right bank heated oxygen sensor (rear) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

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

⚠ CAUTION

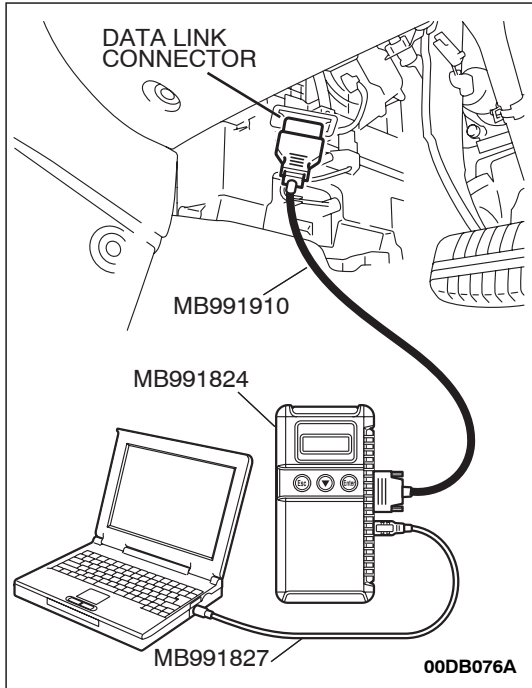
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 : Then go to Step 2.

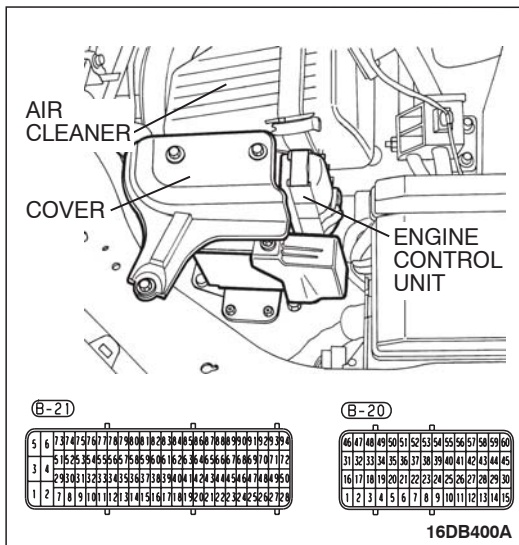
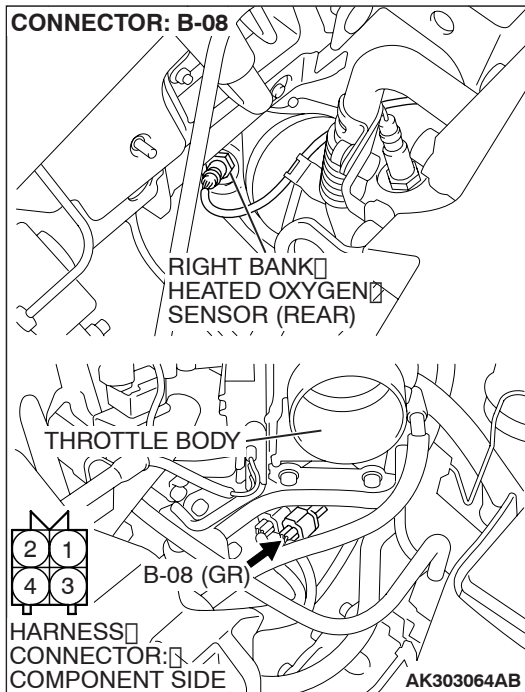


STEP 2. Check harness connector B-08 at right bank heated oxygen sensor (rear) and harness connector B-20 at ENGINE-ECU for damage.

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 5.

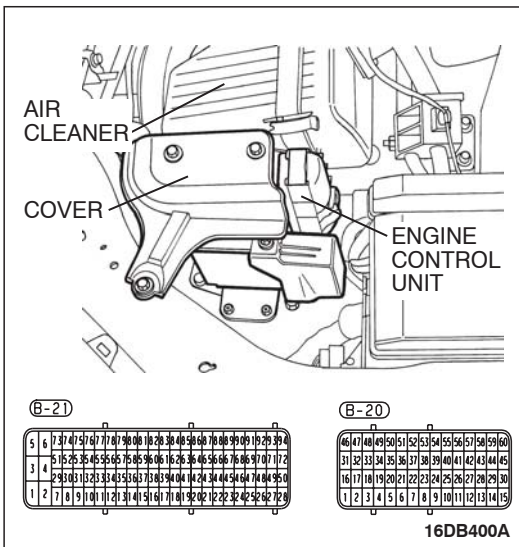
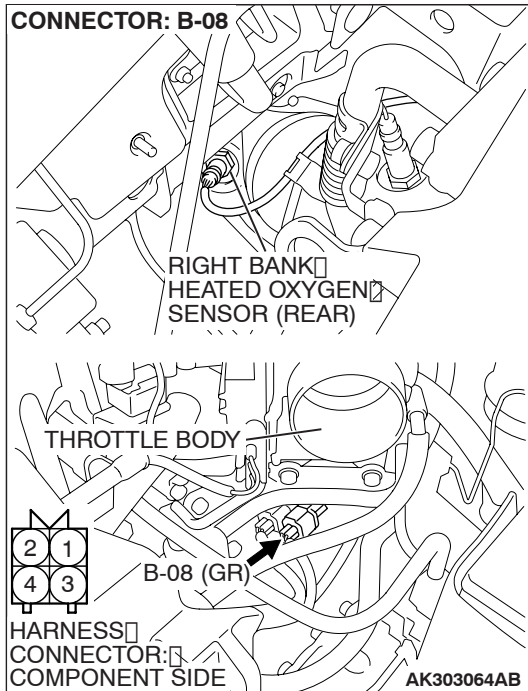


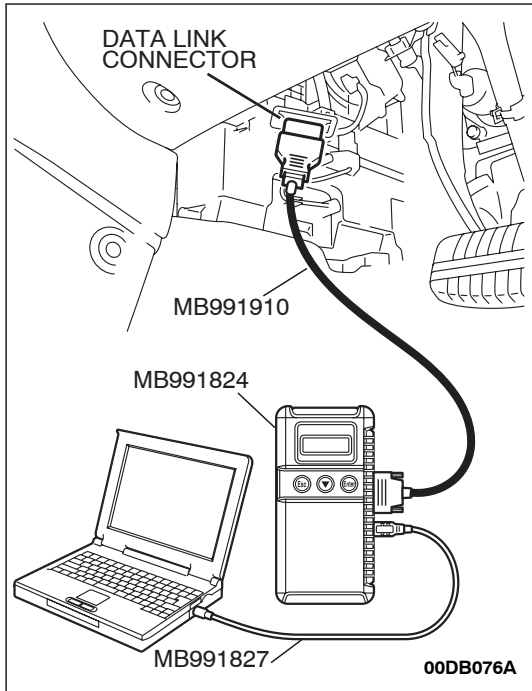
STEP 3. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 60).

Q: Is the harness wire in good condition?

YES : Then go to Step 4.

NO : Repair or replace it. Then go to Step 5.





STEP 4. Using diagnostic tool, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 sensor. Then go to Step 5.

STEP 5. Test the EOBD drive cycle.

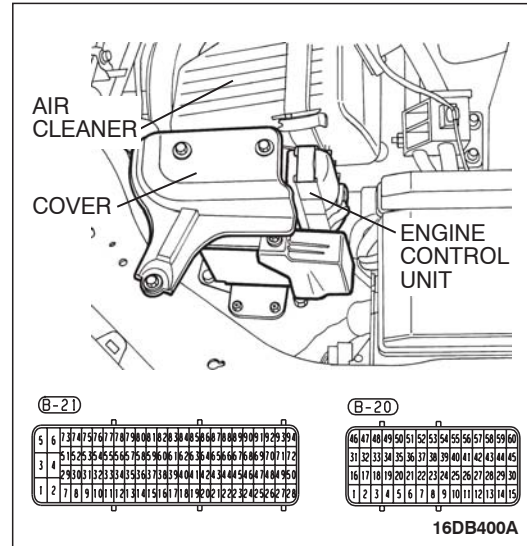
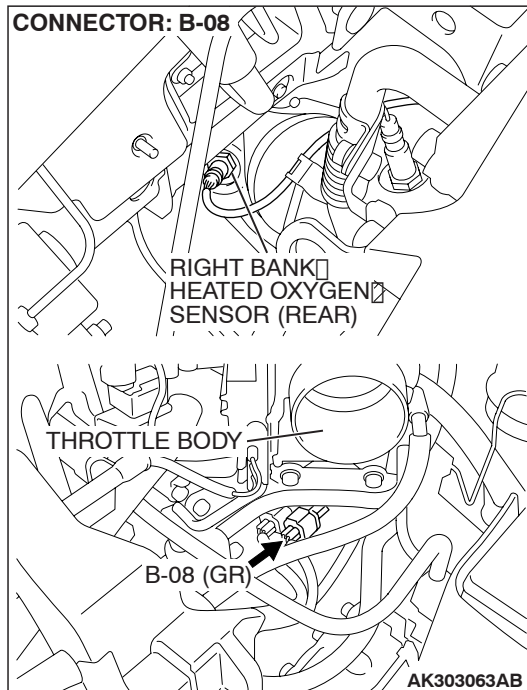
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 60) from the output terminal (terminal No.1) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 59).

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 ENGINE-ECU checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Engine speed between 1320 and 3200rpm.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

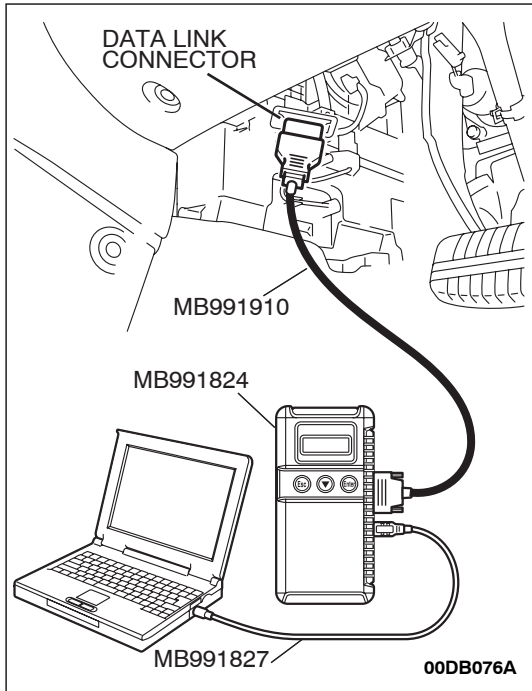
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) deteriorated.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 sensor. Then go to Step 2.

STEP 2. Test the EOBD drive cycle.

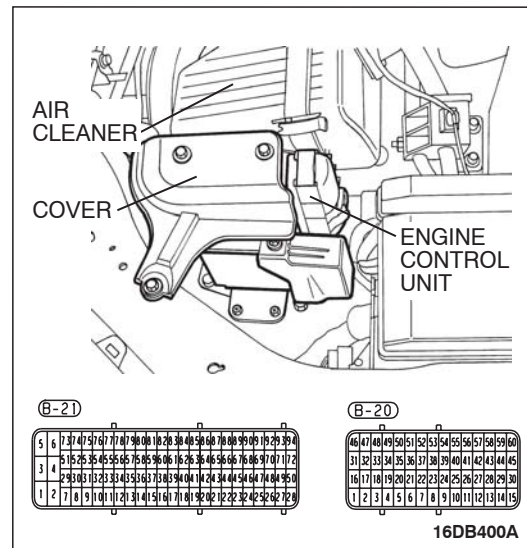
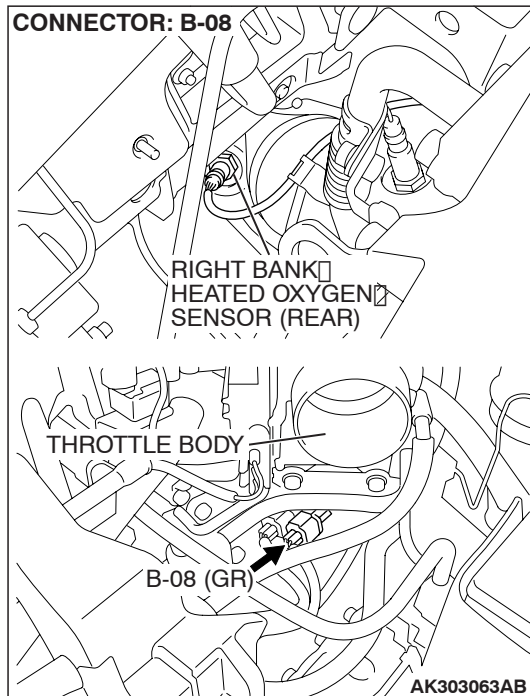
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0139 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0140: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 60) from the output terminal (terminal No. 1) of the right bank heated oxygen sensor (rear).
- Terminal No. 2 of the right bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 59).
- The ENGINE-ECU 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 ENGINE-ECU checks for the right bank heated oxygen sensor (rear) output voltage.

DTC SET CONDITIONS

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Right bank heated oxygen sensor (rear) failed.
- Open circuit in right bank heated oxygen sensor (rear) output line.
- Open circuit in right bank heated oxygen sensor (rear) sensor ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)
- MB991824: V.C.I.

- MB991827: USB Cable
- MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

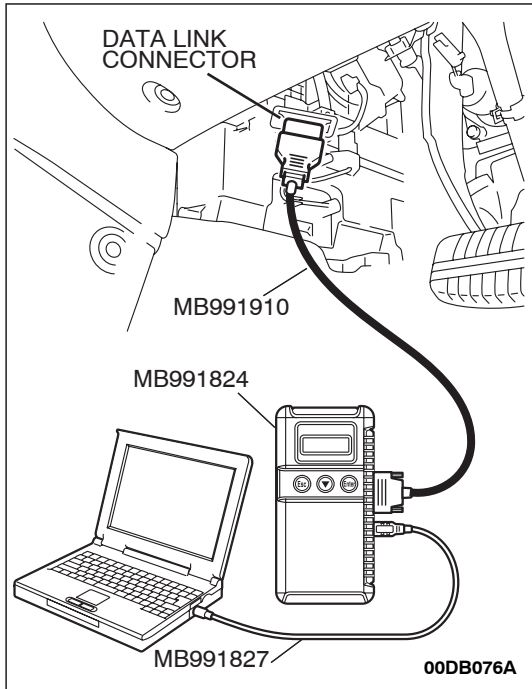
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

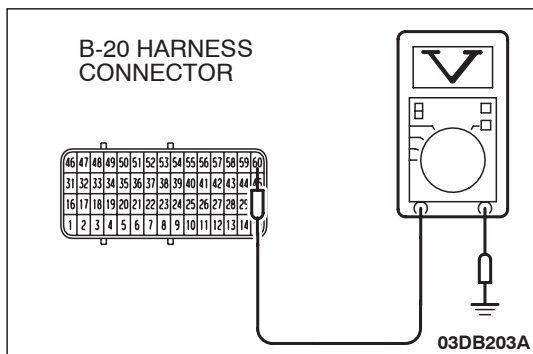
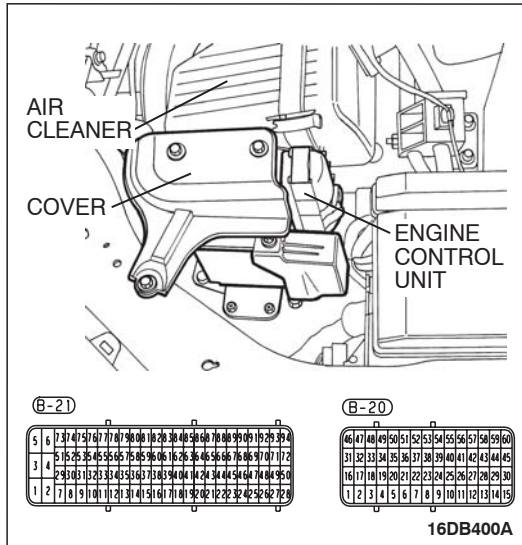
YES : It can be assumed that this malfunction is intermittent.
Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

NO : Then go to Step 2.



STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the all ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).



- (4) Measure the voltage between terminal No. 60 and ground.
 - Warm engine. When the engine is revved, the output voltage should alternate between 0 and 0.6-1.0 volts.

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

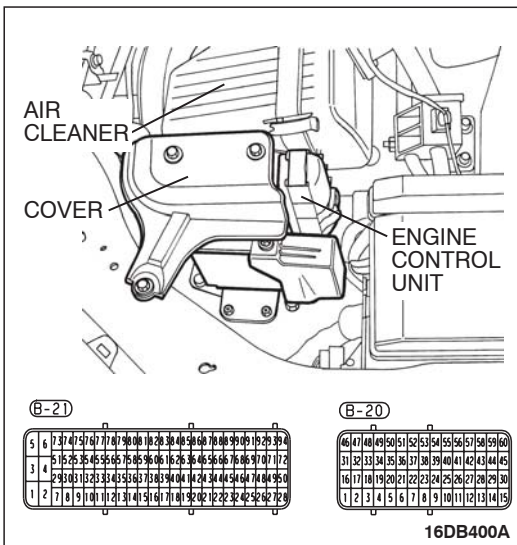
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

Q: Is the harness connector in good condition?

NO : 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?

NO : Repair or replace it. Then go to Step 7.

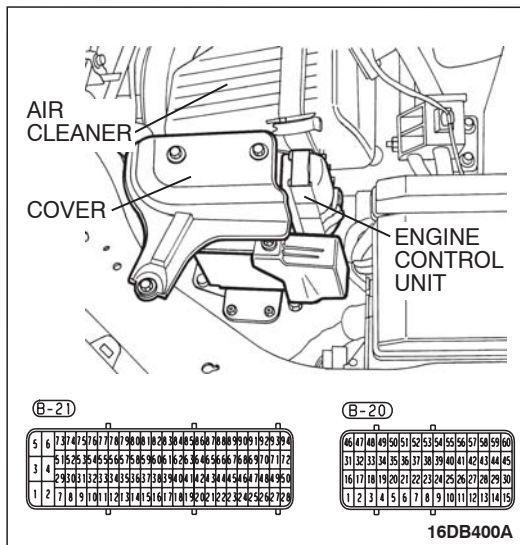
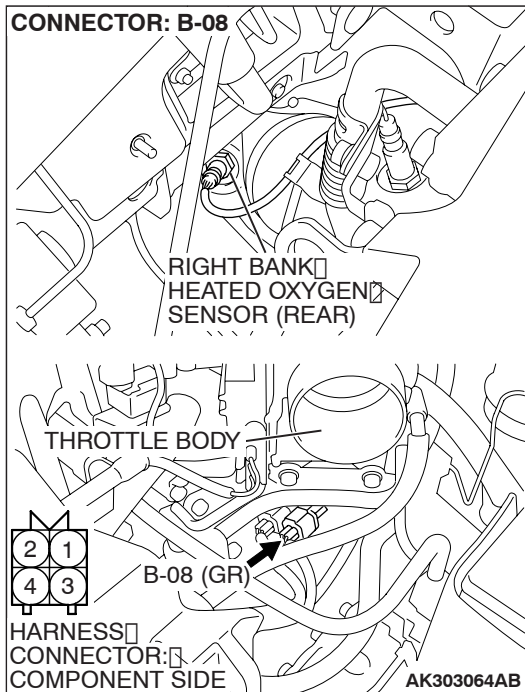


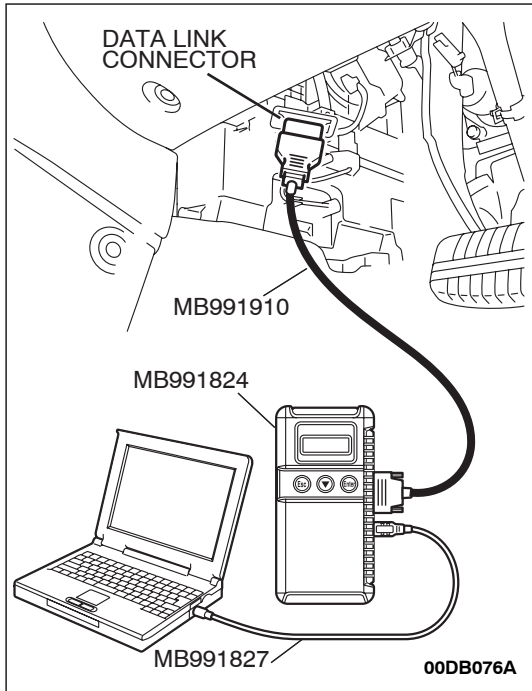
STEP 5. Check for open circuit between right bank heated oxygen sensor (rear) connector B-08 (terminal No. 2) and ENGINE-ECU connector B-20 (terminal No. 59).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Then go to Step 7.





STEP 6. Using diagnostic tool, check data list item AD: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 7.

STEP 7. Test the EOBD drive cycle.

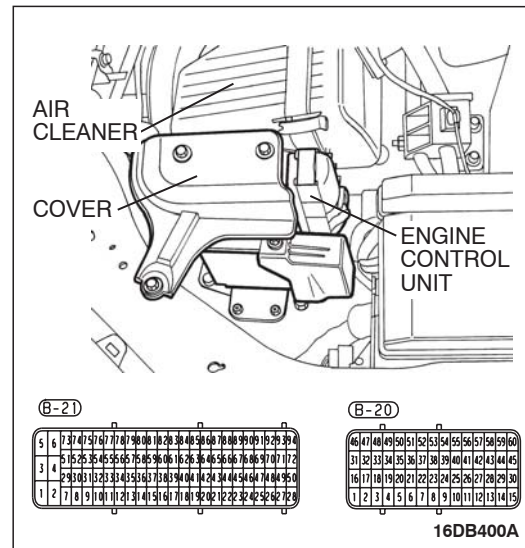
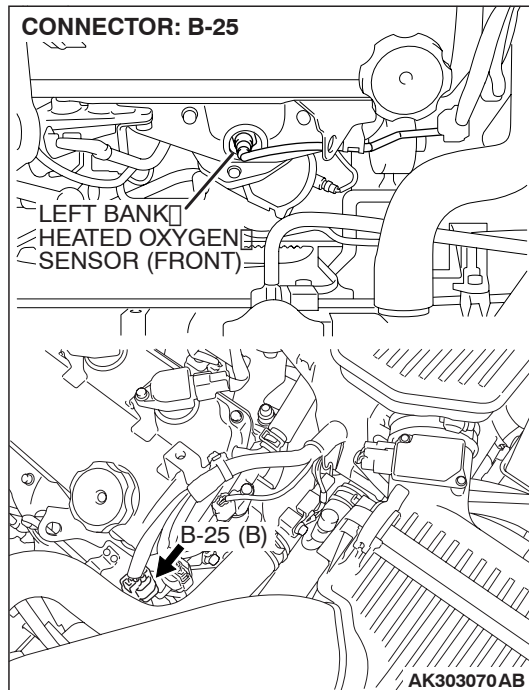
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0150: Heated Oxygen Sensor Circuit (bank 2, sensor 1).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 15) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with or ENGINE-ECU (terminal No. 14).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Idling.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#)

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

- Left bank heated oxygen sensor (front) failed.
- Short circuit in left bank heated oxygen sensor (front) output line to heater circuit ground line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- Diagnostic tool (MUT-III Sub Assembly)
- MB991824: V.C.I.

- MB991827: USB Cable
- MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

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

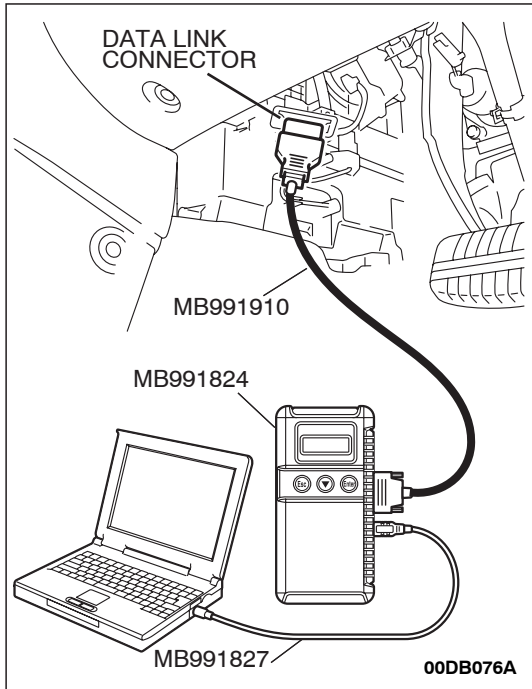
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 1.0 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 -1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

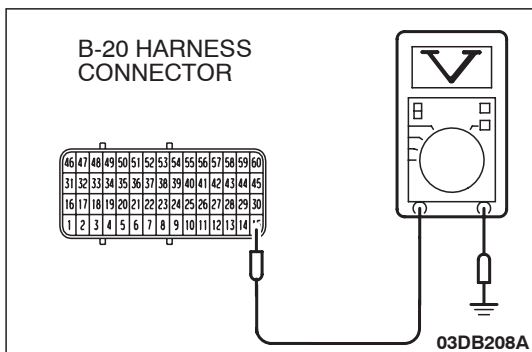
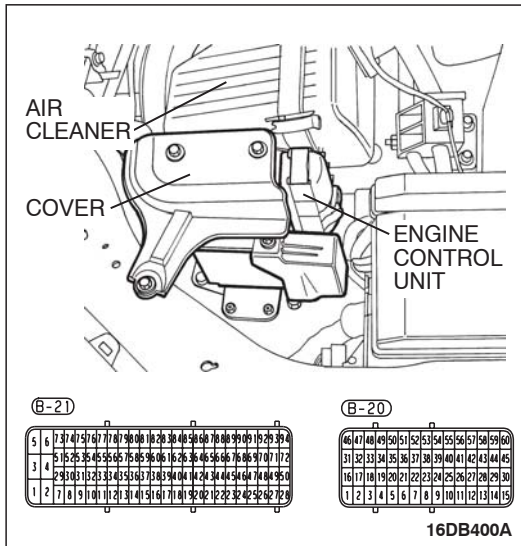
NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

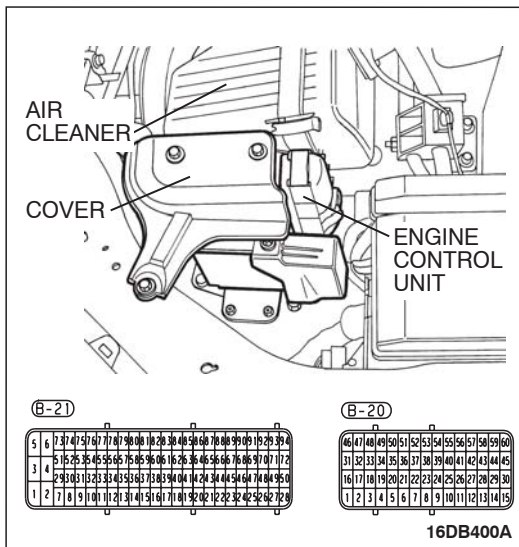
- (4) Measure the voltage between terminal No. 15 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage cycling within the specified range?

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

Q: Is the harness connector in good condition?

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

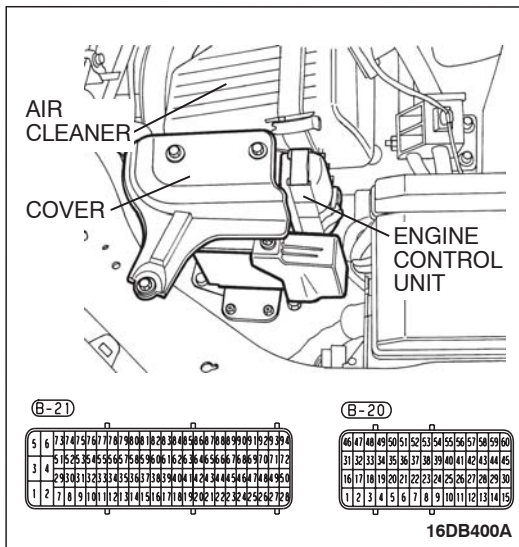
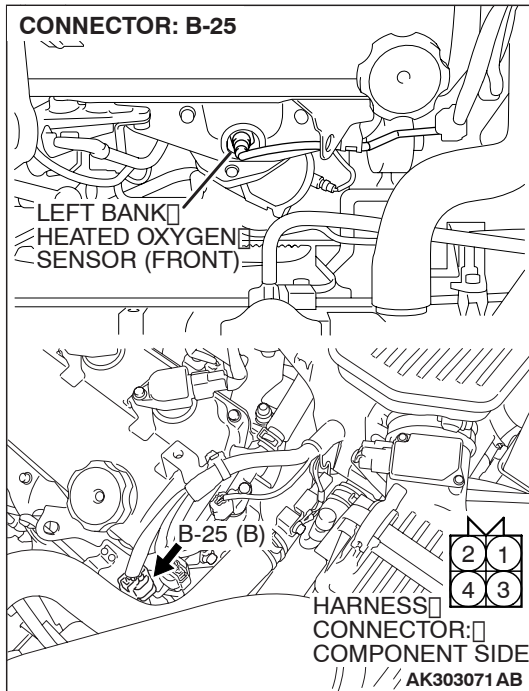


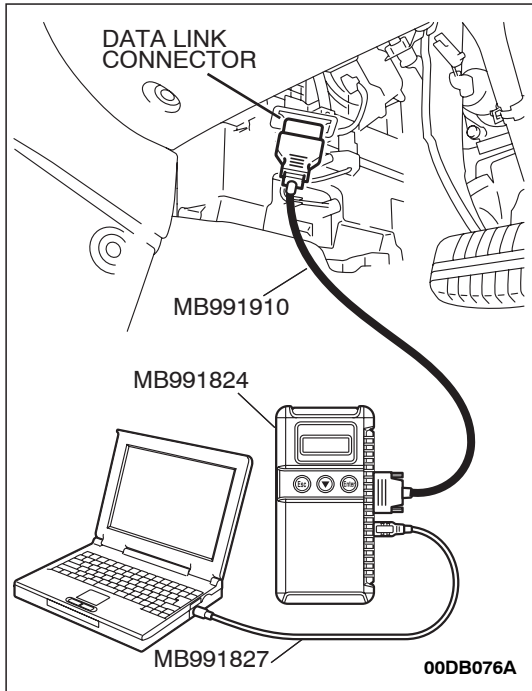
STEP 4. Check for short to heater circuit ground harness wire between right bank heated oxygen sensor (front) connector B-25 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the faulty oxygen sensor. Then go to Step 6.

STEP 6. Test the EOBD drive cycle.

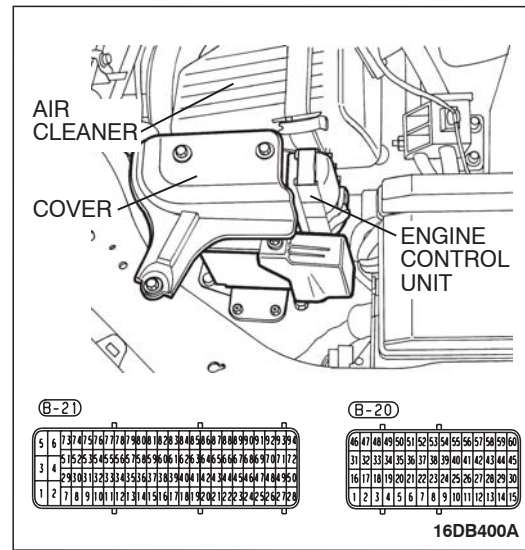
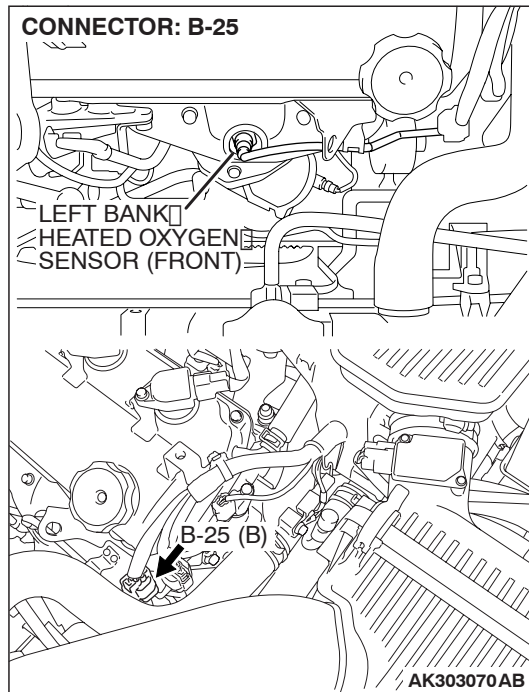
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0150 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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



DIAGNOSIS

Required Special Tools:

- Diagnostic tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

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

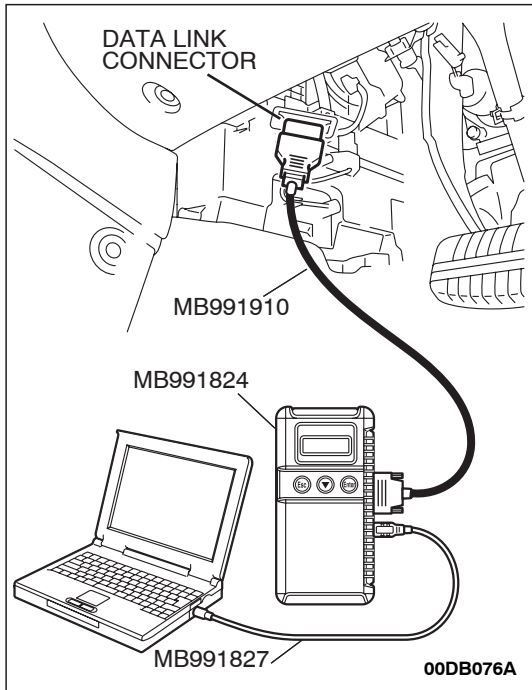
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 1.0 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 -1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

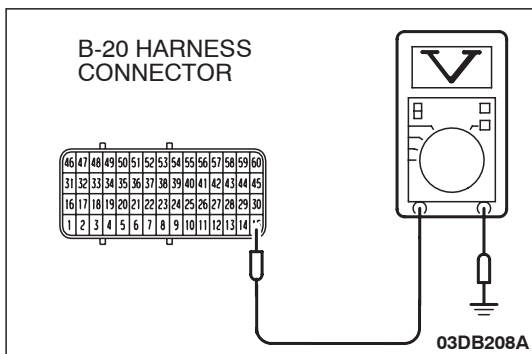
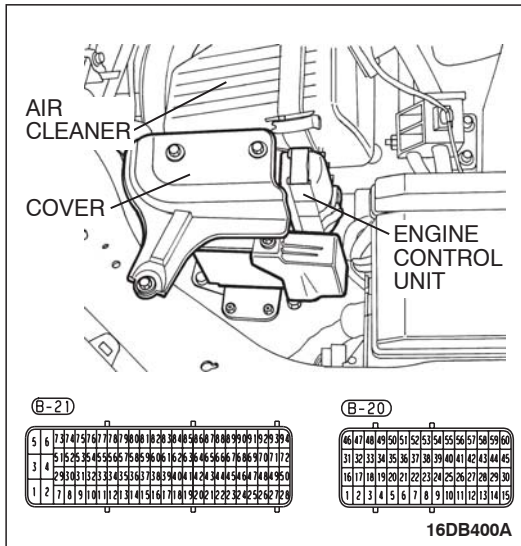
NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 15 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

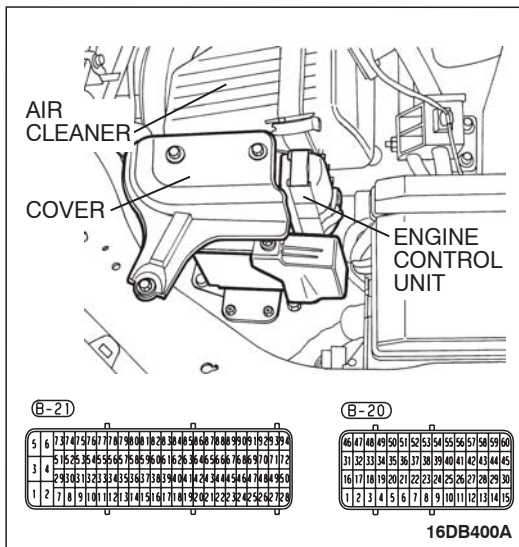
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

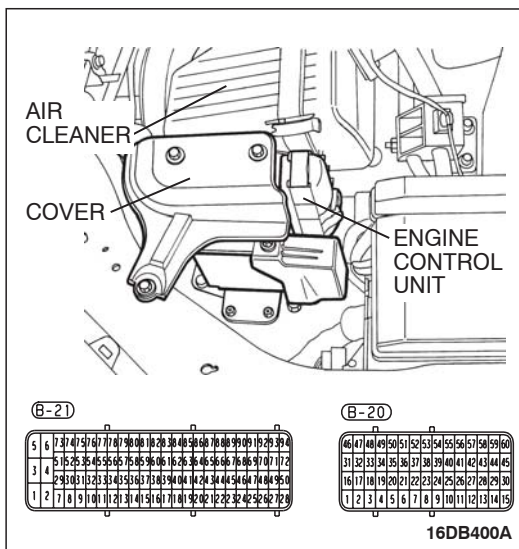
Q: Is the harness connector in good condition?

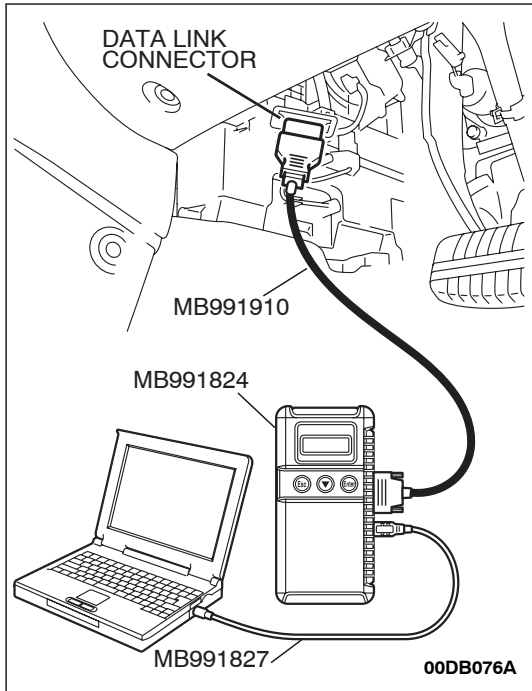
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.



Q: Is the harness wire in good condition?

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the faulty oxygen sensor. Then go to Step 6.

STEP 6. Test the EOBD drive cycle.

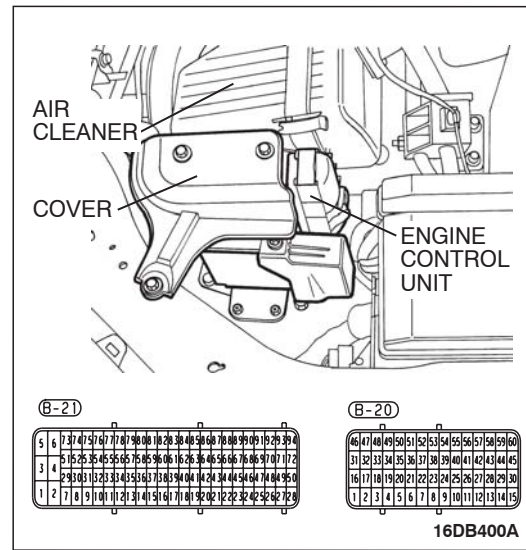
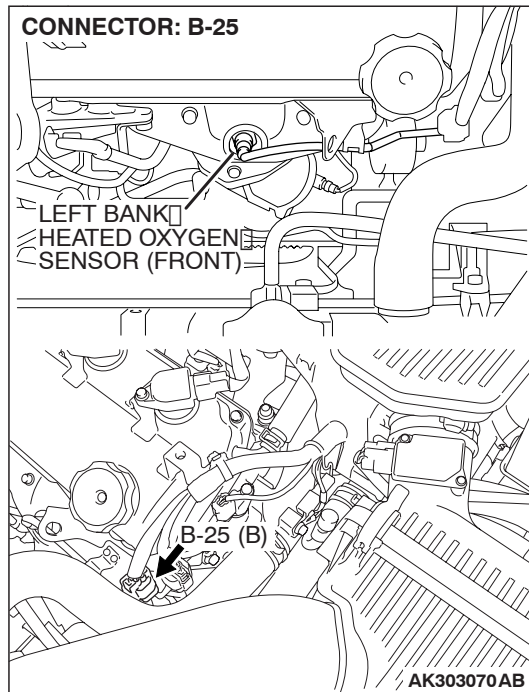
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 15) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 14).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Internal Resistance of the Nernst - cell is equal or greater than a modelled resistance based on the heating output of the O₂-sensor and the modelled exhasused gas temperature.
- Idling.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Short circuit to battery voltage in left bank heated oxygen sensor (front) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

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

⚠ CAUTION

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

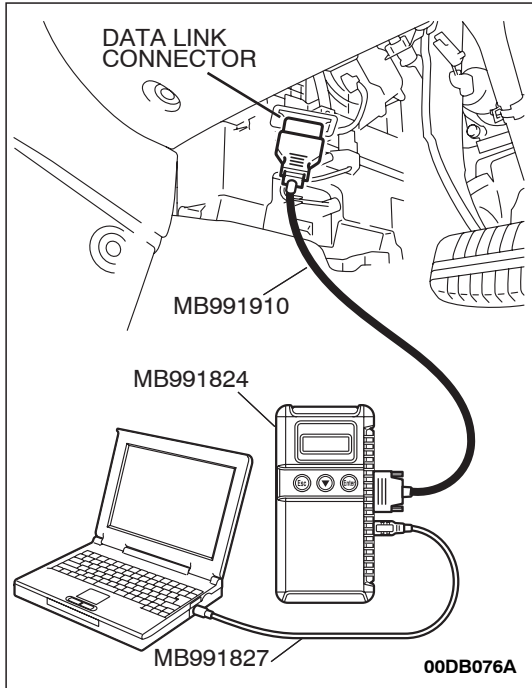
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

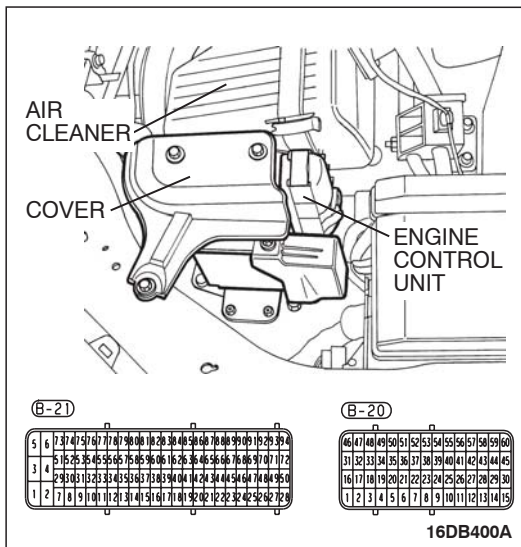
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

NO : Then go to Step 2.



Q: Is the harness connector in good condition?

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

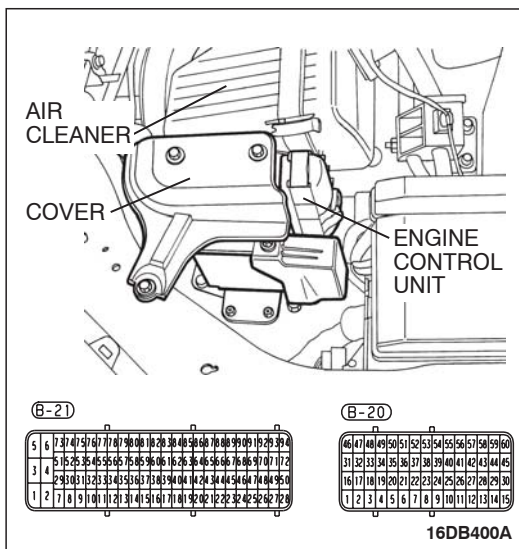
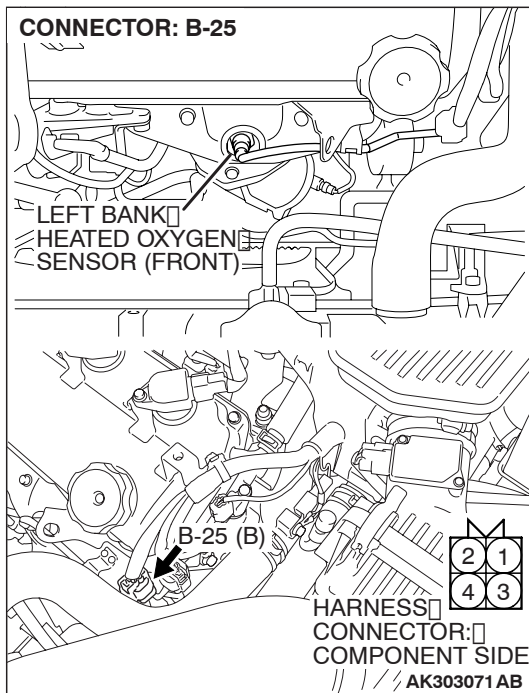


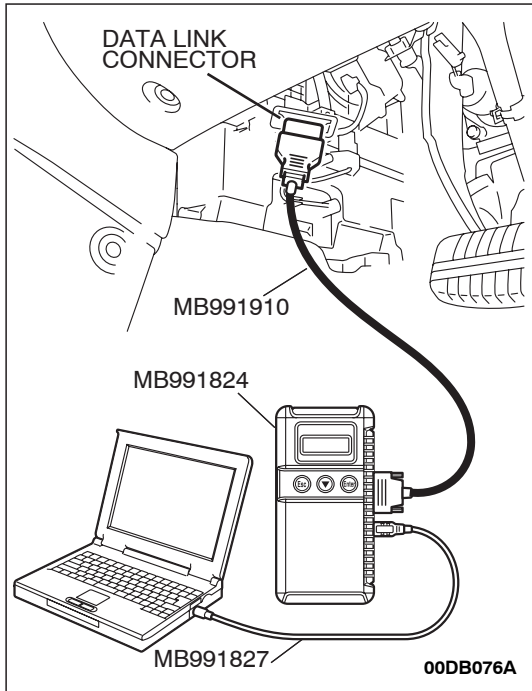
STEP 3. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-25 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Then go to Step 4.

NO : Repair or replace it. Then go to Step 5.





STEP 4. Using diagnostic tool, check data list item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
 - Warm engine. When the engine is revved up and down, the output voltage should cycle between 0.1 to 0.8 volt.
 - Warm engine. When the engine is idling, the output voltage should alternate between 0.1 to 0.6 - 1.0 volt.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are low or appear slow to cycle during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the sensor. Then go to Step 5.

STEP 5. Test the EOBD drive cycle.

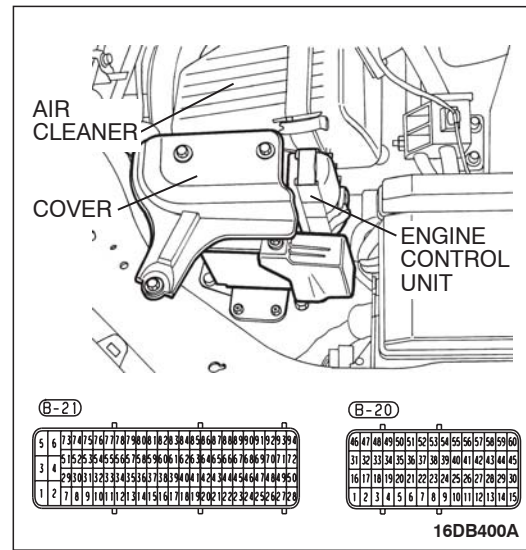
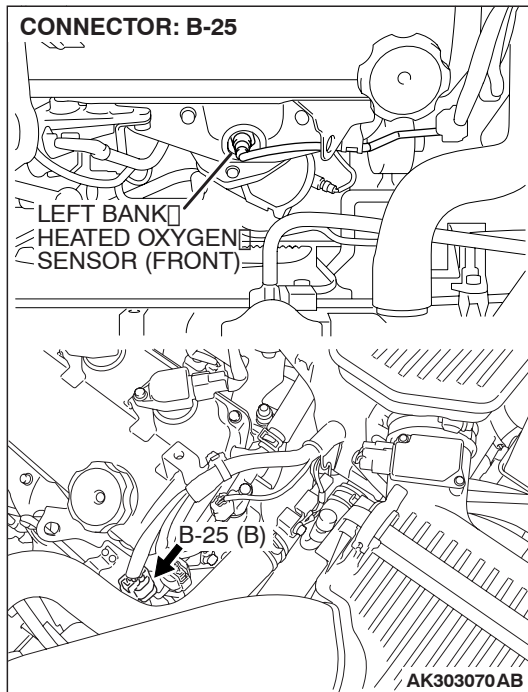
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 15) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 14).

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

DTC SET CONDITIONS

Check Conditions

- Engine speed between 1320 and 3200rpm.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Left bank heated oxygen sensor (front) deteriorated.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- (5) Warm up the engine, hold at 2,500 r/min.
 - Output voltage alternates between 0.1 volt and 0.6 – 1.0 volt 10 times or more within 10 seconds.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning.

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 sensor. Then go to Step 2.

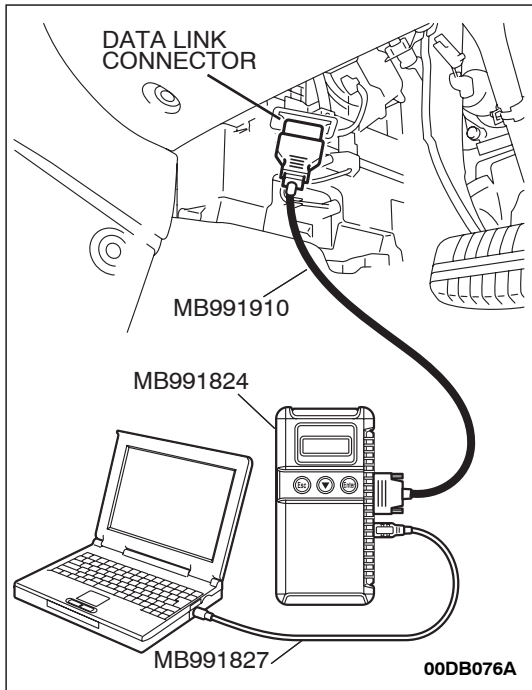
STEP 2. Test the EOBD drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (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 P0134 has been set, TCL related DTC U1120 is also set. After P0134 has been diagnosed, don't forget to erase DTC U1120.

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 15) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (front).
- Terminal No. 2 of the left bank heated oxygen sensor (front) is grounded with ENGINE-ECU (terminal No. 14).

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

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts
- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

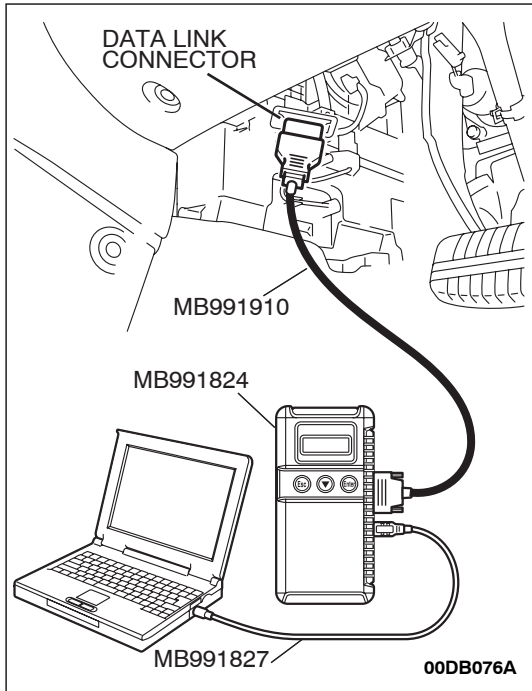
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor failed.
- Open circuit in left bank heated oxygen sensor (front) output line.
- Open circuit in left bank heated oxygen sensor (front) sensor ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
- MB992044: ENGINE-ECU Check Harness



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

⚠ CAUTION

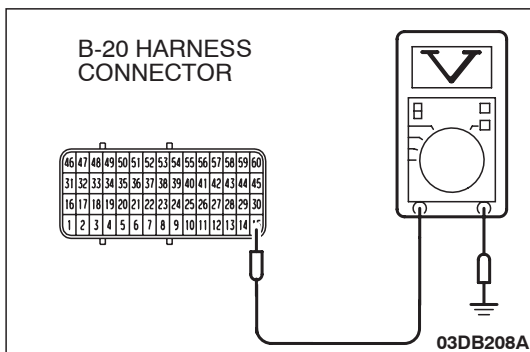
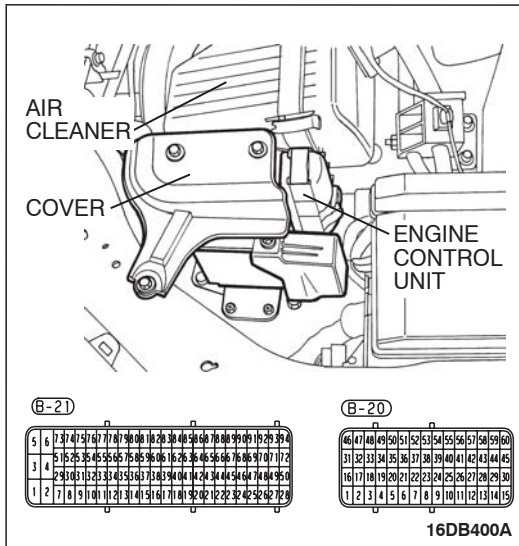
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool 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 alternate between 0 and 0.6 to 1.0 volts.
- (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 : Then go to Step 2.



STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the all ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 15 and ground.
 - Warm engine. When the engine is revved, the output voltage should alternate between 0 and 0.6-1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

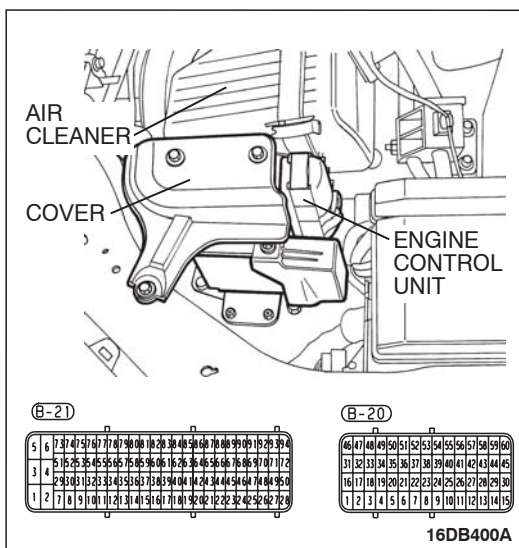
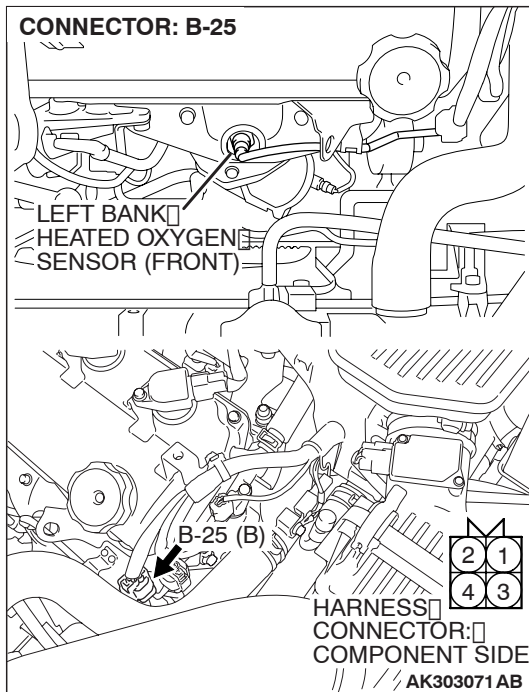
NO : Then go to Step 3.

STEP 3. Check harness connector B-25 at left bank heated oxygen sensor (front) and connector B-20 at ENGINE-ECU for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

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

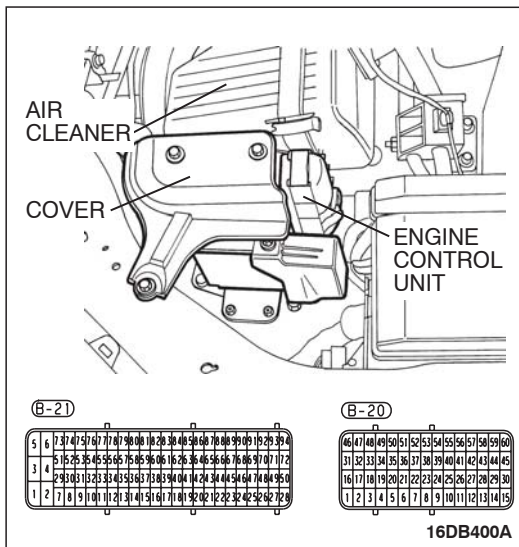
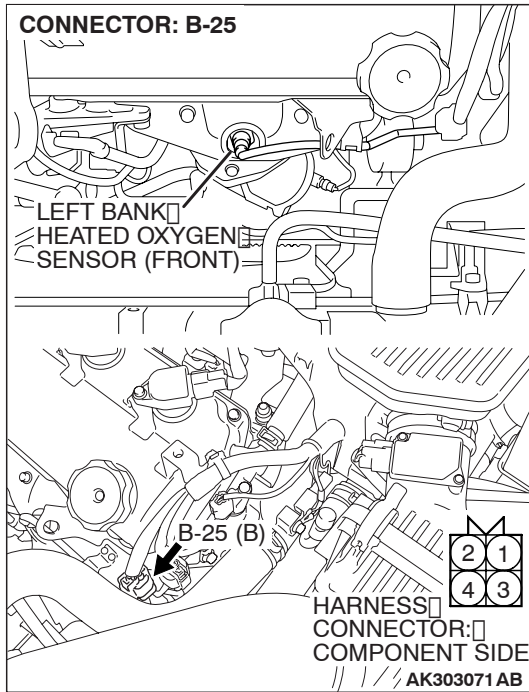


STEP 4. Check for open circuit between left bank heated oxygen sensor (front) connector B-25 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 15).

Q: Is the harness wire in good condition?

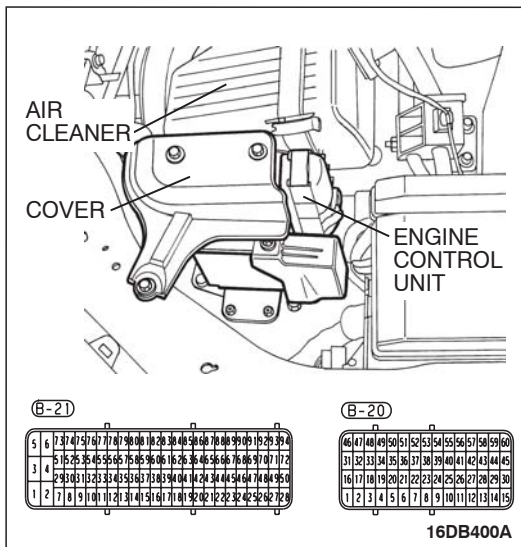
YES : Go to Step 5.

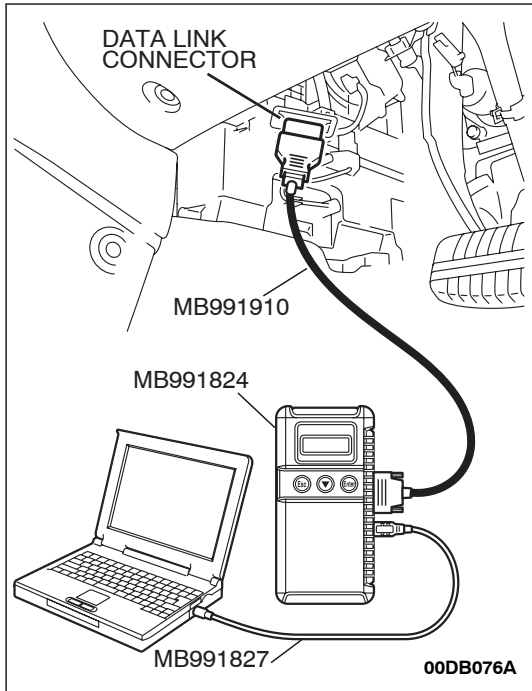
NO : Repair or replace it. Then go to Step 7.



Q: Is the harness wire in good condition?

NO : Repair or replace it. Then go to Step 7.





STEP 6. Using diagnostic tool, check data list item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool 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 alternate between 0 and 0.6 to 1.0 volts.
- (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 sensor. Then go to Step 7.

STEP 7. Test the EOBD drive cycle.

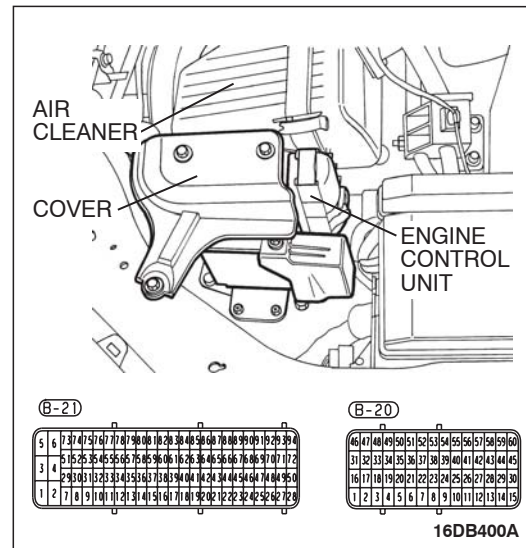
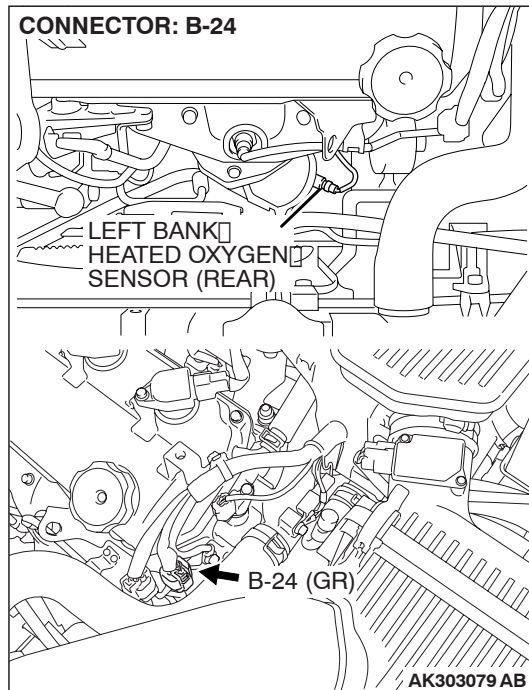
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0154 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0156: Heated Oxygen Sensor Circuit (bank 2, sensor 2).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 30) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 29).

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 ENGINE-ECU checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Battery voltage < 11.02 volts

- Engine coolant temperature is higher than 80°C.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Left bank heated oxygen sensor (rear) failed.
- Short circuit in left bank heated oxygen sensor (rear) output line to heater circuit ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

- MB992044: ENGINE-ECU Check Harness

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

⚠ CAUTION

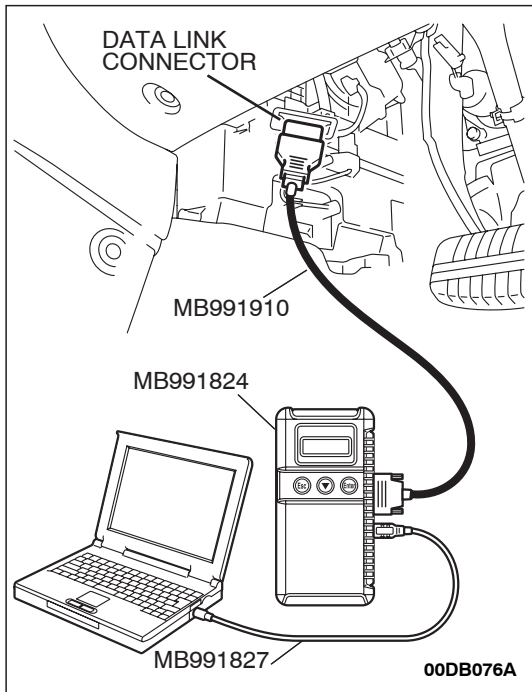
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

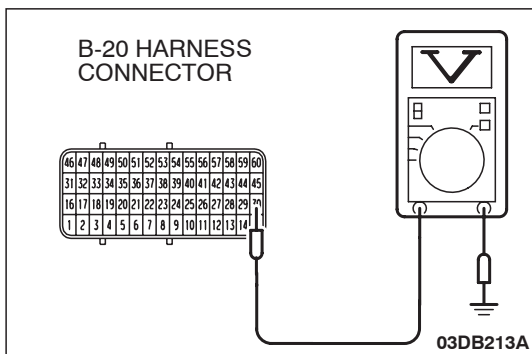
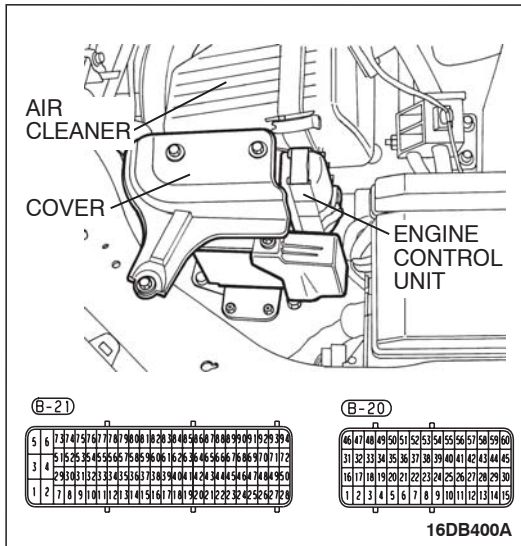
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the all ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 30 and ground.
 - Warm engine. When the engine is revved, the output voltage should alternate between 0 and 0.6-1.0 volts.

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

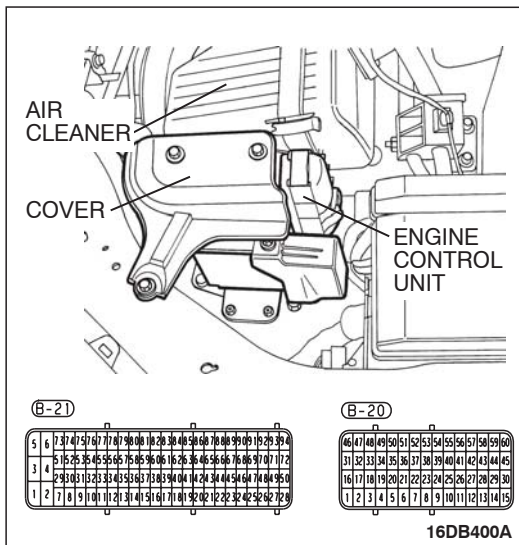
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

Q: Is the harness connector in good condition?

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

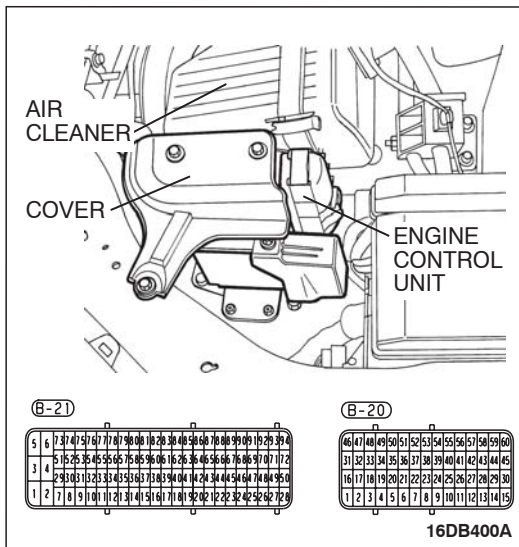
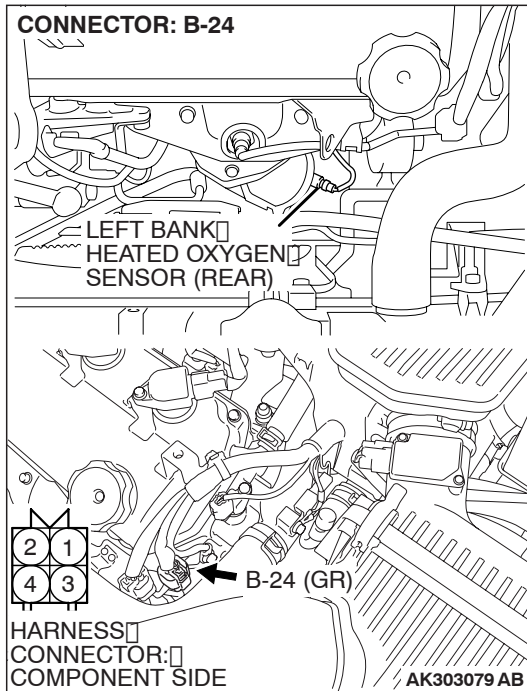


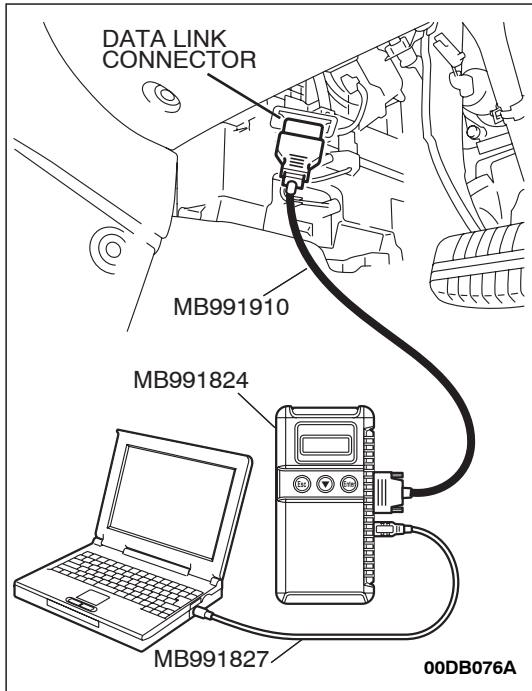
STEP 4. Check for short to heater circuit ground harness wire between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

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

STEP 6. Test the EOBD drive cycle.

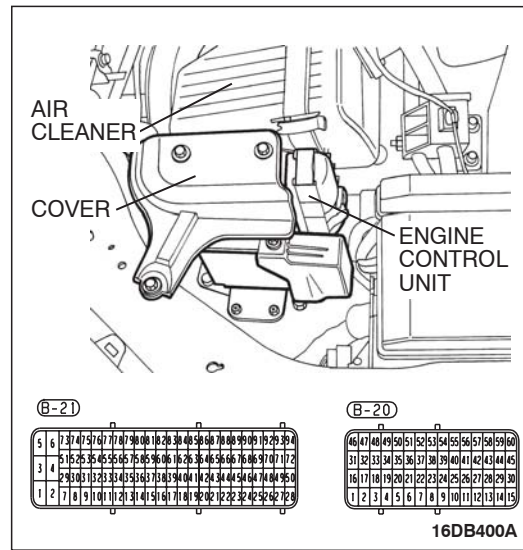
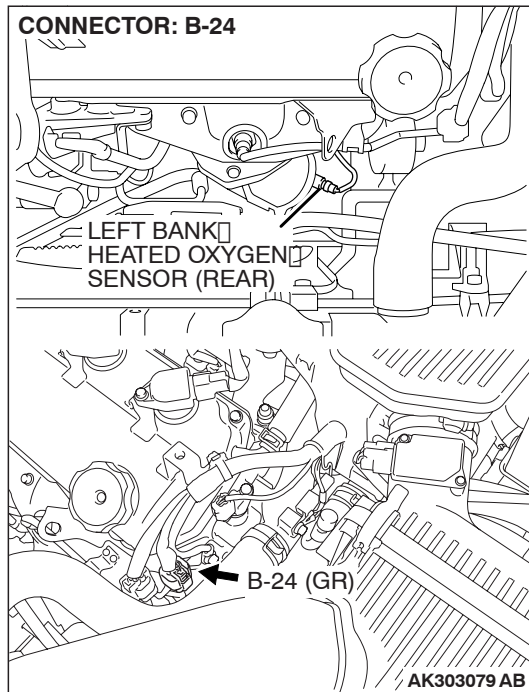
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0156 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

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



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 30) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 29).

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 ENGINE-ECU checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

Judgement Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

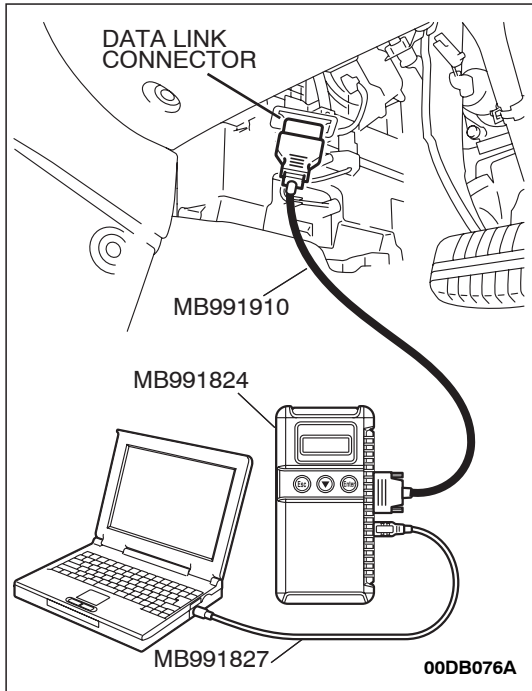
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) failed.
- Short circuit to ground in left bank heated oxygen sensor (rear) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

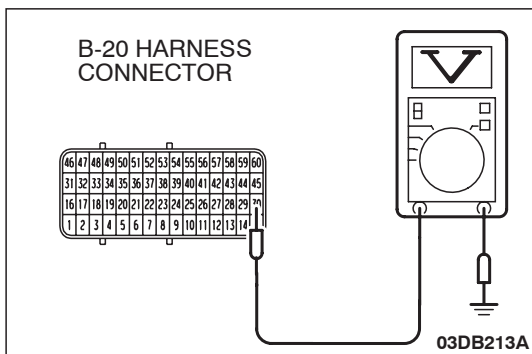
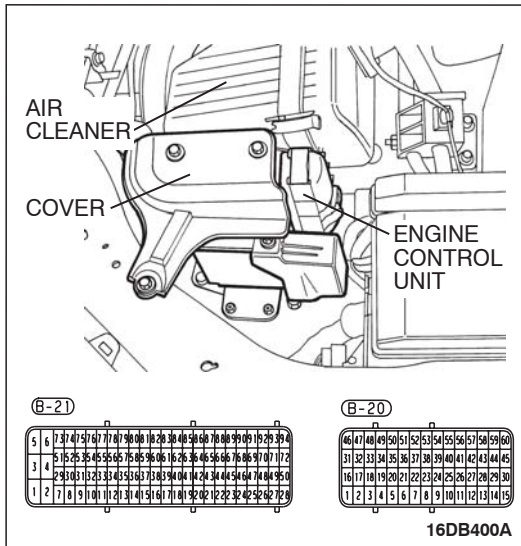
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

- (1) Disconnect the ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 30 and ground.
 - Warm engine. When the engine is 2,500 r/min, the output voltage should cycle between 0.1 to 0.8-1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

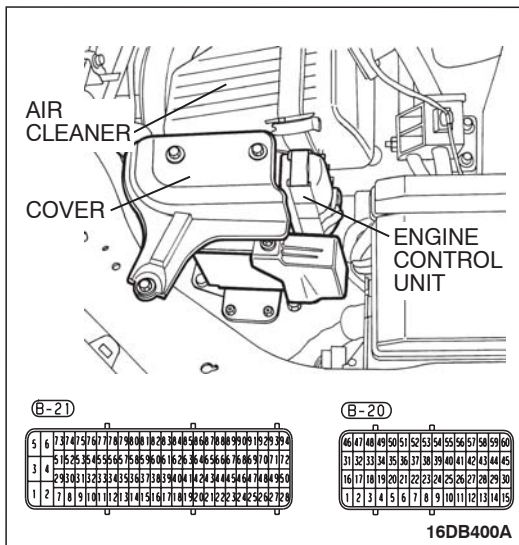
Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (front). Then go to Step 6.

Q: Is the harness connector in good condition?

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

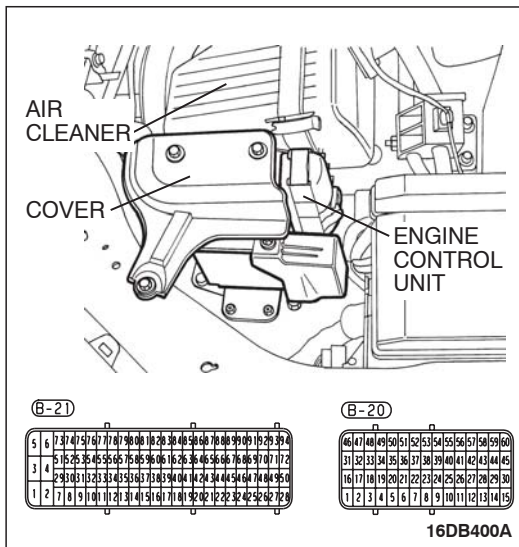
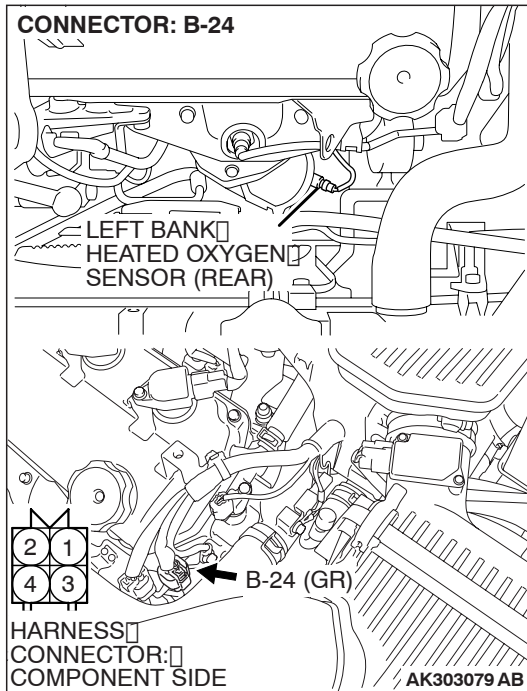


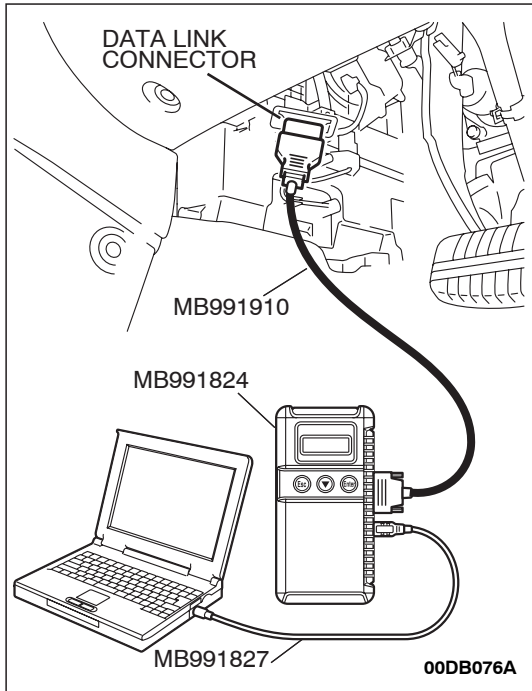
STEP 4. Check for short circuit to ground between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair or replace it. Then go to Step 6.





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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

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

STEP 6. Test the EOBD drive cycle.

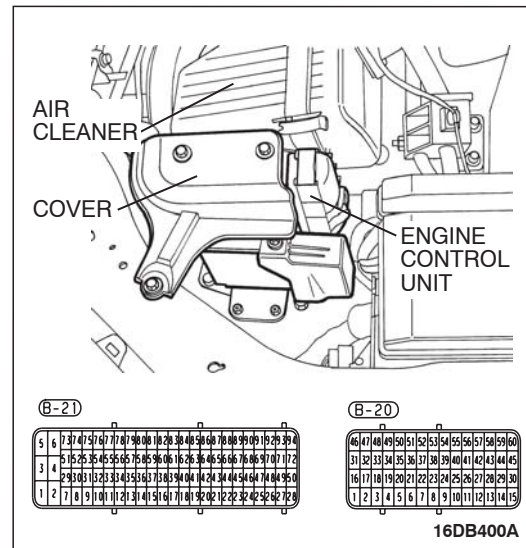
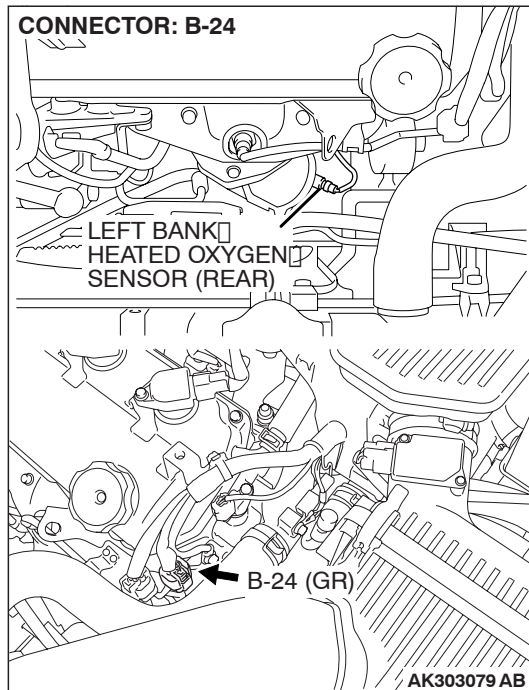
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 30) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 29).

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 ENGINE-ECU checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – Procedure 6 – Other Monitor [P.13A-11](#).

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

- Short circuit t battery voltage in left bank heated oxygen sensor (rear) output line.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

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

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

⚠ CAUTION

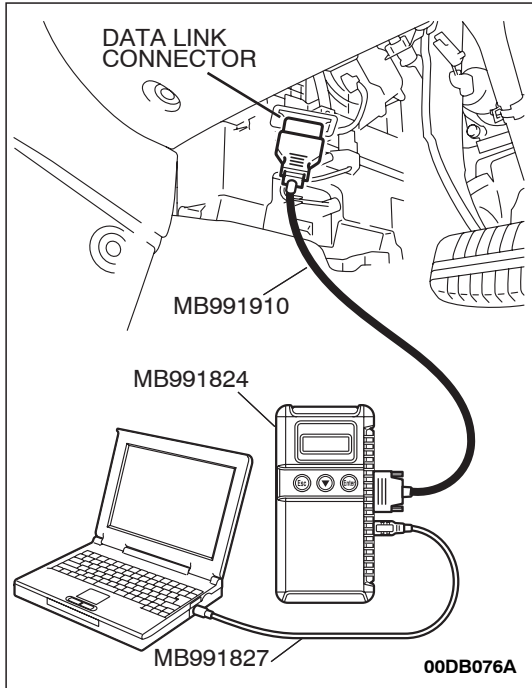
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

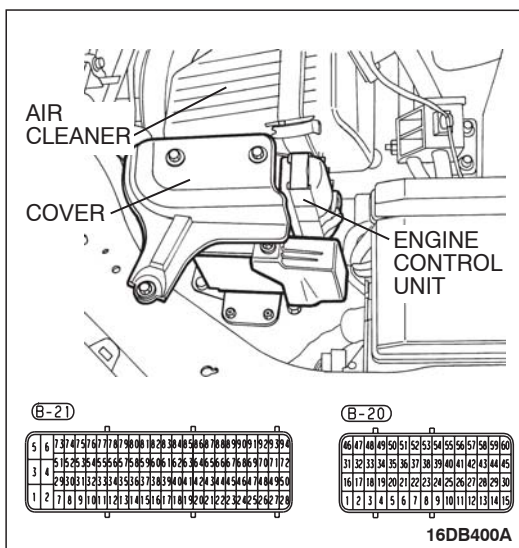
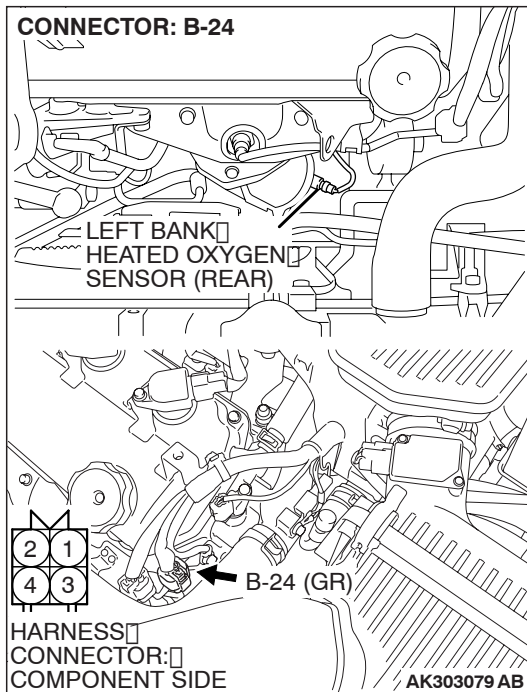


STEP 2. Check harness connector B-24 at left bank heated oxygen sensor (rear) and harness connector B-20 at ENGINE-ECU for damage.

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 5.

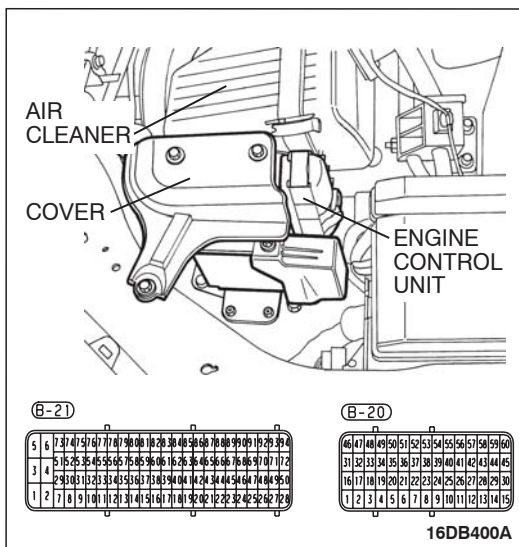
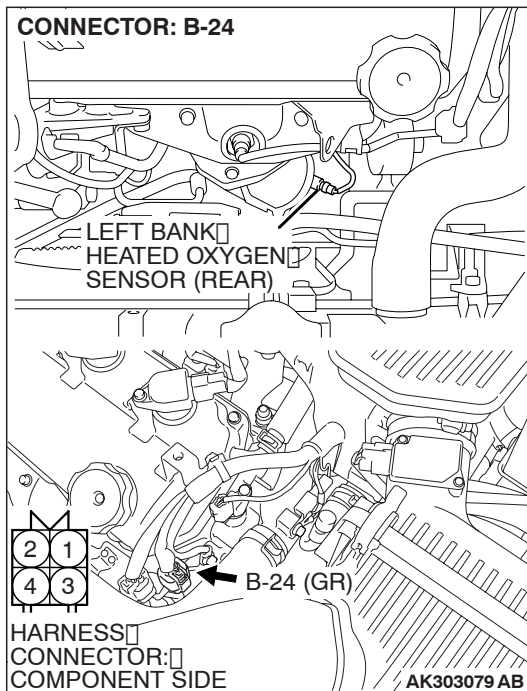


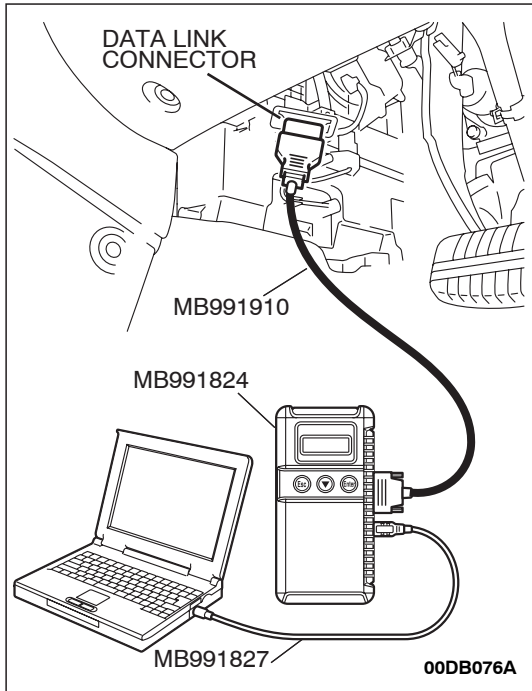
STEP 3. Check for short circuit to power supply between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Then go to Step 4.

NO : Repair or replace it. Then go to Step 5.





STEP 4. Using diagnostic tool, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

NOTE: If data list readings are consistently low or appear slow to cycle(should cycle every 0.5-1.0 sec.) during check the sensor is likely to be malfunctioning. Ensure wiring and connector checks are performed prior to replacing sensor.

Q: Is the sensor operating properly?

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

NO : Replace the sensor. Then go to Step 5.

STEP 5. Test the EOBD drive cycle.

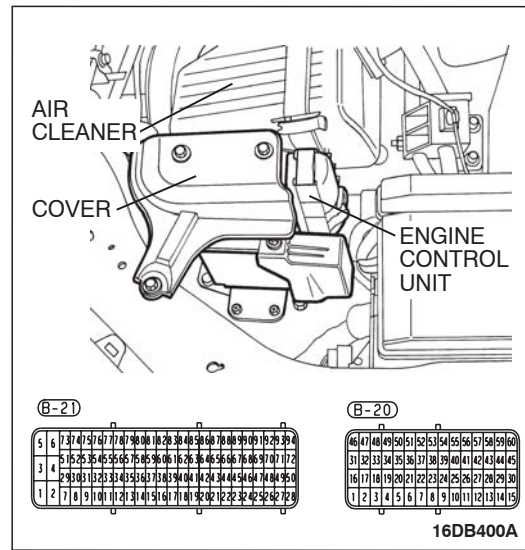
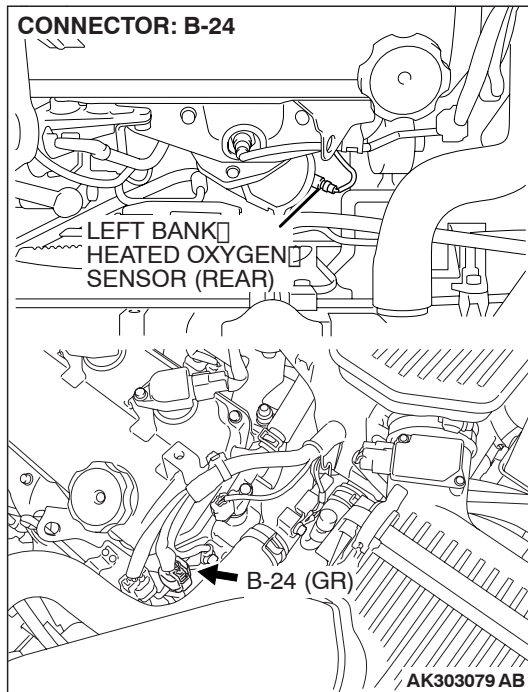
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

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).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 30) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 29) .

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- Engine speed between 1320 and 3200rpm.

Judgment Criteria

- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

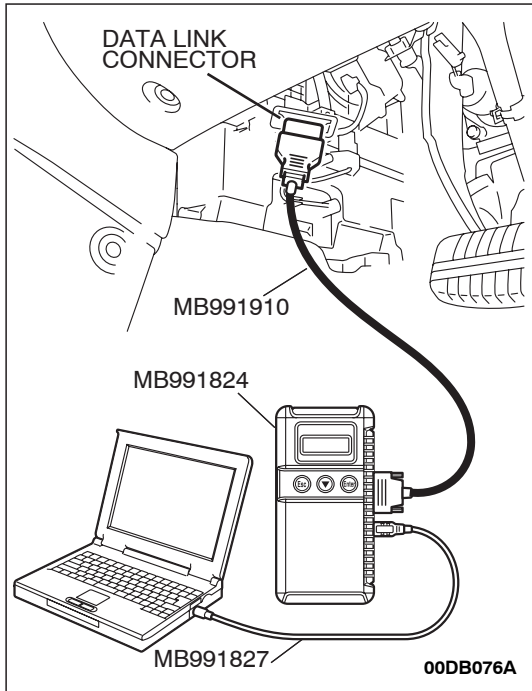
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) deteriorated.
- Refer to component locations GROUP-[70](#)
- Refer to configuration diagrams GROUP-[80](#)
- Refer to circuit diagrams GROUP-[90](#)

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- (4) Warm up the engine.
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the EOBD drive cycle.

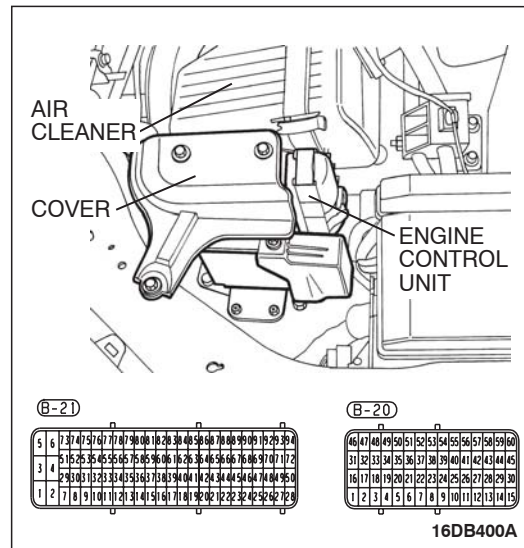
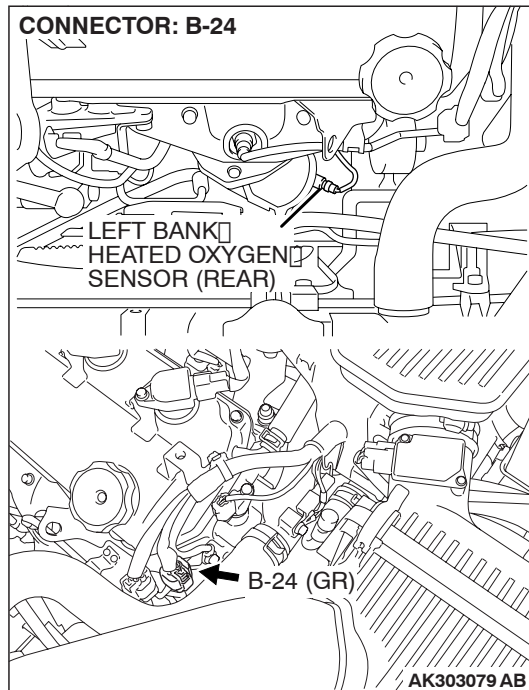
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0159 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0160: Heated Oxygen Sensor Circuit No Activity (bank 2, sensor 2).



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ENGINE-ECU (terminal No. 30) from the output terminal (terminal No. 1) of the left bank heated oxygen sensor (rear).
- Terminal No. 2 of the left bank heated oxygen sensor (rear) is grounded with ENGINE-ECU (terminal No. 29) .
- The ENGINE-ECU applies an offset voltage of 0.5 volt to terminal No. 2 of the left bank heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated left bank oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ENGINE-ECU checks for the left bank heated oxygen sensor (rear) output voltage.

DTC SET CONDITIONS

Check Conditions

- Battery voltage is between 10.7 and 16.1volts.

- Engine speed is above 20 r/min.
- Engine start achieved.

Judgment Criteria

- Signal check.
- MIL is activated after 2 Drive cycles.
- No limp home.

EOBD DRIVE CYCLE PATTERN

Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).

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

- Left bank heated oxygen sensor (rear) failed.
- Open circuit in left bank heated oxygen sensor (rear) output line.
- Open circuit in left bank heated oxygen sensor (rear) sensor ground.
- Wiring harness or connector damage.
- Refer to component locations [GROUP-70](#)
- Refer to configuration diagrams [GROUP-80](#)
- Refer to circuit diagrams [GROUP-90](#)

DIAGNOSIS

Required Special Tools:

- : Diagnostic Tool (MUT-III Sub Assembly)
- MB991824: V.C.I.

- MB991827: USB Cable
- MB991910: Main Harness A

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

⚠ CAUTION

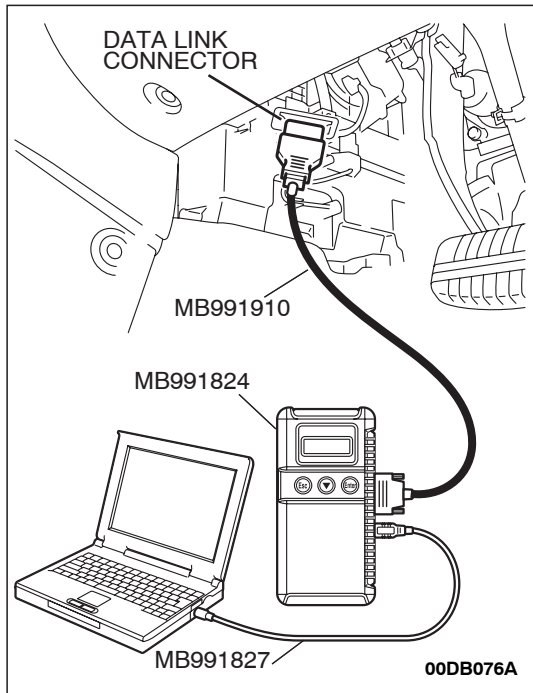
To prevent damage to diagnostic tool, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting diagnostic tool .

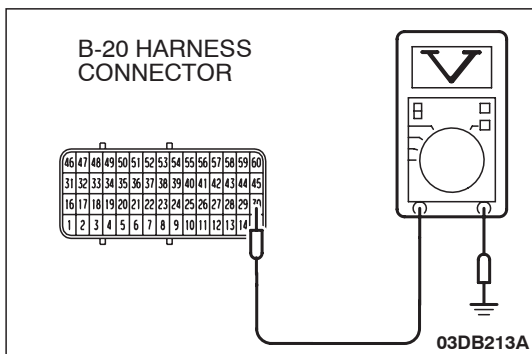
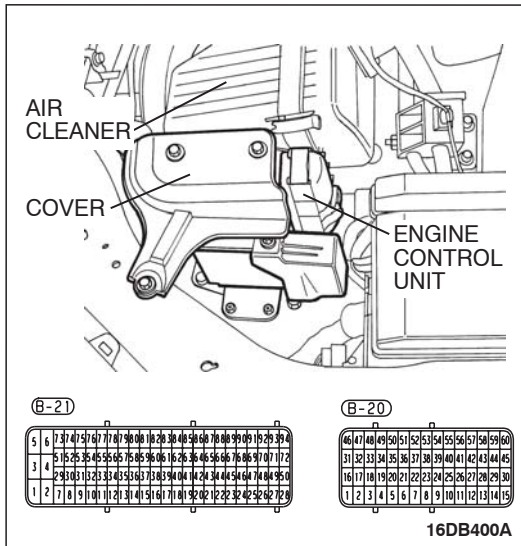
- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AD, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 : Then go to Step 2.





STEP 2. Measure the sensor output voltage at ENGINE-ECU connector B-20 by using ENGINE-ECU check harness special tool MB992044.

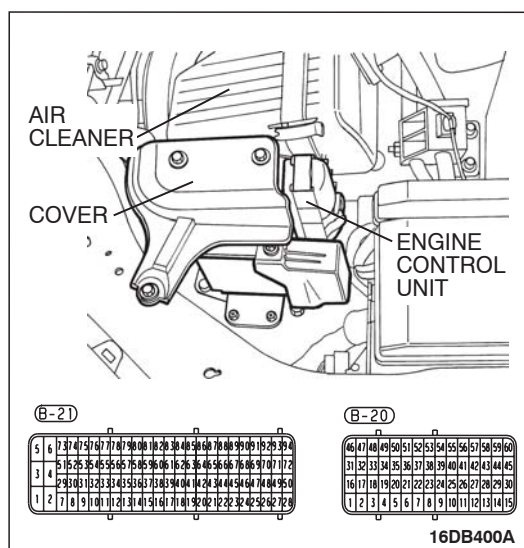
- (1) Disconnect the all ENGINE-ECU connectors and connect ENGINE-ECU check harness special tool MB992044 between the separated connectors.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).

- (4) Measure the voltage between terminal No. 30 and ground.
 - Warm engine. When the engine is revved, the output voltage should alternate between 0 and 0.6-1.0 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage cycling within the specified range?

YES : Go to Step 6.

NO : Then go to Step 3.

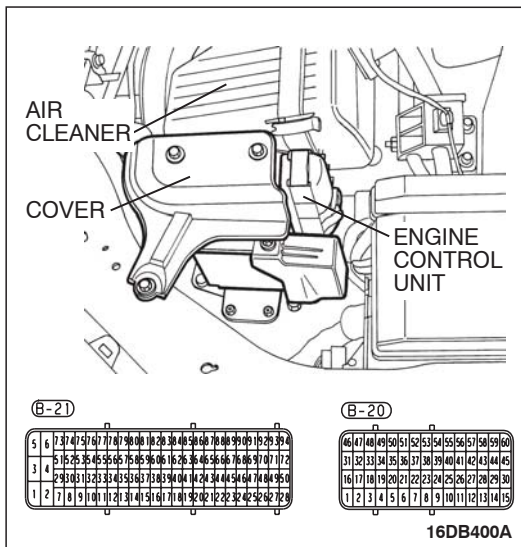
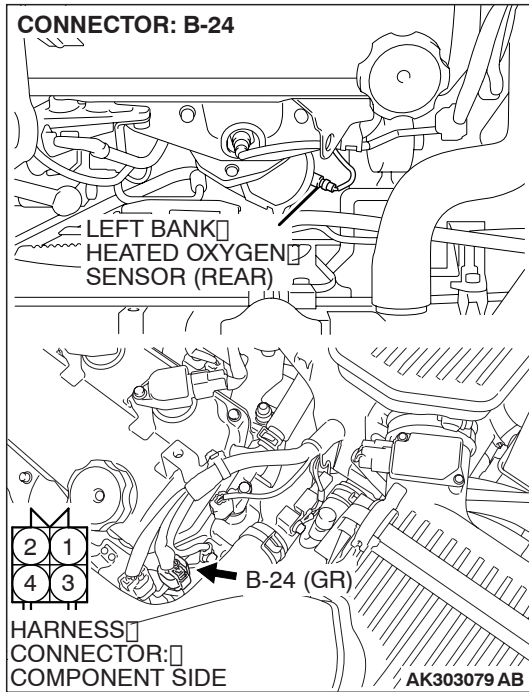


STEP 4. Check for open circuit between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 1) and ENGINE-ECU connector B-20 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 7.

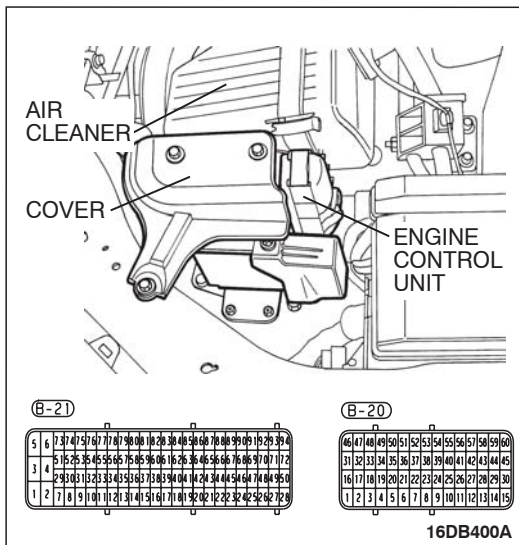
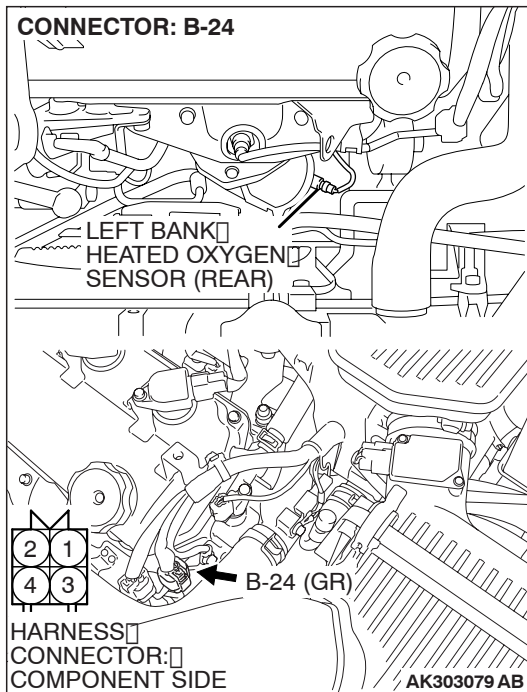


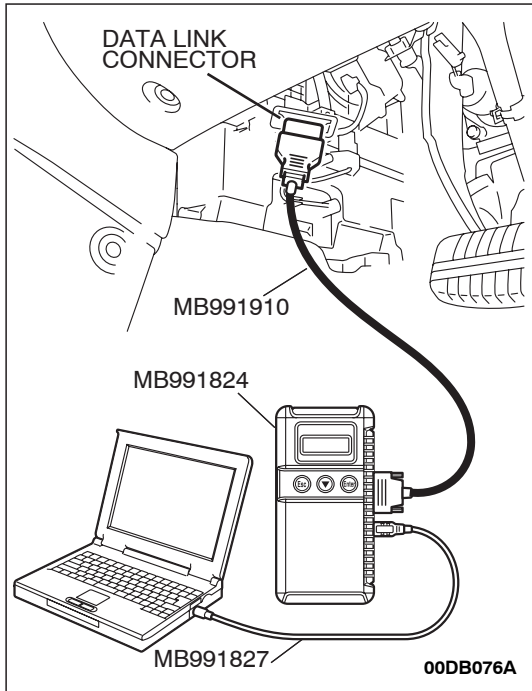
STEP 5. Check for open circuit between left bank heated oxygen sensor (rear) connector B-24 (terminal No. 2) and ENGINE-ECU connector B-20 (terminal No. 29).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Then go to Step 7.





STEP 6. Using diagnostic tool, check data list item AF: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

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

- (1) Connect diagnostic tool to the data link connector.
- (2) Start the engine and run at idle.
- (3) Ensure engine is at running temperature (80° C or higher).
- (4) Set diagnostic tool to the data reading mode for item AF, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
 - Warming up the engine. When the engine is revved, the output voltage should alternate between 0 and 0.6 to 1.0 volts.
- (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 7.

STEP 7. Test the EOBD drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – EOBD Drive Cycle – [P.13A-11](#).
- (2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

[NEXT PAGE](#)