DTC P0171: System too Lean (bank 1)

Fuel Trim Circuit
- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION
- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

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

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

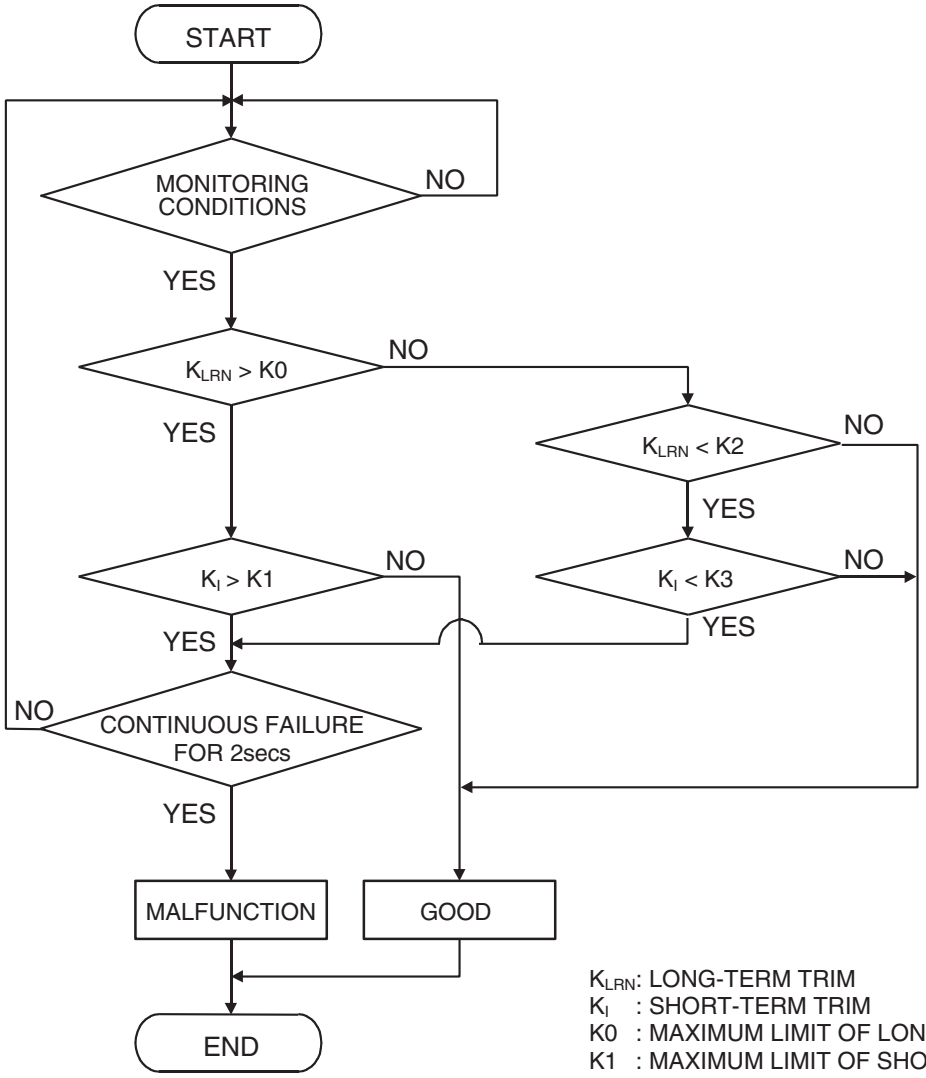
MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Volume airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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

AK501063

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is higher than 100 Hz.

Judgement Criteria

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

or

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

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is lower than 100 Hz.

TSB Revision

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

or
- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

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

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

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

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

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

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

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

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

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

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

DIAGNOSIS

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

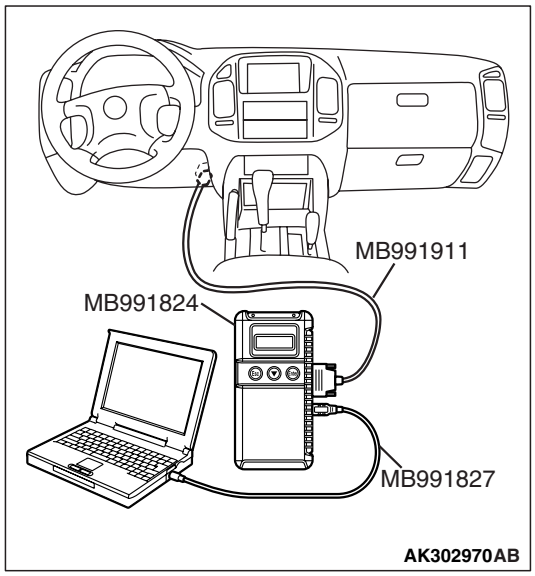
YES : Repair it. Then go to Step 16.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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

STEP 3. Using scan tool MB991958, check data list item 12: Volume Airflow Sensor.



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

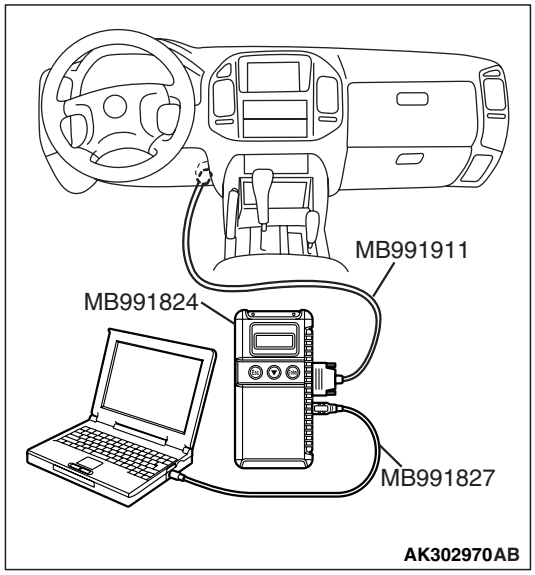
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13A-109, DTC P0102 – Volume Airflow Circuit Low Input P.13A-118.

STEP 4. Using scan tool MB991958, check data list item 13: Intake Air Temperature Sensor.

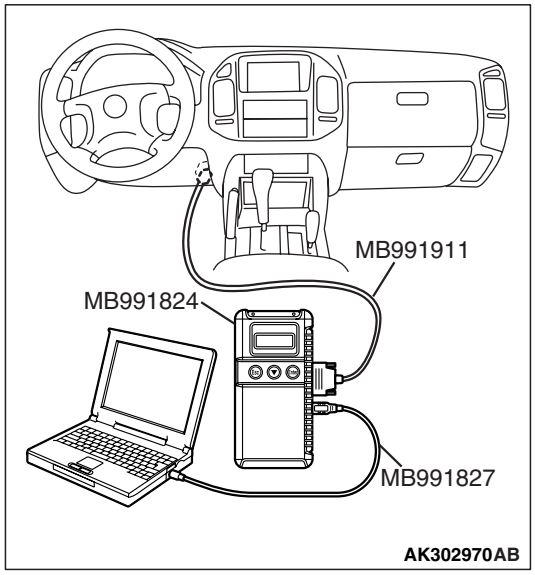


(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-156, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-163, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-168.



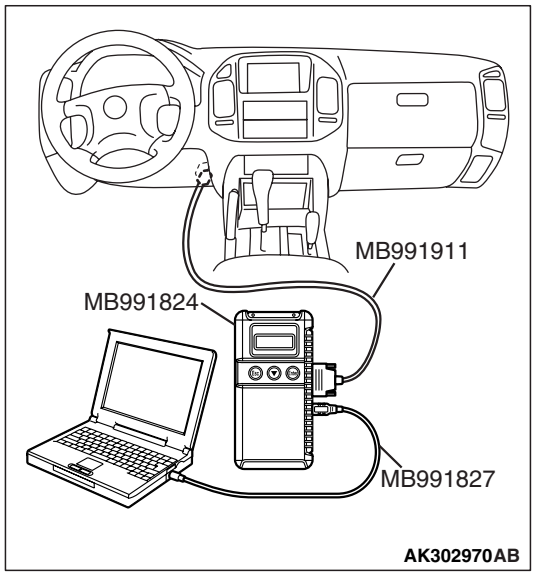
STEP 5. Using scan tool MB991958, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-175, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-188.



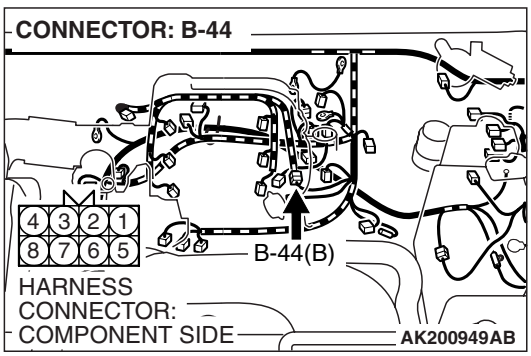
STEP 6. Using scan tool MB991958, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P2228 – Barometric Pressure Circuit Low Input P.13A-872, DTC P2229 – Barometric Pressure Circuit High Input P.13A-881.

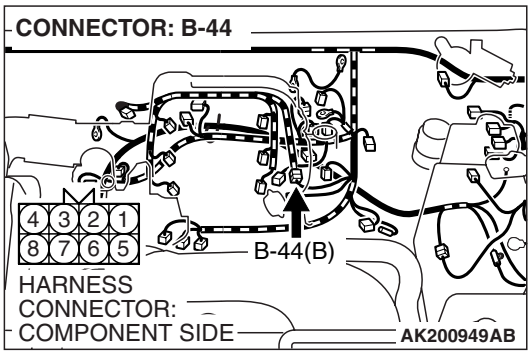


STEP 7. Check harness connector B-44 at injector intermediate connector for damage.

Q: Is the harness connector in good condition?

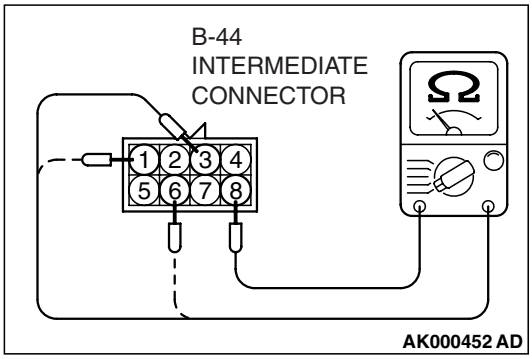
YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

TSB Revision



STEP 8. Check the right bank injector resistance at intermediate connector B-44.

(1) Disconnect the intermediate connector B-44.



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

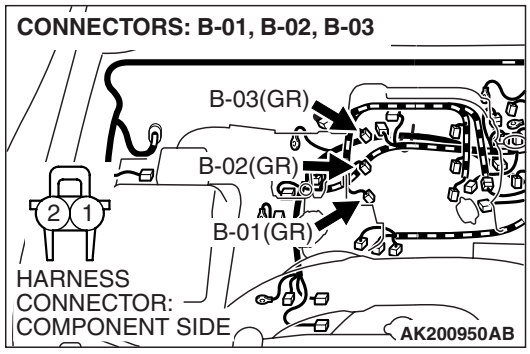
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

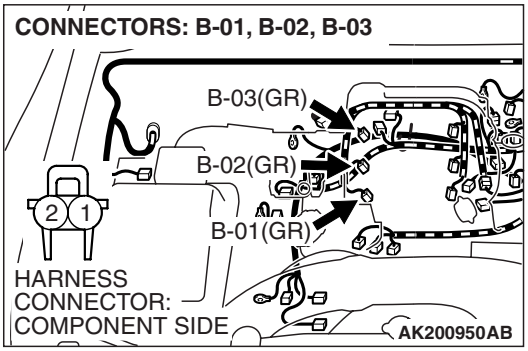
YES : Go to Step 11.
NO : Go to Step 9.

STEP 9. Check harness connector B-01, B-02, B-03 at right bank injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

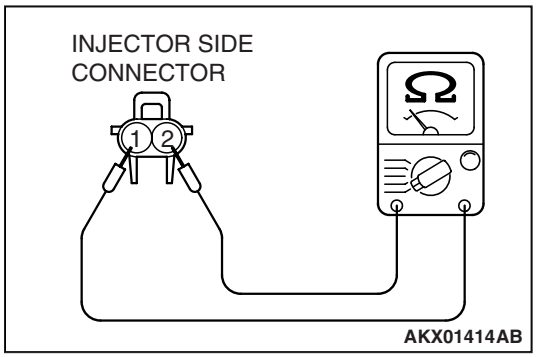




STEP 10. Check the right bank injector.

(1) Remove the intake manifold.

(2) Disconnect the right bank injector connector.



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

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

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

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 16.

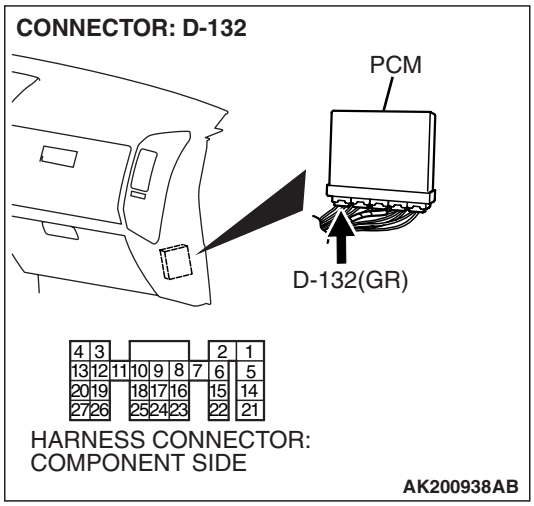
NO : Replace the injector. Then go to Step 16.

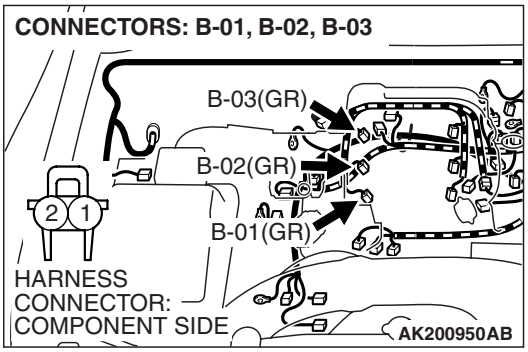
STEP 11. Check harness connector D-132 at PCM for damage.

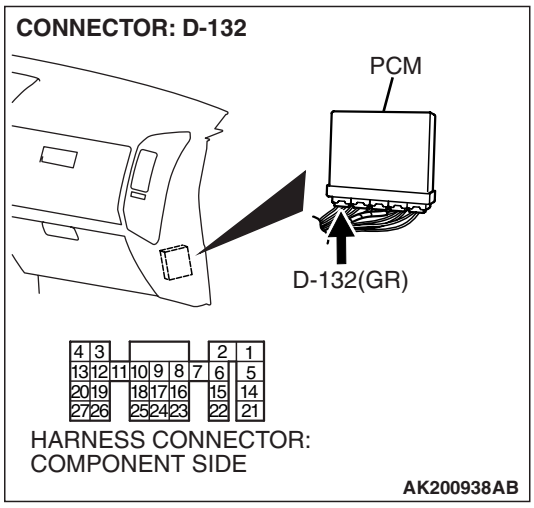
Q: Is the harness connector in good condition?

YES : Go to Step 12.

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







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

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

Q: Is the harness wire in good condition?

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

STEP 13. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1048.

Q: Are there any abnormalities?

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

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

Q: Are there any abnormalities?

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

STEP 15. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the PCM. Then go to Step 16.
NO : The inspection is complete.

TSB Revision

STEP 16. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

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

Q: Is DTC P0171 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0172: System too Rich (bank 1)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

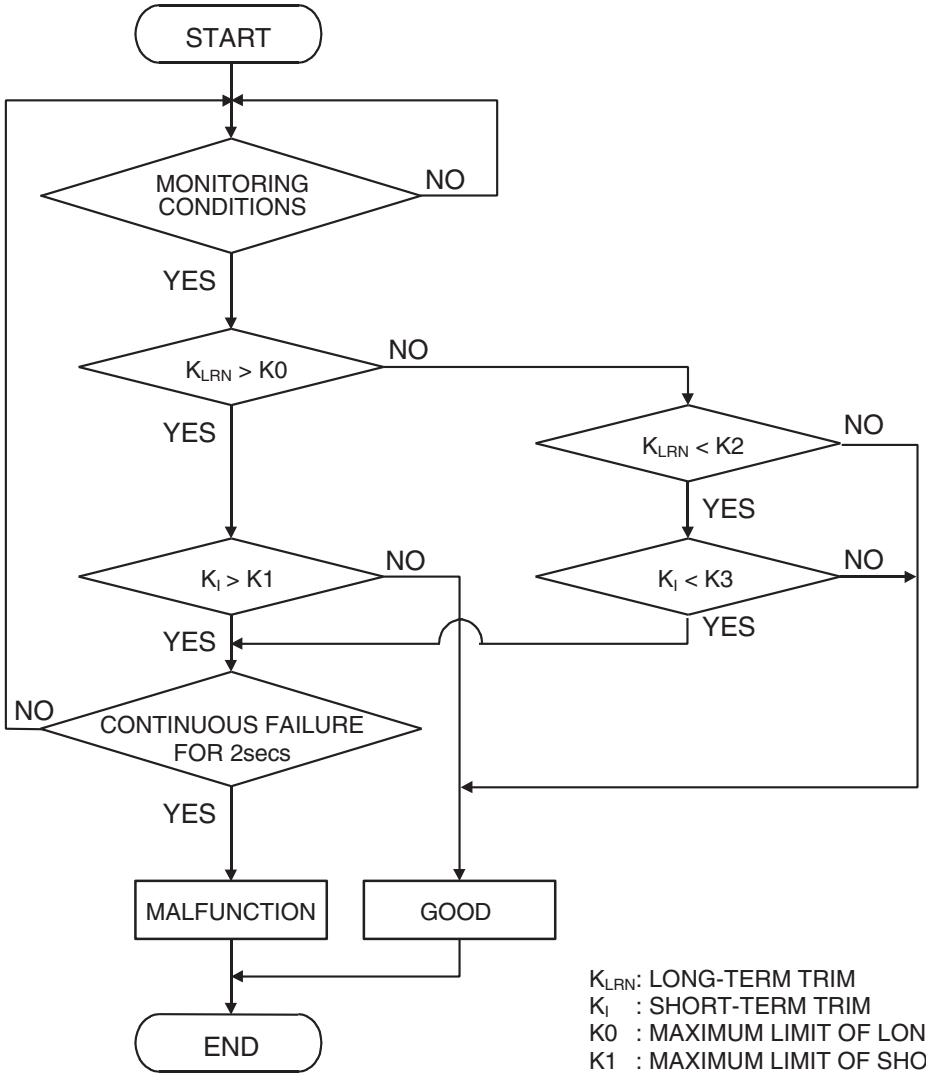
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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

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Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is higher than 100 Hz.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be lower than −7.4 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is lower than 100 Hz.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be lower than −12.5 percent for 5 seconds.

TSB Revision

Check Conditions

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

Judgement Criteria

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

or

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

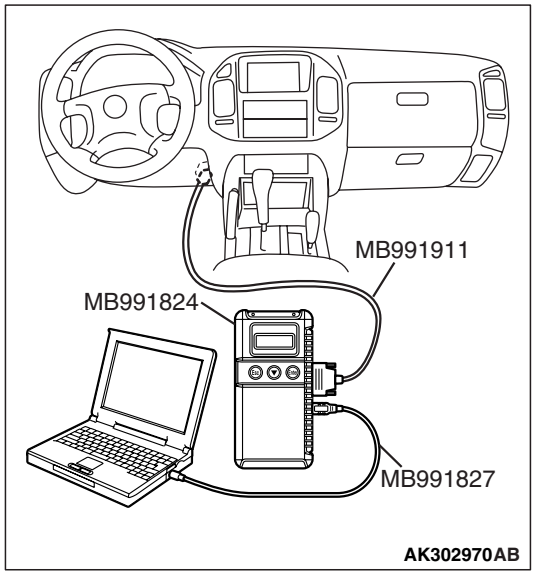
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 12: Volume Airflow Sensor.

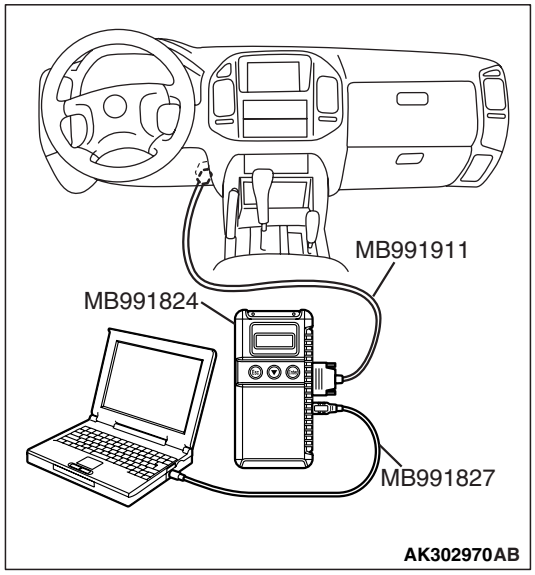
⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
  - When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13A-109, DTC P0102 – Volume Airflow Circuit Low Input P.13A-118.



STEP 2. Using scan tool MB991958, check data list item 13: Intake Air Temperature Sensor.

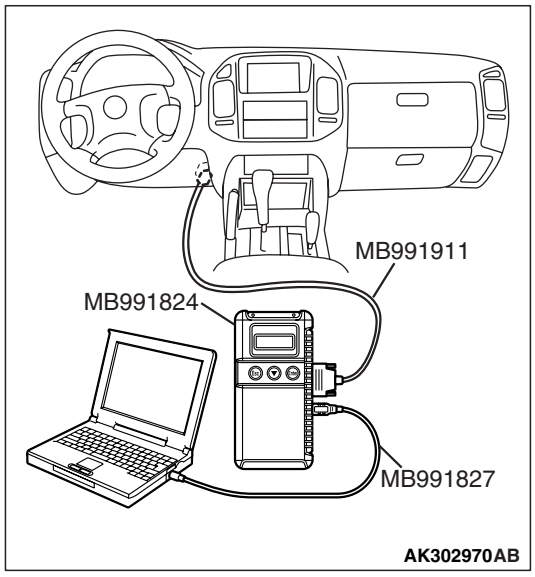
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-156, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-163, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-168.



STEP 3. Using scan tool MB991958, check data list item 21: Engine Coolant Temperature Sensor.

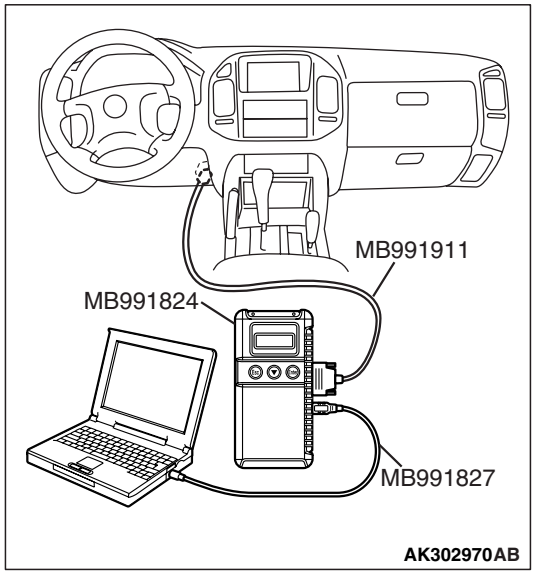
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-175, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-188.



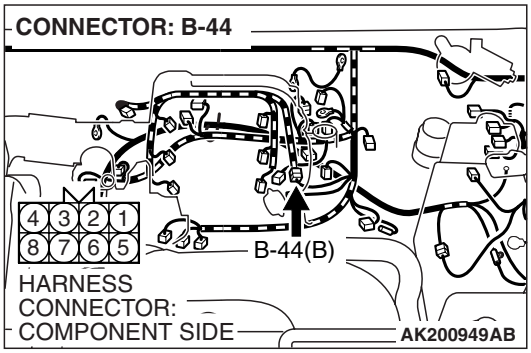
STEP 4. Using scan tool MB991958, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P2228 – Barometric Pressure Circuit Low Input P.13A-872, DTC P2229 – Barometric Pressure Circuit High Input P.13A-881.



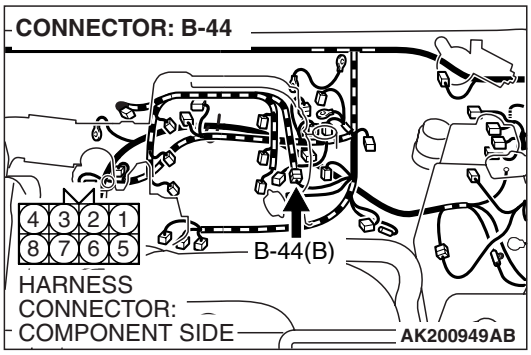
STEP 5. Check harness connector B-44 at intermediate connector for damage.

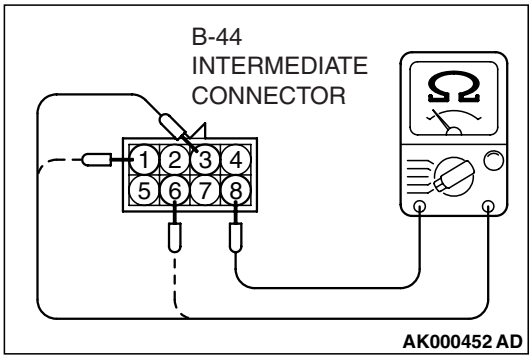
Q: Is the harness connector in good condition?

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

STEP 6. Check the right bank injector resistance at intermediate connector B-44.

(1) Disconnect the intermediate connector B-44.





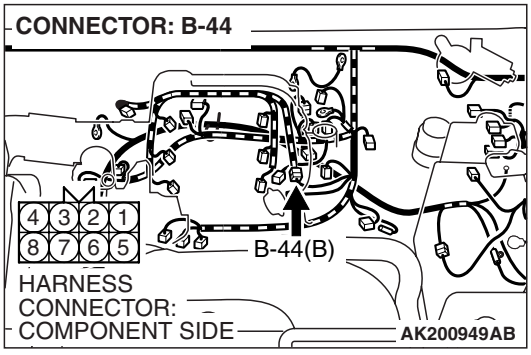
(2) Measure the resistance between each male connector side connector terminal.
   a. Measure the resistance between terminal No. 8 and No. 3 at No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 8 and No. 1 at No. 3 cylinder injector.
   c. Measure the resistance between terminal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

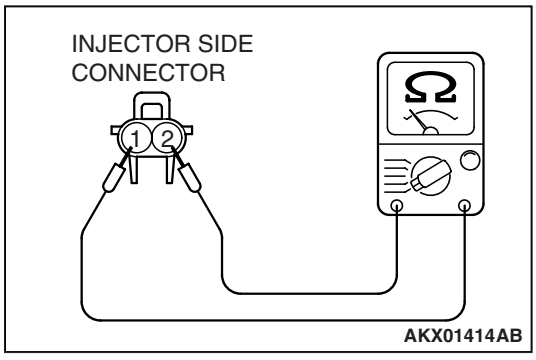
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

STEP 7. Check the right bank injector.

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





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

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

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

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

STEP 8. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13A-1048.

Q: Are there any abnormalities?

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

STEP 9. Replace the right bank injector.
(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the PCM. Then go to Step 10.
NO : The inspection is complete.

STEP 10. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

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

DTC P0174: System too Lean (bank 2)

Fuel Trim Circuit
- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION
- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

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

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

MONITOR EXECUTION
Continuous

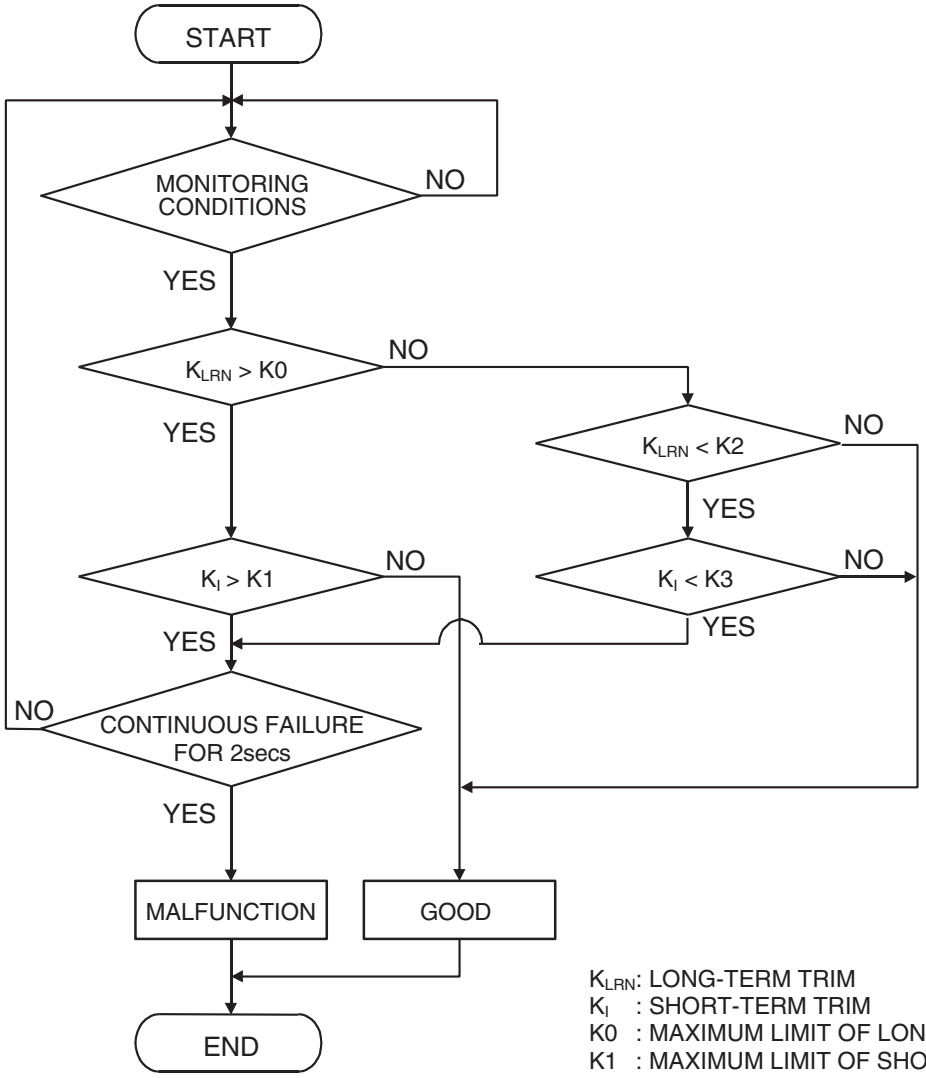
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Volume airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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

AK501063

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is higher than 100 Hz.

Judgement Criteria

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

or

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

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is lower than 100 Hz.

TSB Revision

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

or
- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

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

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

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

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

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

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

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

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

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

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

DIAGNOSIS

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

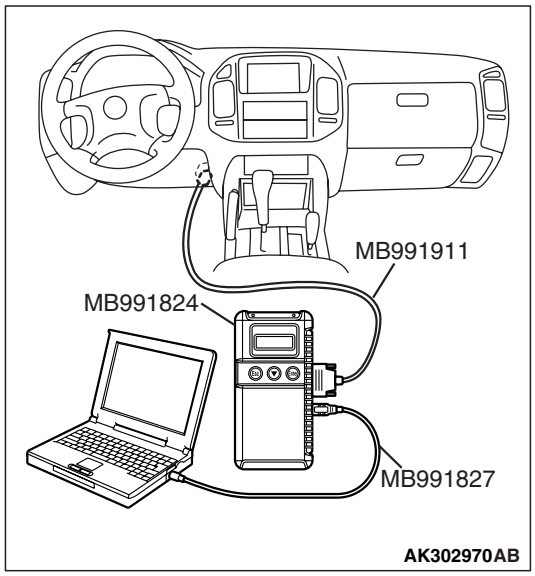
YES : Repair it. Then go to Step 16.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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

STEP 3. Using scan tool MB991958, check data list item 12: Volume Airflow Sensor.



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

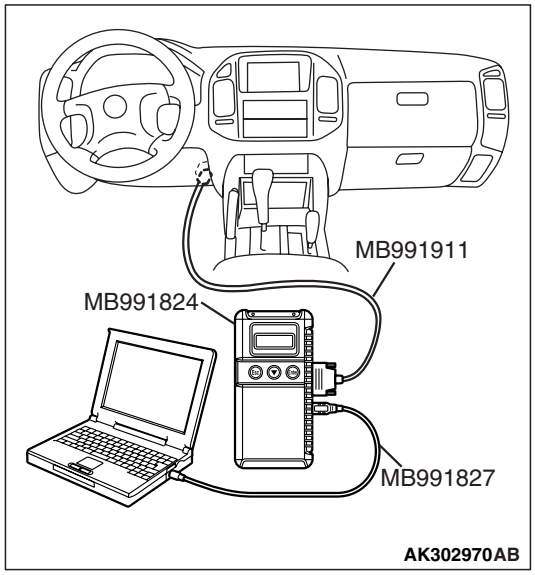
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
- When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13A-109, DTC P0102 – Volume Airflow Circuit Low Input P.13A-118.

STEP 4. Using scan tool MB991958, check data list item 13: Intake Air Temperature Sensor.

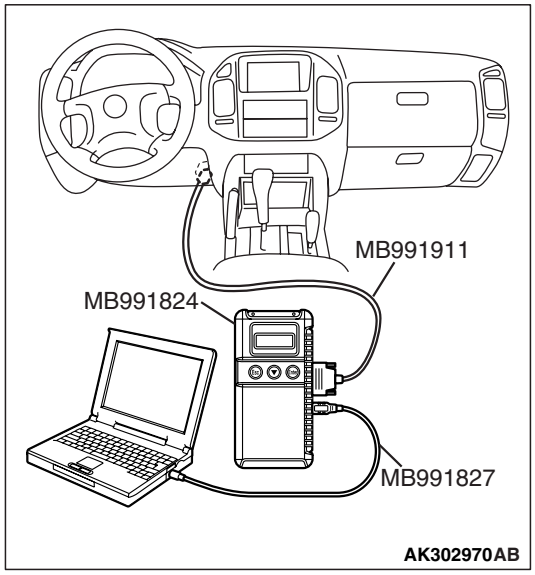


(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-156, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-163, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-168.



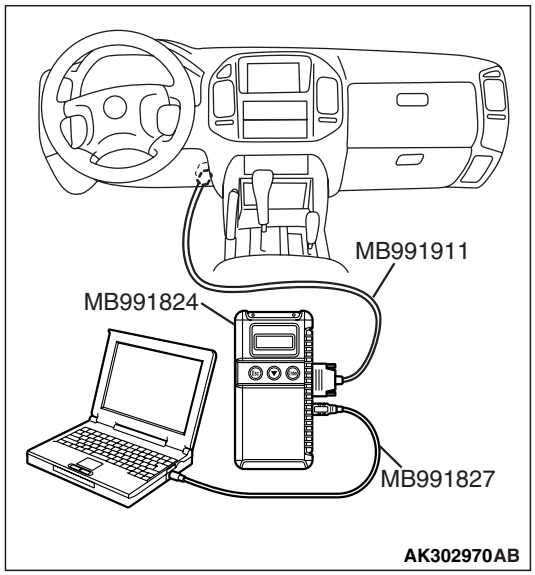
STEP 5. Using scan tool MB991958, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-175, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-188.



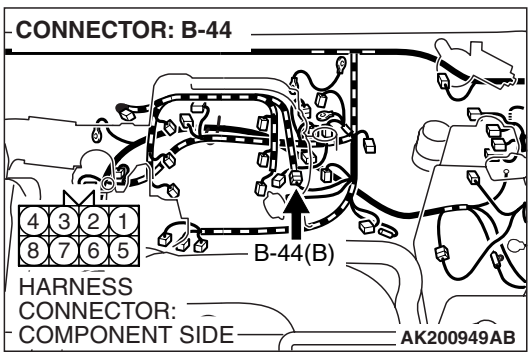
STEP 6. Using scan tool MB991958, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P2228 – Barometric Pressure Circuit Low Input P.13A-872, DTC P2229 – Barometric Pressure Circuit High Input P.13A-881.



STEP 7. Check harness connector B-44 at injector intermediate connector for damage.

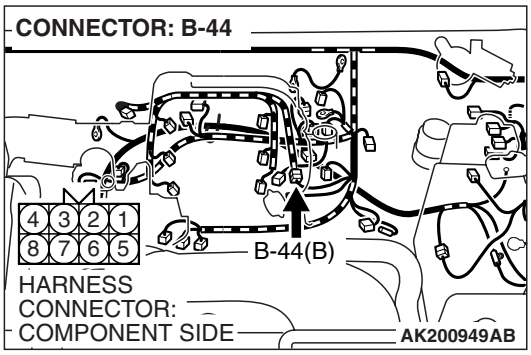
Q: Is the harness connector in good condition?

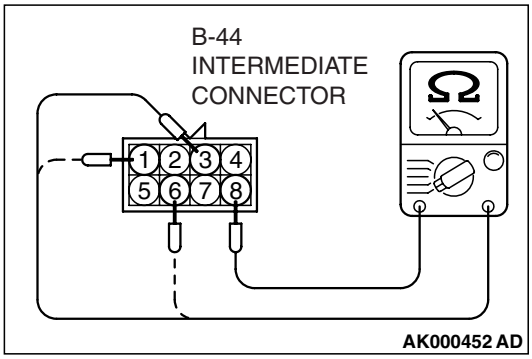
YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

TSB Revision

STEP 8. Check the left bank injector resistance at intermediate connector B-44.

(1) Disconnect the intermediate connector B-44.





(2) Measure the resistance between each male connector side connector terminal.
   a. Measure the resistance between terminal No. 8 and No. 2 at No. 2 cylinder injector.
   b. Measure the resistance between terminal No. 8 and No. 7 at No. 4 cylinder injector.
   c. Measure the resistance between terminal No. 8 and No. 5 at No. 6 cylinder injector.
   - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

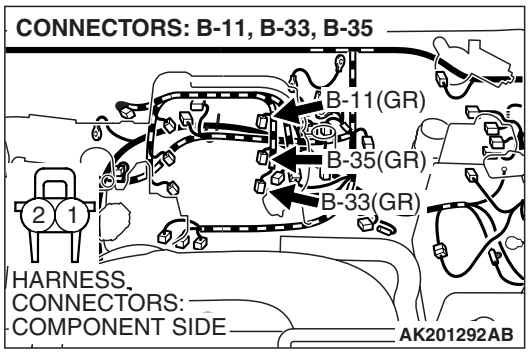
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

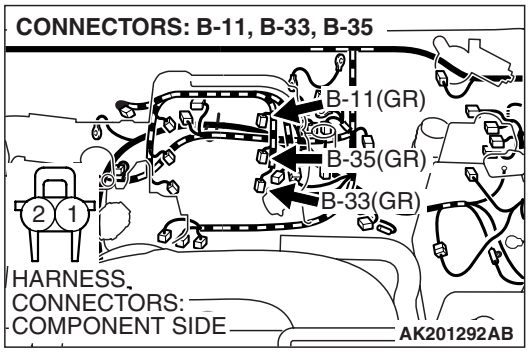
YES : Go to Step 11.
NO : Go to Step 9.

STEP 9. Check harness connector B-33, B-35, B-11 at left bank injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

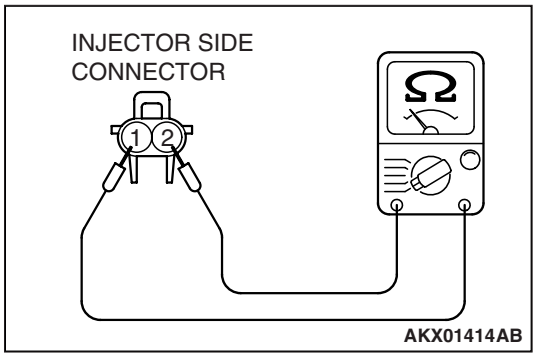




STEP 10. Check the left bank injector.

(1) Remove the intake manifold.

(2) Disconnect the left bank injector connector.



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

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

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

YES : Repair harness wire between injector intermediate connector and left bank injector connector because of harness damage. Then go to Step 16.

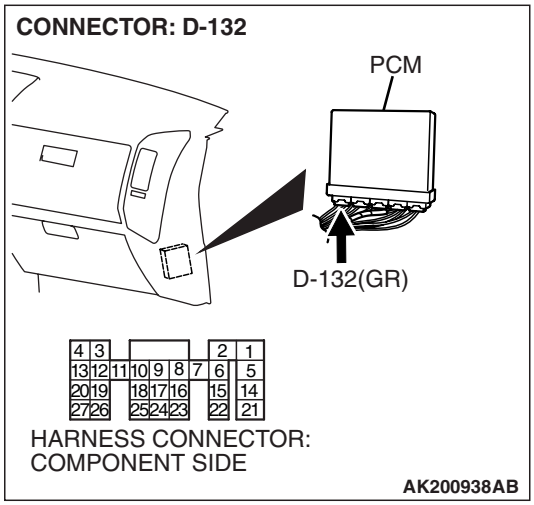
NO : Replace the injector. Then go to Step 16.

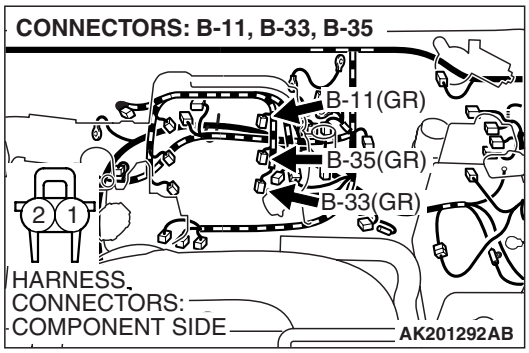
STEP 11. Check harness connector D-132 at PCM for damage.

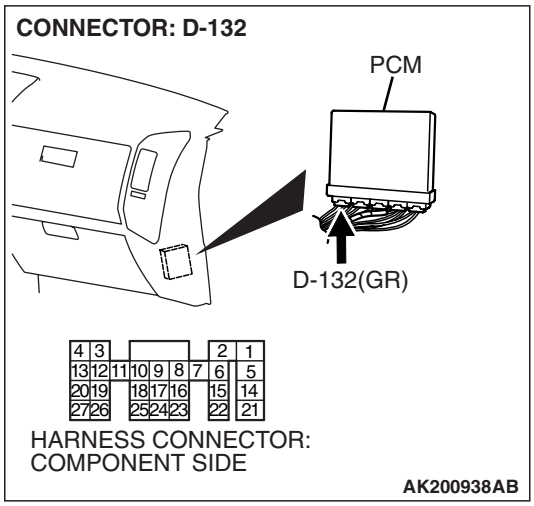
Q: Is the harness connector in good condition?

YES : Go to Step 12.

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







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

a. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 9) at No. 2 cylinder injector.
b. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 2) at No. 4 cylinder injector.
c. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 25) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

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

STEP 13. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-1048.

Q: Are there any abnormalities?

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

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

Q: Are there any abnormalities?

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

STEP 15. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

YES : Replace the PCM. Then go to Step 16.
NO : The inspection is complete.

STEP 16. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

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

Q: Is DTC P0174 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0175: System too Rich (bank 2)

Fuel Trim Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

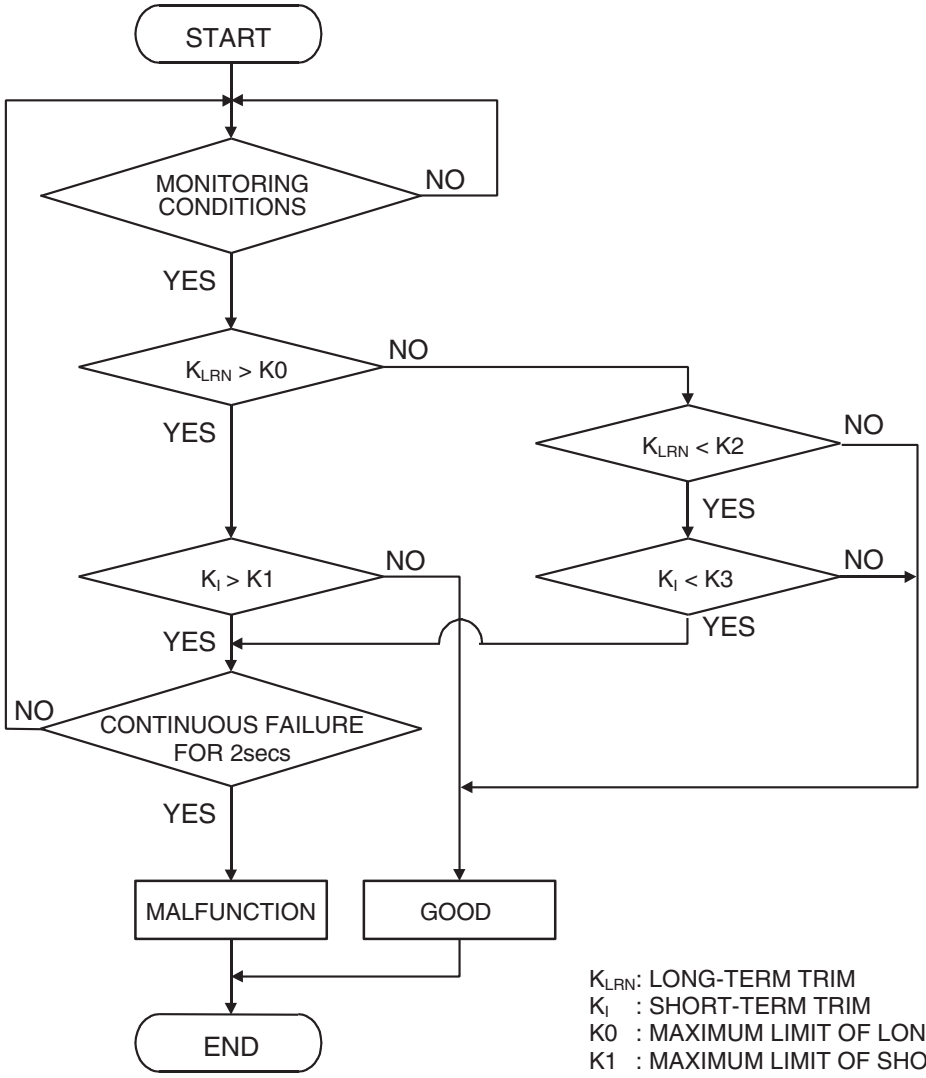
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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

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Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is higher than 100 Hz.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be lower than −7.4 percent for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Volume airflow sensor output frequency is lower than 100 Hz.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be lower than −12.5 percent for 5 seconds.

TSB Revision

Check Conditions

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

Judgement Criteria

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

or

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.

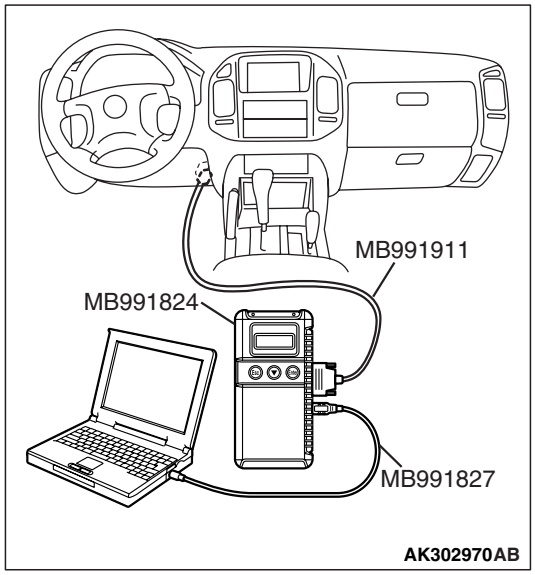
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 12: Volume Airflow Sensor.

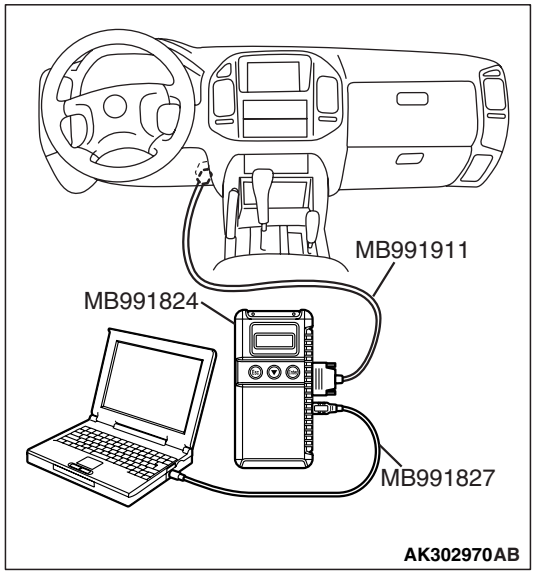
⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 12, Volume Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 17 and 43 Hz (between 3.5 and 7.5 gm/s).
  - When 2,500 r/min, between 64 and 104 Hz (between 13.6 and 19.6 gm/s).
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to DTC P0101 – Volume Airflow Circuit Range/Performance Problem P.13A-109, DTC P0102 – Volume Airflow Circuit Low Input P.13A-118.



STEP 2. Using scan tool MB991958, check data list item 13: Intake Air Temperature Sensor.

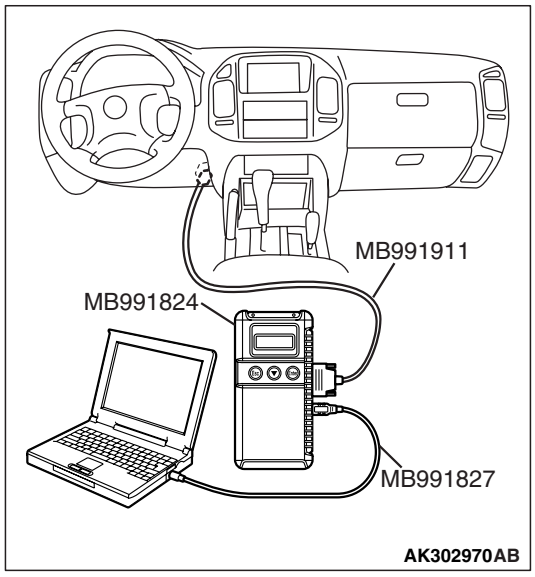
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-156, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-163, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-168.



STEP 3. Using scan tool MB991958, check data list item 21: Engine Coolant Temperature Sensor.

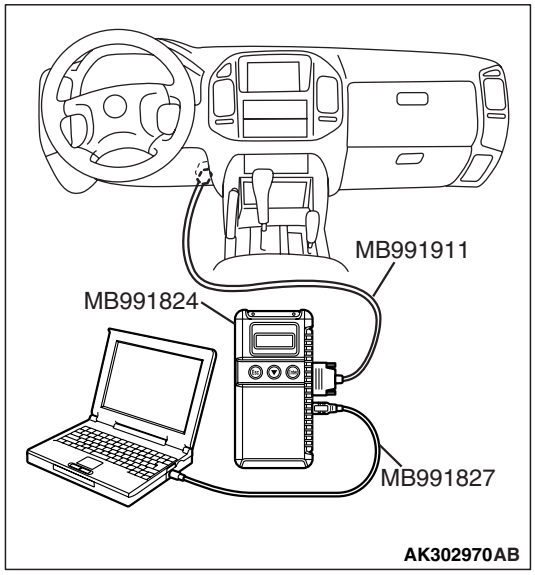
(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-175, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-188.



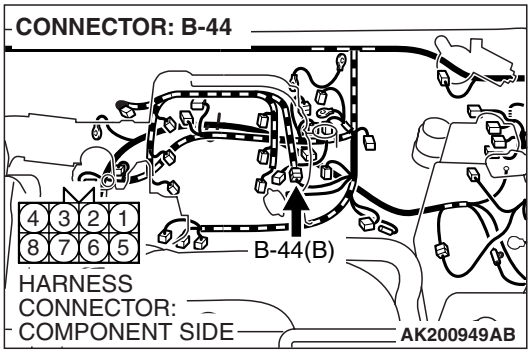
STEP 4. Using scan tool MB991958, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa. (23.9 in.Hg).

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P2228 – Barometric Pressure Circuit Low Input P.13A-872, DTC P2229 – Barometric Pressure Circuit High Input P.13A-881.

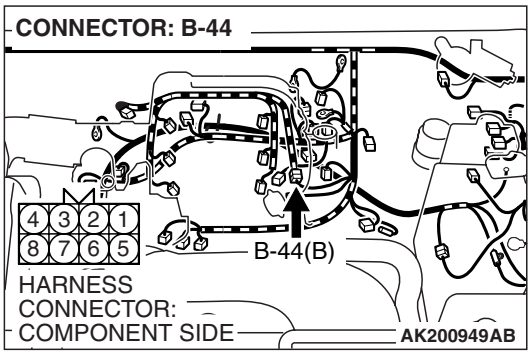


STEP 5. Check harness connector B-44 at intermediate connector for damage.

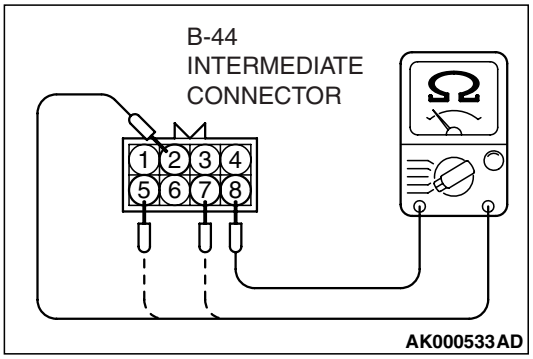
Q: Is the harness connector in good condition?

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

STEP 6. Check the left bank injector resistance at intermediate connector B-44.



(1) Disconnect the intermediate connector B-44.

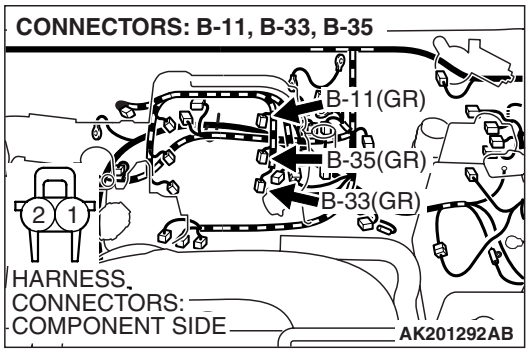


(2) Measure the resistance between each male connector side connector terminal.
   a. Measure the resistance between terminal No. 8 and No. 2 at No. 2 cylinder injector.
   b. Measure the resistance between terminal No. 8 and No. 7 at No. 4 cylinder injector.
   c. Measure the resistance between terminal No. 8 and No. 5 at No. 6 cylinder injector.
   - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

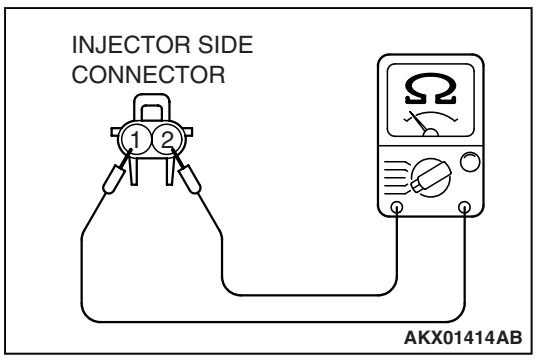
Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?

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

STEP 7. Check the left bank injector.



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



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

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

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

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

STEP 8. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13A-1048.

Q: Are there any abnormalities?

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

STEP 9. Replace the left bank injector.
(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0175 set?

YES : Replace the PCM. Then go to Step 10.
NO : The inspection is complete.

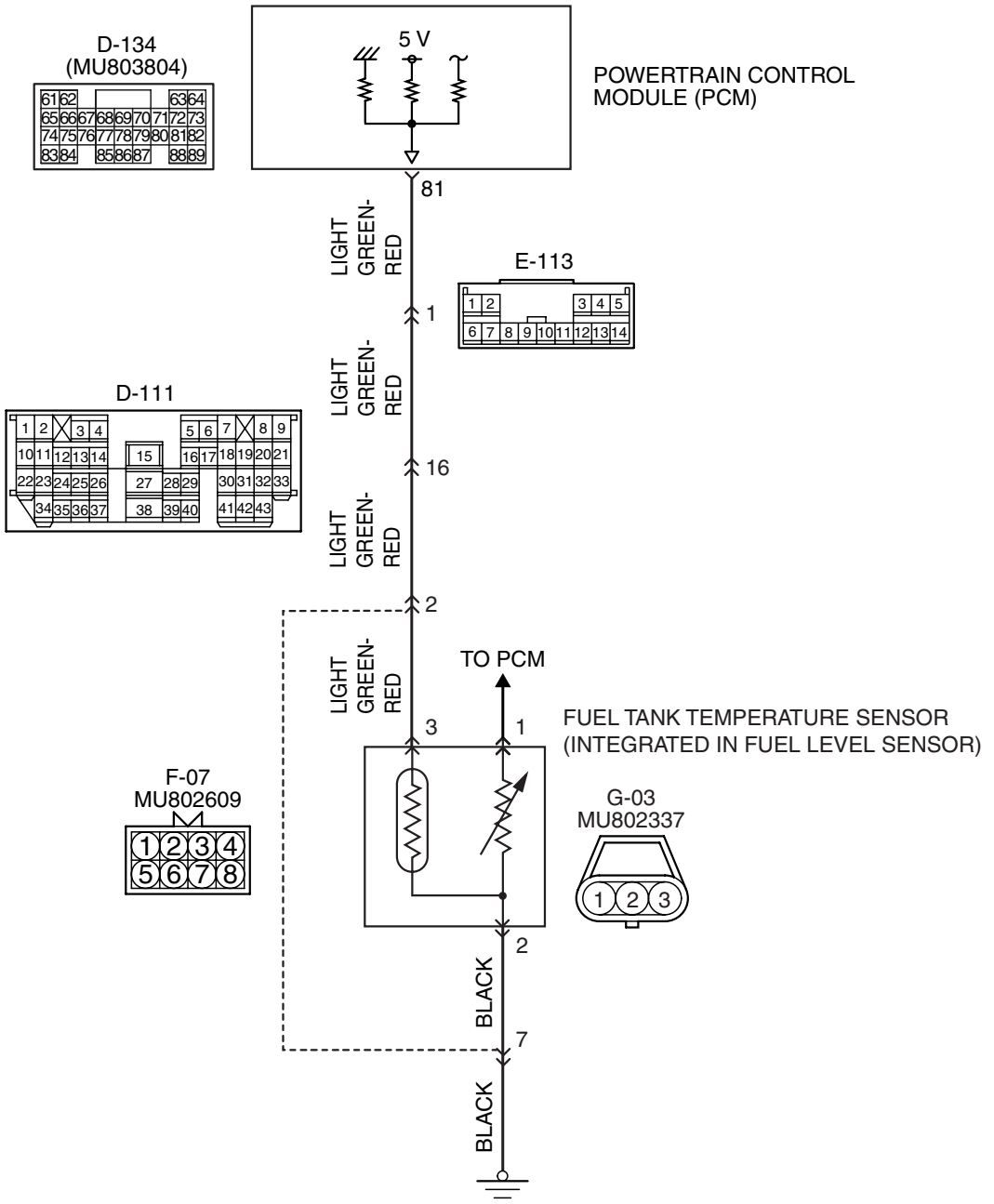
STEP 10. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 19 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

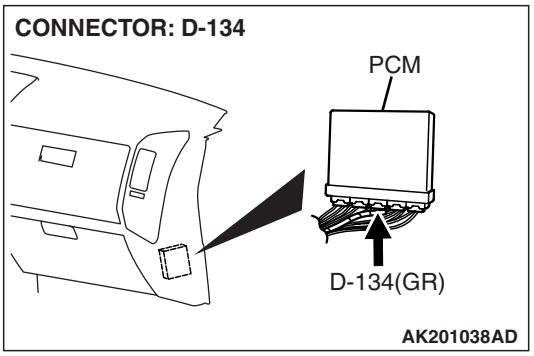
Q: Is DTC P0175 set?

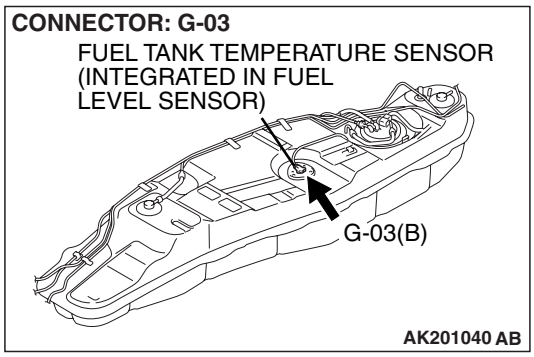
YES : Retry the troubleshooting.
NO : The inspection is complete.

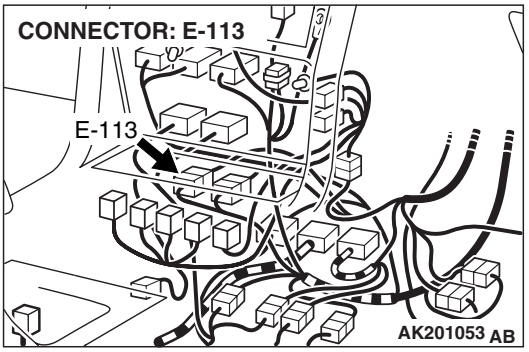
DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

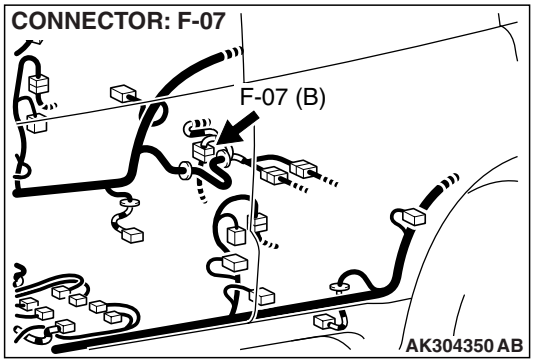
Fuel Tank Temperature Sensor Circuit

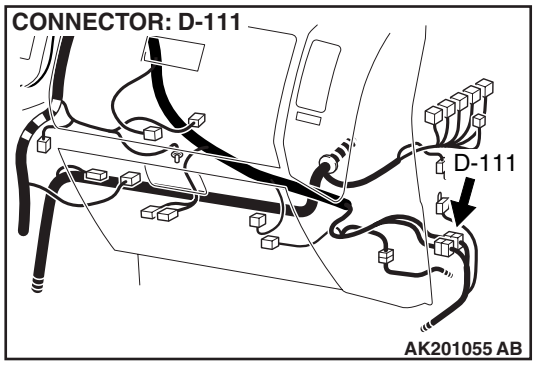












CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

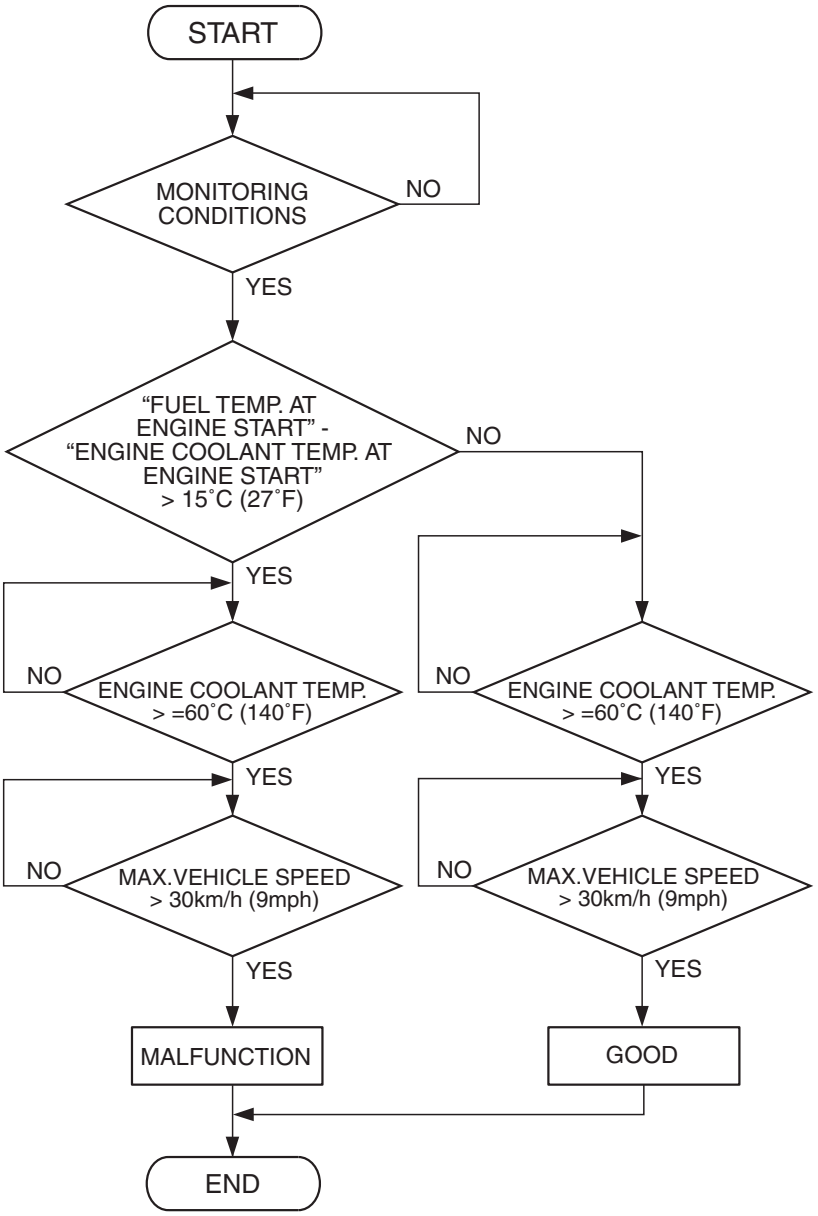
Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

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

Judgement Criterion

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

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-4.

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

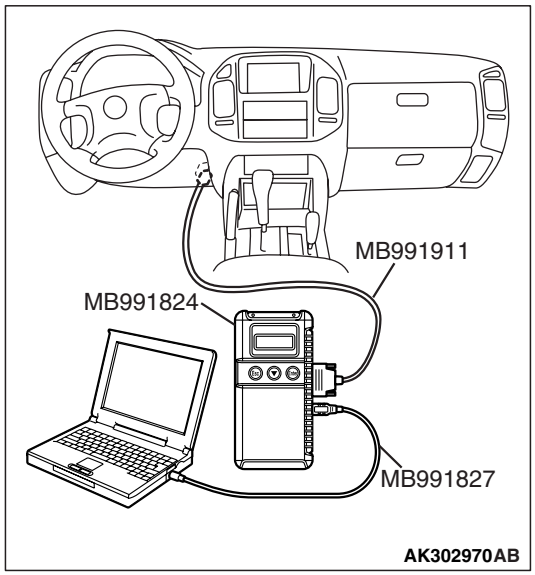
- Fuel tank temperature sensor failed.
- Harness damage or connector damage.
- PCM failed.

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

DIAGNOSIS

Required Special Tools:

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



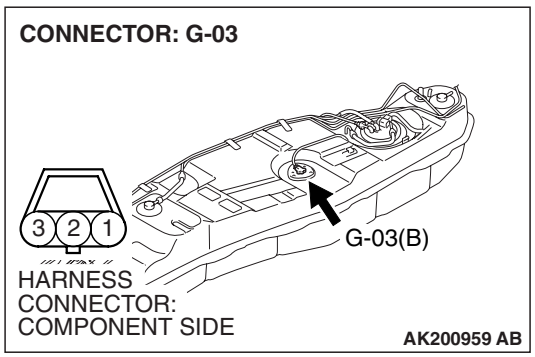
STEP 1. Using scan tool MB991958, check data list item 4A: Fuel Tank Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.



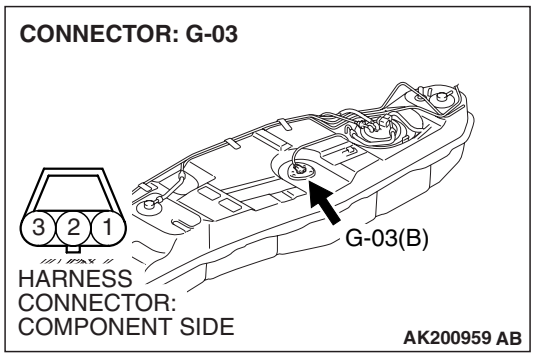
STEP 2. Check harness connector G-03 at the fuel tank temperature sensor for damage.

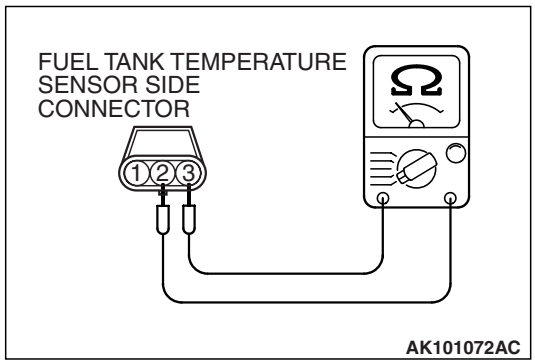
Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector G-03.





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

Standard value:
0.5 – 12.0 kΩ

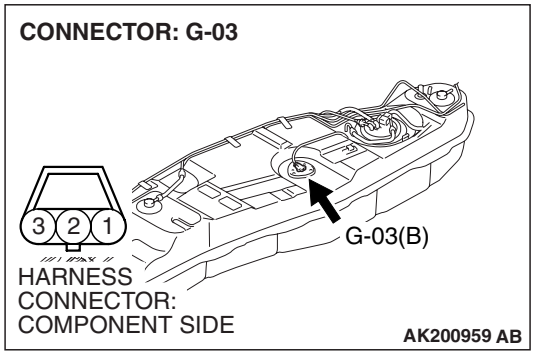
Q: Is the measured resistance between 0.5 and 12.0 kΩ?

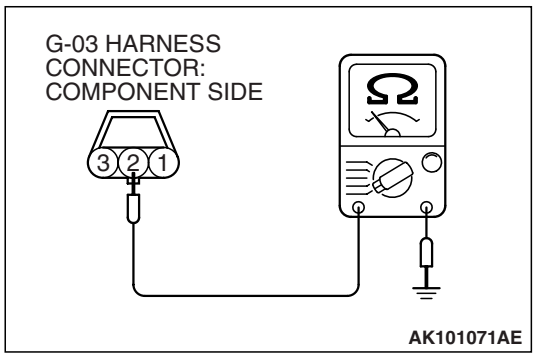
YES : Go to Step 4.

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

STEP 4. Check the continuity at fuel tank temperature sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.





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

Q: Does continuity exist?

YES : Go to Step 5.

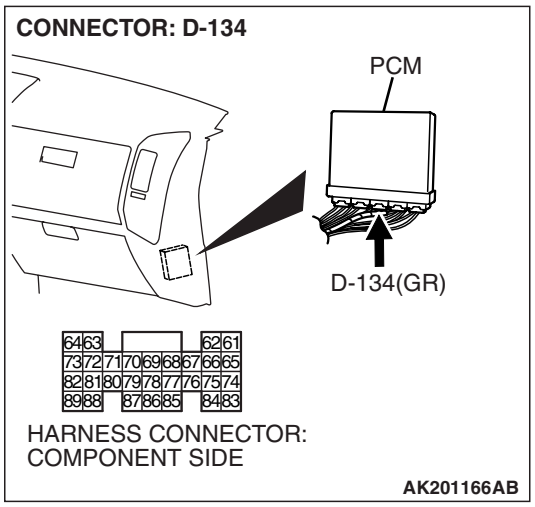
NO : Check harness connector F-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fuel tank temperature sensor connector G-03 (terminal No. 2) and ground because of harness damage. Then go to Step 7.

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

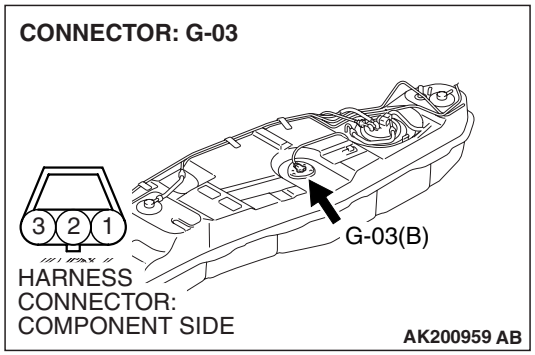
Q: Is the harness connector in good condition?

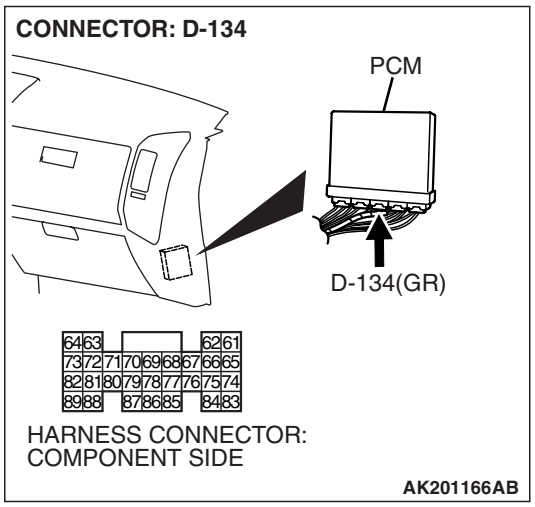
YES : Go to Step 6.

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



STEP 6. Check for harness damage between fuel tank temperature sensor connector G-03 (terminal No. 3) and PCM connector D-134 (terminal No. 81).





NOTE: Check harness after checking intermediate connectors D-111, E-113 and F-07. If the intermediate connectors are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then go to Step 7.
NO : Repair it. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.

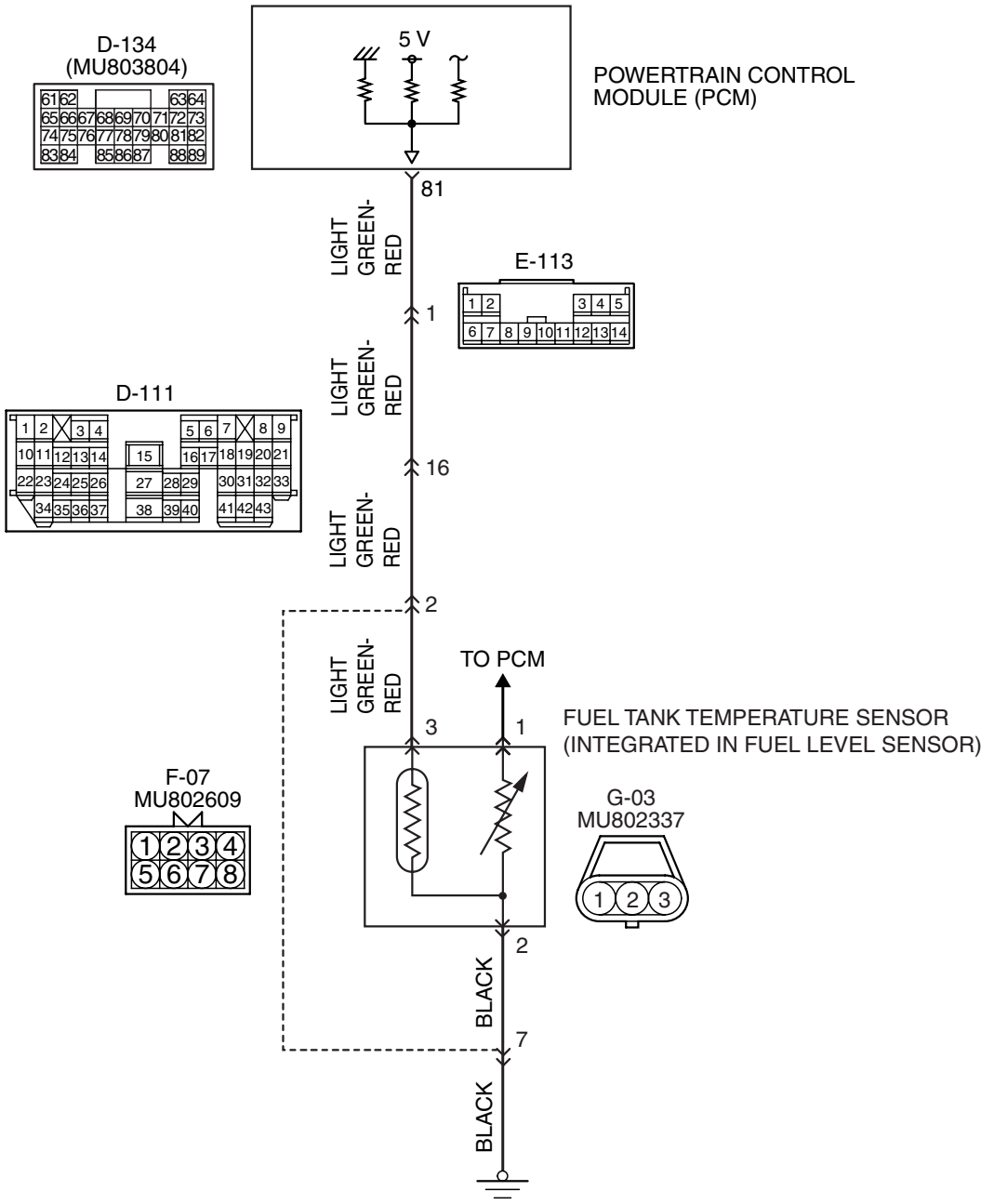
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0181 set?

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

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

Fuel Tank Temperature Sensor Circuit



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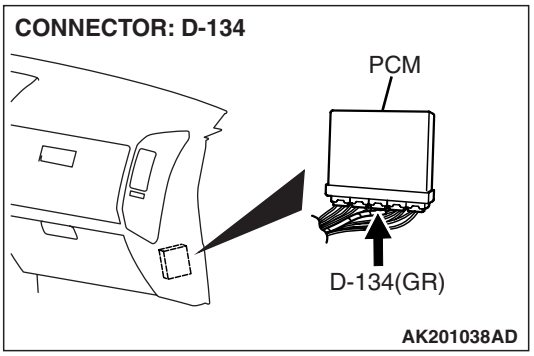
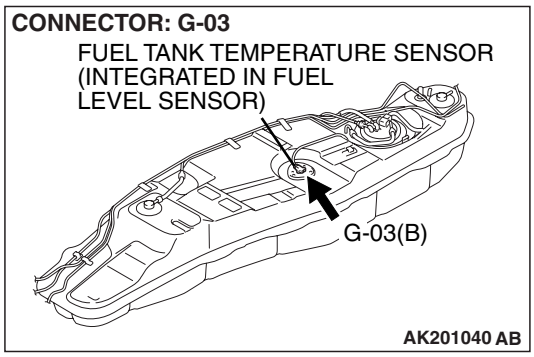
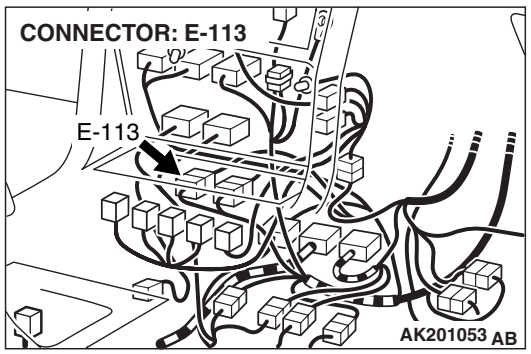
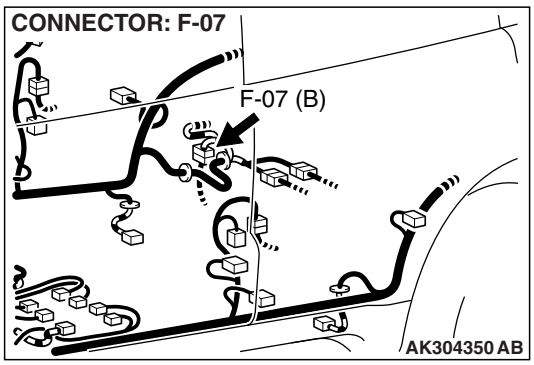
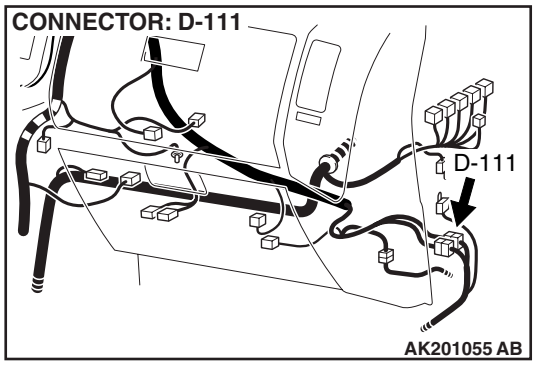










CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

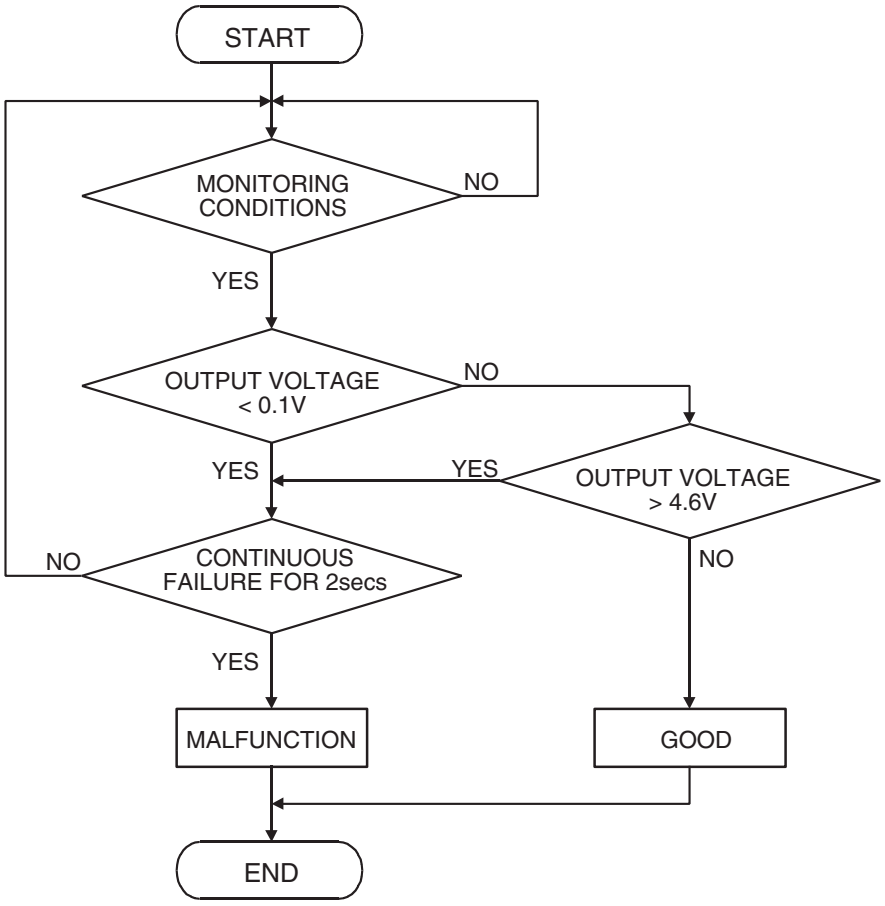
Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

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

TSB Revision

DIAGNOSIS

Required Special Tools:

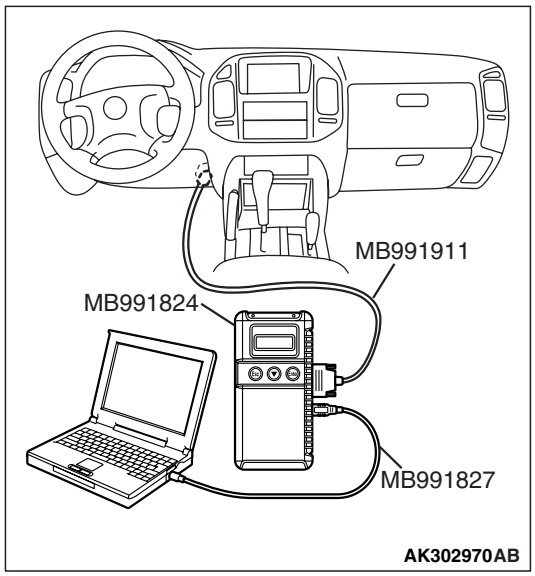
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

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

⚠ CAUTION

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

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



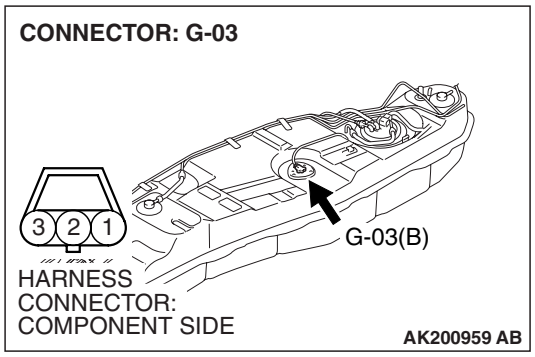
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.

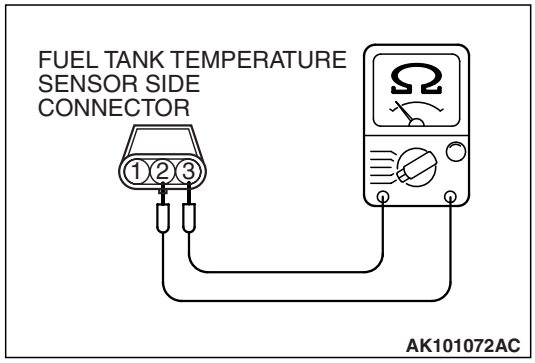
STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector G-03.



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

Standard value:
0.5 – 12.0 kΩ



Q: Is the resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 3.

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

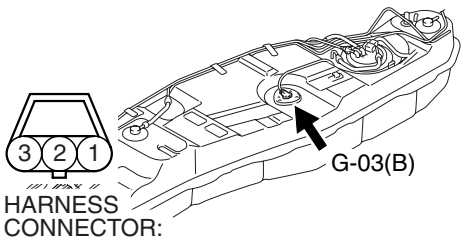
STEP 3. Check harness connector G-03 at the fuel tank temperature sensor and harness connector D-134 at PCM for damage.

Q: Are the harness connector in good condition?

YES : Go to Step 4.

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

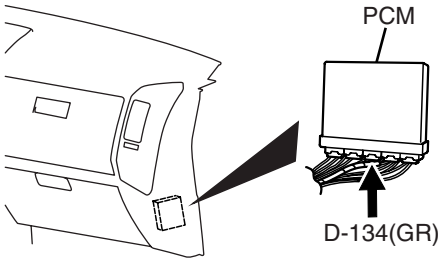
CONNECTOR: G-03



HARNESS CONNECTOR: COMPONENT SIDE

AK200959 AB

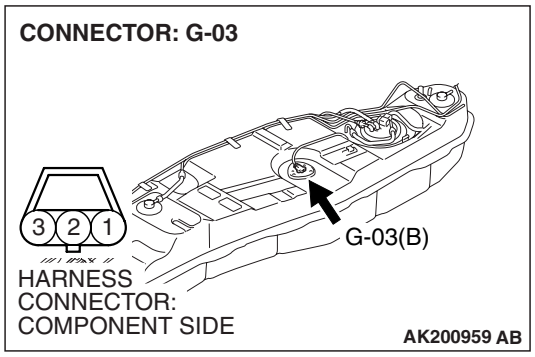
CONNECTOR: D-134

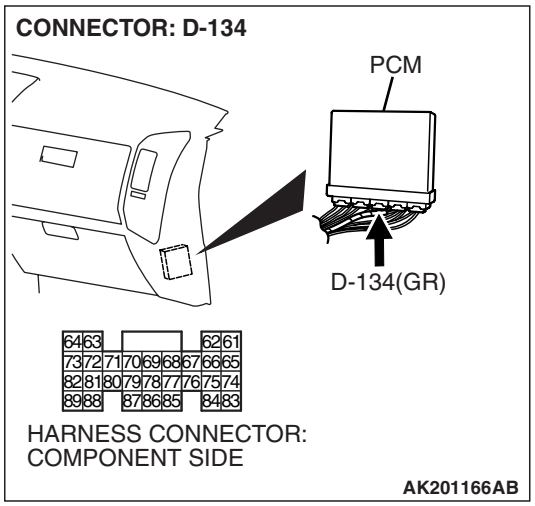


HARNESS CONNECTOR: COMPONENT SIDE

AK201166AB

STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector G-03 and PCM connector D-134.





NOTE: Check harness after checking intermediate connectors D-111, E-113 and F-07. If the intermediate connectors are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

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

STEP 5. Test the OBD-II drive cycle.

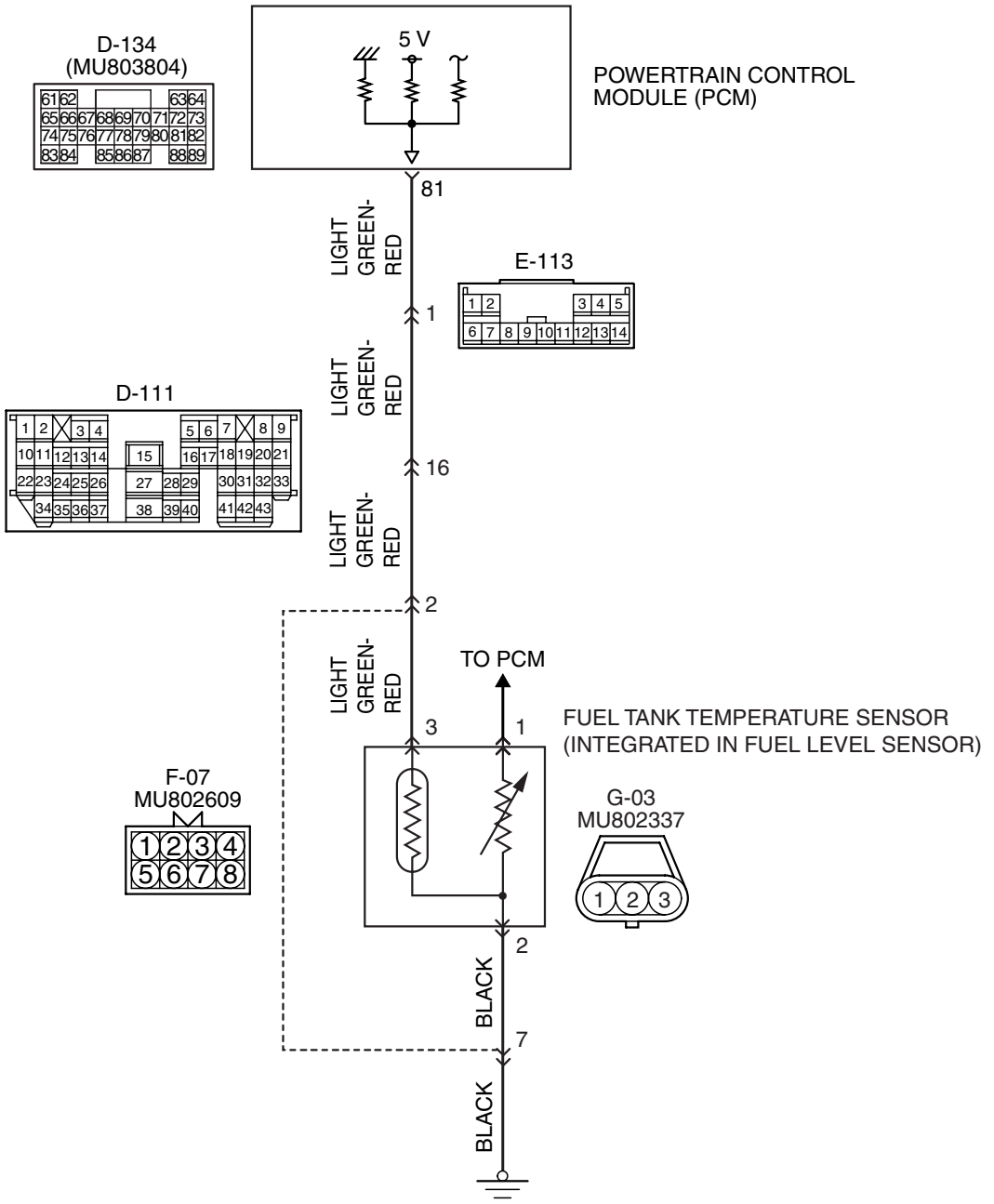
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0182 set?

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

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

Fuel Tank Temperature Sensor Circuit



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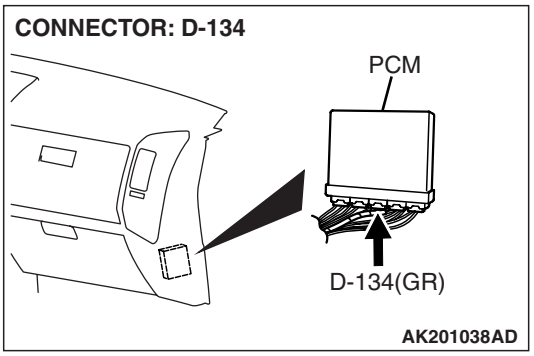
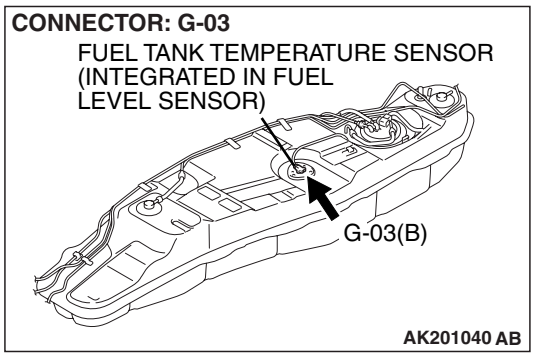
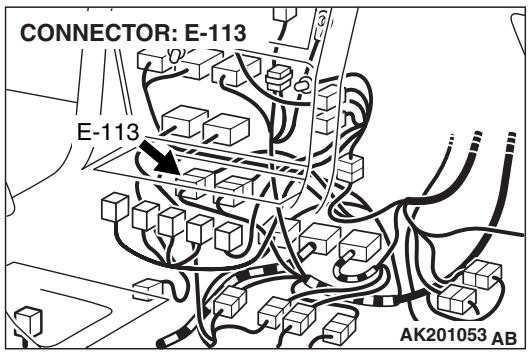
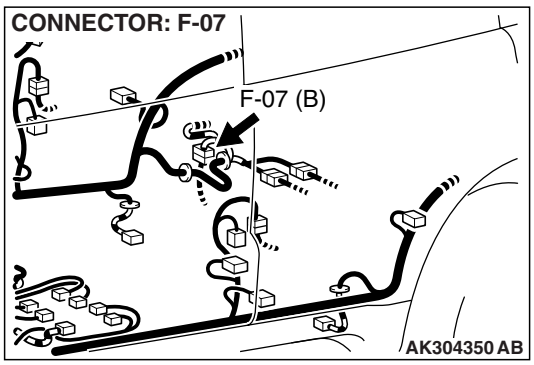
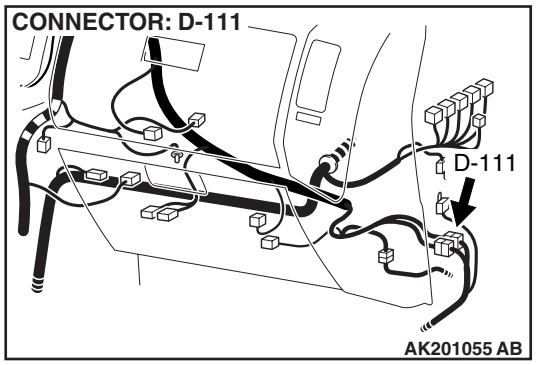
TSB Revision











CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the PCM (terminal No. 81) via the resistor in the PCM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

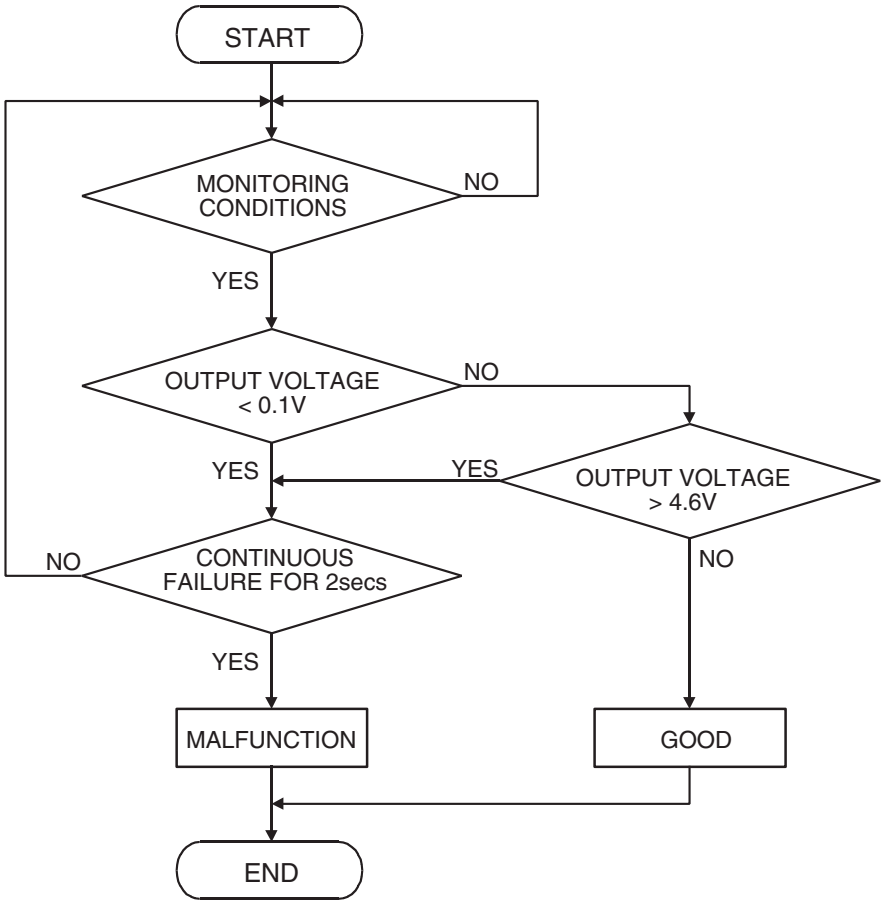
Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK302940

Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

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

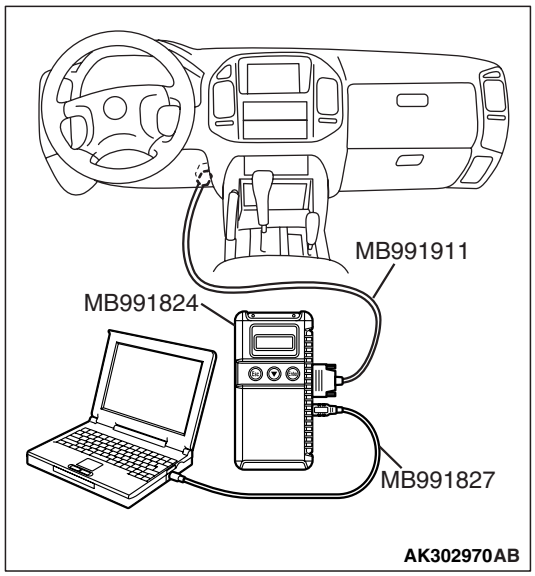
TSB Revision

DIAGNOSIS

Required Special Tools:

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

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



⚠ CAUTION

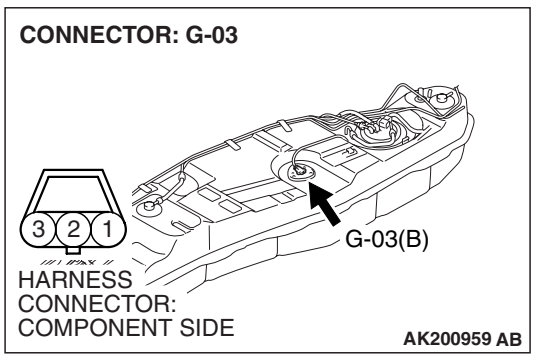
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector G-03 at the fuel tank temperature sensor for damage.

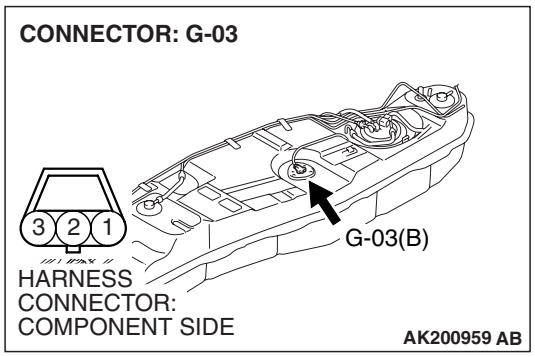


Q: Is the harness connector in good condition?

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

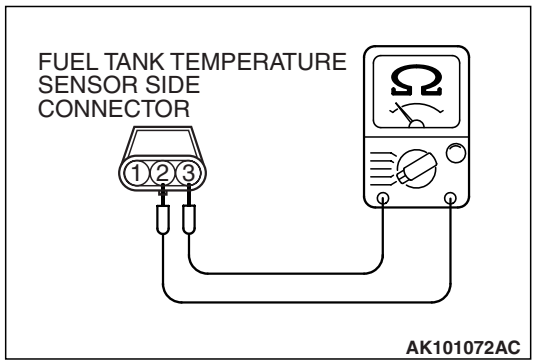
STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector G-03



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

Standard value:
0.5 – 12.0 kΩ

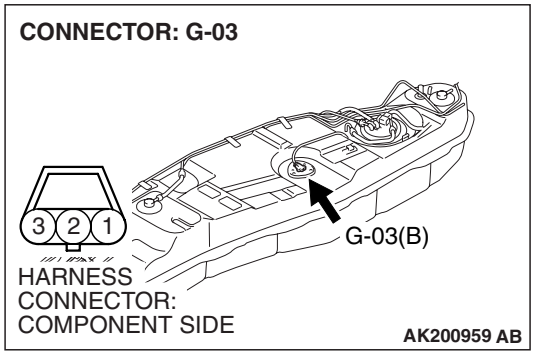


Q: Is the resistance between 0.5 and 12.0 kΩ?

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

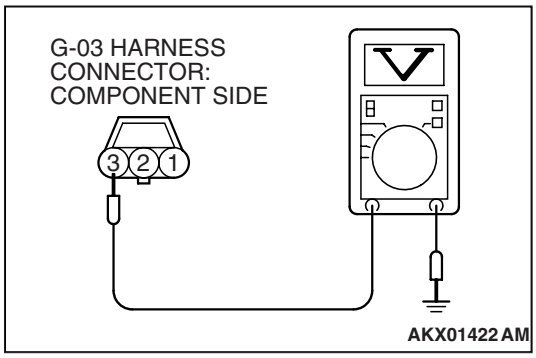
STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



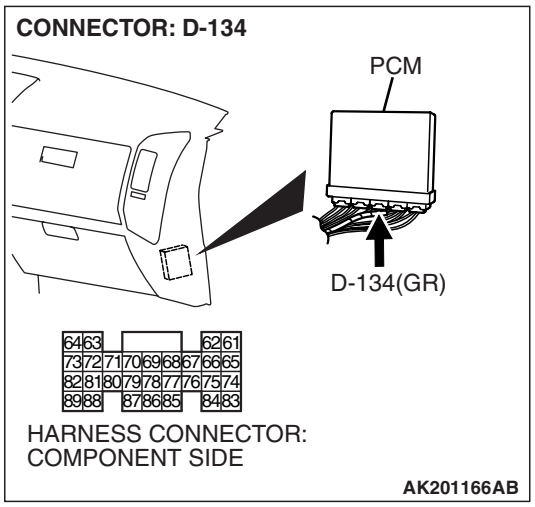
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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



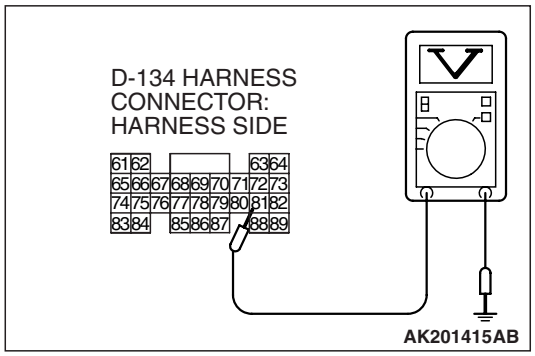
Q: Is the measured voltage between 4.5 and 4.9 volts?

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



STEP 5. Check the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the fuel tank temperature sensor connector G-03.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 81 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

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

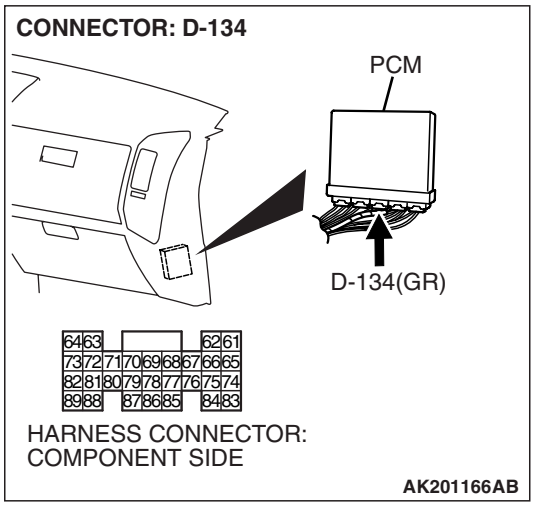
Q: Is the measured voltage between 4.5 and 4.9 volts?

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

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

Q: Is the harness connector in good condition?

YES : Check connectors D-111, E-113 and F-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connectors are in good condition, repair the harness wire between fuel tank temperature sensor connector G-03 and PCM connector D-134 because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

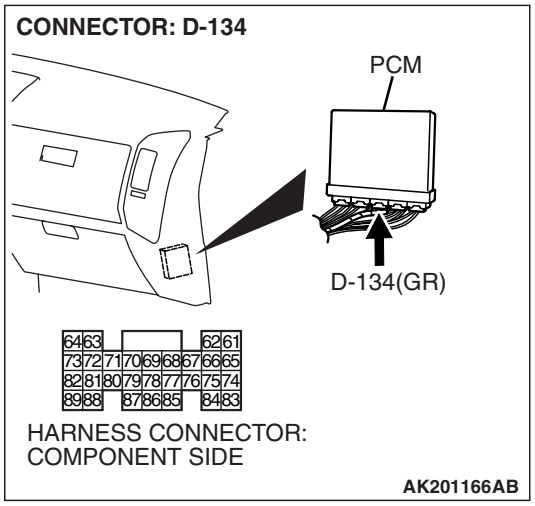


STEP 7. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

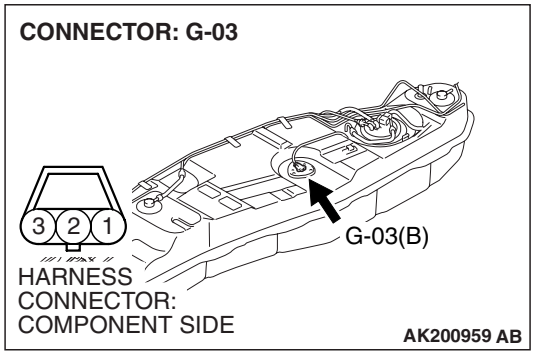
YES : Replace the PCM. Then go to Step 11.

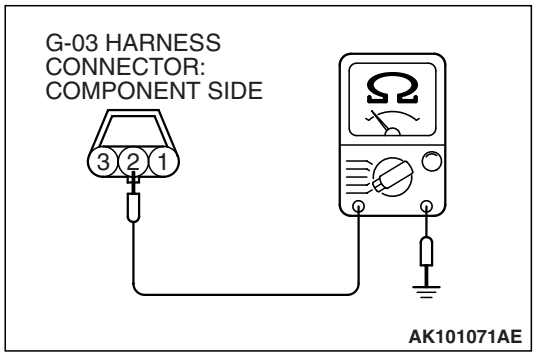
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at fuel tank temperature sensor harness side connector G-03.

(1) Disconnect the connector G-03 and measure at the harness side.





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

- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 9.

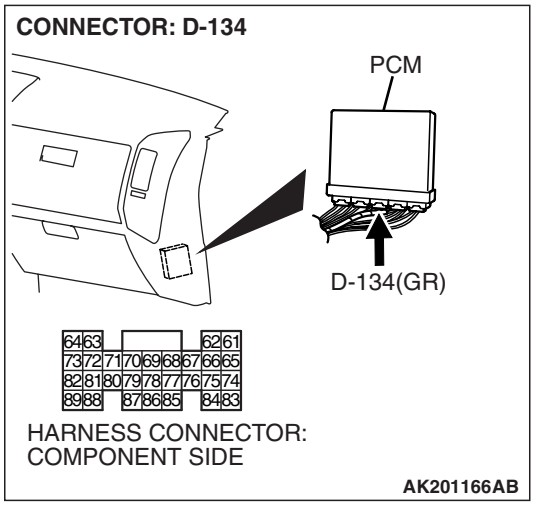
NO : Check connector F-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair harness wire between fuel tank temperature sensor connector G-03 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 11.

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

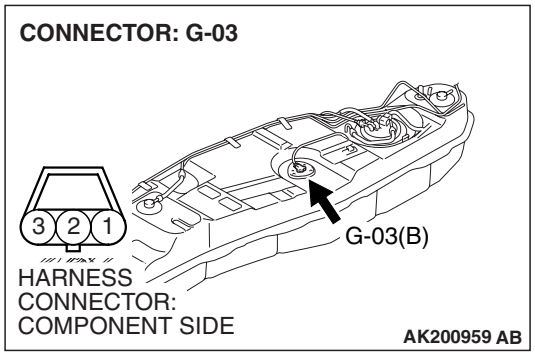
Q: Is the harness connector in good condition?

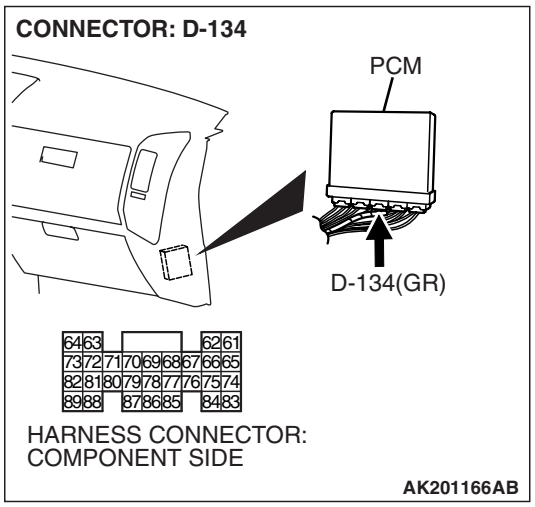
YES : Go to Step 10.

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



STEP 10. Check for open circuit and harness damage between fuel tank temperature sensor connector G-03 and PCM connector D-134.





NOTE: Check harness after checking intermediate connector E-113, D-111 and F-07. If the intermediate connectors are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

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

STEP 11. Test the OBD-II drive cycle.

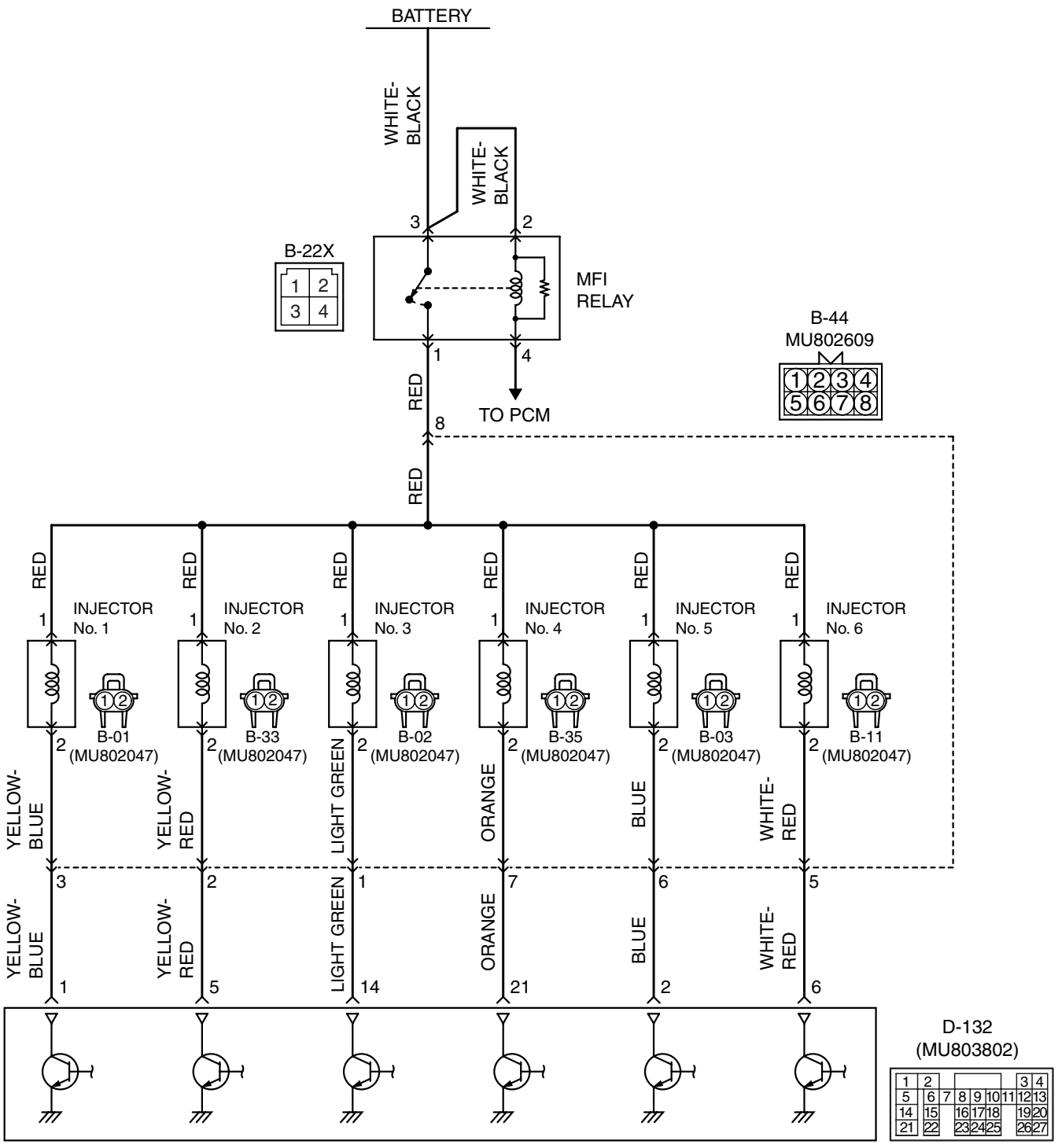
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0183 set?

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

DTC P0201: Injector Circuit Malfunction-Cylinder 1, DTC P0202: Injector Circuit Malfunction-Cylinder 2, DTC P0203: Injector Circuit Malfunction-Cylinder 3, DTC P0204: Injector Circuit Malfunction-Cylinder 4, DTC P0205: Injector Circuit Malfunction-Cylinder 5, DTC P0206: Injector Circuit Malfunction-Cylinder 6

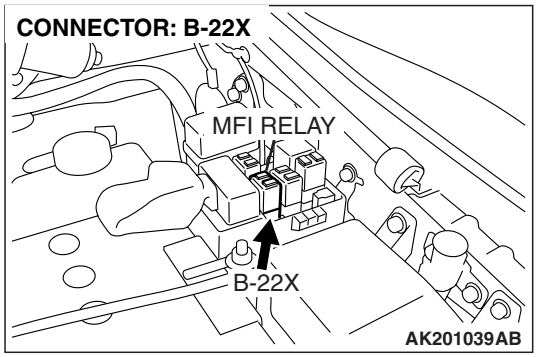
Injector Circuit

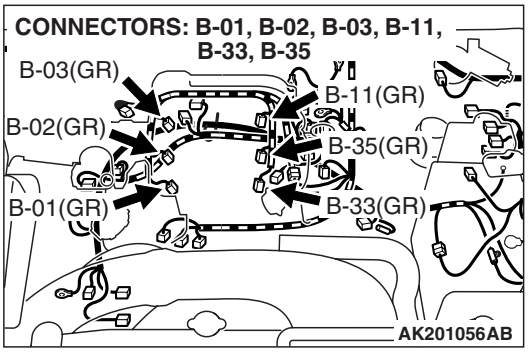


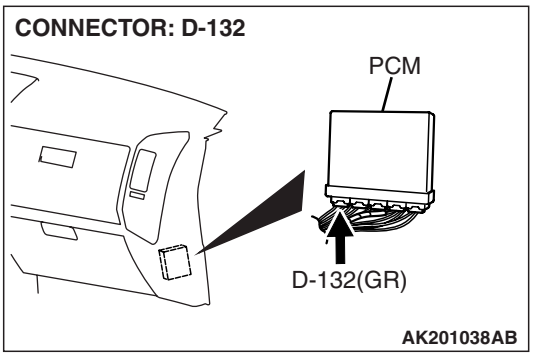
POWERTRAIN CONTROL MODULE (PCM)

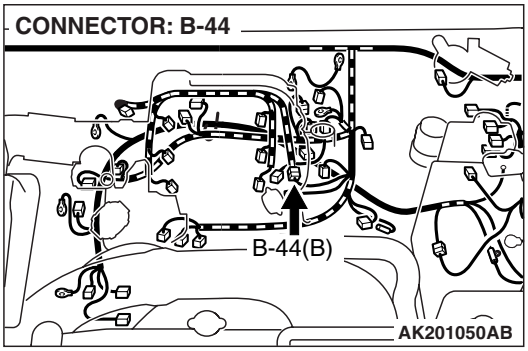
AK400980

TSB Revision









CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 1).
- The PCM controls the injectors by turning the power transistor in the PCM ON and OFF.

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the PCM.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The PCM checks this surge voltage.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after injector is operated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

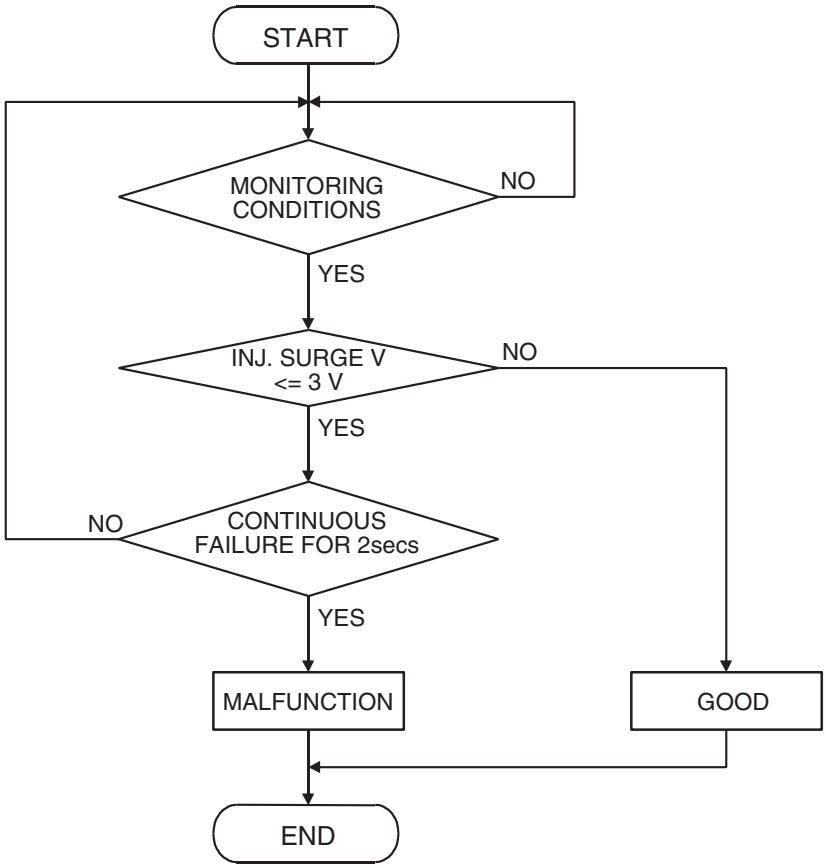
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



AK401591

Check Condition

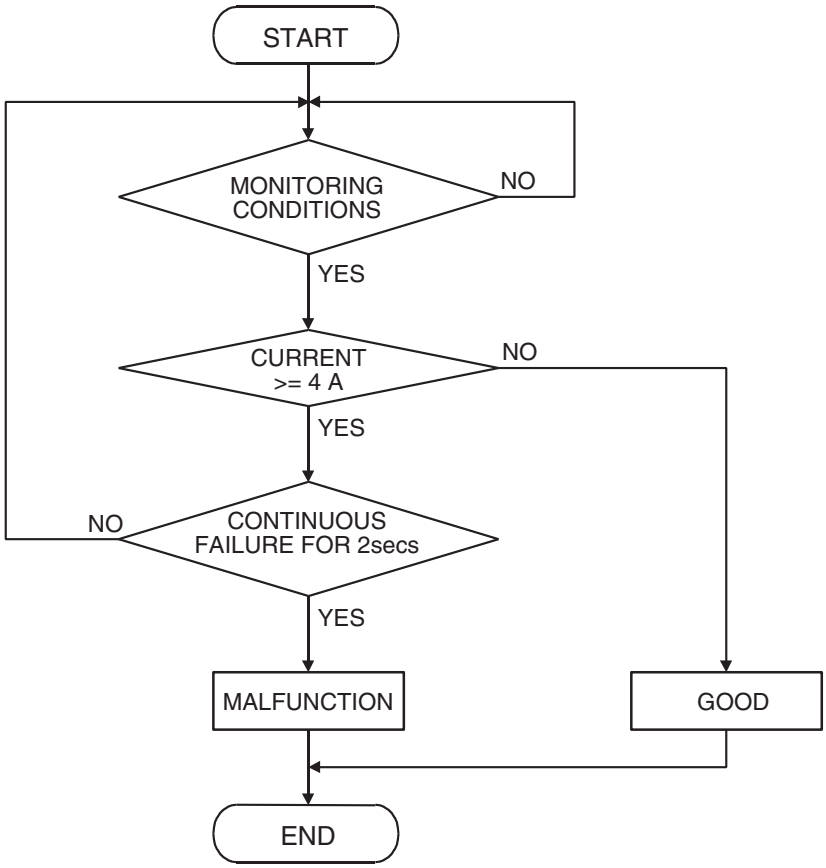
- Engine is running.

Judgement Criterion

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

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK401592

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4 ampere or more with the injector driving.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

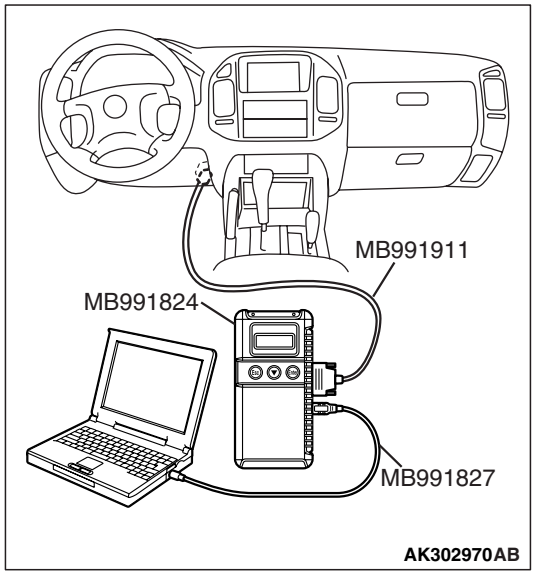
- Injector failed.
- Open or shorted injector circuit, or harness damage.
- Connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB998474: Test Harness

STEP 1. Using scan tool MB991958, check actuator test item 01, 02, 03, 04, 05, 06: Injectors.



⚠ CAUTION

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

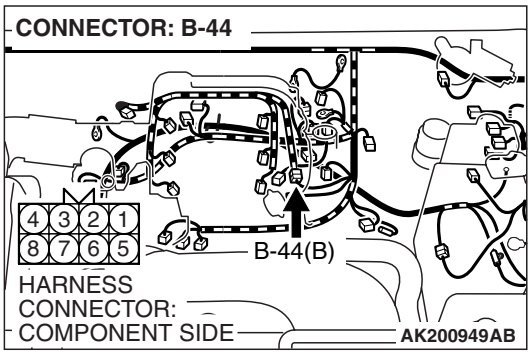
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 01, 02, 03, 04, 05, 06, Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - The idle should become slightly rougher.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.

STEP 2. Check harness connector B-44 at intermediate connector for damage.



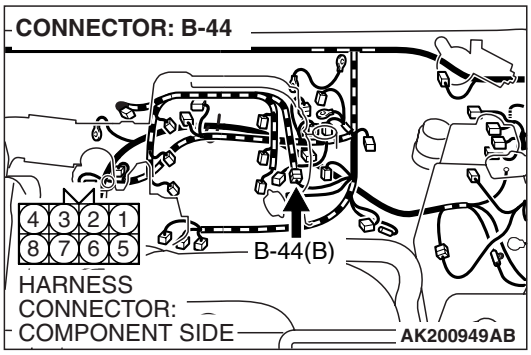
Q: Is the harness connector in good condition?

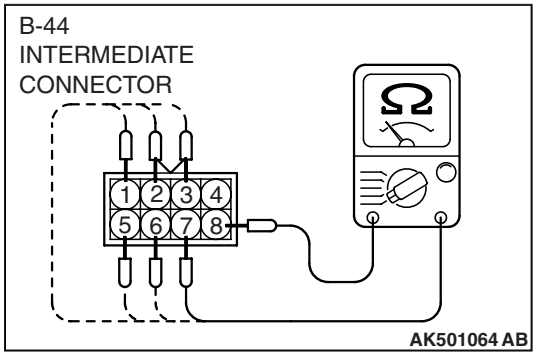
YES : Go to Step 3.

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

STEP 3. Check the injector resistance at intermediate connector B-44.

(1) Disconnect the intermediate connector B-44.



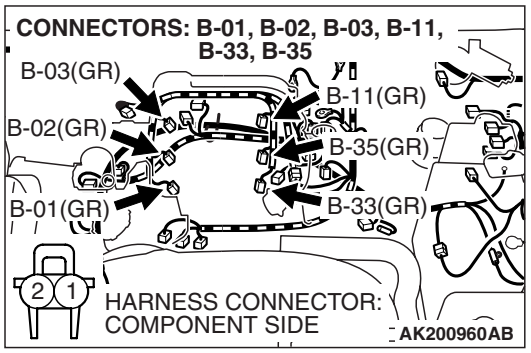


(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal No. 8 and No. 3 at No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 8 and No. 2 at No. 2 cylinder injector.
   c. Measure the resistance between terminal No. 8 and No. 1 at No. 3 cylinder injector.
   d. Measure the resistance between terminal No. 8 and No. 7 at No. 4 cylinder injector.
   e. Measure the resistance between terminal No. 8 and No. 6 at No. 5 cylinder injector.
   f. Measure the resistance between terminal No. 8 and No. 5 at No. 6 cylinder injector.
   - Resistance should be between 13 and 16 ohms [at 20°C (68°F)].

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

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

STEP 4. Check the harness connector at injector for damage.

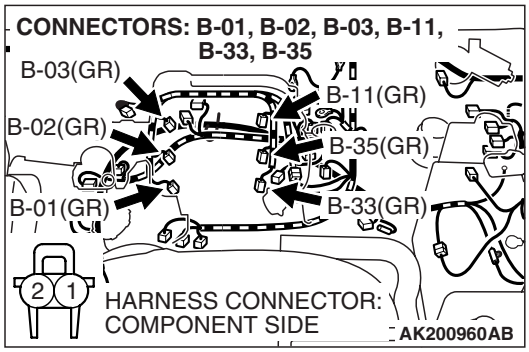


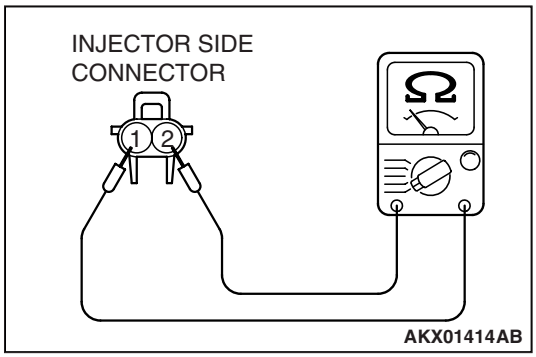
   a. Check the harness connector B-01 at No. 1 cylinder injector.
   b. Check the harness connector B-33 at No. 2 cylinder injector.
   c. Check the harness connector B-02 at No. 3 cylinder injector.
   d. Check the harness connector B-35 at No. 4 cylinder injector.
   e. Check the harness connector B-03 at No. 5 cylinder injector.
   f. Check the harness connector B-11 at No. 6 cylinder injector.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

TSB Revision





STEP 5. Check the injector.

(1) Disconnect the injector connector B-01 <No. 1 cylinder> or B-33 <No. 2 cylinder> or B-02 <No. 3 cylinder> or B-35 <No. 4 cylinder> or B-03 <No. 5 cylinder> or B-11 <No. 6 cylinder>.

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

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

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

YES : Repair harness wire between intermediate connector B-44 and injector connector because of open circuit or short circuit to ground or harness damage. Then go to Step 13.

a. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-01 (terminal No. 1) and injector connector B-01 (terminal No. 2) and intermediate connector B-44 (terminal No. 3) at No. 1 cylinder injector.
b. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-33 (terminal No. 1) and injector connector B-33 (terminal No. 2) and intermediate connector B-44 (terminal No. 2) at No. 2 cylinder injector.
c. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-02 (terminal No. 1) and injector connector B-02 (terminal No. 2) and intermediate connector B-44 (terminal No. 1) at No. 3 cylinder injector.
d. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-35 (terminal No. 1) and injector connector B-35 (terminal No. 2) and intermediate connector B-44 (terminal No. 7) at No. 4 cylinder injector.
e. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-03 (terminal No. 1) and injector connector B-03 (terminal No. 2) and intermediate connector B-44 (terminal No. 6) at No. 5 cylinder injector.

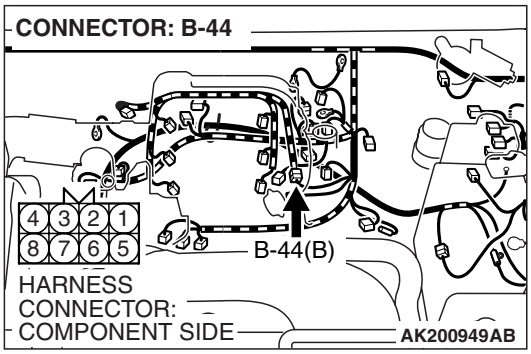
f. Repair the harness wire between intermediate connector B-44 (terminal No. 8) and injector connector B-11 (terminal No. 1) and injector connector B-11 (terminal No. 2) and intermediate connector B-44 (terminal No. 5) at No. 6 cylinder injector.

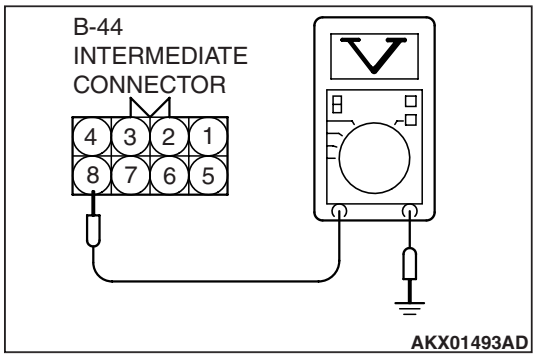
NO : Replace the injector. Then go to Step 13.

STEP 6. Measure the power supply voltage at intermediate connector B-44.

(1) Disconnect the connector B-44.

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





(3) Measure the voltage between terminal No. 8 and ground at the female connector side.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 8.

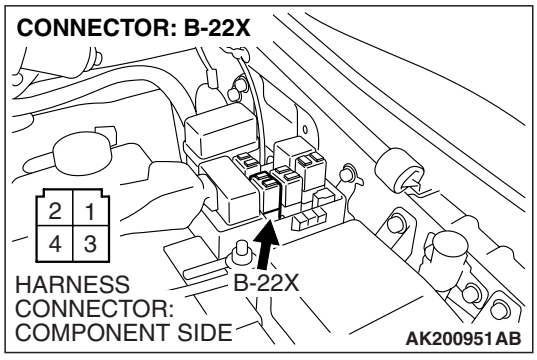
NO : Go to Step 7.

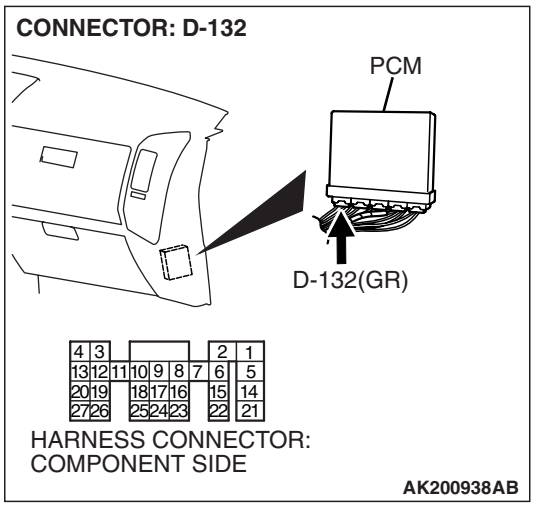
STEP 7. Check harness connector B-22X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and intermediate connector B-44 (terminal No. 8) because of open circuit or short circuit to ground. Then go to Step 13.

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



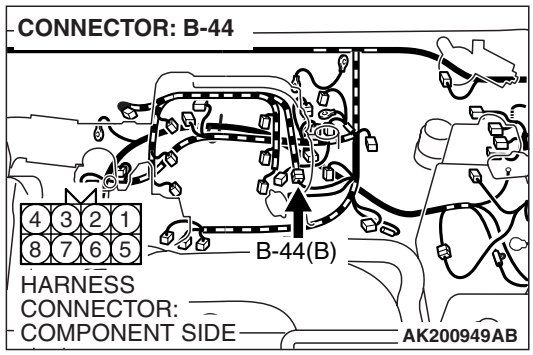


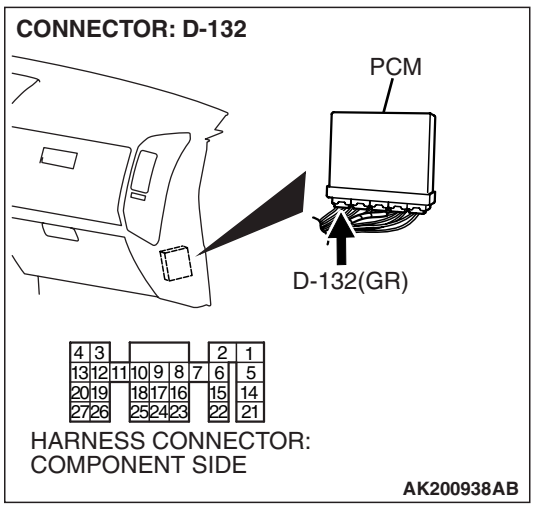
STEP 8. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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





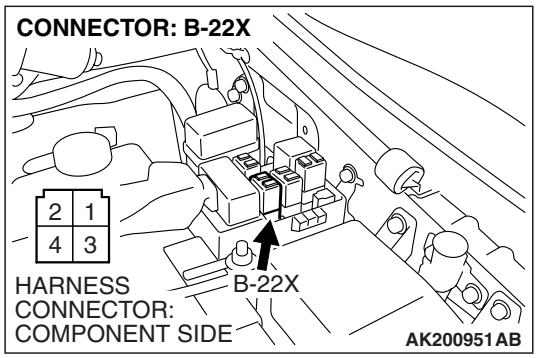
STEP 9. Check for open circuit and short circuit to ground and harness damage between intermediate connector and PCM connector.

a. Check the harness wire between intermediate connector B-44 (terminal No. 3) and PCM connector D-132 (terminal No. 1) at No. 1 cylinder injector.
b. Check the harness wire between intermediate connector B-44 (terminal No. 2) and PCM connector D-132 (terminal No. 5) at No. 2 cylinder injector.
c. Check the harness wire between intermediate connector B-44 (terminal No. 1) and PCM connector D-132 (terminal No. 14) at No. 3 cylinder injector.
d. Check the harness wire between intermediate connector B-44 (terminal No. 7) and PCM connector D-132 (terminal No. 21) at No. 4 cylinder injector.
e. Check the harness wire between intermediate connector B-44 (terminal No. 6) and PCM connector D-132 (terminal No. 2) at No. 5 cylinder injector.
f. Check the harness wire between intermediate connector B-44 (terminal No. 5) and PCM connector D-132 (terminal No. 6) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 13.

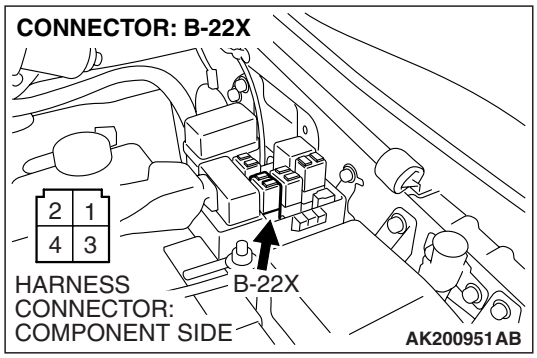


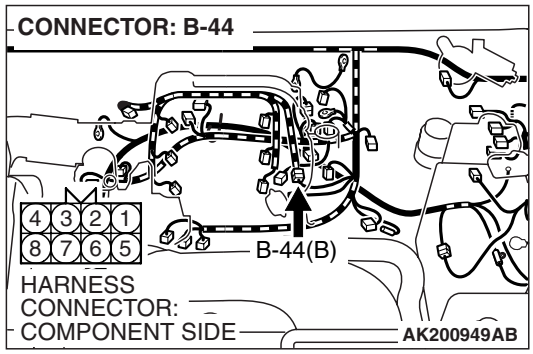
STEP 10. Check harness connector B-22X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.

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



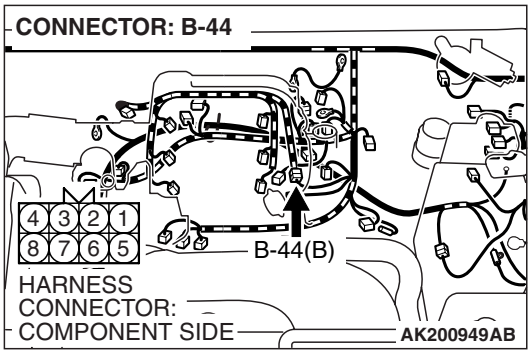


STEP 11. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and intermediate connector B-44 (terminal No. 8).

Q: Is the harness wire in good condition?

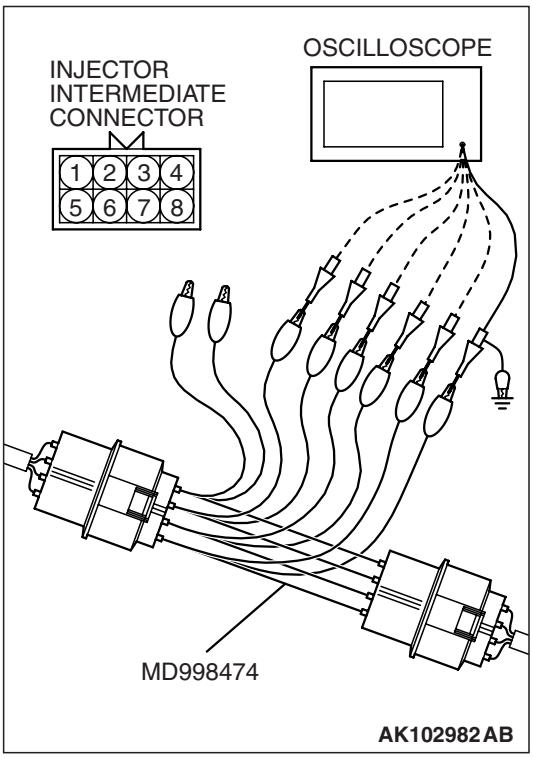
YES : Go to Step 12.

NO : Repair it. Then go to Step 13.



STEP 12. Using the oscilloscope, check the injector.

(1) Disconnect the intermediate connector B-44 and connect the test harness special tool (MB998474) in between.

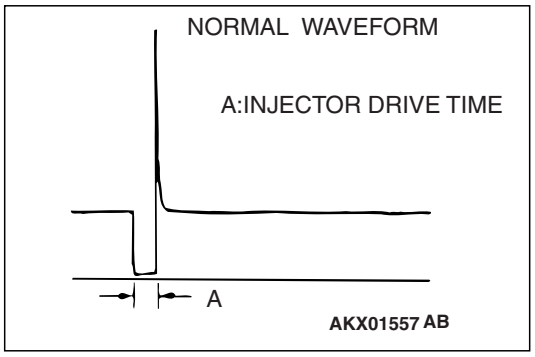


(2) Connect the oscilloscope probe to each injector intermediate connector terminal to oscilloscope each cylinder:
- Terminal No. 3 (green clip) at No. 1 cylinder injector.
- Terminal No. 2 (white clip) at No. 2 cylinder injector.
- Terminal No. 1 (blue clip) at No. 3 cylinder injector.
- Terminal No. 7 (yellow clip) at No. 4 cylinder injector.
- Terminal No. 6 (red clip) at No. 5 cylinder injector.
- Terminal No. 5 (black clip) at No. 6 cylinder injector.

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

- *PCM terminal No. 1 at No. 1 cylinder injector.*
- *PCM terminal No. 5 at No. 2 cylinder injector.*
- *PCM terminal No. 14 at No. 3 cylinder injector.*
- *PCM terminal No. 21 at No. 4 cylinder injector.*
- *PCM terminal No. 2 at No. 5 cylinder injector.*
- *PCM terminal No. 6 at No. 6 cylinder injector.*

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

YES : 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.00-13.

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

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

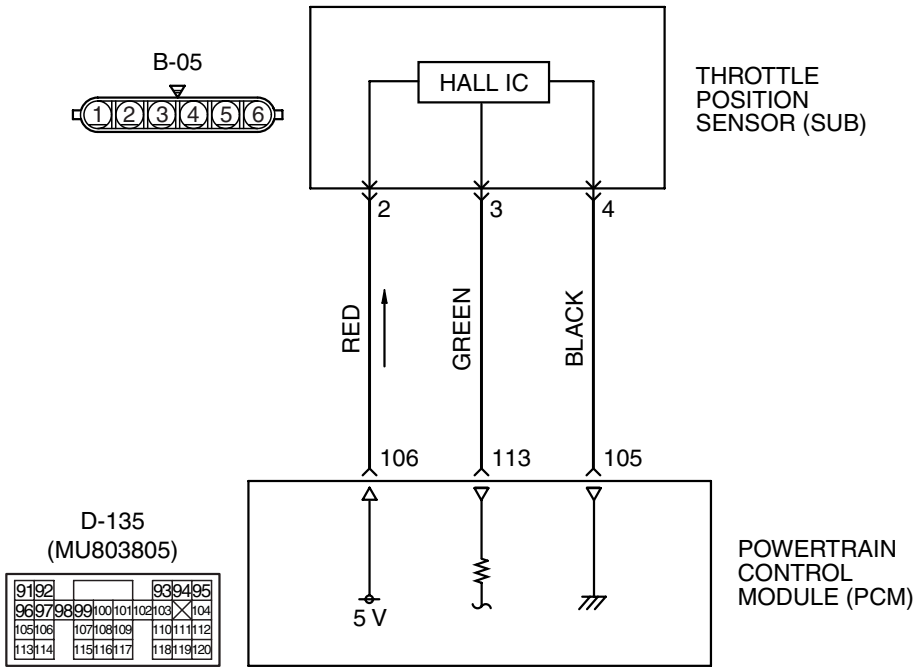
Q: Is DTC P0201, P0202, P0203, P0204, P0205 and P0206 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0222: Throttle Position Sensor (sub) Circuit Low Input

Throttle Position Sensor (sub) Circuit



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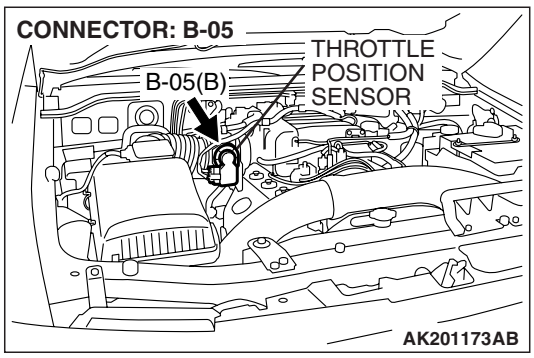
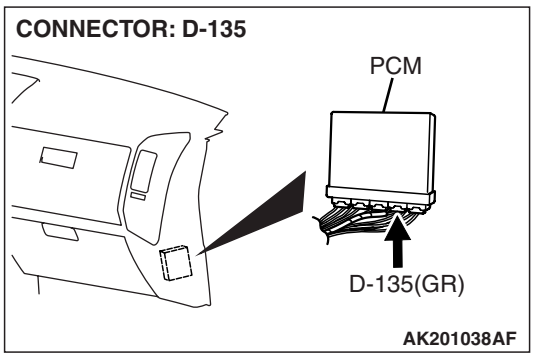




TSB Revision

CIRCUIT OPERATION

- 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded to the PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistance between the throttle position sensor (sub) output terminal (terminal No. 3) and ground terminal (terminal No. 4) will increase according to the rotation.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

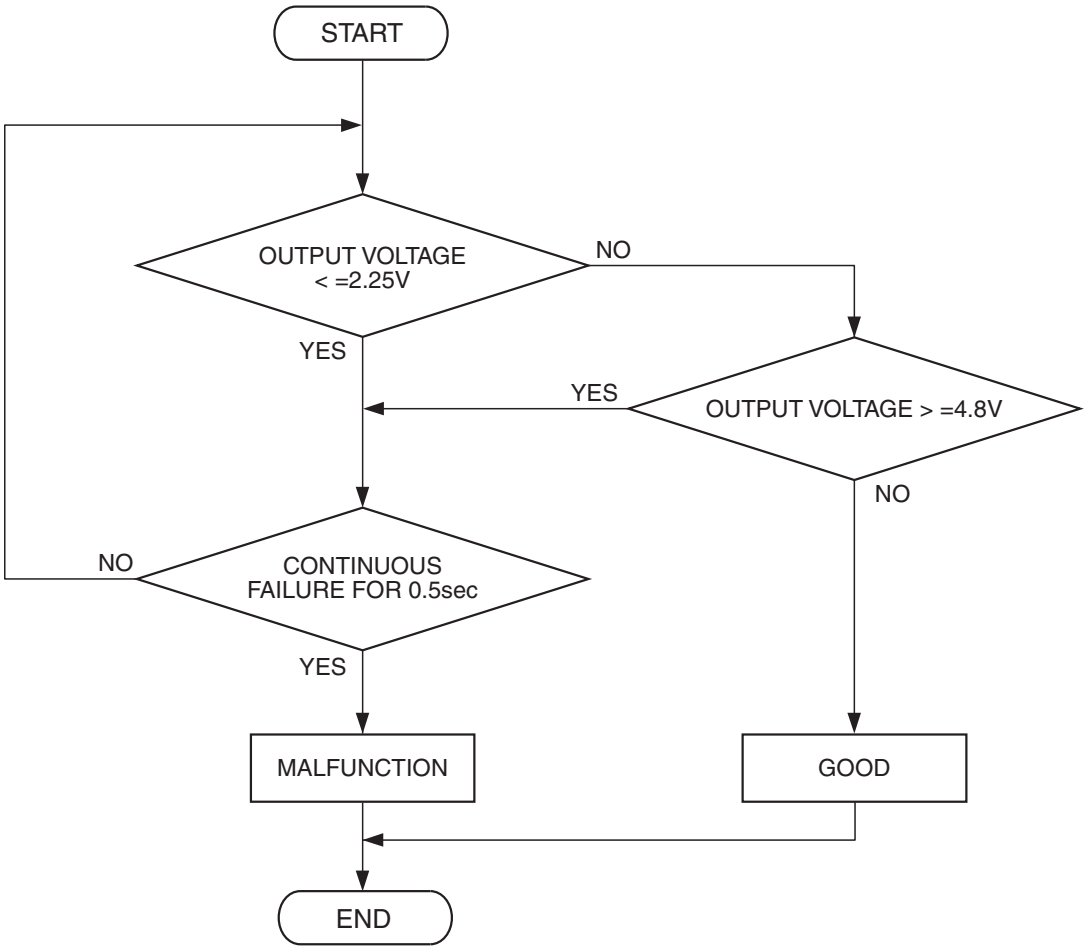
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (sub) output voltage should be 2.25 volts or less for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

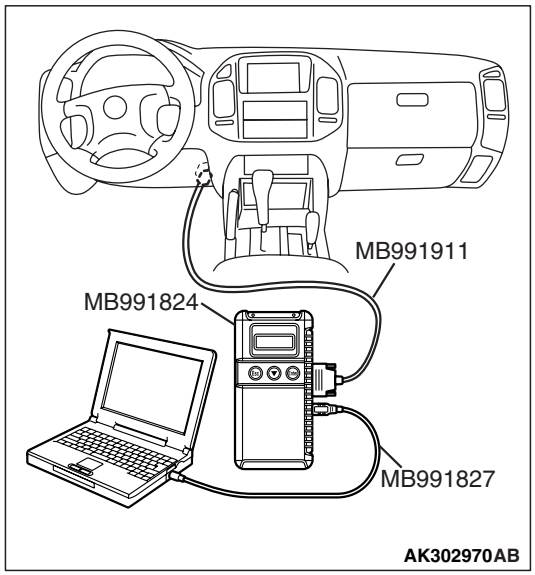
TSB Revision

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 14: Throttle Position Sensor (sub).



⚠ CAUTION

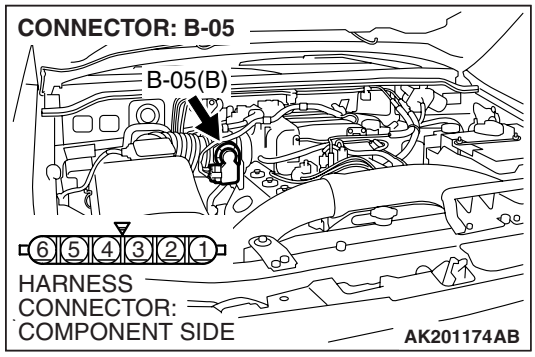
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991958 to the data reading mode for item 14, Throttle Position Sensor (sub).
  - Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
  - Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

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



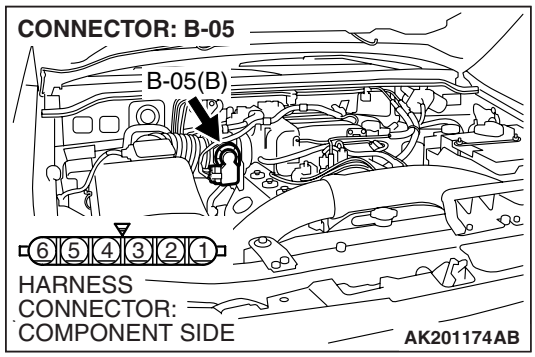
Q: Is the harness connector in good condition?

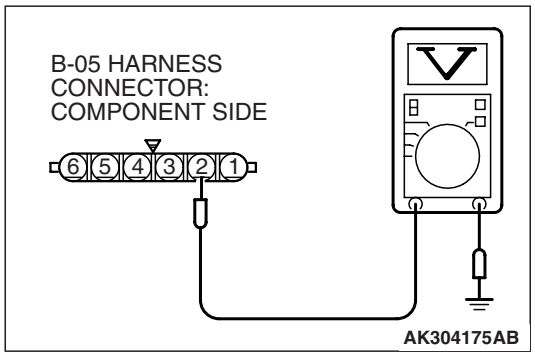
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

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

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

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





(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

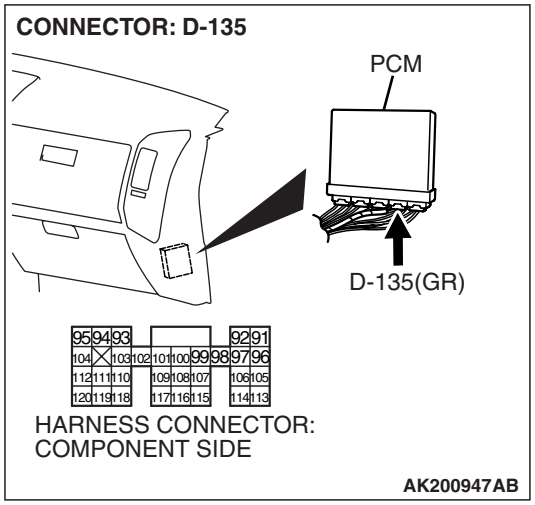
Q: Is the measured voltage between 4.9 and 5.1 volts?

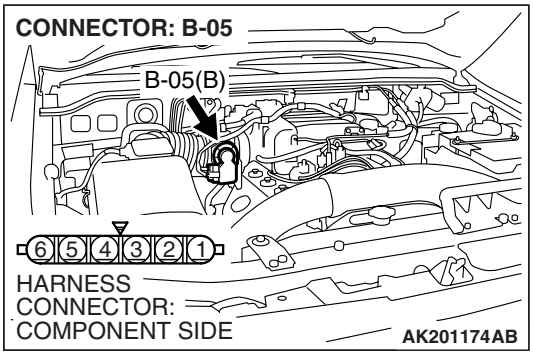
YES : Go to Step 7.
NO : Go to Step 4.

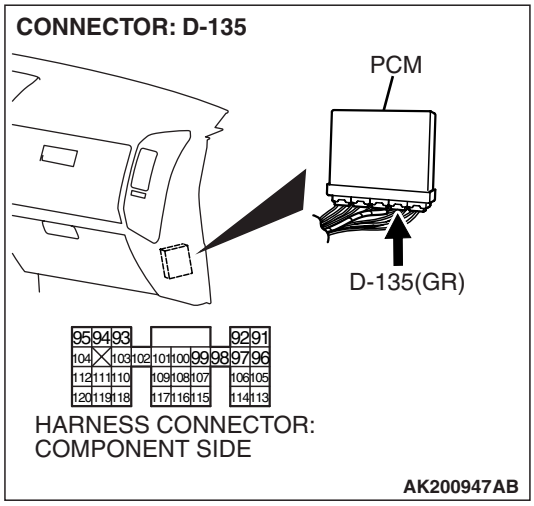
STEP 4. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

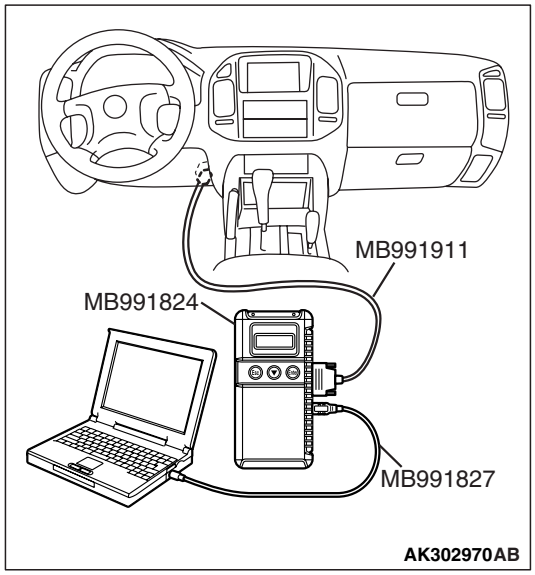






STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 (terminal No. 106).
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.



STEP 6. Using scan tool MB991958, check data list item 14: Throttle Position Sensor (sub).

⚠ CAUTION

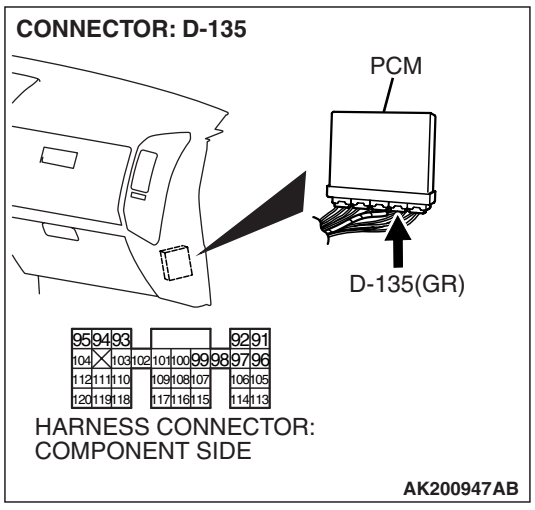
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991958 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

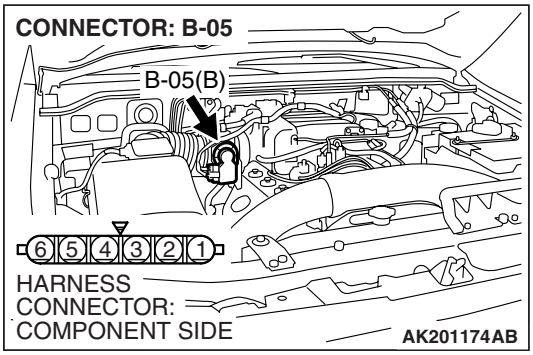
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the PCM. Then go to Step 11.

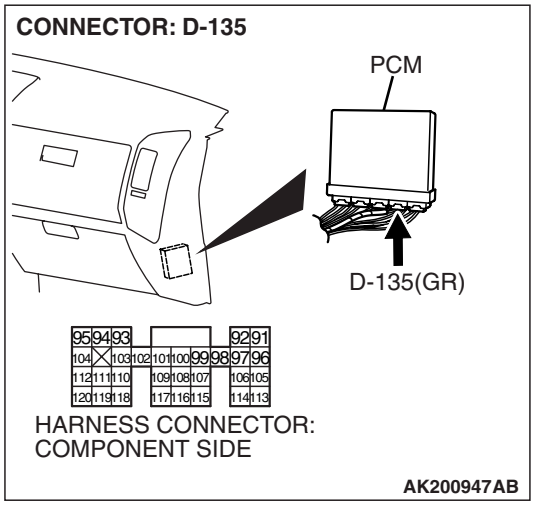


STEP 7. Check harness connector D-135 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 8. Check for harness damage between throttle position sensor connector B-05 (terminal No. 2) and PCM connector D-135 (terminal No. 106).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

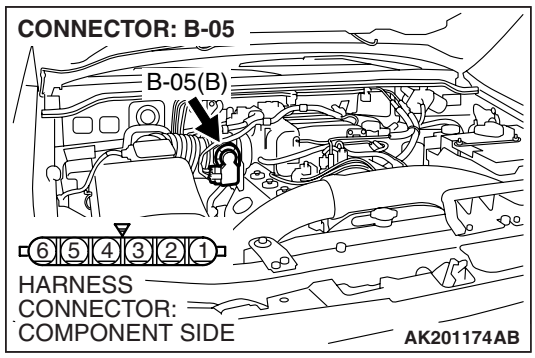
NO : Repair it. Then go to Step 11.

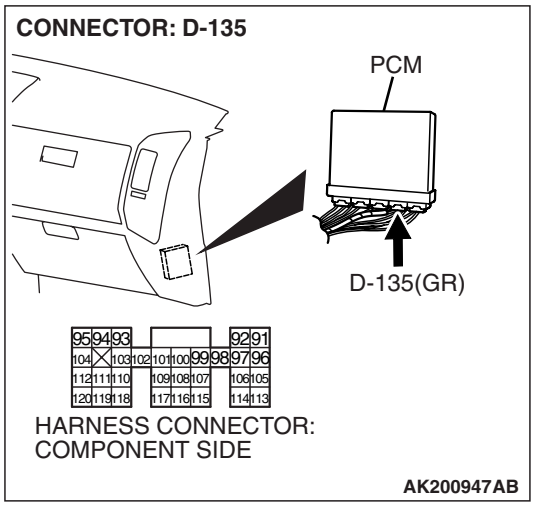
STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-05 (terminal No. 3) and PCM connector D-135 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.





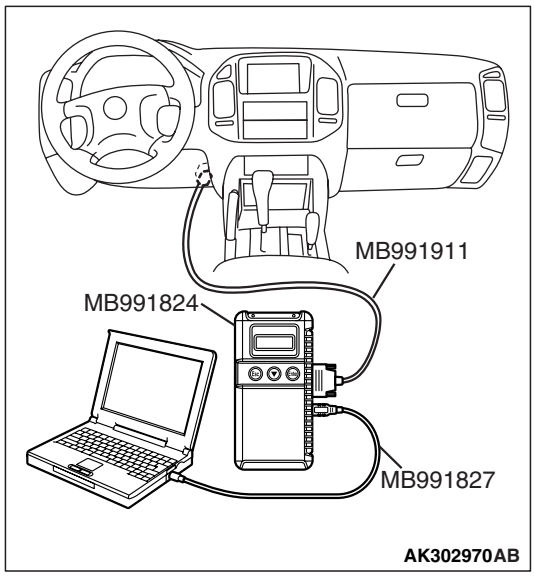
STEP 10. Replace the throttle body assembly.

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

Q: Is DTC P0222 set?

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

NO : The inspection is complete.



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

⚠ CAUTION

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

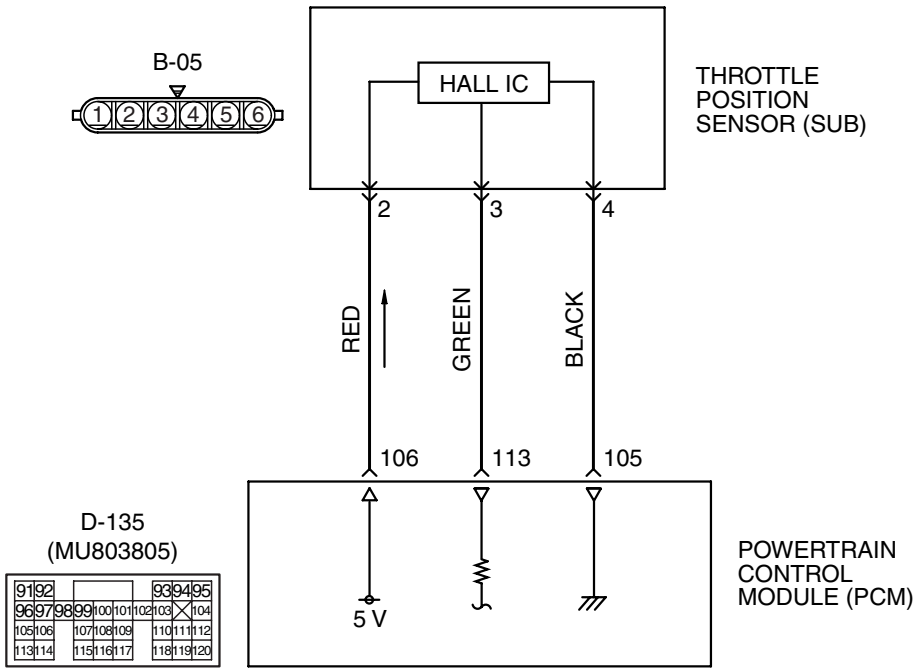
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 set?

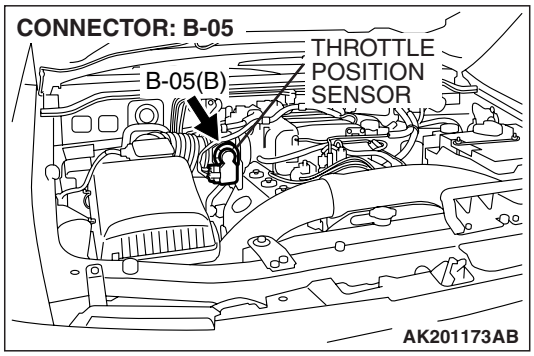
YES : Retry the troubleshooting.
NO : The inspection is complete.

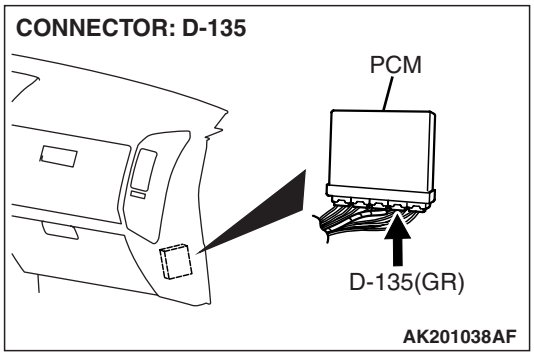
DTC P0223: Throttle Position Sensor (sub) Circuit High Input

Throttle Position Sensor (sub) Circuit



TSB Revision





CIRCUIT OPERATION

- 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 2) from the PCM (terminal No. 106).
  The ground terminal (terminal No. 4) is grounded to the PCM (terminal No. 105).
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistance between the throttle position sensor (sub) output terminal (terminal No. 3) and ground terminal (terminal No. 4) will increase according to the rotation.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

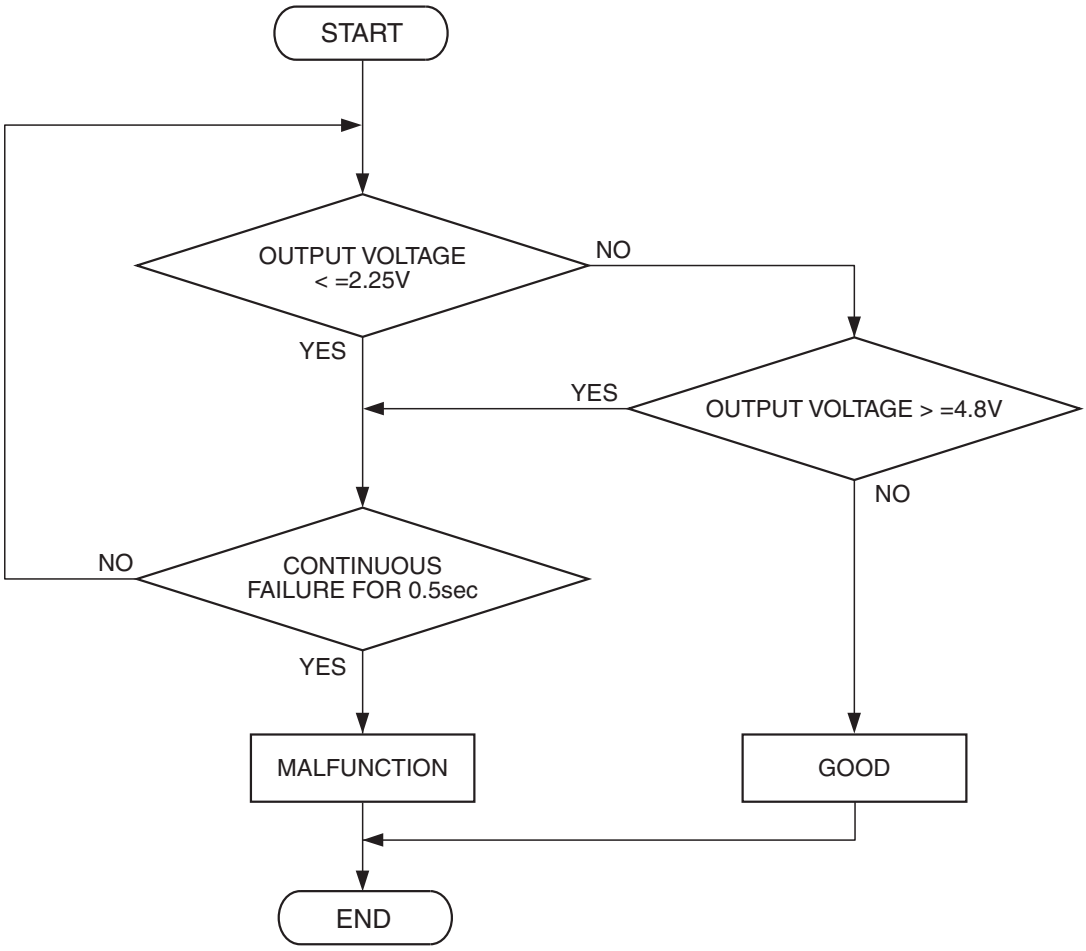
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

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

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

- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- PCM failed.

OBD-II DRIVE CYCLE PATTERN

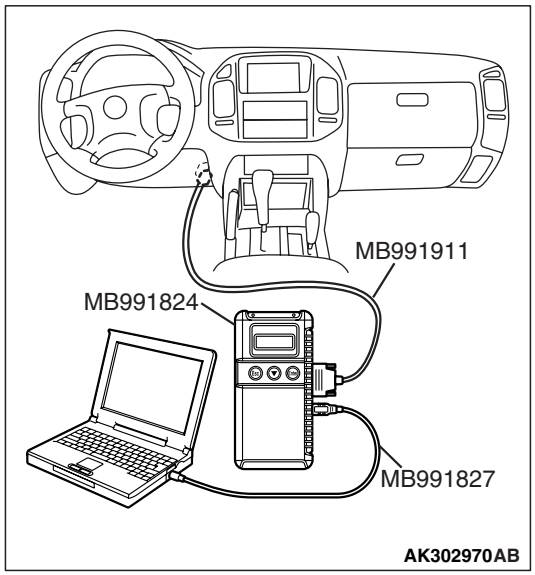
None.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 14: Throttle Position Sensor (sub).



⚠ CAUTION

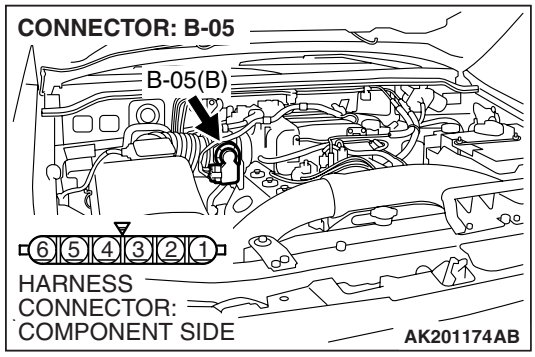
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991958 to the data reading mode for item 14, Throttle Position Sensor (sub).
  - Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
  - Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

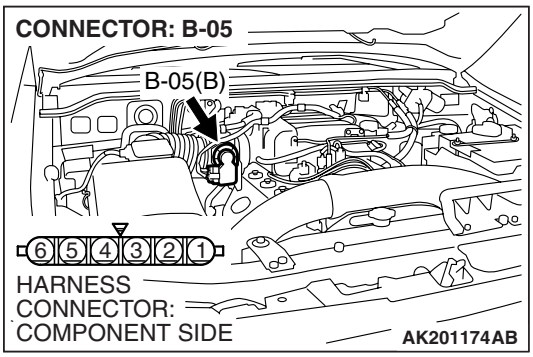
STEP 2. Check harness connector B-05 at throttle position sensor for damage.



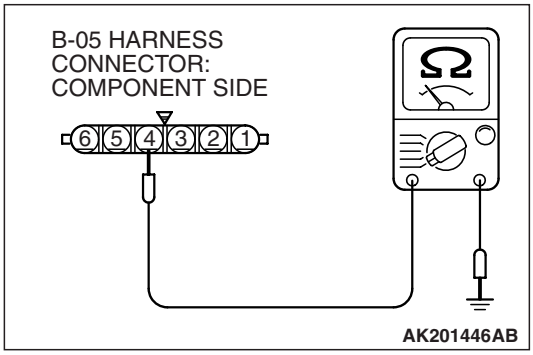
Q: Is the harness connector in good condition?

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-05.



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

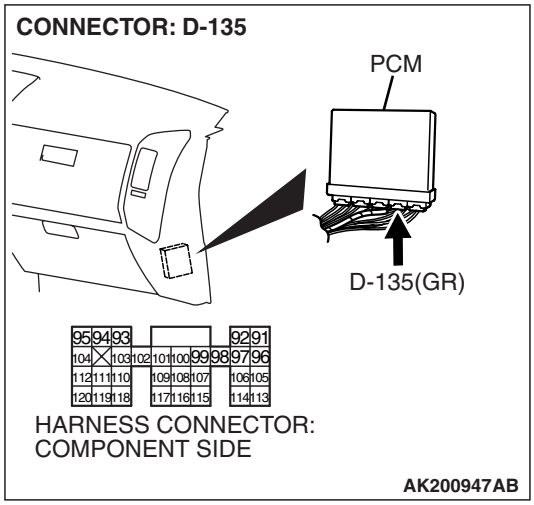


(2) Measure the continuity between terminal No. 4 and ground
- Should be less than 2 ohms.

Q: Does continuity exist?

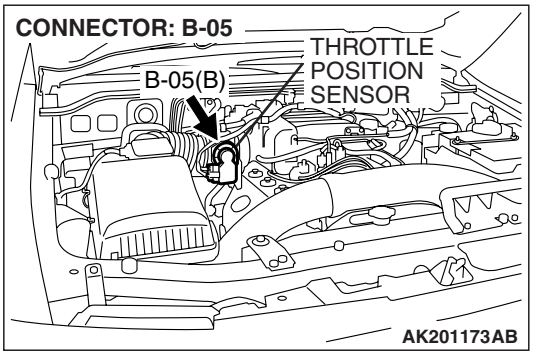
YES : Go to Step 7.
NO : Go to Step 4.

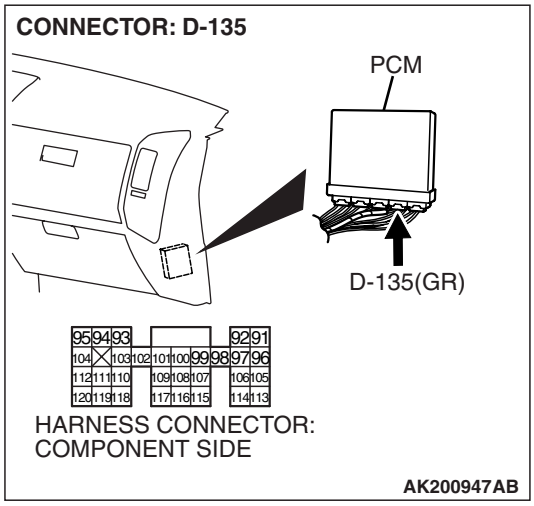
STEP 4. Check harness connector D-135 at PCM for damage.



Q: Is the harness connector in good condition?

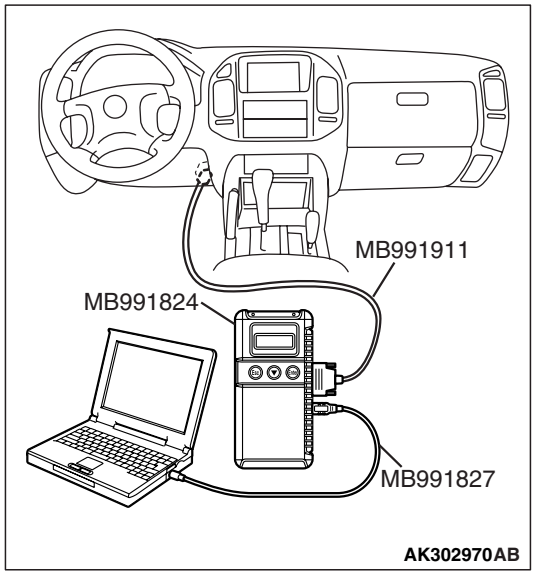
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.





STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-05 (terminal No. 4) and PCM connector D-135 (terminal No. 105).
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 14: Throttle Position Sensor (sub).

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 1, No. 2, No. 3, and No. 4.
(6) Set scan tool MB991958 to the data reading mode for item 14, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 and 2.8 volts when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

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

Q: Is the sensor operating properly?

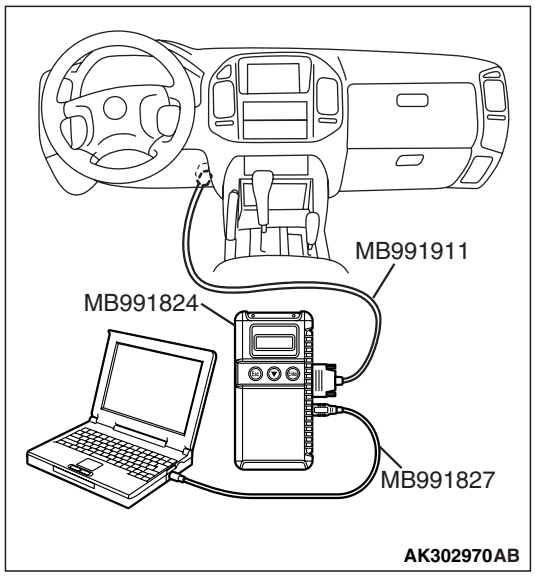
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the PCM. Then go to Step 8.

STEP 7. Replace the throttle body assembly.

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

Q: Is DTC P0223 set?

YES : Replace the PCM. Then go to Step 8.
NO : The inspection is complete.



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

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

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

Q: Is DTC P0223 set?

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

DTC P0300: Random/Multiple Cylinder Misfire Detected

Random Misfire Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

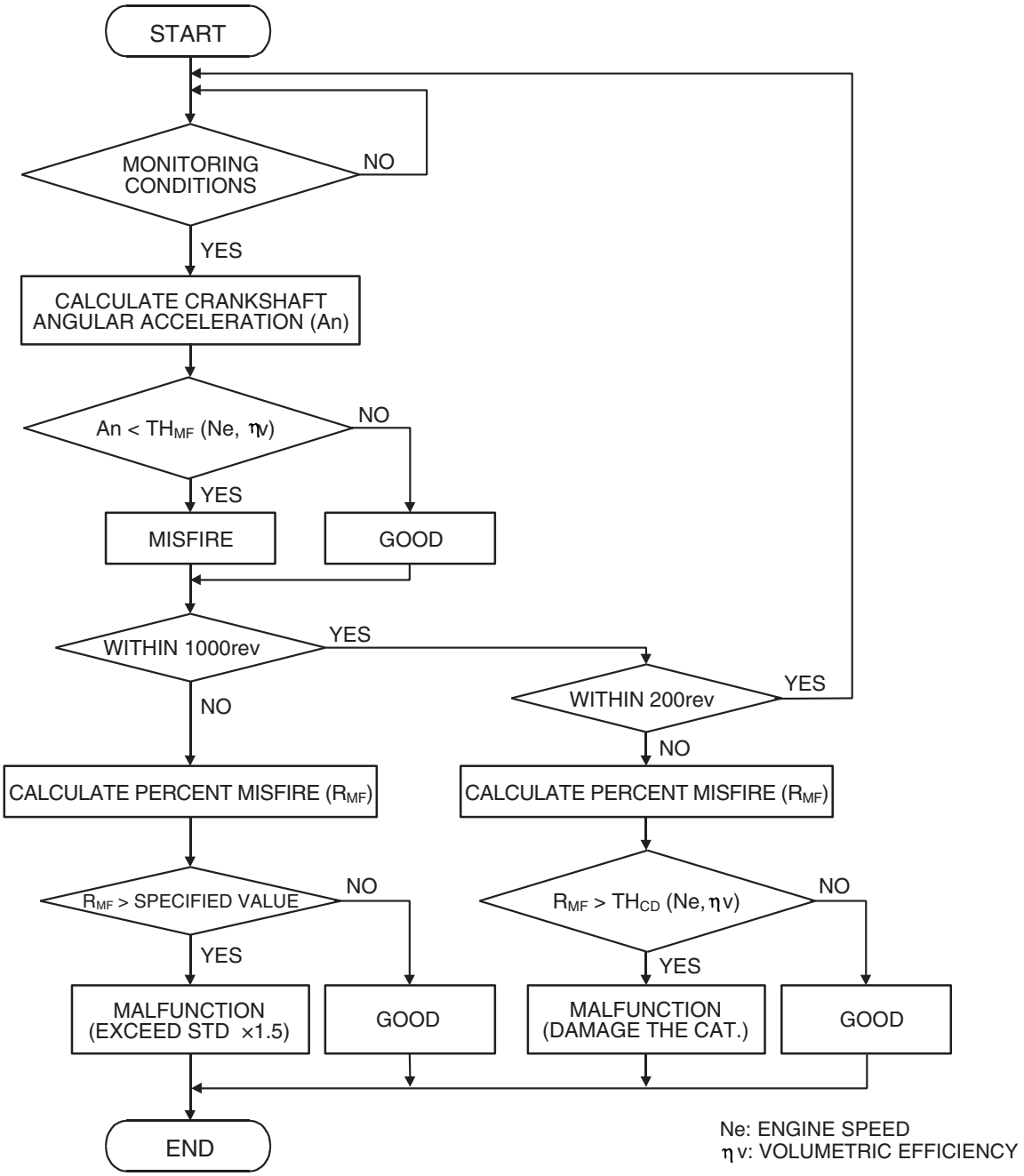
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

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

or

- Misfire has occurred in 18 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.

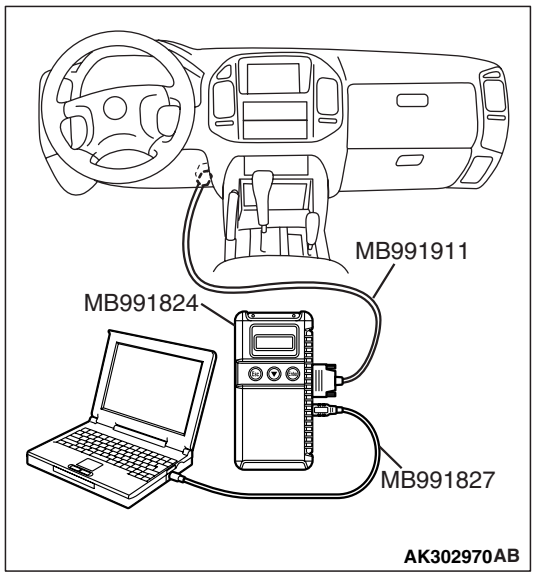
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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



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

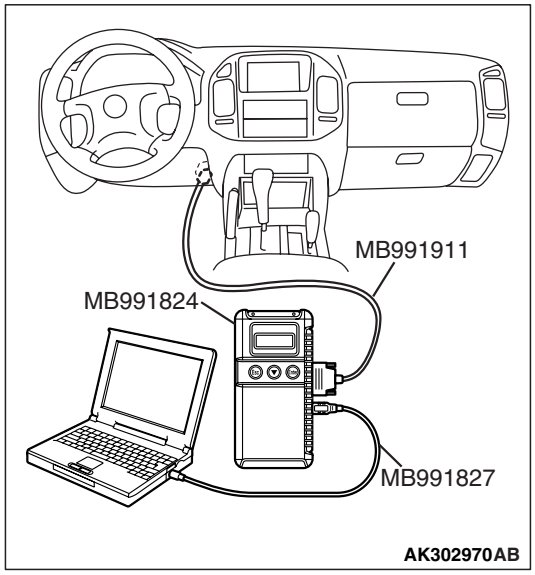
⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 22, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
  - The pulse width should be constant.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0335 – Crankshaft Position Sensor Circuit. P.13A-483



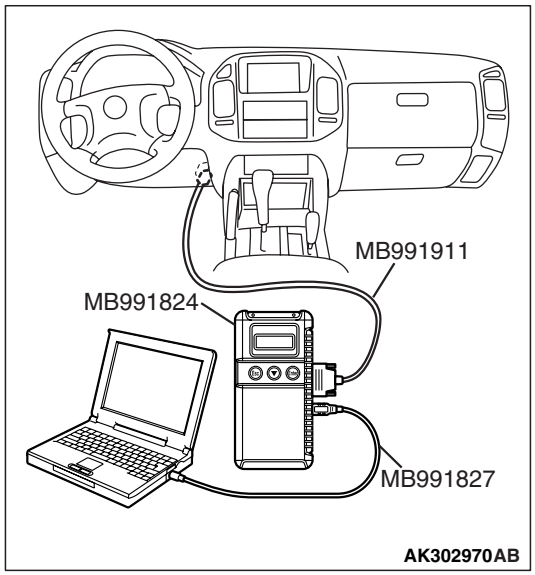
STEP 2. Using scan tool MB991958, check data list item 81 <bank 1> and 83 <bank 2>: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 81 <bank 1> and 83 <bank 2>, Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the load is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to DTC P0171 – System too Lean (bank 1) P.13A-385, DTC P0172 – System too Rich (bank 1) P.13A-393, DTC P0174 – System too Lean (bank 2) P.13A-399, DTC P0175 – System too Rich (bank 2) P.13A-407.



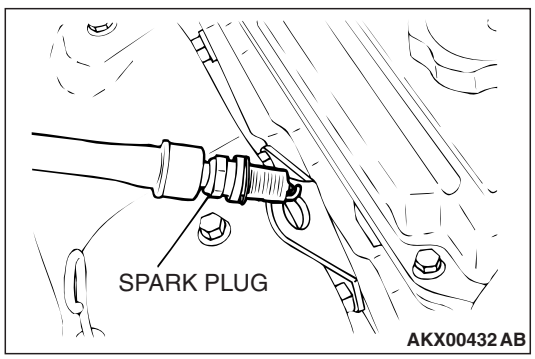
STEP 3. Using scan tool MB991958, check data list item 82 <bank 1> and 84 <bank 2>: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 82 <bank 1> and 84 <bank 2>, Short-Term Fuel Trim.
- The fuel trim should be between –7.4 and +7.4 percent when the load is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to DTC P0171 – System too Lean (bank 1) P.13A-385, DTC P0172 – System too Rich (bank 1) P.13A-393, DTC P0174 – System too Lean (bank 2) P.13A-399, DTC P0175 – System too Rich (bank 2) P.13A-407.



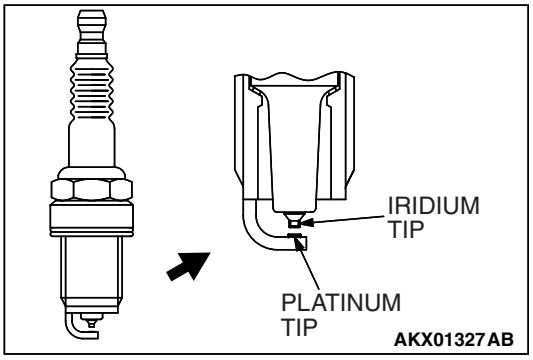
STEP 4. Check the each ignition coil spark.

(1) Remove the intake manifold.
(2) Remove the spark plug and connect to the spark plug cable.
(3) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

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

TSB Revision



STEP 5. Check the spark plugs.

⚠ CAUTION

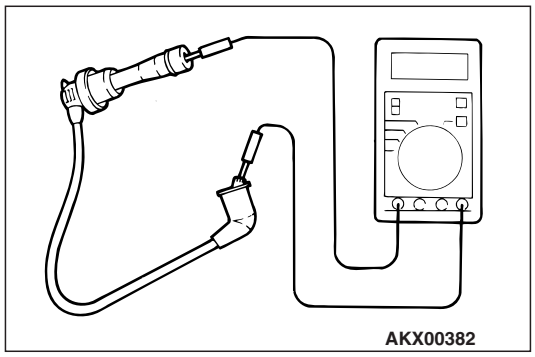
Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

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

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 0.95 mm (0.037 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 6.
NO : Replace the faulty spark plug. Then go to Step 13.



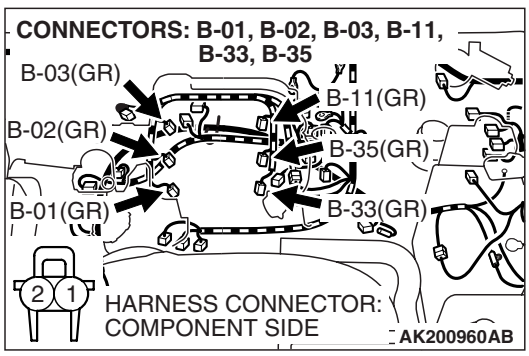
STEP 6. Check the spark plug cable.

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

Limit: maximum 9 kΩ

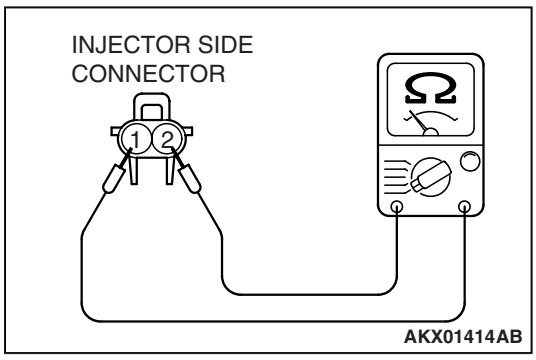
Q: Is the resistance normal?

YES : Refer to INSPECTION PROCEDURE 31 – Ignition Circuit System P.13A-991.
NO : Replace the faulty spark plug cable. Then go to Step 13.



STEP 7. Check the injector.

(1) Disconnect the injector connector.

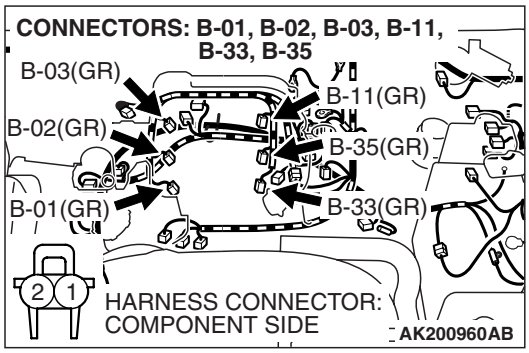


(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

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

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

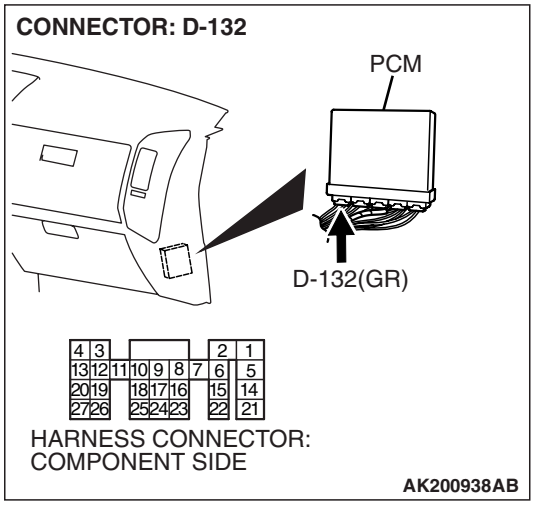


STEP 8. Check harness connector B-01, B-33, B-02, B-35, B-03, B-11 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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

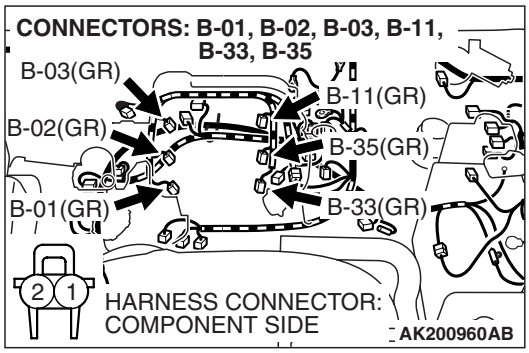


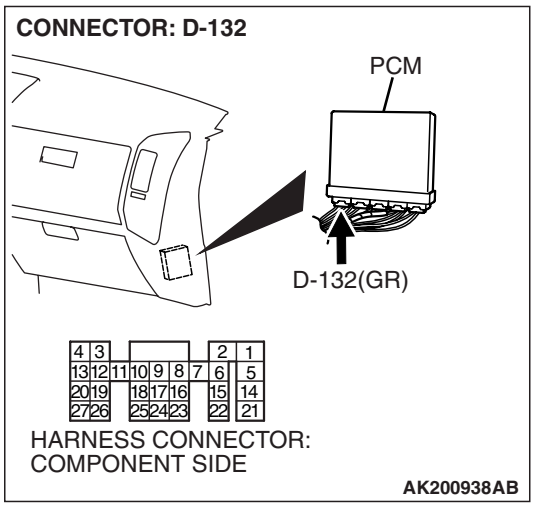
STEP 9. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





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

a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) at No. 1 cylinder injector.
b. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 5) at No. 2 cylinder injector.
c. Check the harness wire between injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 14) at No. 3 cylinder injector.
d. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 21) at No. 4 cylinder injector.
e. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 2) at No. 5 cylinder injector.
f. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 6) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 13.

STEP 11. Check the following items.

(1) Check the following items, and repair or replace the defective component.
   a. Check for skipped timing belt teeth.
   b. Check compression.
   c. EGR valve failed.

Q: Are there any abnormalities?

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

STEP 12. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the PCM. Then go to Step 13.
NO : The inspection is complete.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.

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

Q: Is DTC P0300 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected, DTC P0305: Cylinder 5 Misfire Detected, DTC P0306: Cylinder 6 Misfire Detected

Misfire Detected Circuit

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

CIRCUIT OPERATION

- Refer to DTC P0201 – P0206, Injector Circuit. P.13A-436

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

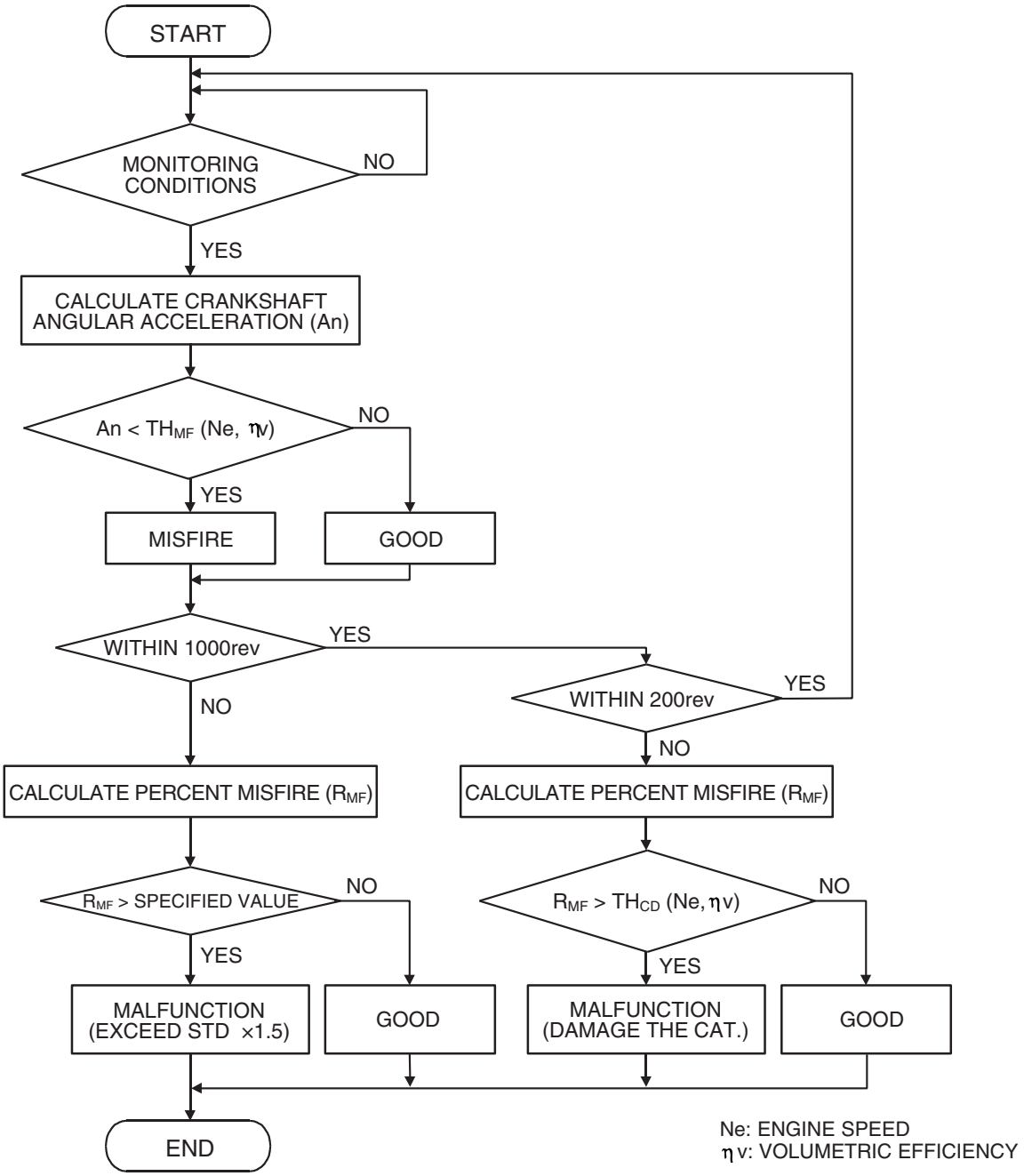
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/25 ms to +0.06 V/10 ms.

TSB Revision

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

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

or

- Misfire has occurred in 18 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

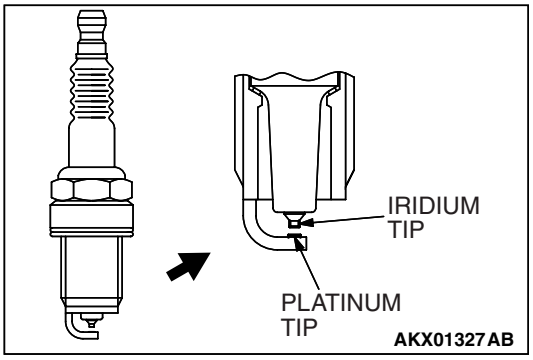
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.

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

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

DIAGNOSIS



STEP 1. Check the spark plugs.

⚠ CAUTION

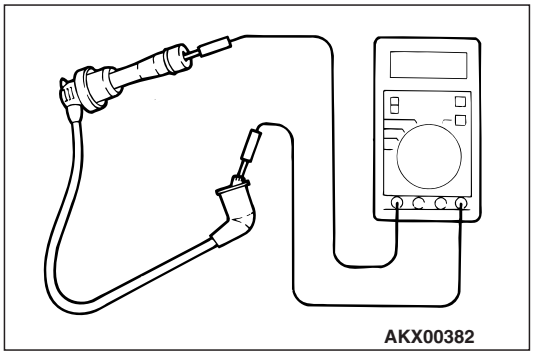
Do not attempt to adjust the gap of the iridium plug. Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

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

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 0.95 mm (0.037 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 2.
NO : Replace the spark plug. Then go to Step 9.



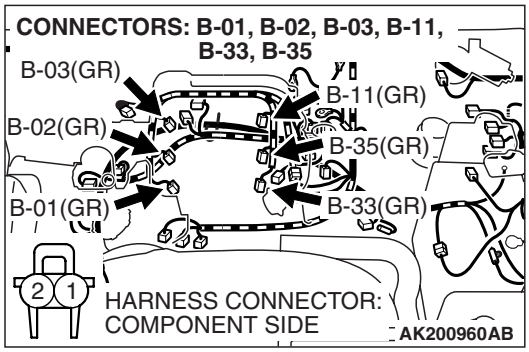
STEP 2. Check the spark plug cable.

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

Limit: maximum 9 kΩ

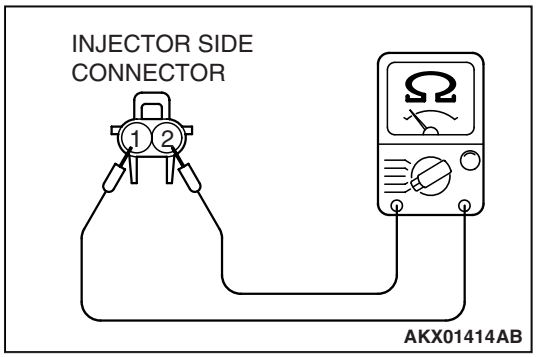
Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the spark plug cable. Then go to Step 9.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-01, B-33, B-02, B-35, B-03, B-11.



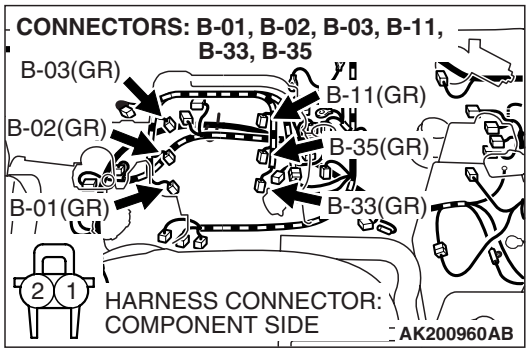
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.

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



STEP 4. Check harness connector B-01, B-33, B-02, B-35, B-03, B-11 at injector for damage.

a. Check the harness connector B-01 at No. 1 cylinder injector.
b. Check the harness connector B-33 at No. 2 cylinder injector.
c. Check the harness connector B-02 at No. 3 cylinder injector.
d. Check the harness connector B-35 at No. 4 cylinder injector.
e. Check the harness connector B-03 at No. 5 cylinder injector.
f. Check the harness connector B-11 at No. 6 cylinder injector.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

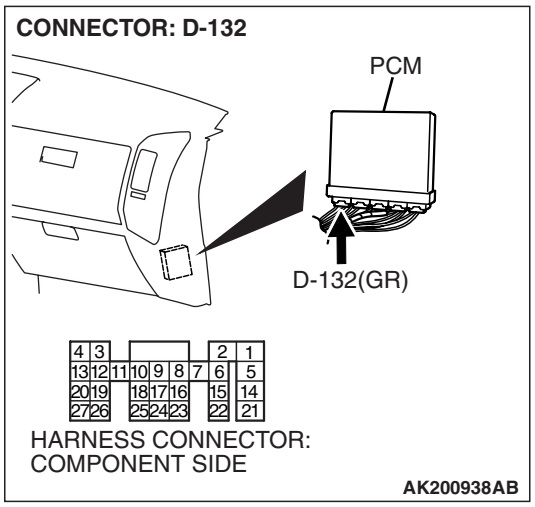
NO : Repair or replace the injector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 5. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

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



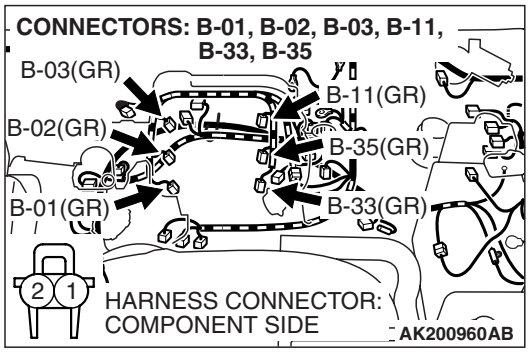
STEP 6. Check for harness damage between injector connector and PCM connector.

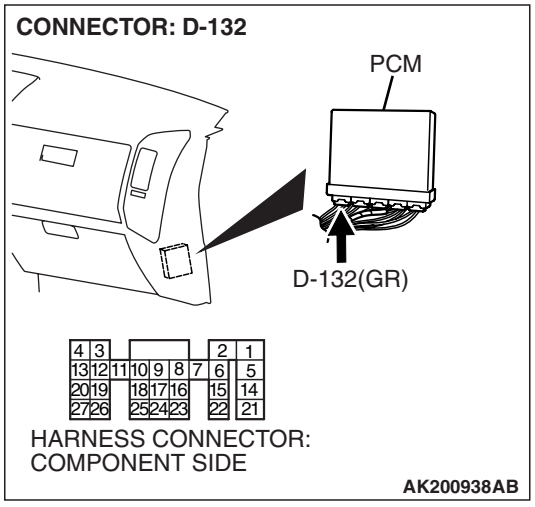
a. Check the harness wire between injector connector B-01 (terminal No. 2) and PCM connector D-132 (terminal No. 1) at No. 1 cylinder injector.
b. Check the harness wire between injector connector B-33 (terminal No. 2) and PCM connector D-132 (terminal No. 5) at No. 2 cylinder injector.
c. Check the harness wire between injector connector B-02 (terminal No. 2) and PCM connector D-132 (terminal No. 14) at No. 3 cylinder injector.
d. Check the harness wire between injector connector B-35 (terminal No. 2) and PCM connector D-132 (terminal No. 21) at No. 4 cylinder injector.
e. Check the harness wire between injector connector B-03 (terminal No. 2) and PCM connector D-132 (terminal No. 2) at No. 5 cylinder injector.
f. Check the harness wire between injector connector B-11 (terminal No. 2) and PCM connector D-132 (terminal No. 6) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 9.





STEP 7. Check the compression.
Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check.

Q: Are there any abnormalities?

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

STEP 8. Replace the injector.
(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.
(3) Check the diagnostic trouble code (DTC).

Q: Are DTC P0301, P0302, P0303, P0304, P0305 and P0306 sets?

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

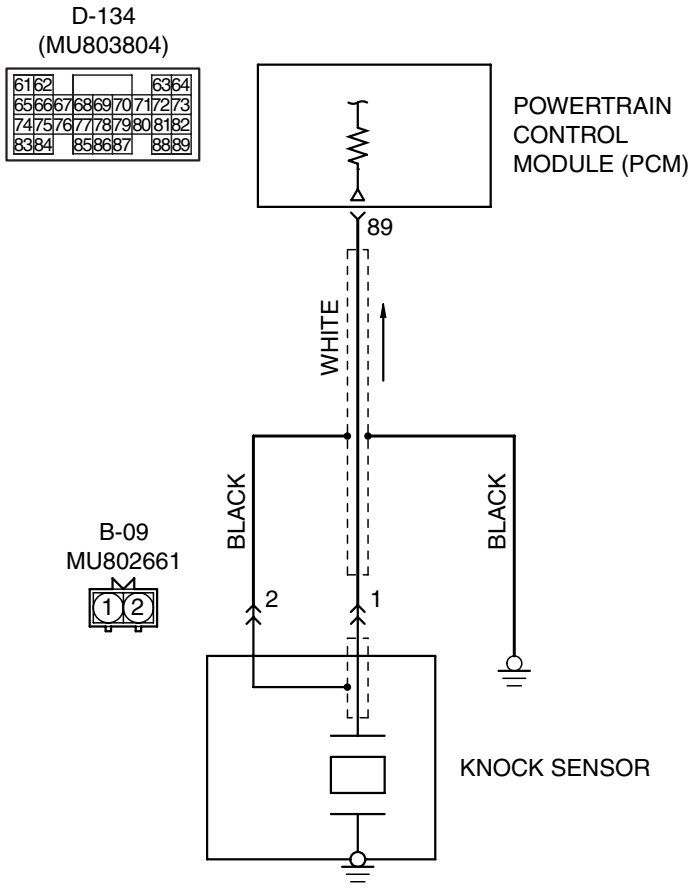
STEP 9. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Are DTC P0301, P0302, P0303, P0304, P0305 and P0306 sets?

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

DTC P0325: Knock Sensor Circuit

Knock Sensor Circuit



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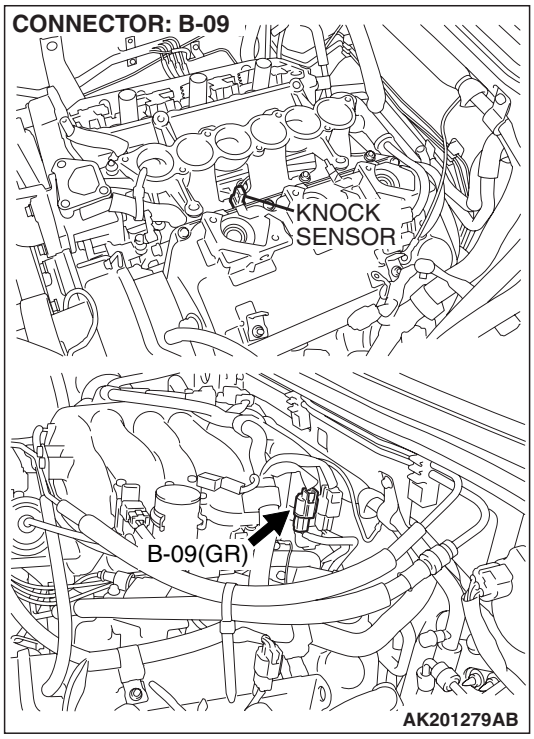
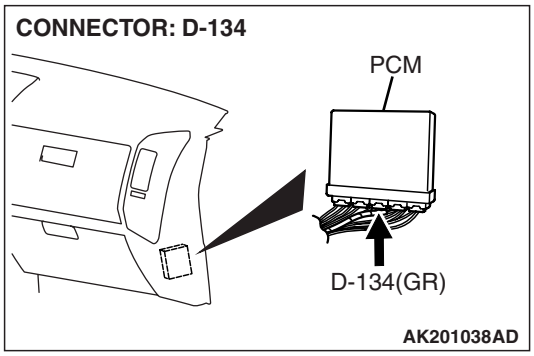




CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the PCM (terminal No. 89).

TECHNICAL DESCRIPTION

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

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 3,000 r/min.

Judgment Criterion

- Knock sensor output voltage (knock sensor peak voltage in each 1/3 turn of the crankshaft) has not changed more than 0.06 V in the last consecutive 200 periods.

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

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

DIAGNOSIS

Required Special Tools:

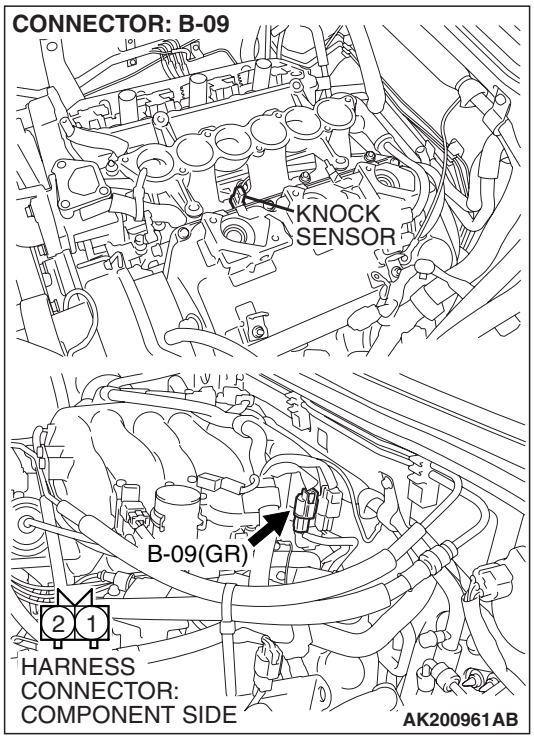
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check harness connector B-09 at the knock sensor for damage.

Q: Is the harness connector in good condition?

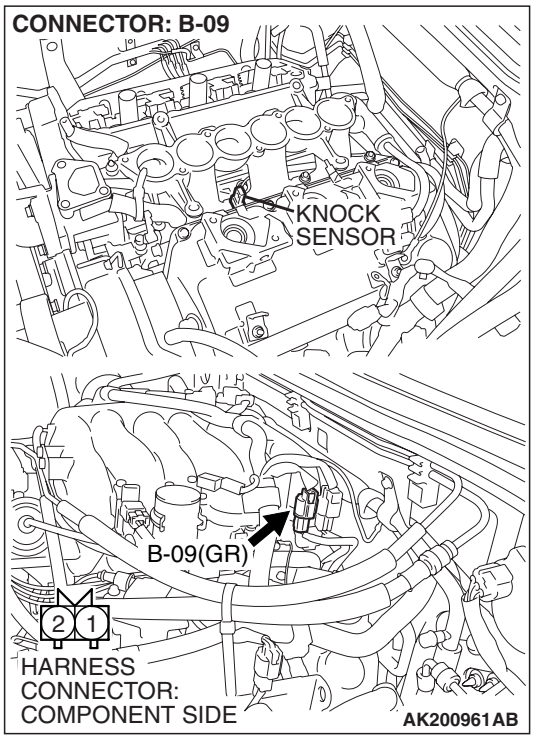
YES : Go to Step 2.

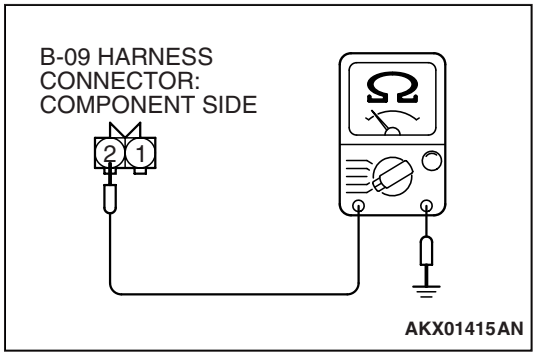
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 2. Check the continuity at knock sensor harness side connector B-09.

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





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

Q: Does continuity exist?

YES : Go to Step 3.

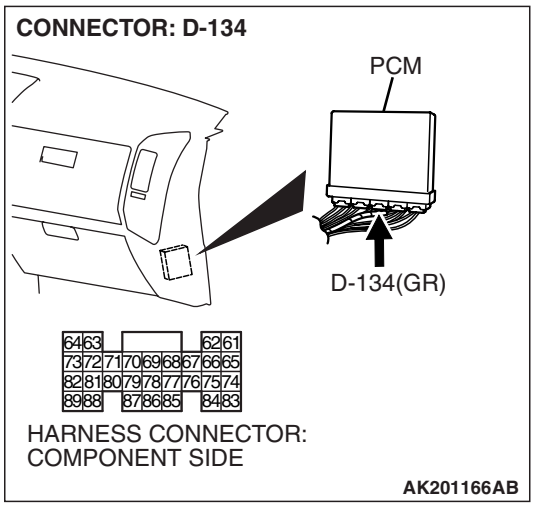
NO : Repair harness wire between knock sensor connector B-09 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 6.

STEP 3. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

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

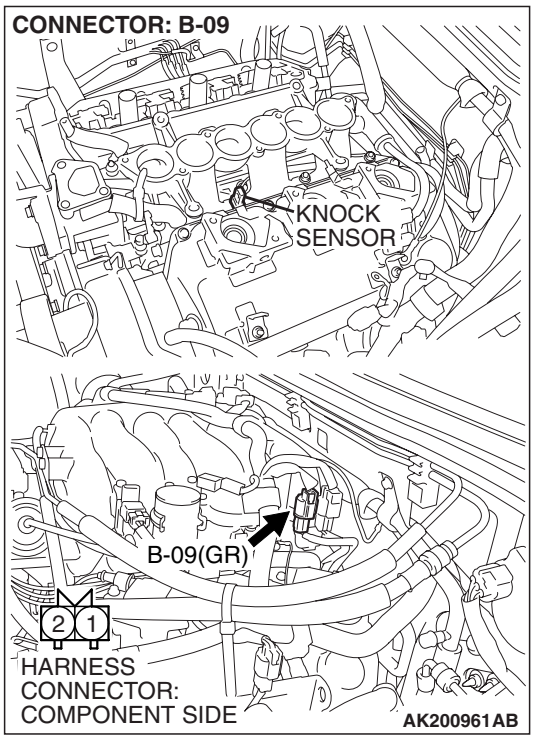


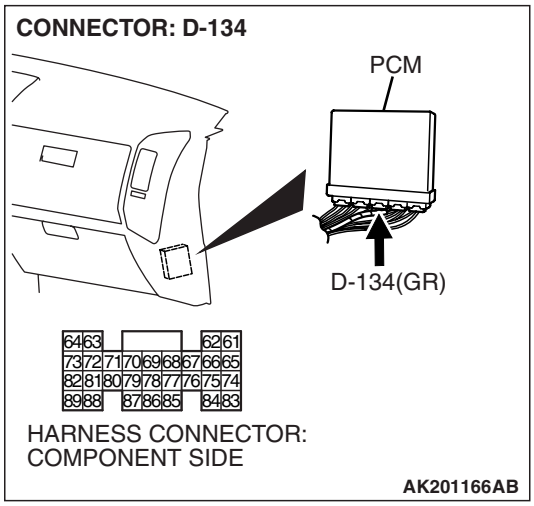
STEP 4. Check for open circuit, short circuit to ground and harness damage between knock sensor connector B-09 (terminal No. 1) and PCM connector D-134 (terminal No. 89).

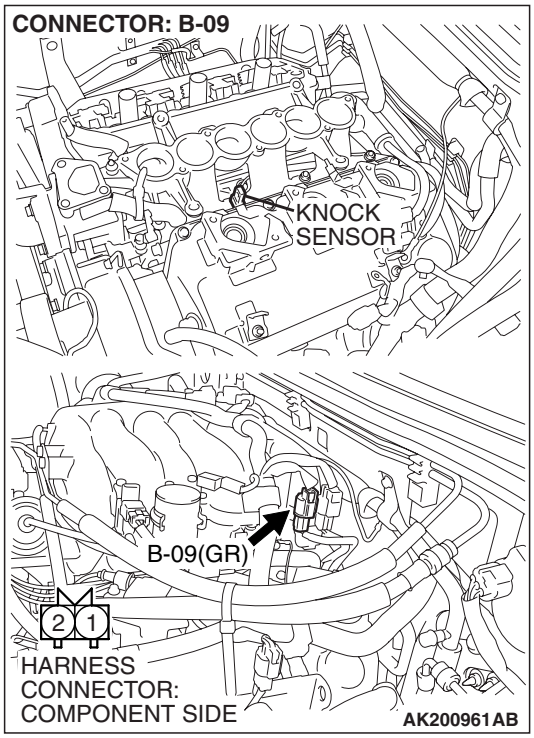
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.

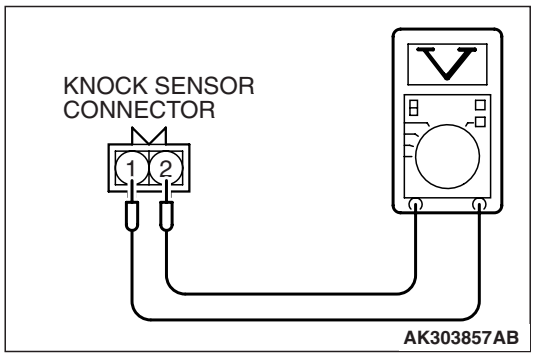






STEP 5. Check the knock sensor.

(1) Disconnect the knock sensor connector B-09.
(2) Start the engine and run at idle.

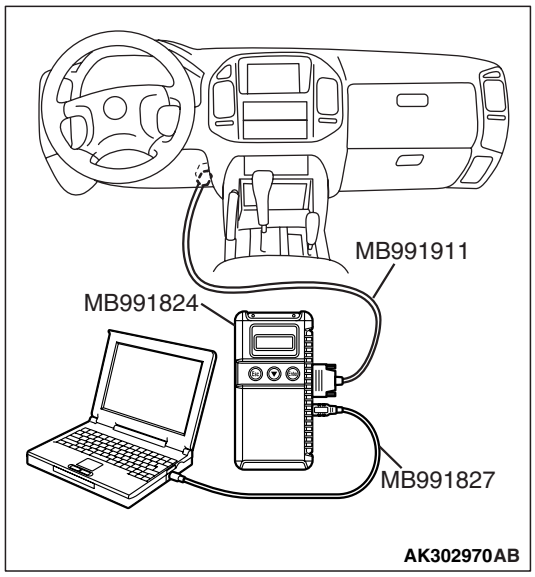


(3) Measure the voltage between knock sensor side connector terminal No. 1 (output) and No. 2 (ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

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

Q: Is the sensor operating properly?

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



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

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3000 – 5000r/min
- Engine load: 40% or more
- Drive a minimum of 3 seconds after the above conditions have been met.

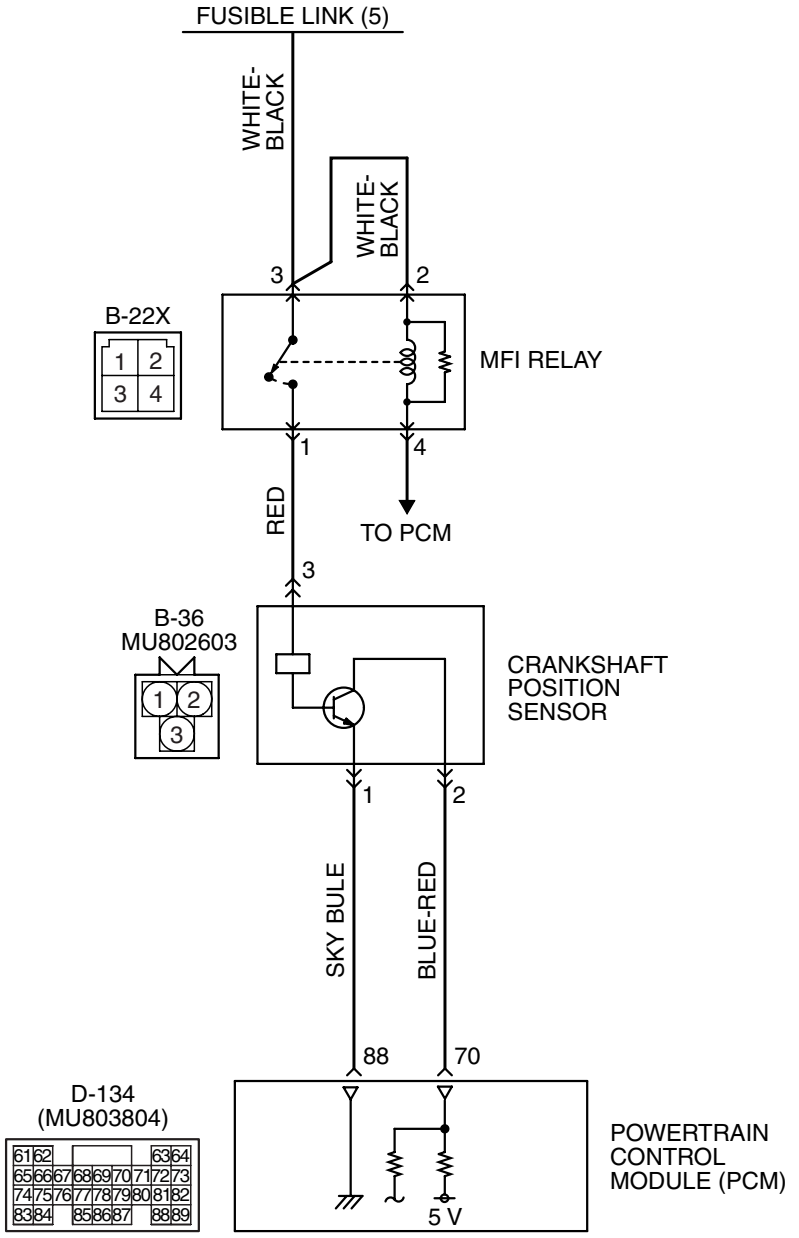
(5) After completing the test drive, read the DTC.Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0325 set?

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

DTC P0335: Crankshaft Position Sensor Circuit

Crankshaft Position Sensor Circuit



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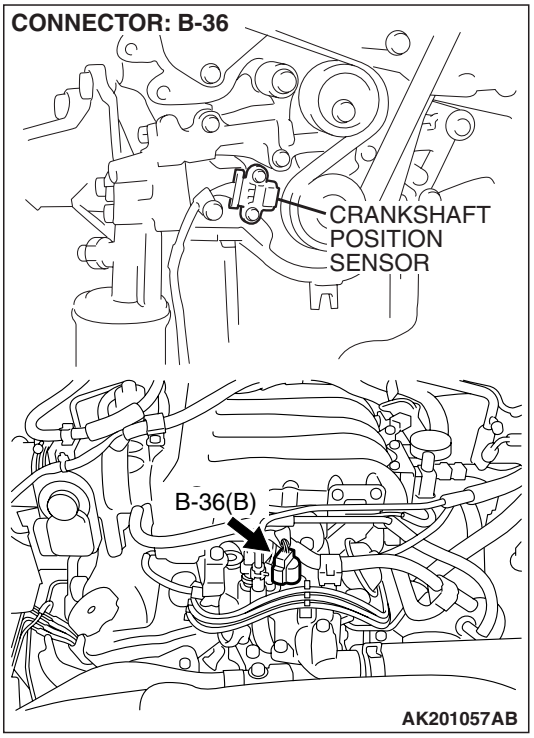
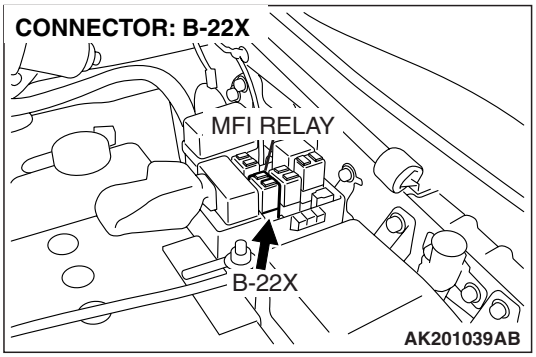
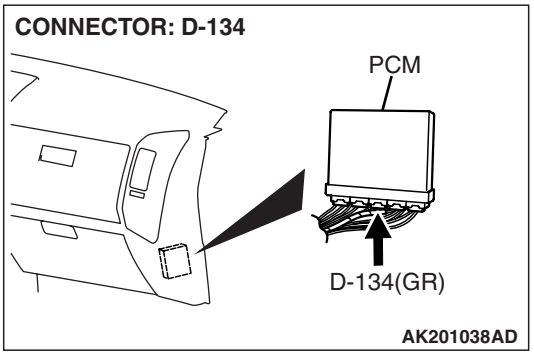






CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 1).
- Terminal No. 1 of the crankshaft position sensor is grounded to the PCM (terminal No. 88).
- 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 70). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the PCM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Crankshaft position sensor signal does not change.
- Crankshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

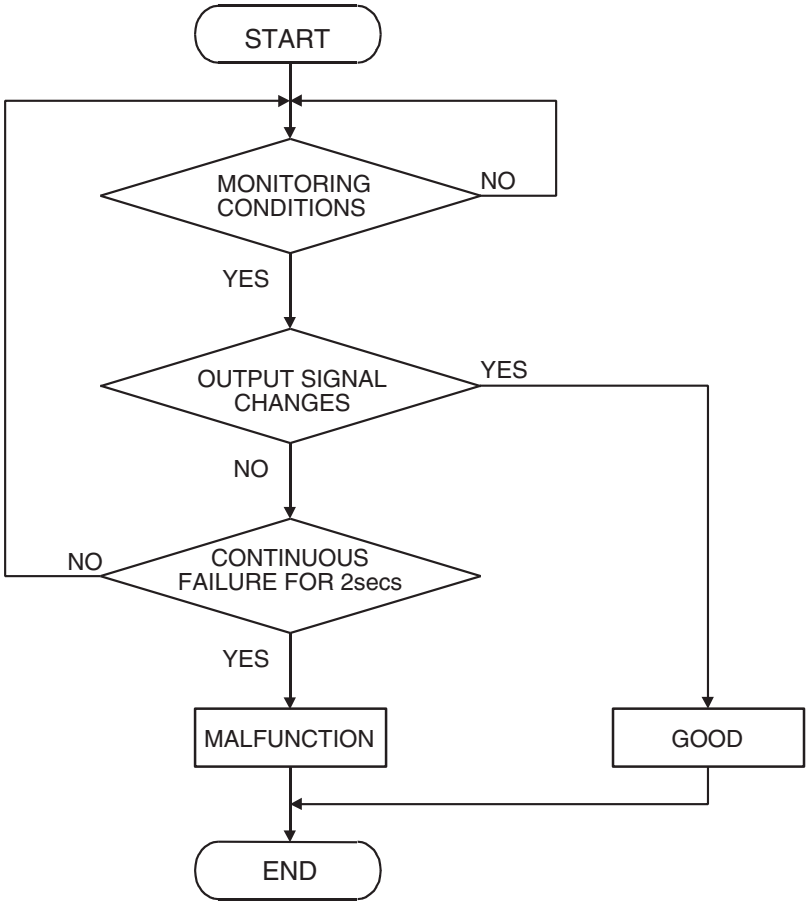
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



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Check Condition

- Engine is being cranked.

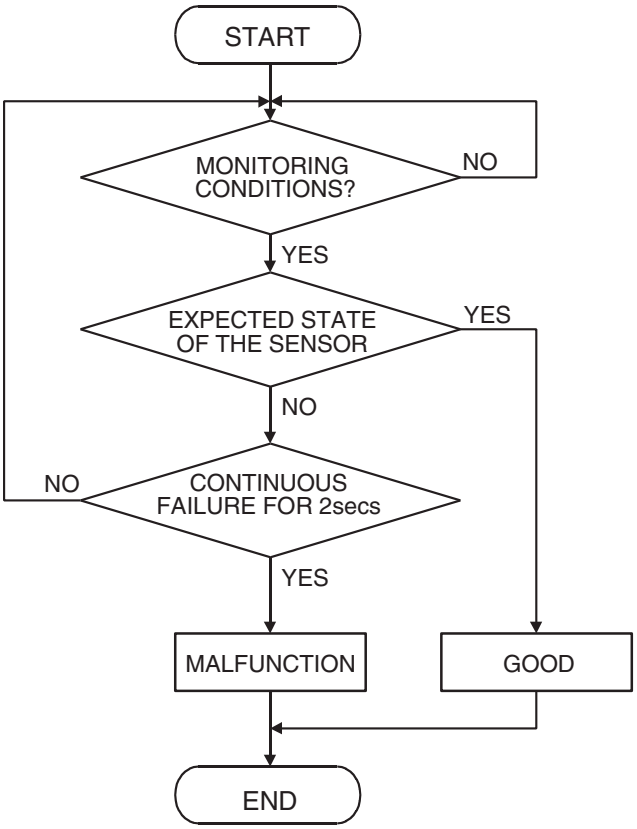
Judgement Criterion

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



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Check Condition, Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

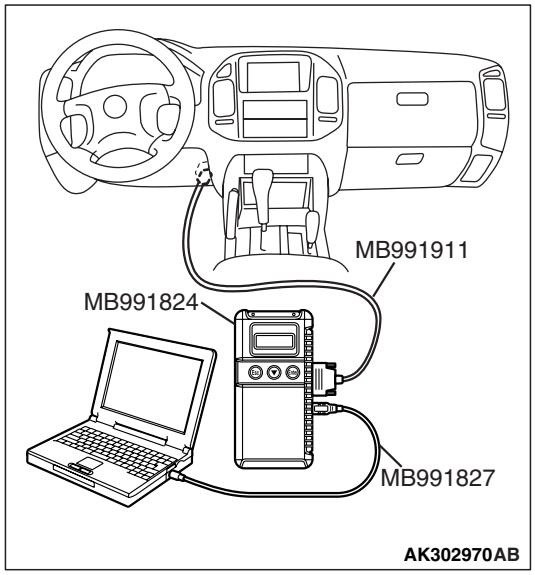
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

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



⚠ CAUTION

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

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

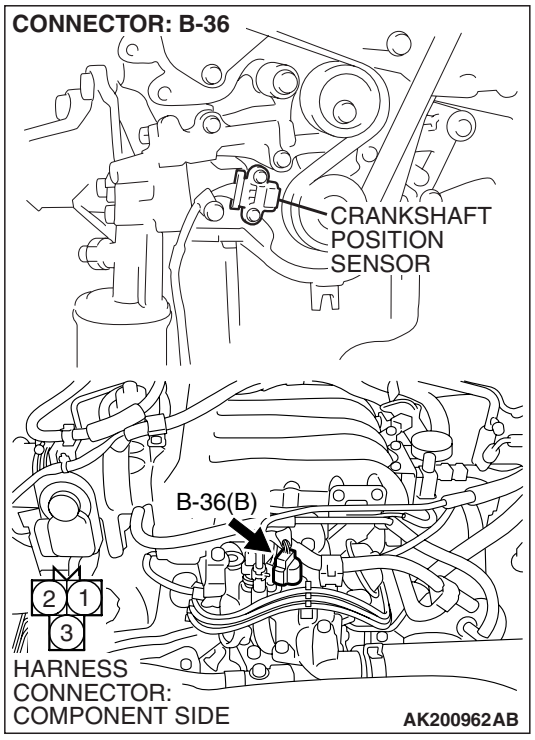
Q: Is the sensor operating properly?

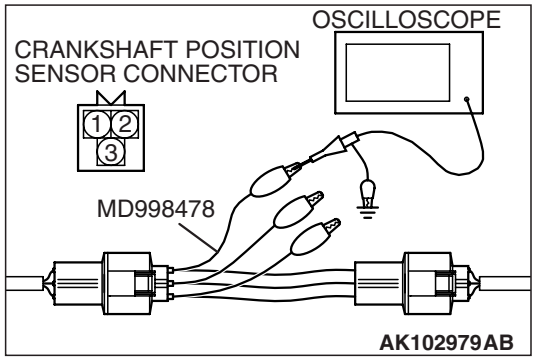
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.

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

(1) Disconnect the crankshaft position sensor connector B-36, and connect the test harness special tool (MD998478) between the separated connectors. (All terminals should be connected.)

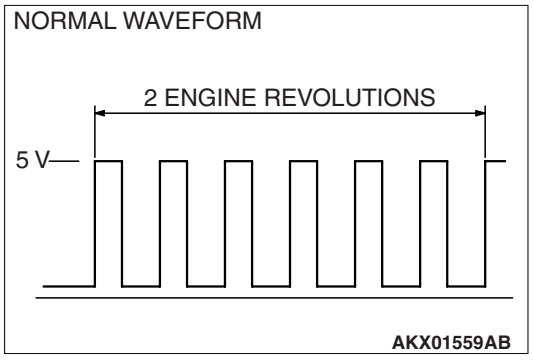




(2) Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2 (black clip of special tool).

NOTE: Connect the oscilloscope probe to terminal No. 70 by backprobing when measuring with the PCM connector.

(3) Start the engine and run at idle.

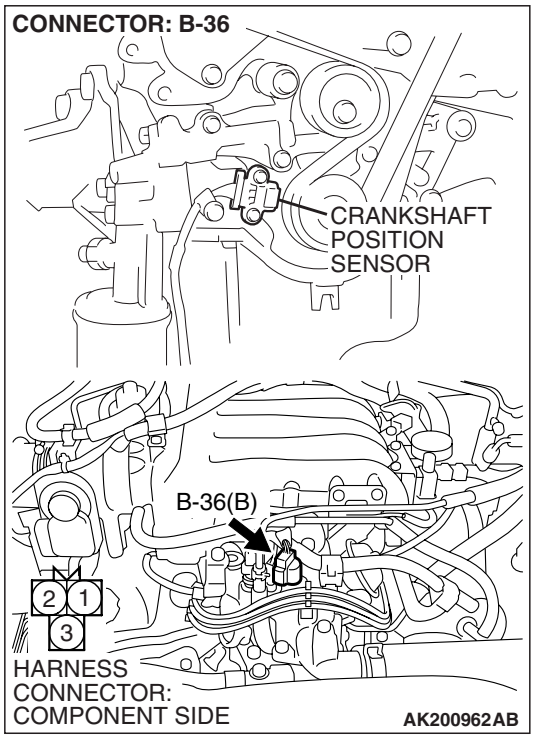


(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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

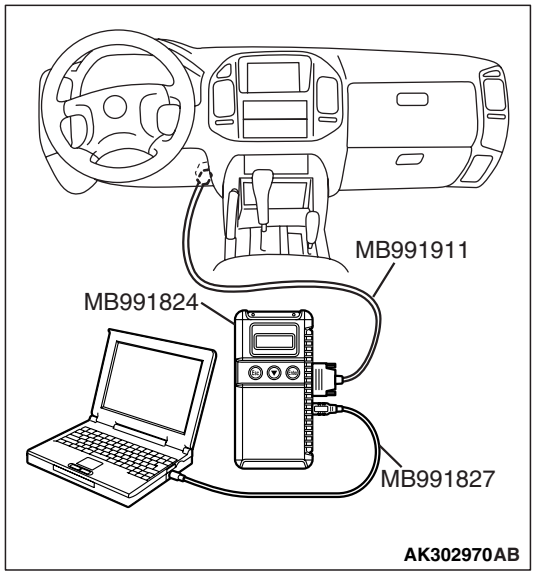


STEP 3. Check harness connector B-36 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

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



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

⚠ CAUTION

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

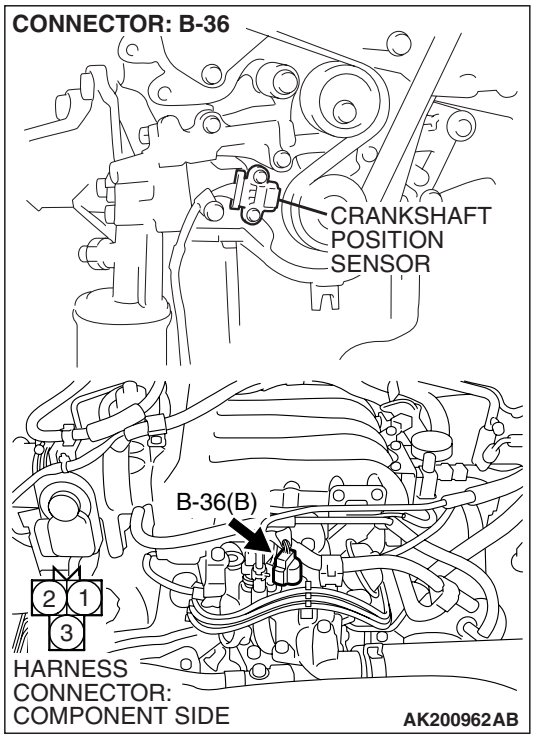
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the PCM. Then go to Step 20.



STEP 5. Check harness connector B-36 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

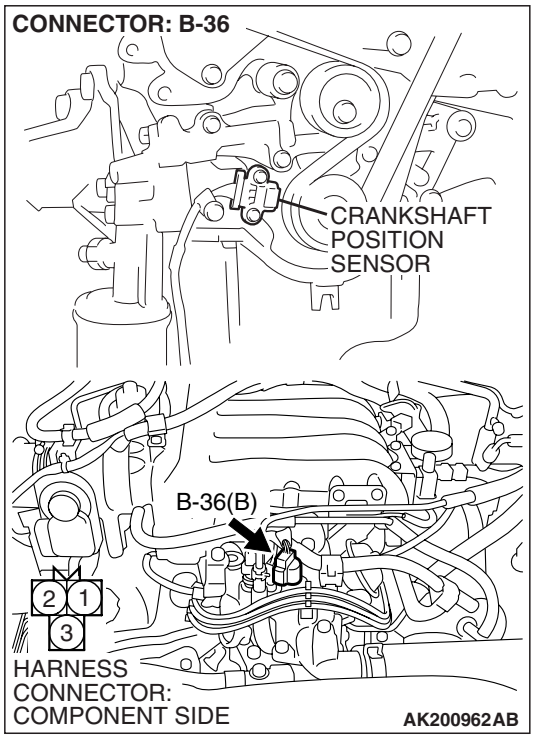
YES : Go to Step 6.

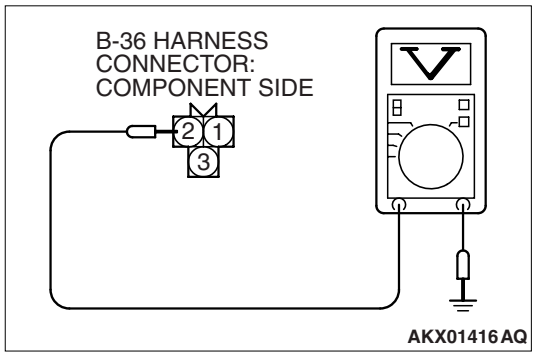
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-36.

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

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





(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

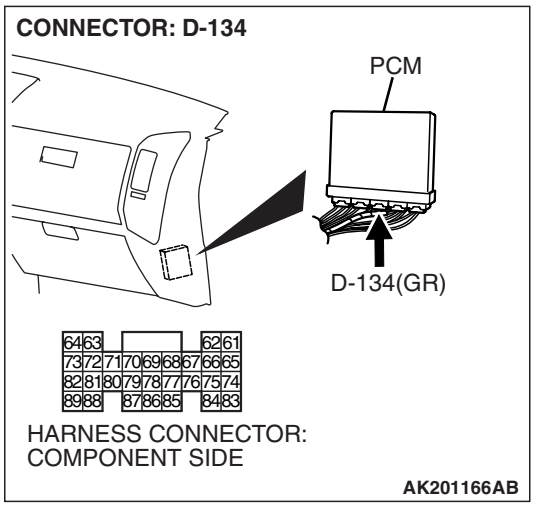
Q: Is the measured voltage between 4.9 and 5.1 volts?

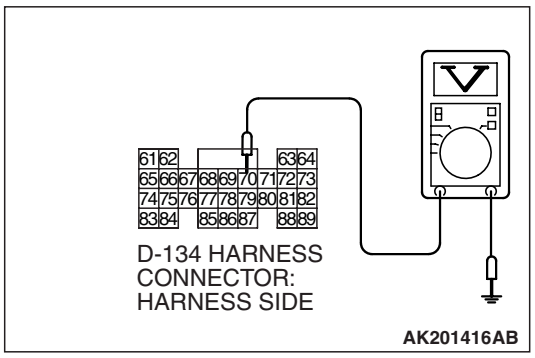
YES : Go to Step 11.

NO : Go to Step 7.

STEP 7. Measure the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the crankshaft position sensor connector B-36.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal No. 70 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

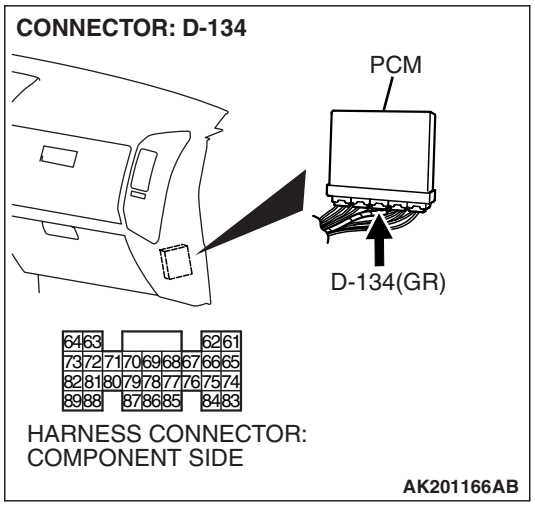
Q: Is the measured voltage between 4.9 and 5.1 volts?

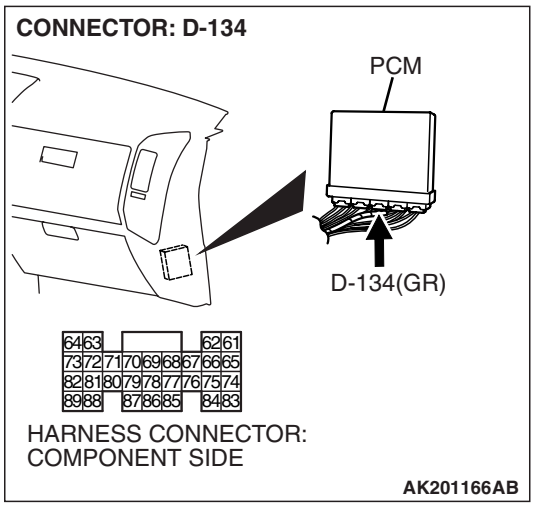
YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor connector B-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70) because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



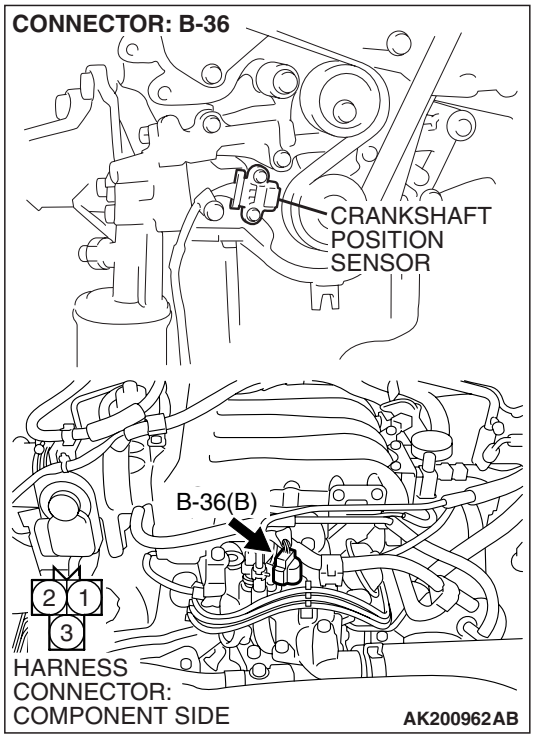


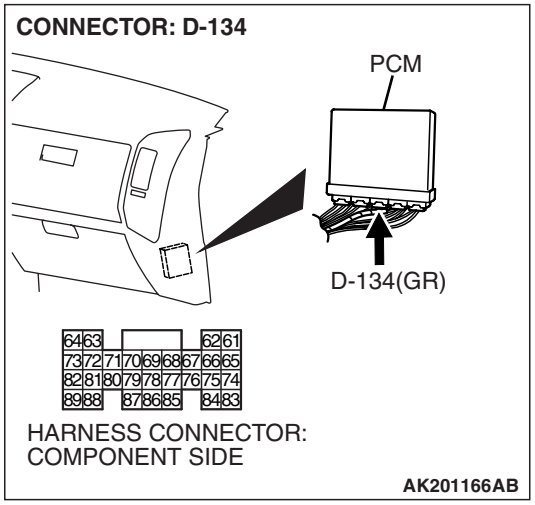
STEP 9. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





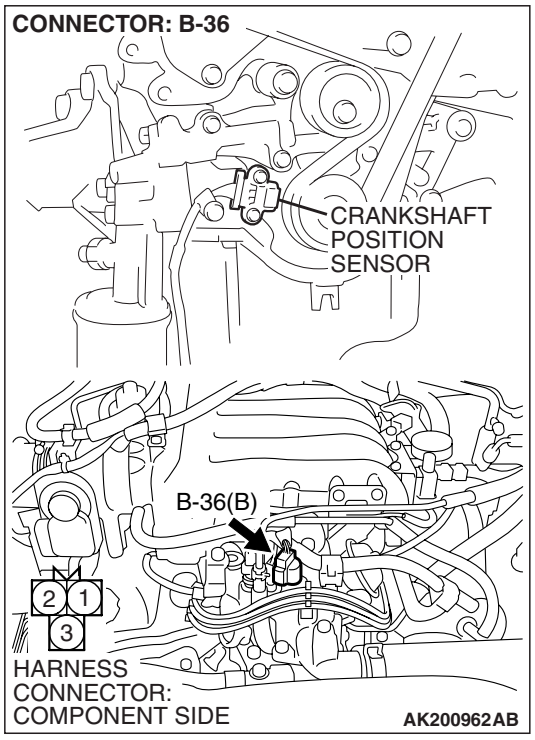
STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70).
Q: Is the harness wire in good condition?

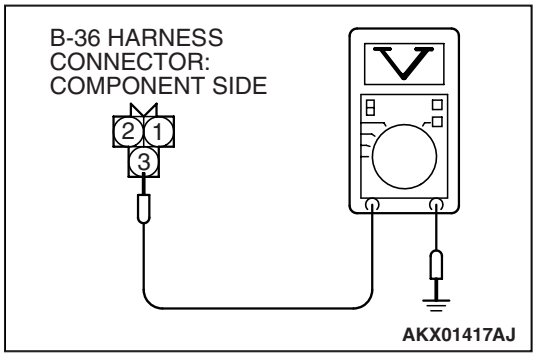
YES : Replace the PCM. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-36.

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

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





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

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

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

YES : Go to Step 13.

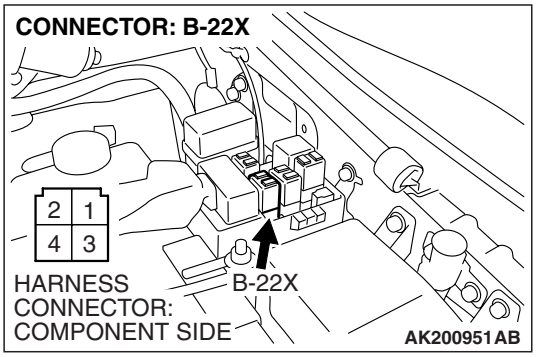
NO : Go to Step 12.

STEP 12. Check harness connector B-22X at MFI relay for damage.

Q: Is the harness connector in good condition?

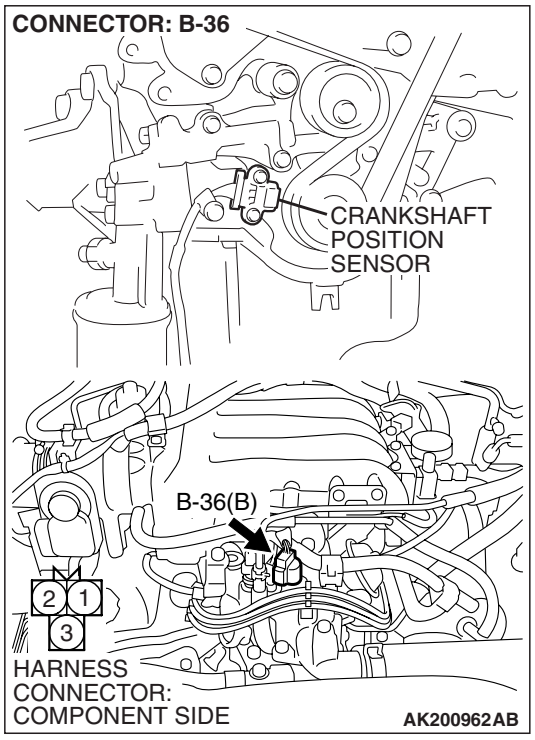
YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and crankshaft position sensor connector B-36 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.

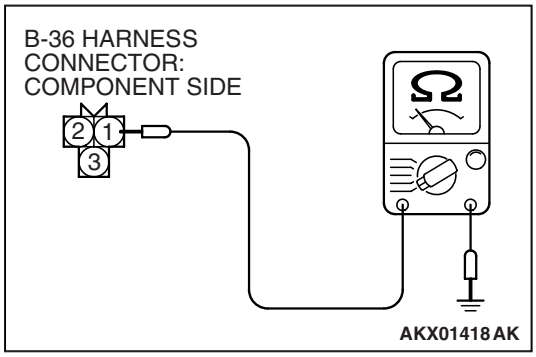
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 13. Check the continuity at crankshaft position sensor harness side connector B-36.

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





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

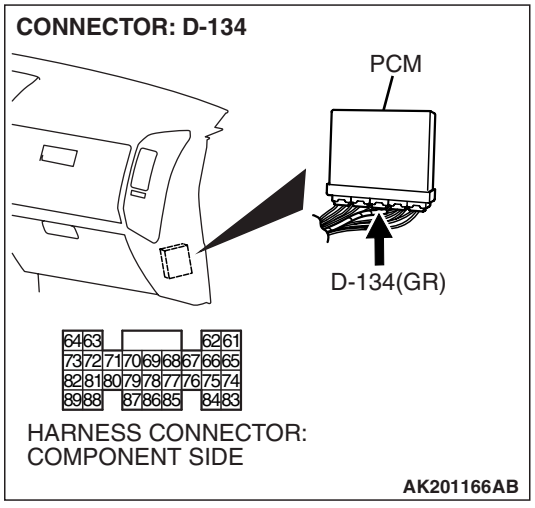
Q: Does continuity exist?

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

STEP 14. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

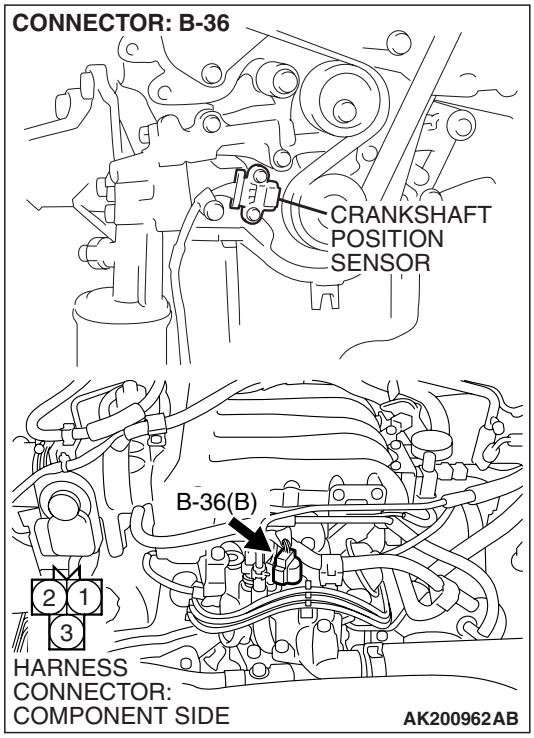


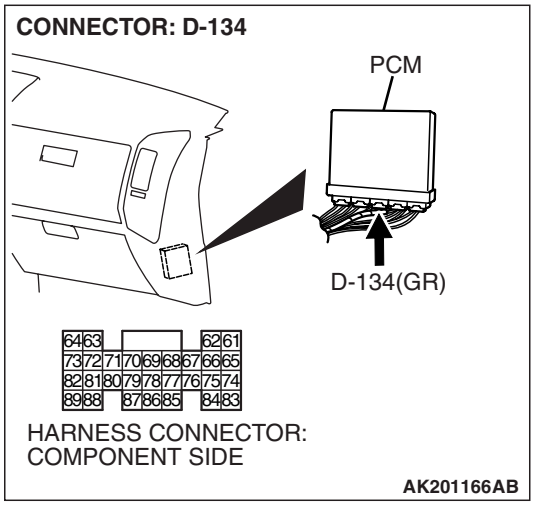
STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-36 (terminal No. 1) and PCM connector D-134 (terminal No. 88).

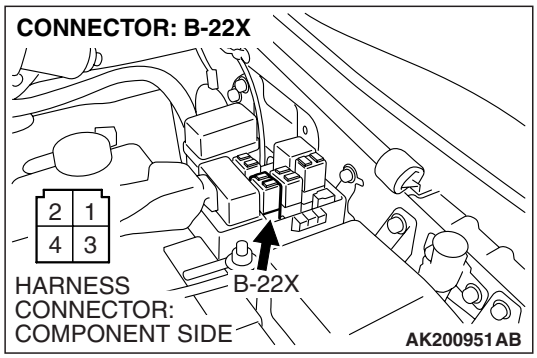
Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 20.





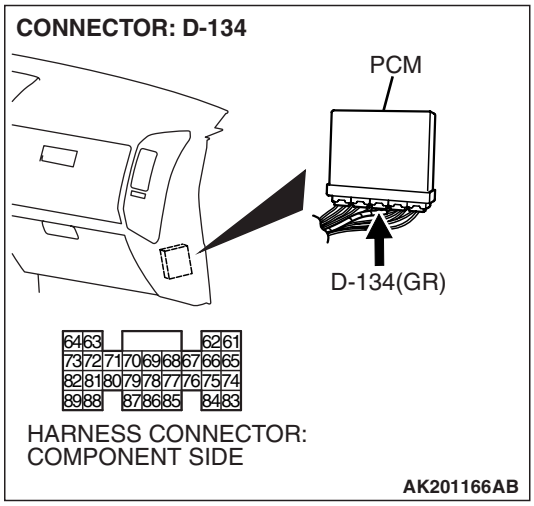


STEP 16. Check harness connector B-22X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

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



STEP 17. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 18.

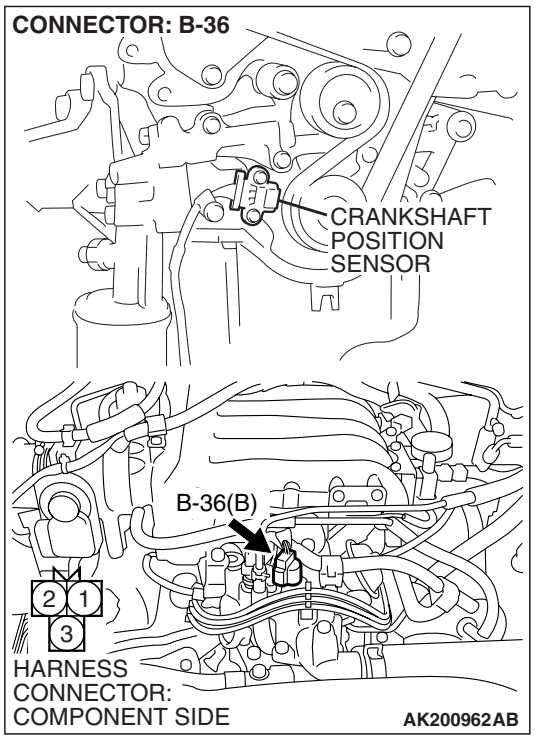
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

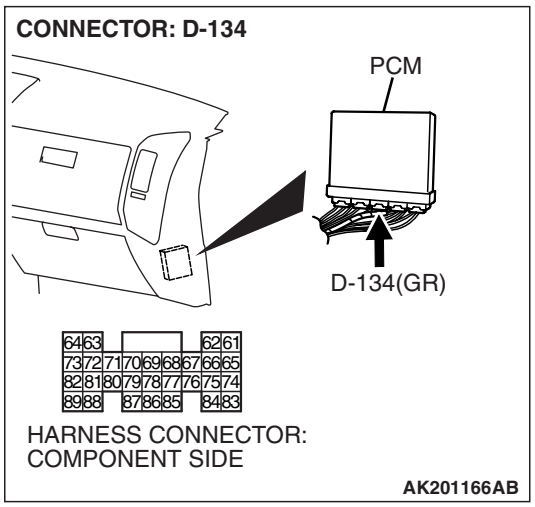
STEP 18. Check for harness damage between crankshaft position sensor connector B-36 (terminal No. 2) and PCM connector D-134 (terminal No. 70).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 20.





STEP 19. Check the crankshaft sensing blade.

Q: Is the crankshaft sensing blade in good condition?

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

NO : Replace it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

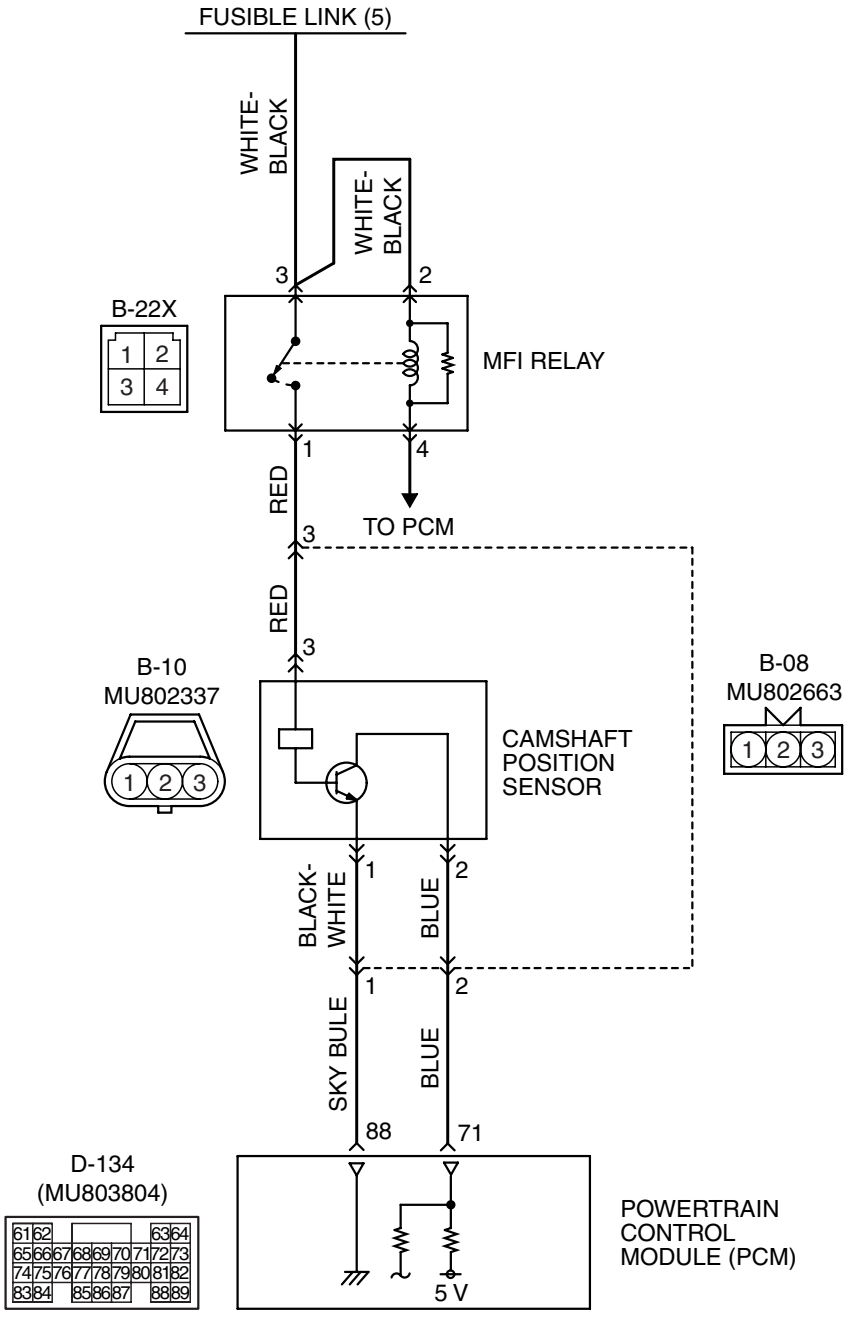
Q: Is DTC P0335 set?

YES : Retry the troubleshooting.

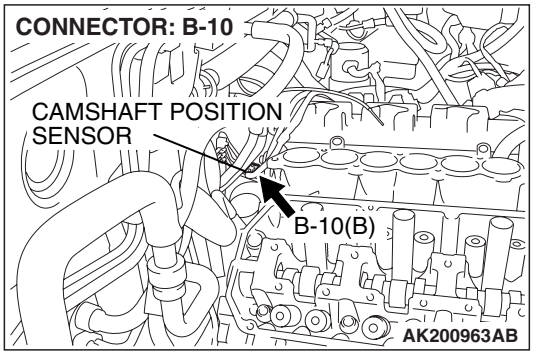
NO : The inspection is complete.

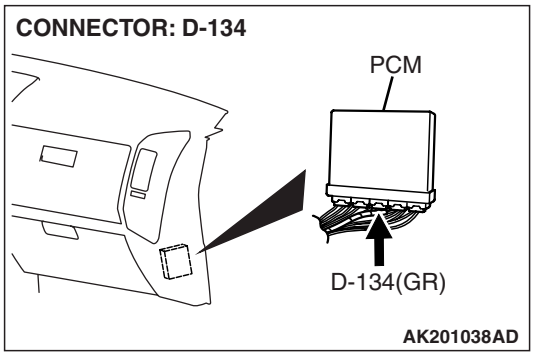
DTC P0340: Camshaft Position Sensor Circuit

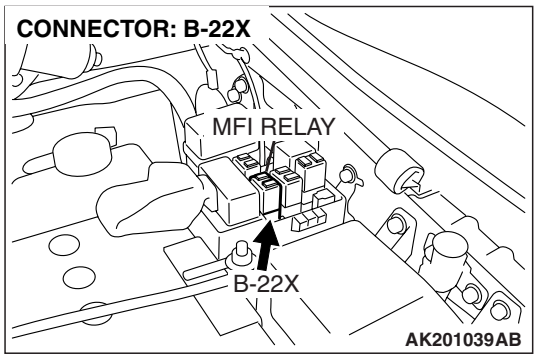
Camshaft Position Sensor Circuit

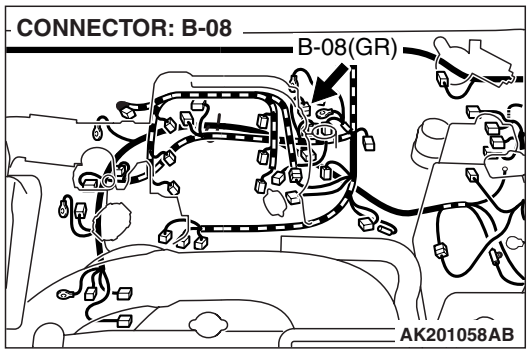


AK400983









CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 1).
- Terminal No. 1 of the camshaft position sensor is grounded to the PCM (terminal No. 88).
- 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the PCM (terminal No. 71). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the PCM.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The PCM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Camshaft position sensor signal does not change.
- Camshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

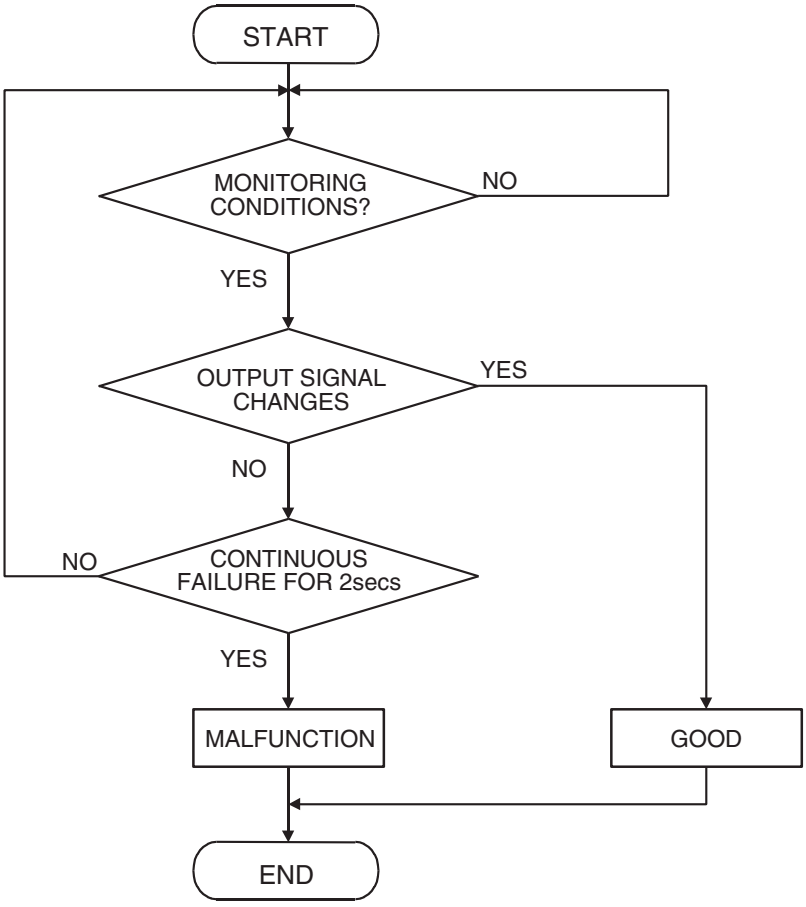
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK302946

Check Condition

- Engine speed is higher than 50 r/min.

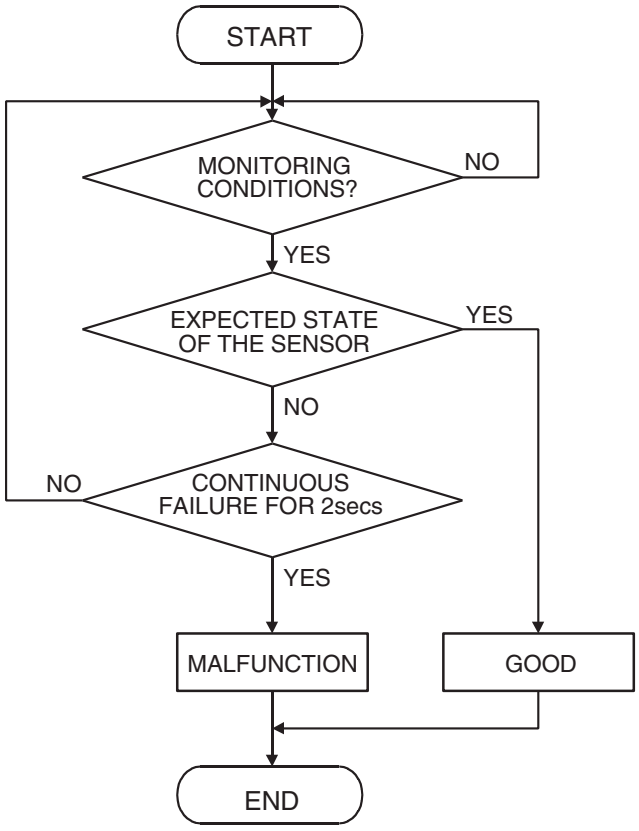
Judgement Criterion

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK302944

Check Condition

- Engine speed is higher than 50 r/min.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

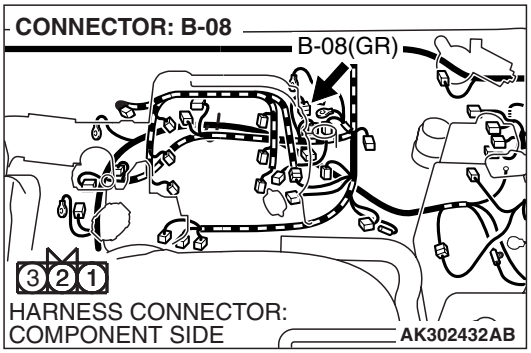
- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, harness damage, or connector damage.
- PCM failed.

TSB Revision

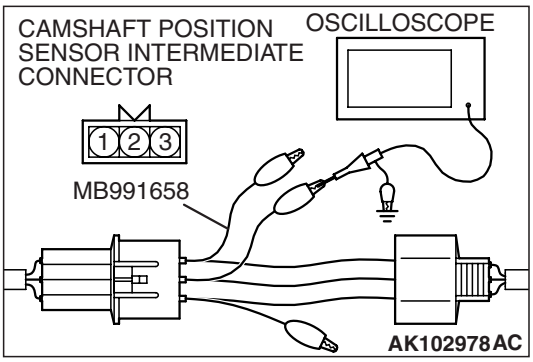
DIAGNOSIS

Required Special Tool:
- MB991658: Test Harness

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



(1) Disconnect the intermediate connector B-08, and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected.)

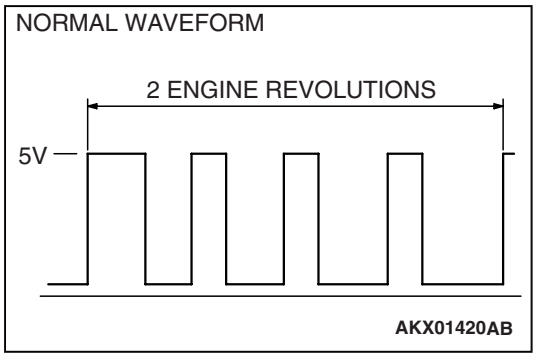


(2) Connect the oscilloscope probe to terminal No. 2 of the camshaft position sensor intermediate connector by backprobing.

NOTE: When measuring with the PCM side connector, connect an oscilloscope probe to terminal No. 71 by backprobing.

(3) Start the engine and run at idle.
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

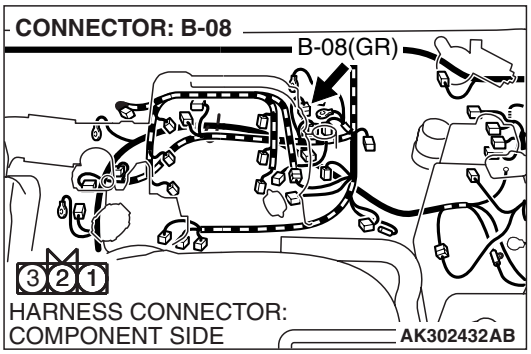
(5) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check harness connector B-08 at intermediate connector for damage.



Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

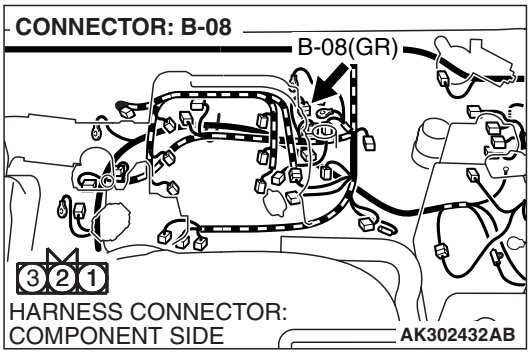
Q: Is DTC P0340 set?

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

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Check harness connector B-08 at intermediate connector for damage.

Q: Is the harness connector in good condition?



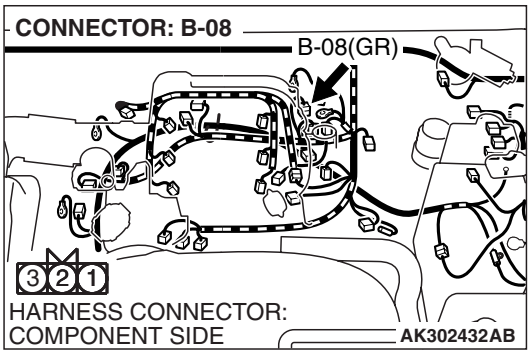
YES : Go to Step 5.

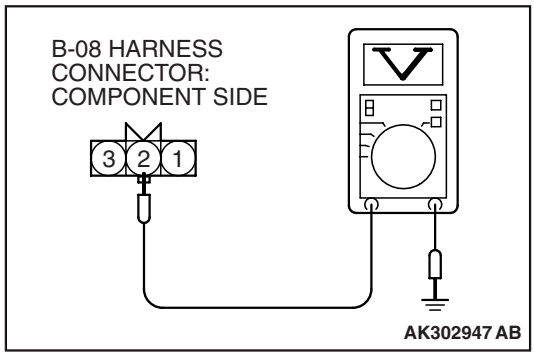
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

STEP 5. Measure the sensor supply voltage at intermediate connector B-08.

(1) Disconnect the intermediate connector B-08.

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





(3) Measure the voltage between terminal No. 2 and ground at the female connector side.

- Voltage should be between 4.9 and 5.1 volts.

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

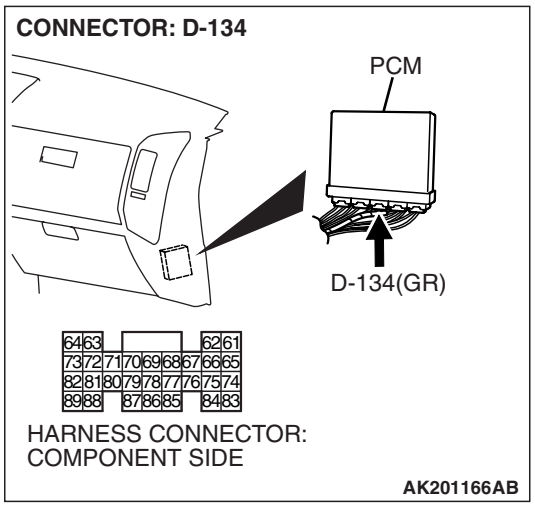
Q: Is the measured voltage between 4.9 and 5.1 volts?

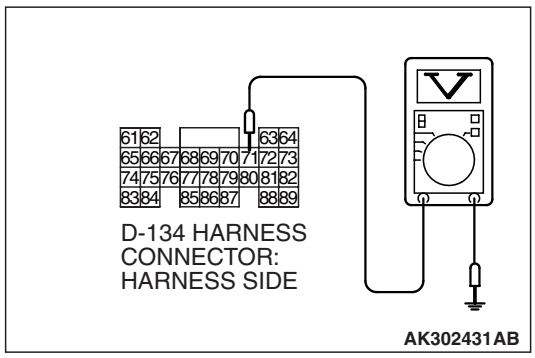
YES : Go to Step 10.

NO : Go to Step 6.

STEP 6. Measure the sensor supply voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect the PCM connector D-134.
(2) Disconnect the intermediate connector B-08.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal No. 71 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

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

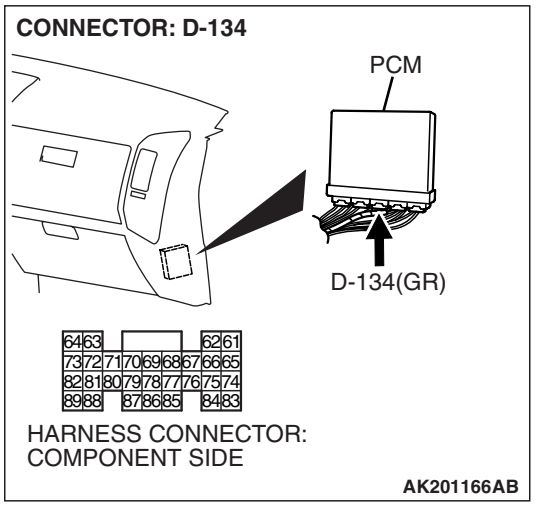
Q: Is the measured voltage between 4.9 and 5.1 volts?

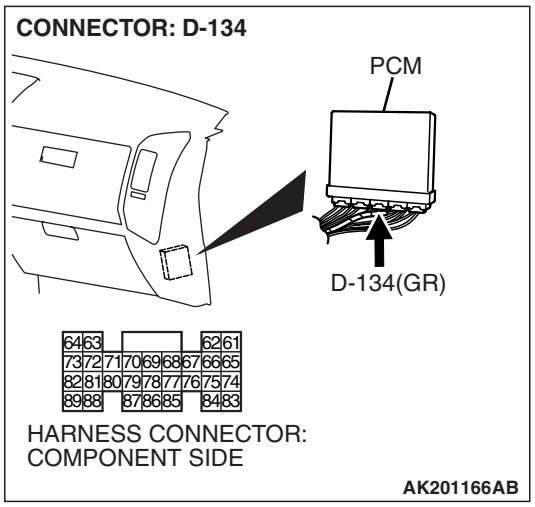
YES : Go to Step 7.
NO : Go to Step 8.

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

Q: Is the harness connector in good condition?

YES : Repair harness wire between intermediate connector B-08 (terminal No. 2) and PCM connector D-134 (terminal No. 71) because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



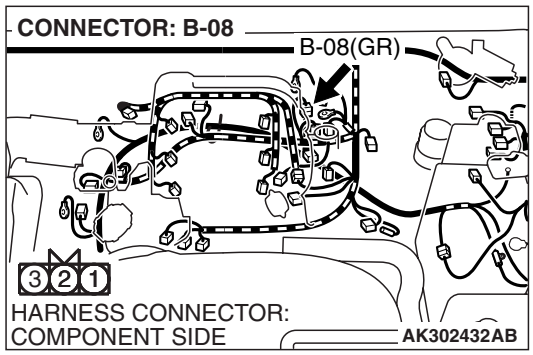


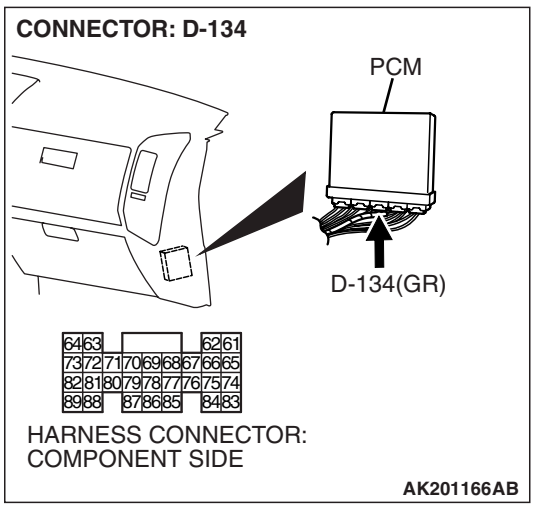
STEP 8. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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



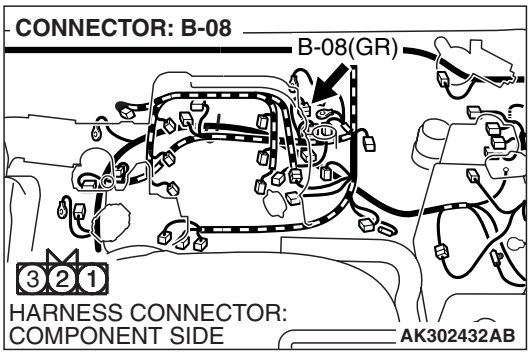


STEP 9. Check for short circuit to ground between intermediate connector B-08 (terminal No. 2) and PCM connector D-134 (terminal No. 71).

Q: Is the harness wire in good condition?

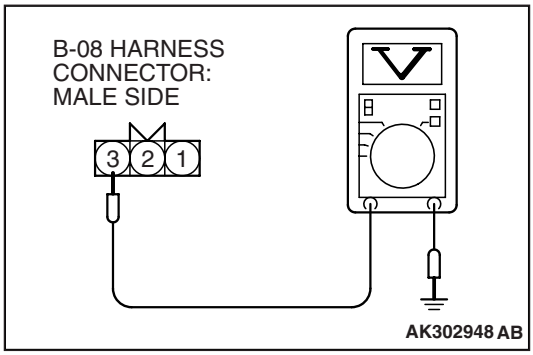
YES : Replace the PCM. Then go to Step 21.

NO : Repair it. Then go to Step 21.



STEP 10. Measure the power supply voltage at intermediate connector B-08.

(1) Disconnect the intermediate connector B-08.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 3 and ground at the female connector side.
- Voltage should be battery positive voltage.

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

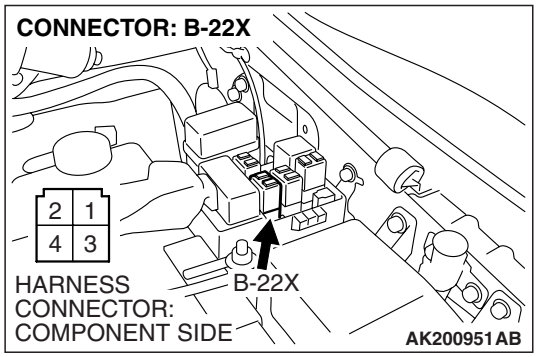
Q: Is battery positive voltage (approximately 12 volts) present?

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

STEP 11. Check harness connector B-22X at the MFI relay for damage.

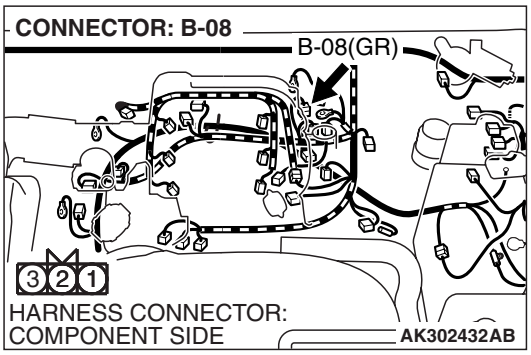
Q: Is the harness connector in good condition?

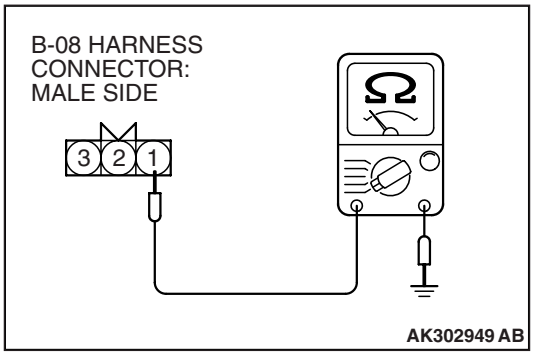
YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and intermediate connector B-08 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 12. Check the continuity at intermediate connector B-08.

(1) Disconnect the intermediate connector B-08.





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

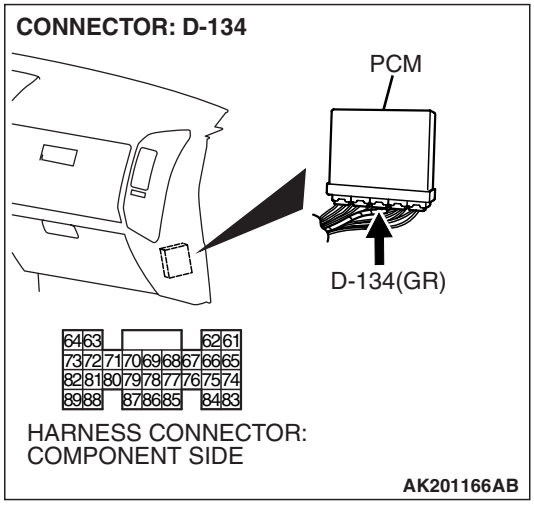
Q: Does continuity exist?

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

STEP 13. Check harness connector D-134 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

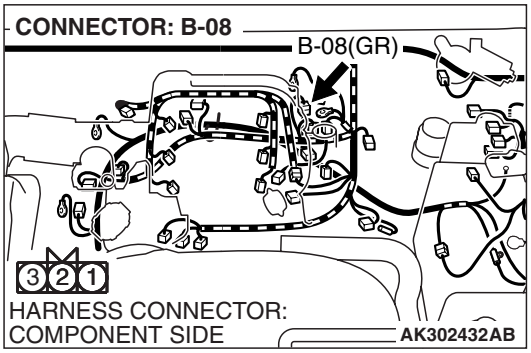


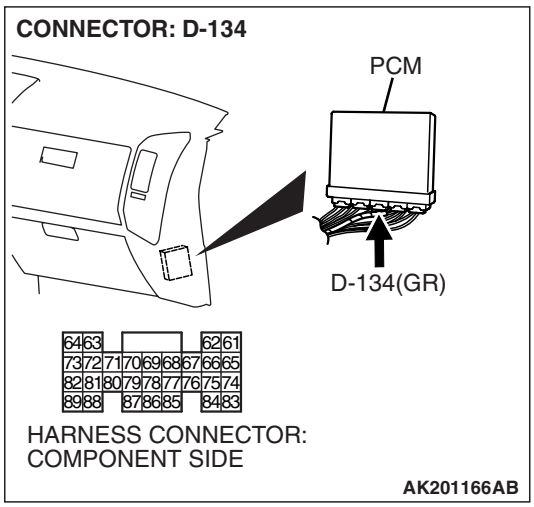
STEP 14. Check for open circuit and harness damage between intermediate connector B-08 (terminal No. 1) and PCM connector D-134 (terminal No. 88).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 21.



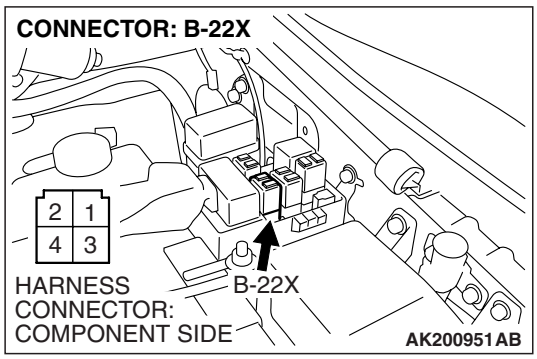


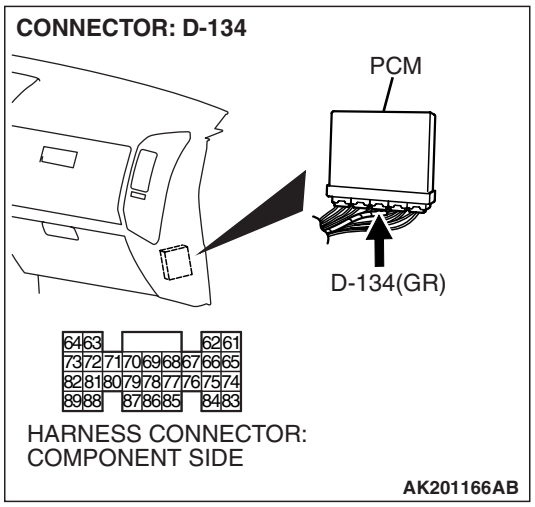
STEP 15. Check harness connector B-22X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.

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





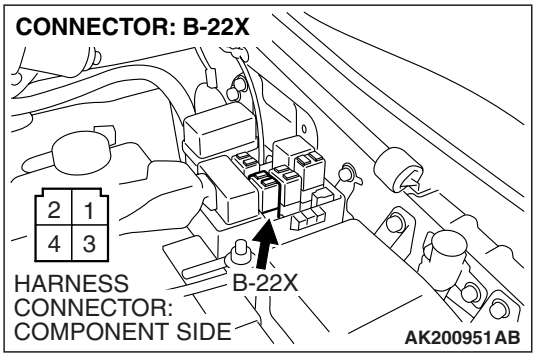
STEP 16. Check harness connector D-134 at PCM for damage.

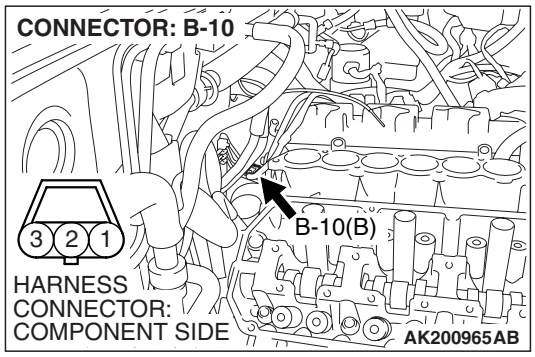
Q: Is the harness connector in good condition?

YES : Go to Step 17.

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

STEP 17. Check for open circuit or short circuit to ground or harness damage between MFI relay connector B-22X (terminal No. 1) and camshaft position sensor connector B-10 (terminal No. 3).





NOTE: Check harness after checking intermediate connector B-08. If intermediate connector B-08 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 21.

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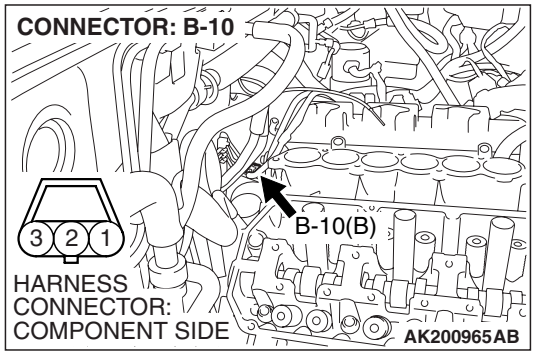
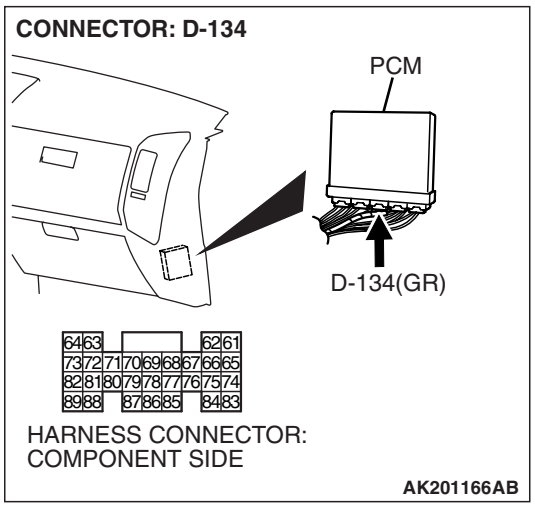
STEP 18. Check for open circuit or short circuit to ground or harness damage between camshaft position sensor connector B-10 (terminal No. 2) and PCM connector D-134 (terminal No. 71).



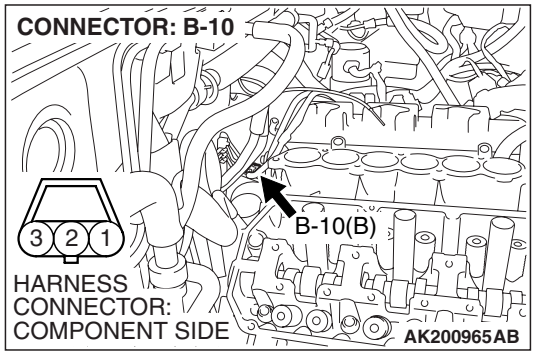


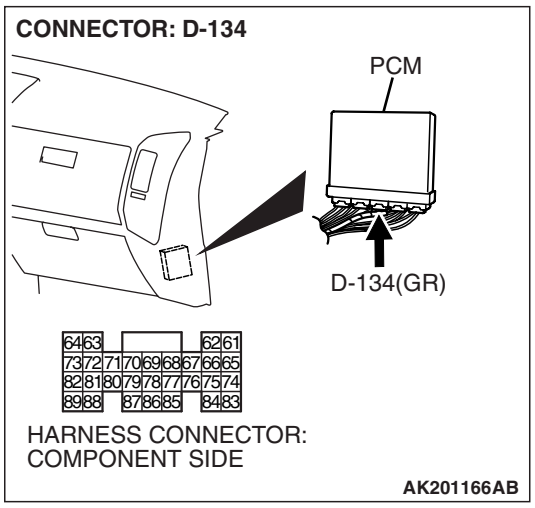
NOTE: Check harness after checking intermediate connector B-08. If intermediate connector B-08 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 21.

STEP 19. Check for open circuit or short circuit to ground or harness damage between camshaft position sensor connector B-10 (terminal No. 1) and PCM connector D-134 (terminal No.88).





NOTE: Check harness after checking intermediate connector B-08. If intermediate connector B-08 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

Q: Is the harness wire in good condition?

YES : Go to Step 20.
NO : Repair it. Then go to Step 21.

STEP 20. Check the camshaft position sensing cylinder.

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

YES : Replace the camshaft position sensor. Then go to Step 21.
NO : Repair it. Then go to Step 21.

STEP 21. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

Q: Is DTC P0340 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR valve (stepper motor) is actuated from the fully closed position toward the open position while the engine is running, EGR gas flows.
- The PCM checks how the EGR gas flow signal changes.

DESCRIPTIONS OF MONITOR METHODS

Small manifold pressure change during exhaust gas recirculation (EGR) operation from closed to open.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

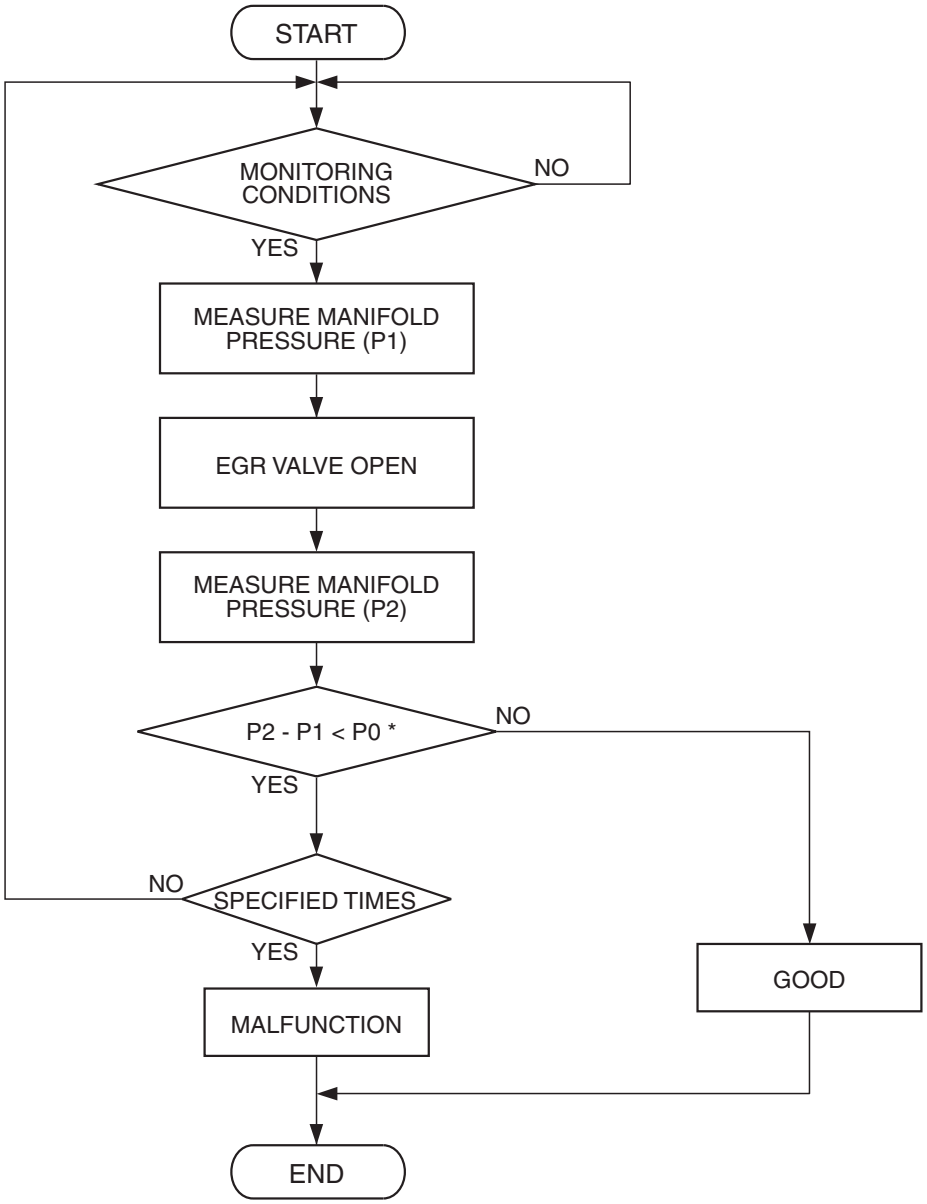
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

- Volume airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



P0 : THRESHOLD VALUE

AK302950

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 910 and 1,650 r/min.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Vehicle speed is 30 km/h (19 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or higher.
- Battery positive voltage is higher than 10.3 volts.
- The accelerator pedal is closed.
- Volumetric efficiency is lower than 28 percent.

TSB Revision

- The PCM monitors for this condition for 3 cycles of 2 seconds each during the drive cycle.

Judgement Criterion

- When the EGR valve opens to the prescribed opening, intake manifold pressure fluctuation width is lower than 2.5 kPa (0.74 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-4.

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

- Dirtiness of the EGR valve and EGR passage.
- EGR valve (stopper motor) failed.
- Open or shorted EGR valve (stopper motor) circuit, or connector damage.
- Manifold absolute pressure sensor failed.
- PCM failed.

DIAGNOSIS

Required Special Tools:

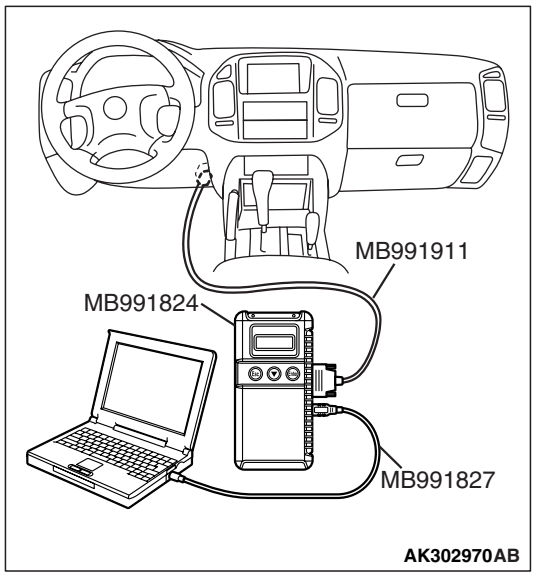
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information P.17-69.

Q: Are there any abnormalities?

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



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

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 95, Manifold Absolute Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- Should be between 16 – 36 kPa (4.7 – 10.6 in.Hg) at engine idling.

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

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.

NO : Refer to DTC P0106 – Manifold Absolute Pressure Sensor Circuit Range/Performance Problem P.13A-127, DTC P0107 – Manifold Absolute Pressure Sensor Circuit Low Input P.13A-139, DTC P0108 – Manifold Absolute Pressure Sensor Circuit High Input P.13A-149.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

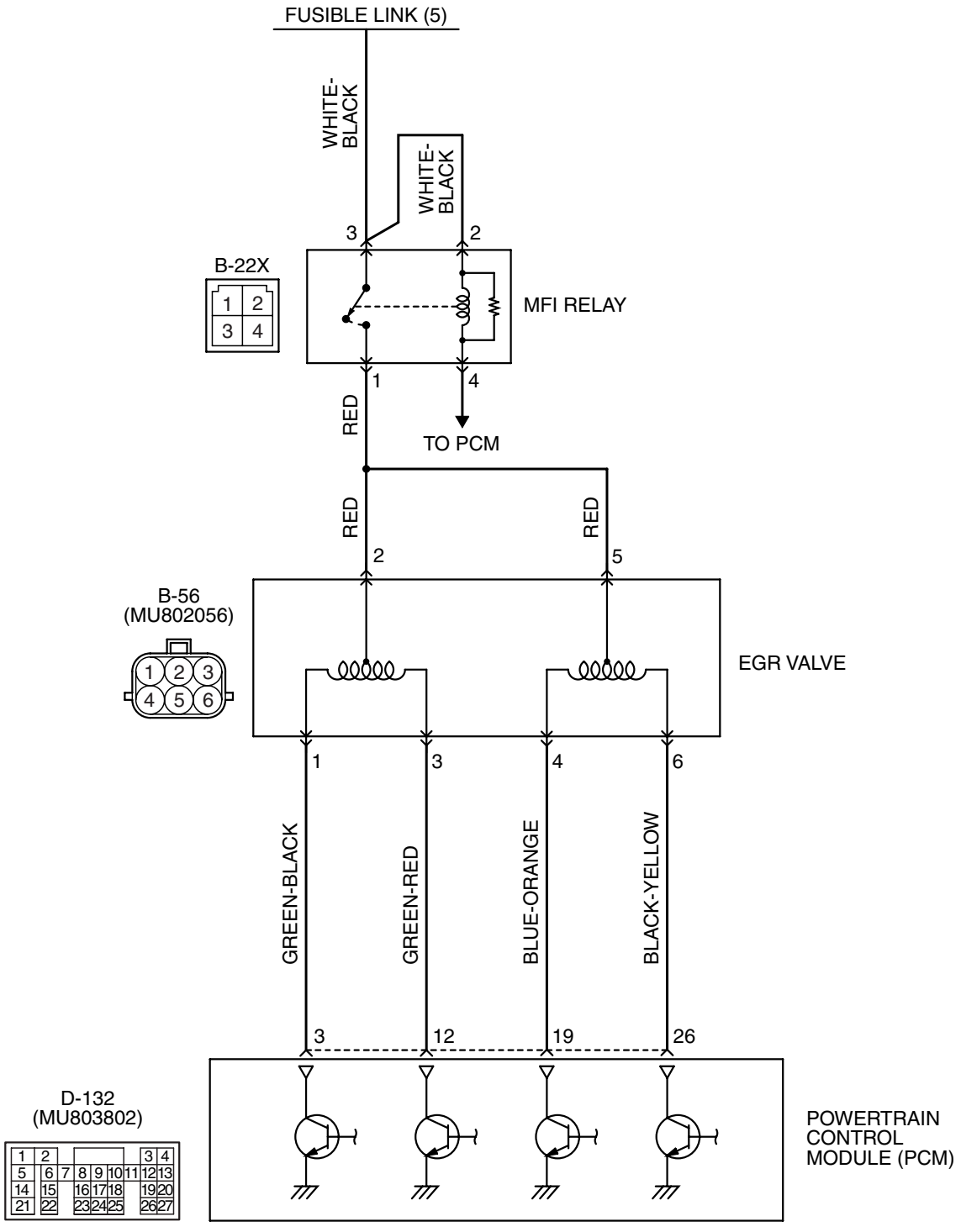
Q: Is DTC P0401 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

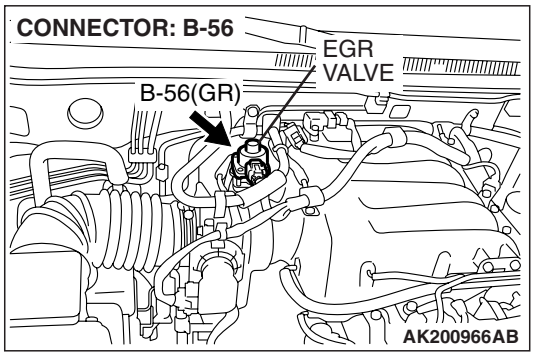
DTC P0403: Exhaust Gas Recirculation Control Circuit

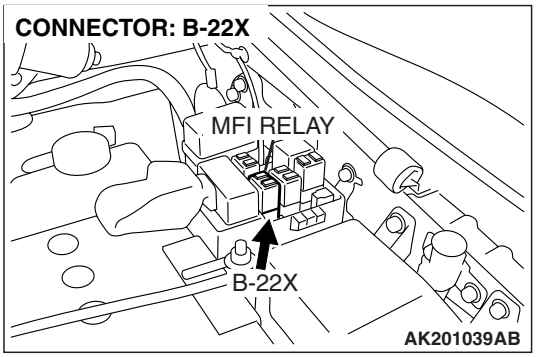
EGR Valve Circuit

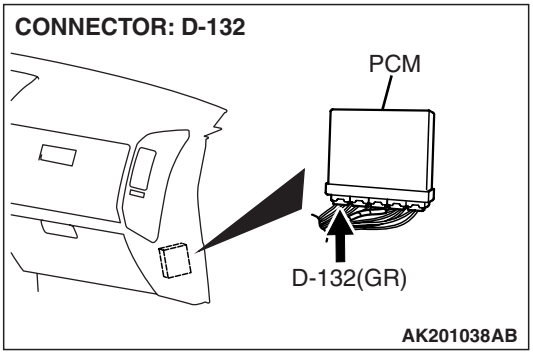


AK400984

TSB Revision







CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 1).
- The PCM (terminals No. 3, No. 12, No. 19, No. 26) drives the stepper motor by sequentially turning "ON" the power transistors in the PCM and providing ground to the EGR valve motor (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR valve (stepper motor) drive circuit, PCM measure the surge voltage of the EGR valve motor coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after stepper motor is operated on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

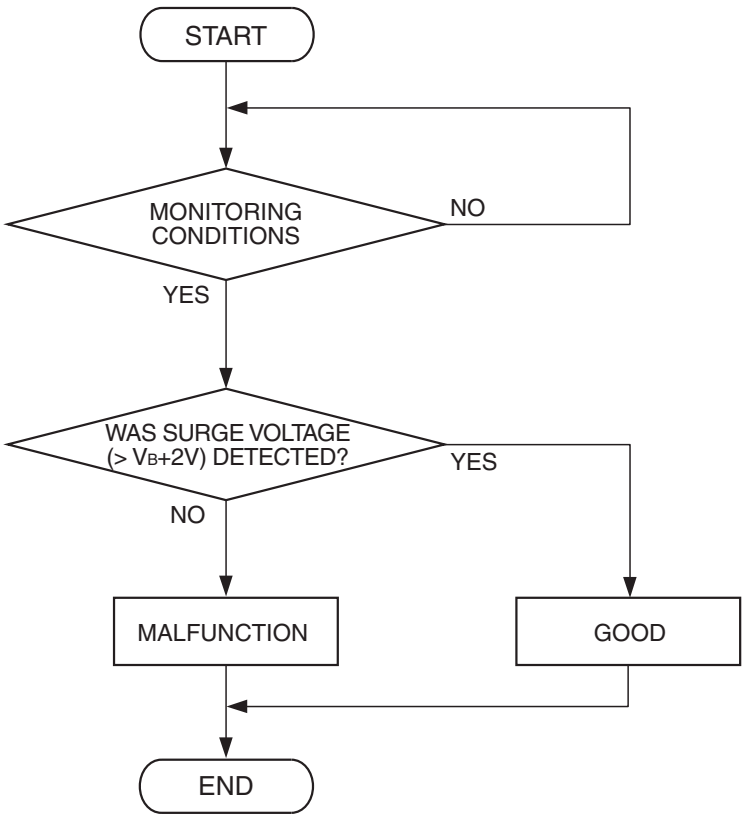
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

- Volume airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK302951

Check Conditions

- Battery positive voltage is higher than 10.3 volts.
- In a few seconds, just after ignition switch is turned to the "ON" position from the "LOCK" (OFF) position. (While EGR valve is initialized.)

Judgement Criterion

- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 3 seconds.

Check Conditions

- Battery positive voltage is higher than 10.3 volts.
- EGR valve is in operation after the engine starting process is complete.

Judgement Criterion

- The EGR valve motor coil surge voltage (battery positive voltage +2 volts) is not detected for 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.

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

- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, harness damage, or connector damage.
- PCM failed.

DIAGNOSIS

Required Special Tools:

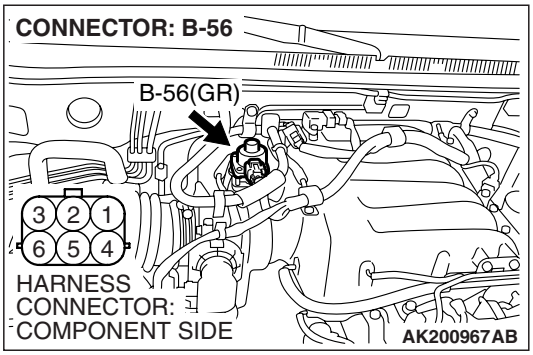
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MD9919658: Test harness

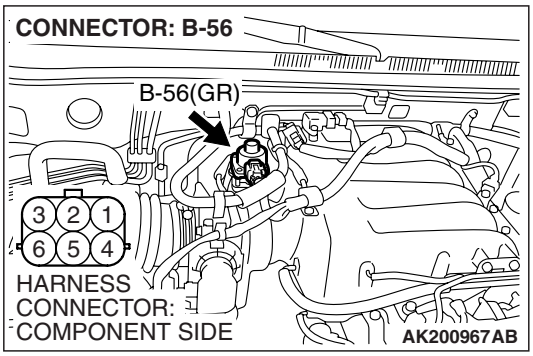
STEP 1. Check harness connector B-56 at EGR valve for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

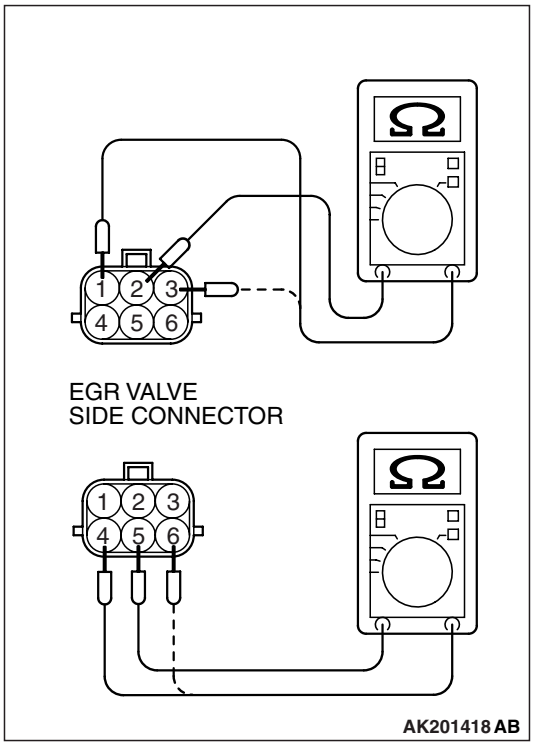
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-56.



(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

Standard value: 20 – 24 ohms [at 20°C (68°F)]

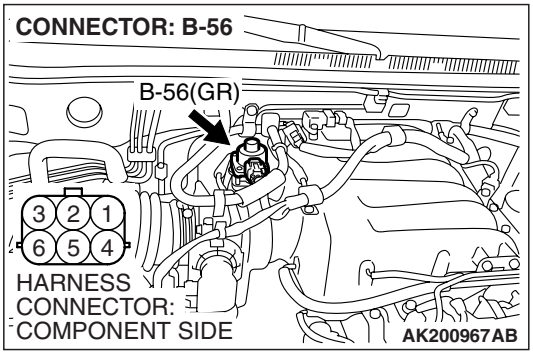
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 4 or terminal No. 6.

Standard value: 20 – 24 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 20 and 24 ohms [at 20°C (68°F)]?

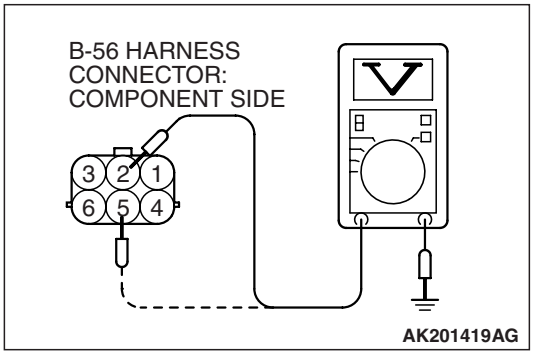
YES : Go to Step 3.

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



STEP 3. Measure the power supply voltage at EGR valve motor harness side connector B-56.

(1) Disconnect the connector B-56 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

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

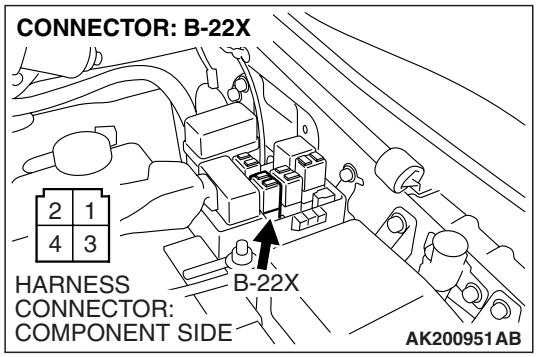
Q: Is battery positive voltage (approximately 12 volts) present?

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

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

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-22X (terminal No. 1) and EGR valve connector B-56 (terminal No. 2, No. 5) because of open circuit or short circuit to ground or harness damage. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



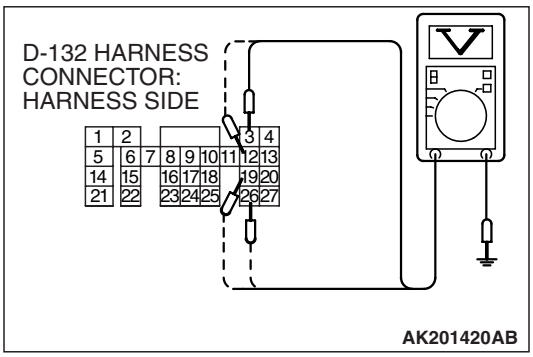
STEP 5. Measure the power supply voltage at PCM connector D-132 by backprobing.

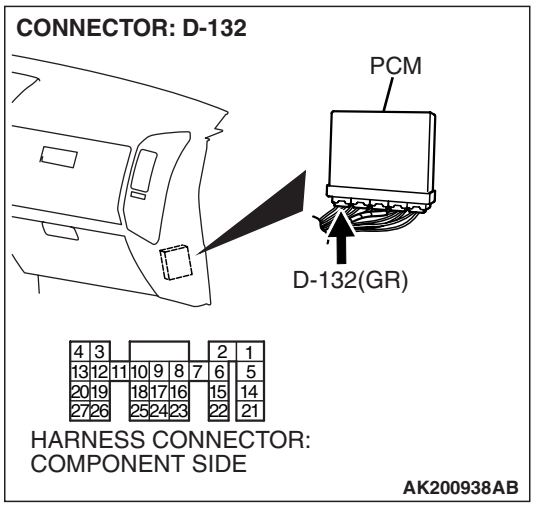
(1) Do not disconnect the connector D-132.
(2) Measure the voltage between terminal (No. 3, No. 12, No. 19, No. 26) and ground by backprobing.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

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

Q: Is the voltage normal?

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



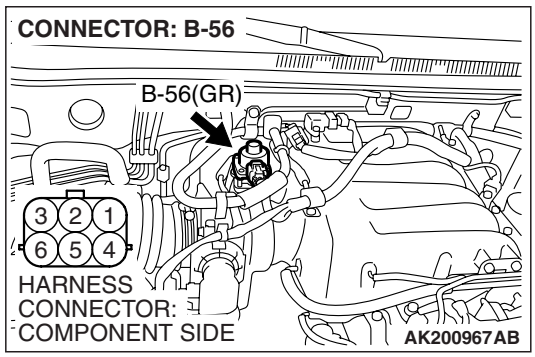


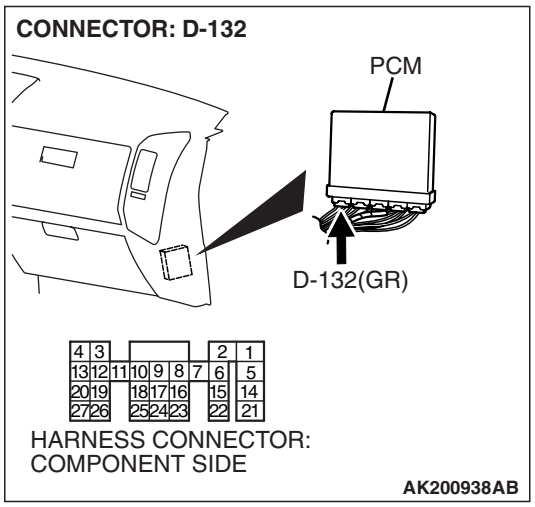
STEP 6. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

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





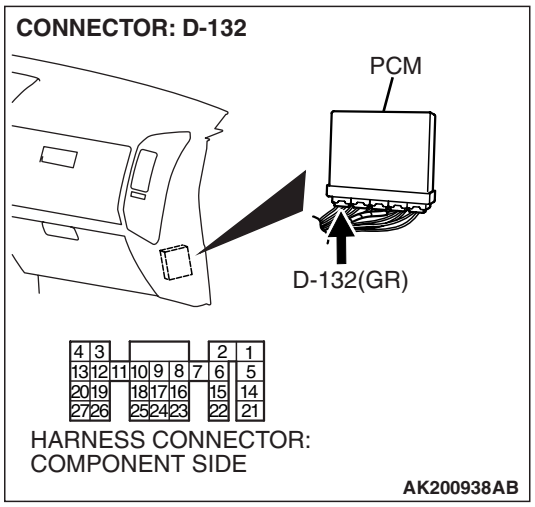
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-56 and PCM connector D-132.

a. EGR valve connector B-56 (terminal No. 1) and PCM connector D-132 (terminal No. 3).
b. EGR valve connector B-56 (terminal No. 3) and PCM connector D-132 (terminal No. 12).
c. EGR valve connector B-56 (terminal No. 4) and PCM connector D-132 (terminal No. 19).
d. EGR valve connector B-56 (terminal No. 6) and PCM connector D-132 (terminal No. 26).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 12.

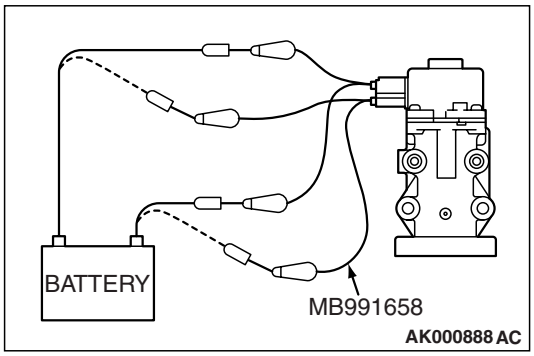


STEP 8. Check harness connector D-132 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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



STEP 9. Check the EGR valve operation using special tool MB991658.

(1) Remove the EGR valve.
(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 2 of the EGR valve connector to the positive battery terminal.
(4) Check to ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(5) Then, use jumper wires to connect the terminal No. 5 of the EGR valve connector to the positive battery terminal.
(6) Check to ensure that the motor operates when the terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

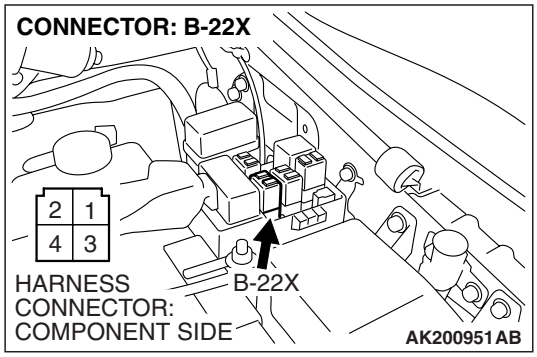
(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

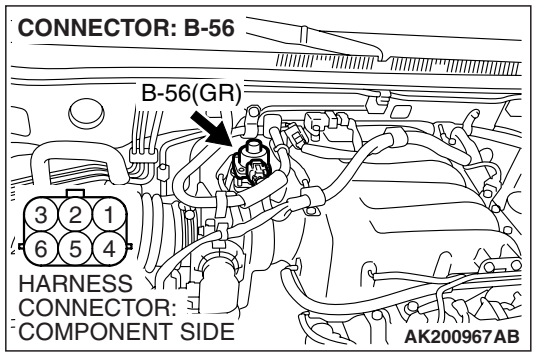
Tighten torque: 24 ± 3 N·m [17 ± 3 ft·lb]

Q: Is the EGR valve operating properly?

YES : Go to Step 10.

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



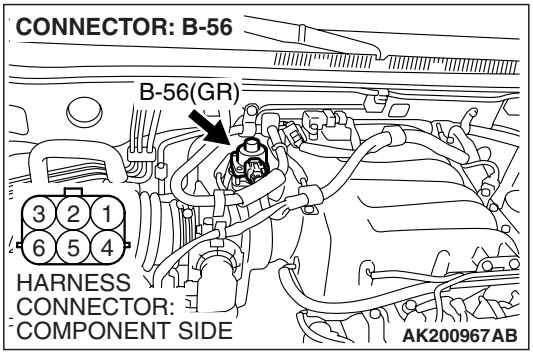


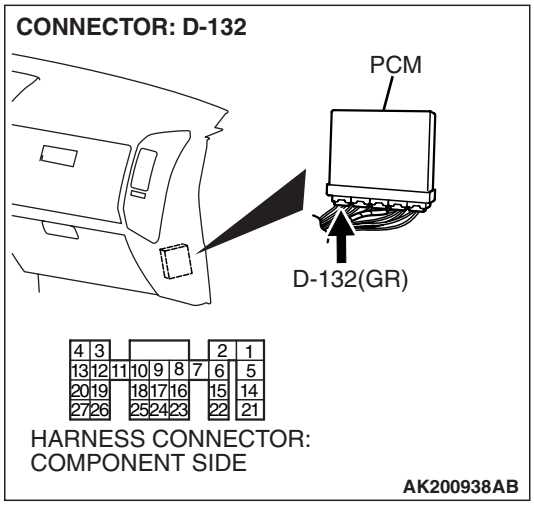
STEP 10. Check for harness damage between MFI relay connector B-22X (terminal No. 1) and EGR valve connector B-56 (terminal No. 2, No. 5).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between EGR valve connector B-56 and PCM connector D-132.

a. EGR valve connector B-56 (terminal No. 1) and PCM connector D-132 (terminal No. 3).
b. EGR valve connector B-56 (terminal No. 3) and PCM connector D-132 (terminal No. 12).
c. EGR valve connector B-56 (terminal No. 4) and PCM connector D-132 (terminal No. 19).
d. EGR valve connector B-56 (terminal No. 6) and PCM connector D-132 (terminal No. 26).

Q: Is the harness wire in good condition?

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

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 20 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

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

DTC P0421: Warm up catalyst Efficiency Below Threshold (bank 1)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

TSB Revision

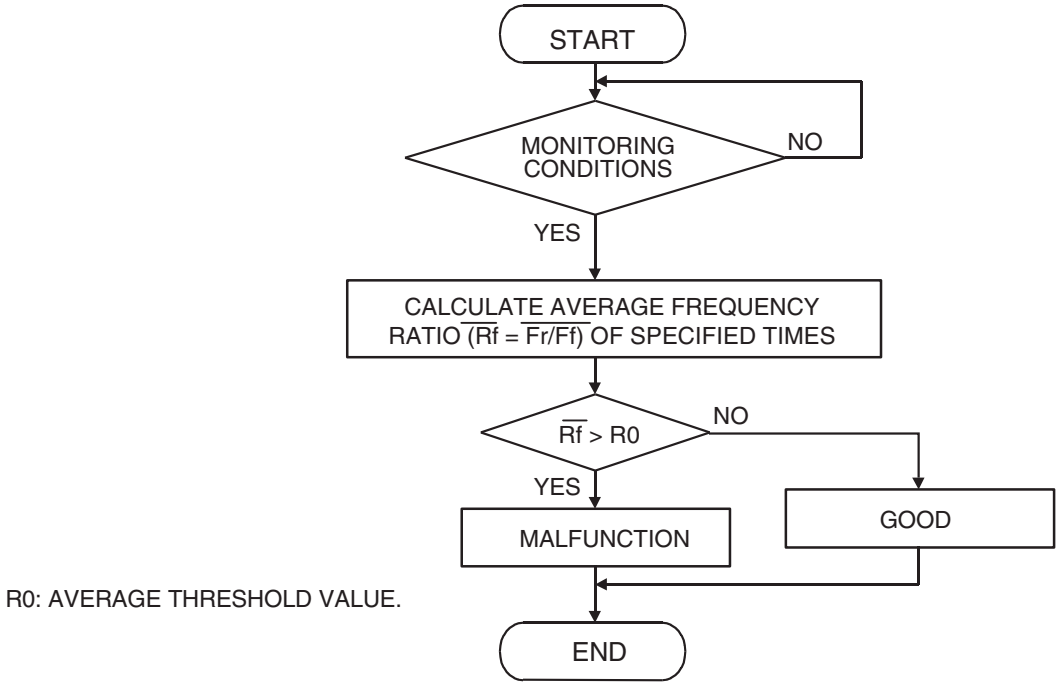
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)
- Volume airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



R0: AVERAGE THRESHOLD VALUE.

AK400998

Check Conditions
- Engine speed is lower than 3,000 r/min.
- The accelerator is not closed.
- Volume airflow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1 mph) or more.
- The PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than −30 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.

Judgement Criterion
- The right bank heated oxygen sensor (rear) signal frequency divided by right bank heated oxygen sensor (front) signal frequency = 0.75 or more.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.

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

- Right bank side catalytic converter deteriorated.
- Right bank heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check for exhaust leak.

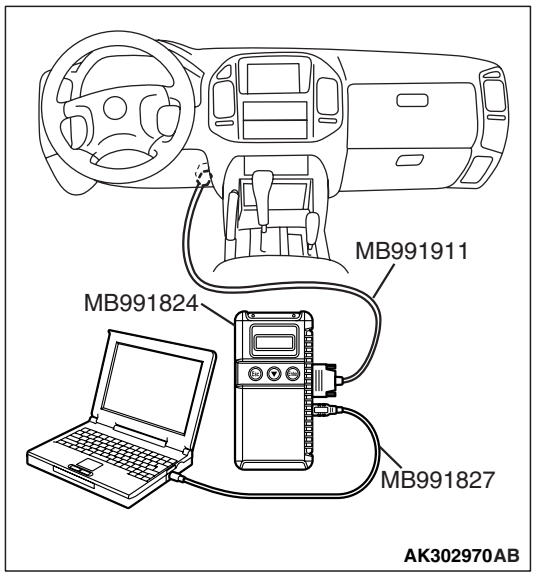
Q: Are there any abnormalities?

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

STEP 2. Using scan tool MB991958, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

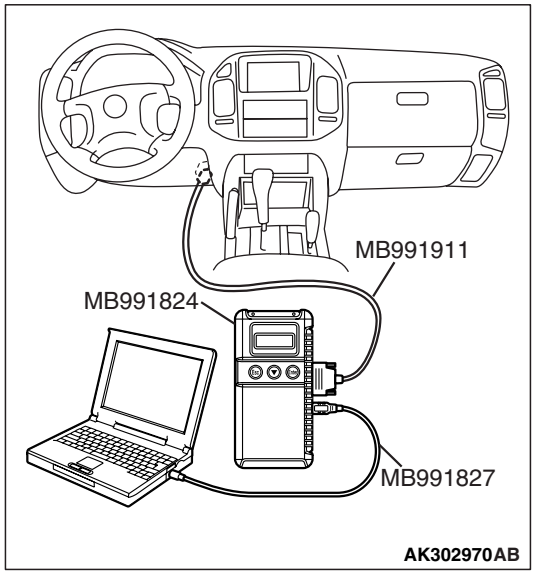
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
  a. Transmission: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0136 – Heated Oxygen Sensor Circuit (Bank 1, Sensor 2) P.13A-269, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 2) P.13A-285, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 2) P.13A-292, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (Bank 1, Sensor 2) P.13A-297, P0140 – Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2) P.13A-301.



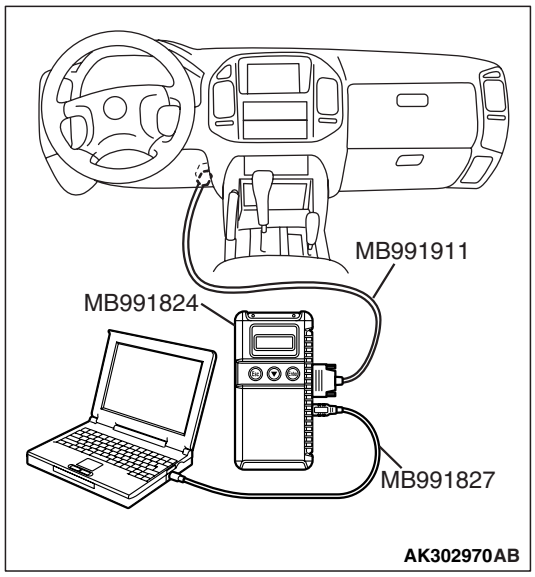
STEP 3. Using scan tool MB991958, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0130 – Heated Oxygen Sensor Circuit (Bank 1, Sensor 1) P.13A-225, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 1) P.13A-241, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 1) P.13A-248, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (Bank 1, Sensor 1) P.13A-253, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (Bank 1, Sensor 1) P.13A-259.



STEP 4. Using scan tool MB991958, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.
(2) Read the diagnostic trouble code.

Q: Is DTC P0421 set?

YES : Replace the right bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.

(2) Read the diagnostic trouble code.

Q: Is DTC P0421 set?

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

NO : The inspection is complete.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.

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

Q: Is DTC P0421 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0431: Warm up catalyst Efficiency Below Threshold (bank 2)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The PCM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

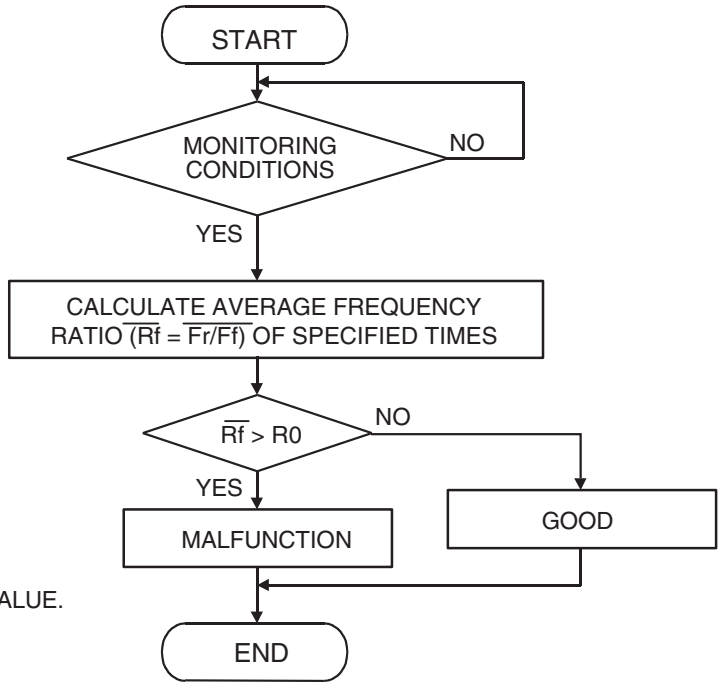
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



R0: AVERAGE THRESHOLD VALUE.

AK400998

Check Conditions

- Engine speed is lower than 3,000 r/min.
- The accelerator is not closed.
- Volume airflow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1 mph) or more.
- The PCM monitors for this condition for 7 cycles of 12 seconds each during the drive cycle.
- Short-term fuel trim is higher than −30 percent and lower than +25 percent.
- The cumulative volume airflow sensor output frequency for every 2 seconds is higher than 4,000 Hz.

Judgement Criterion

- The left bank heated oxygen sensor (rear) signal frequency divided by left bank heated oxygen sensor (front) signal frequency = 0.75 or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function − OBD-II Drive Cycle − Pattern 5 P.13A-4.

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

- Left bank side catalytic converter deteriorated.
- Left bank heated oxygen sensor failed.
- Exhaust leak.
- PCM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

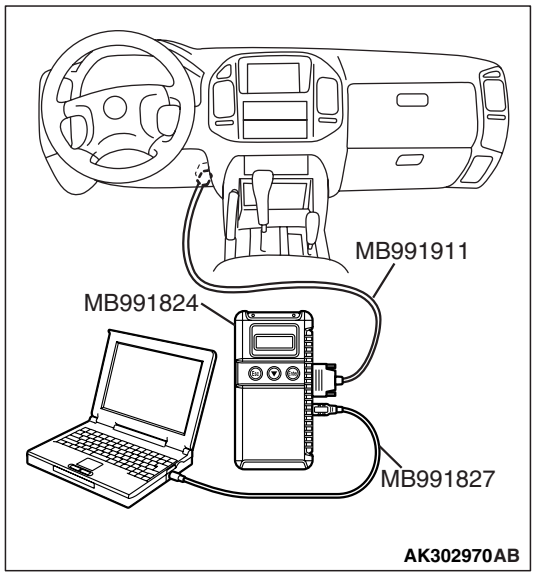
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

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

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

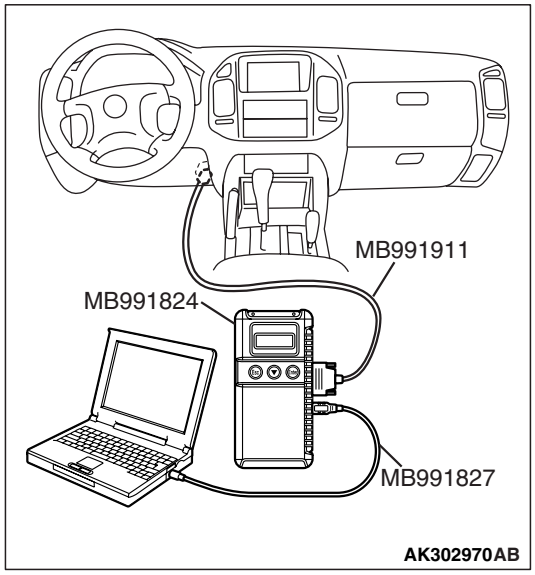


⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  a. Transmission: "L" range
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0156 – Heated Oxygen Sensor Circuit (Bank 2, Sensor 2) P.13A-349, DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (Bank 2, Sensor 2) P.13A-365, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (Bank 2, Sensor 2) P.13A-372, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (Bank 2, Sensor 2) P.13A-377, P0160 – Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2) P.13A-381.



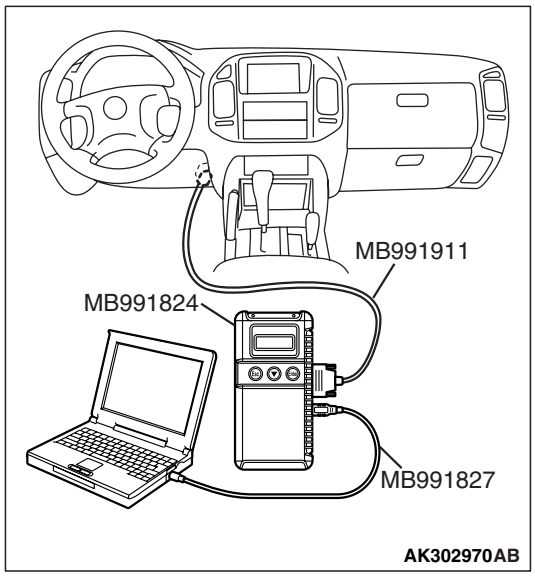
STEP 3. Using scan tool MB991958, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

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

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0150 – Heated Oxygen Sensor Circuit (Bank 2, Sensor 1) P.13A-305, DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (Bank 2, Sensor 1) P.13A-321, DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (Bank 2, Sensor 1) P.13A-328, DTC P0153 – Heated Oxygen Sensor Circuit Slow Response (Bank 2, Sensor 1) P.13A-333, DTC P0154 – Heated Oxygen Sensor Circuit No Activity Detected (Bank 2, Sensor 1) P.13A-339.



STEP 4. Using scan tool MB991958, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.
(2) Read the diagnostic trouble code.

Q: Is DTC P0431 set?

YES : Replace the left bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.
(2) Read the diagnostic trouble code.

Q: Is DTC P0431 set?

YES : Replace the PCM. Then go to Step 7.
NO : The inspection is complete.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-4.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0431 set?

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

NEXT>>