DTC P0171: System too Lean (bank 1)

⚠ CAUTION

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

Fuel Trim Circuit

- Refer to DTC P0201–Injector Circuit –Cylinder 1P.13B-474, P0203–Injector Circuit –Cylinder 3P.13B-497, P0205–Injector Circuit –Cylinder 5.P.13B-520

CIRCUIT OPERATION

- Refer to DTC P0201P.13B-474, P0203P.13B-497, P0205P.13B-520 –Injector Circuit.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or the PCM <A/T> checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

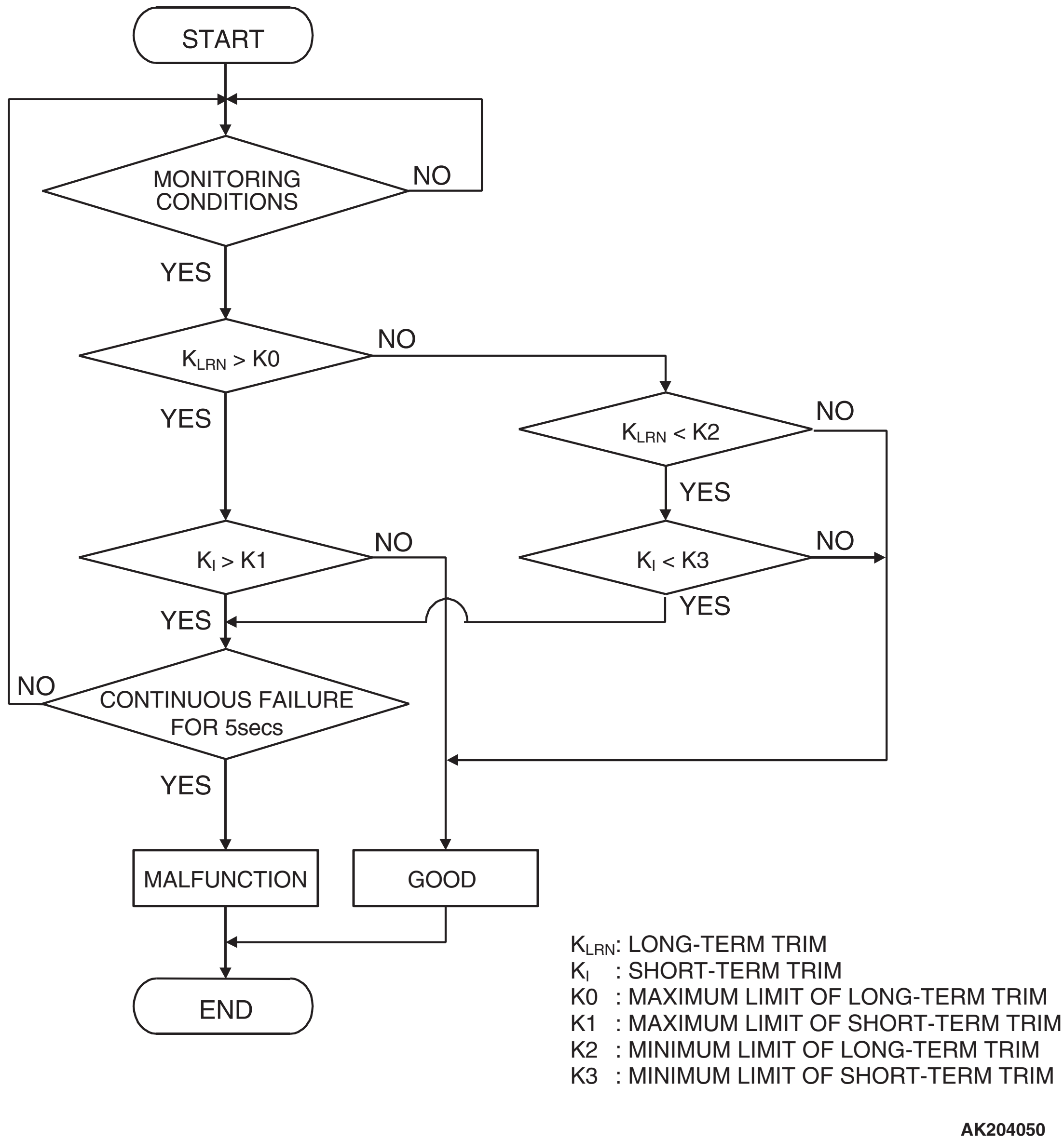
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

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

or
- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +17.2 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +27.3 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +27.3 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +32.0 percent for 5 seconds. <M/T>

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 20 P.13B-6.

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

- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in right bank injector circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

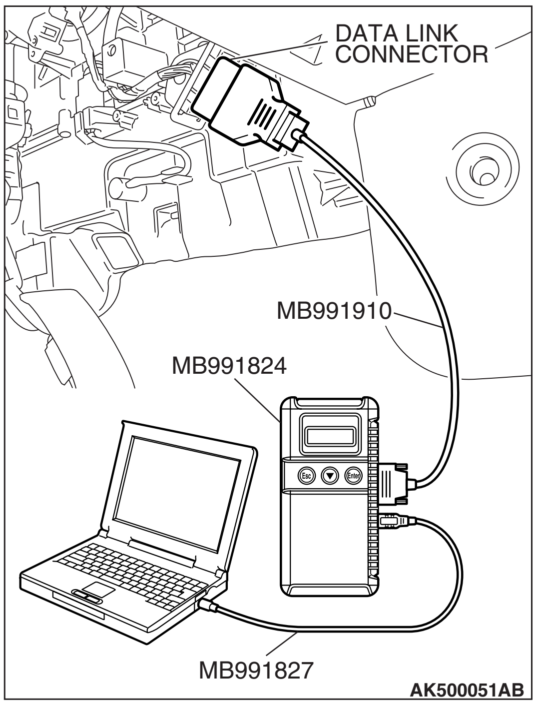
YES : Repair it. Then go to Step 16.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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

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



⚠ CAUTION

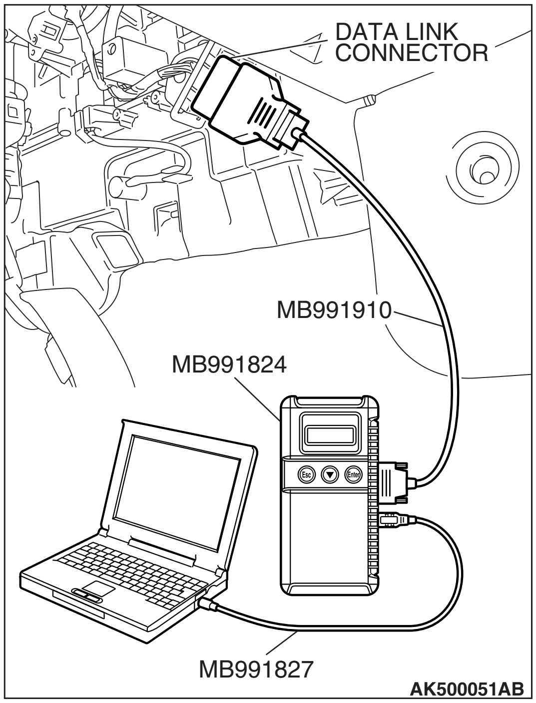
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- When idling, between 1,360 and 1,650 millivolts.
- When 2,500 r/min, between 1,760 and 2,090 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-131, DTC P0102 –Mass Airflow Circuit Low Input P.13B-142, DTC P0103 –Mass Airflow Circuit High Input P.13B-152.



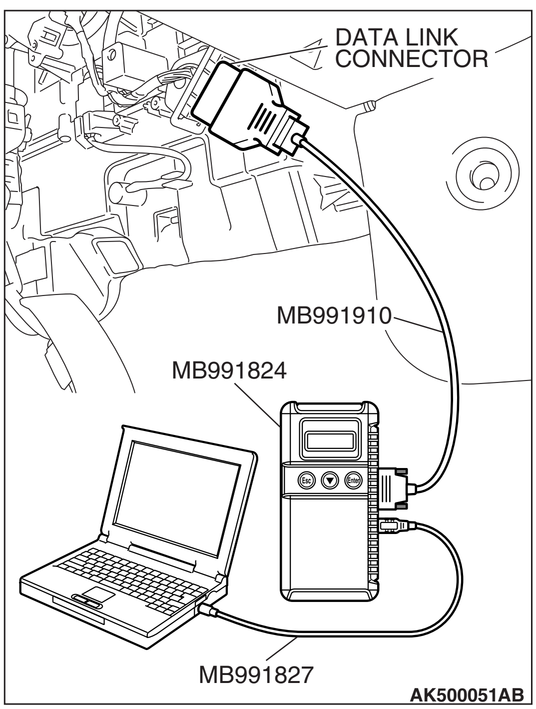
STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-195, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-204, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-211.



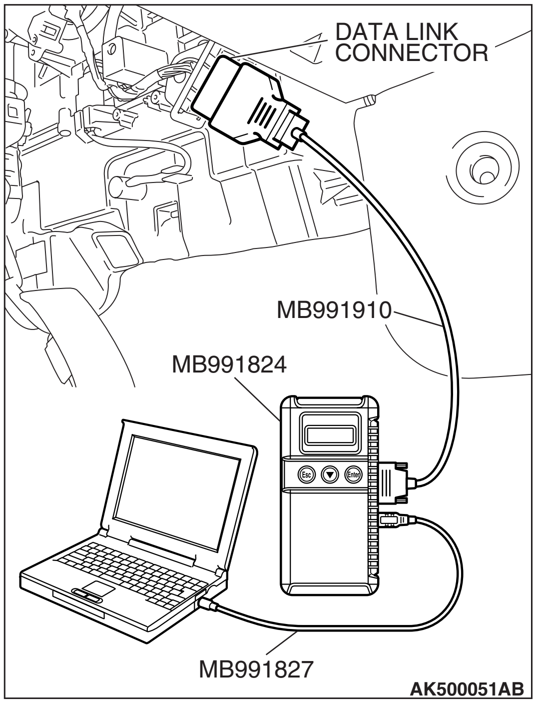
STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-221, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-230, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-237.



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

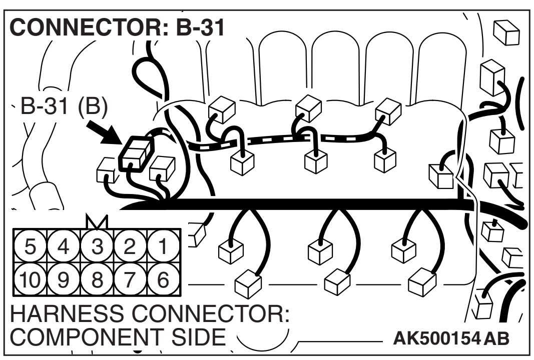
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

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

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-159, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13B-174, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13B-186.

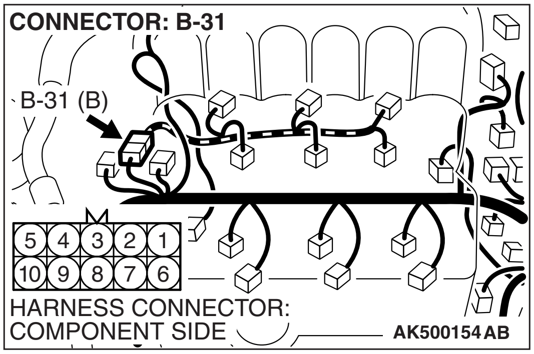


STEP 7. Check harness connector B-31 at intermediate connector for damage.

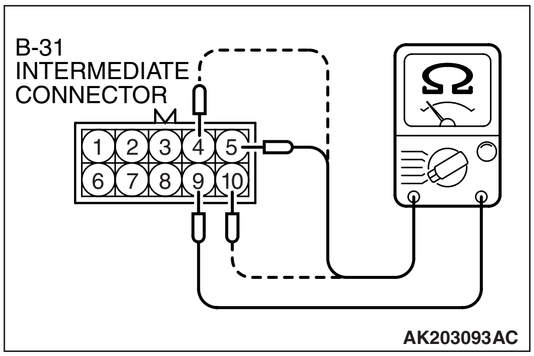
Q: Is the harness connector in good condition?

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

STEP 8. Check the right bank injector resistance at intermediate connector B-31.



(1) Disconnect the intermediate connector B-31.



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

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

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

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

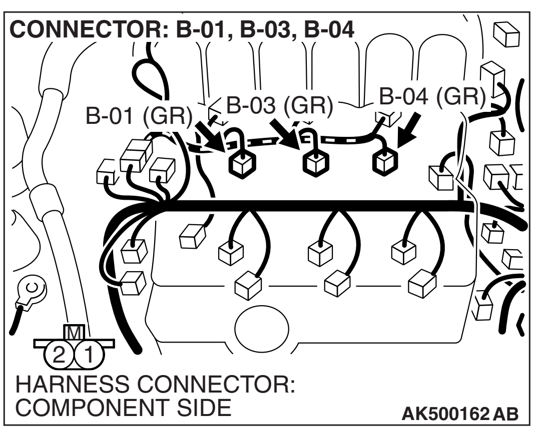
- Resistance should be between 10.5 and 13.5 ohms [at 20° C (68° F)].

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

YES : Go to Step 11.

NO : Go to Step 9.

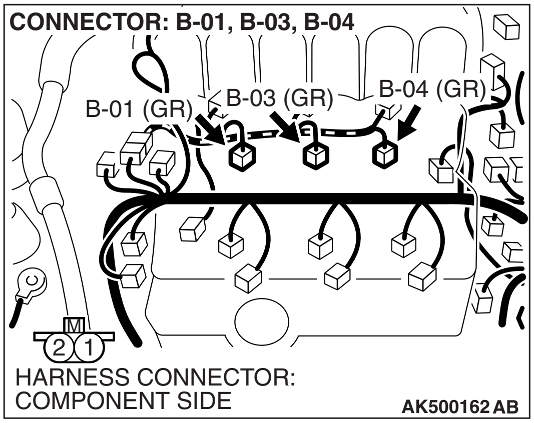
STEP 9. Check harness connector B-03, B-04, B-01 at right bank injector for damage.



Q: Is the harness connector in good condition?

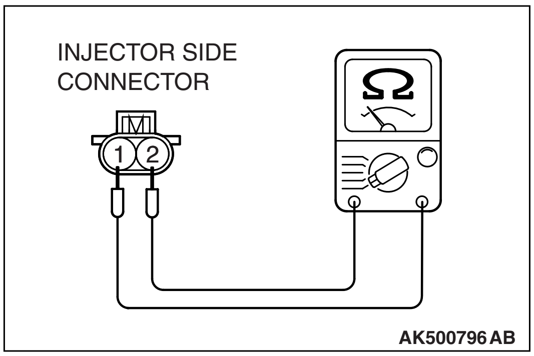
YES : Go to Step 11.

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



STEP 10. Check the right bank injector.

(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector.



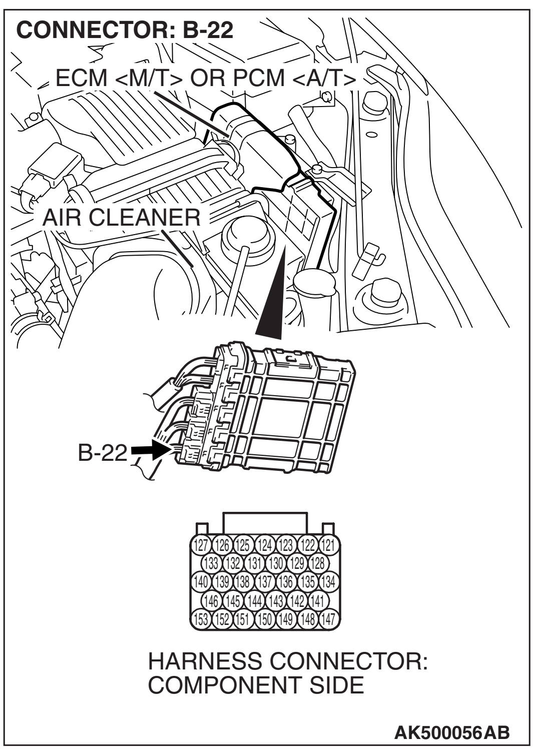
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

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

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

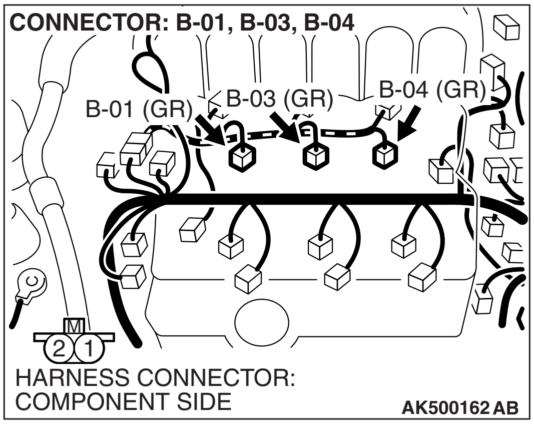


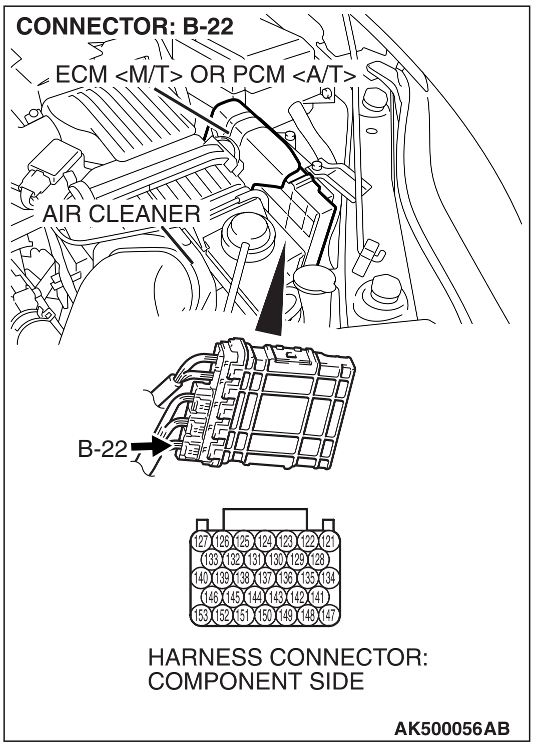
STEP 11. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

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 ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between injector connector B-01 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 153) at No. 1 cylinder injector.
b. Check the harness wire between injector connector B-03 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 140) at No. 3 cylinder injector.
c. Check the harness wire between injector connector B-04 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 133) at No. 5 cylinder injector.

Q: Is the harness wire in good condition?

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

STEP 13. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1280.

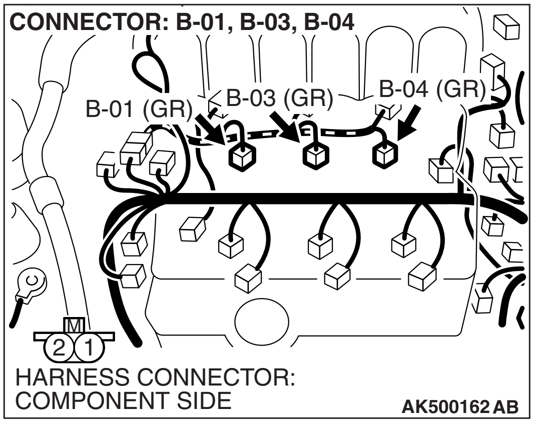
Q: Is the fuel pressure normal?

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

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

Q: Are there any abnormalities?

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



STEP 15. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 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 20 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

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

DTC P0172: System too Rich (bank 1)

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

Fuel Trim Circuit

- Refer to DTC P0201–Injector Circuit –Cylinder 1 P.13B-474, P0203–Injector Circuit –Cylinder 3 P.13B-497, P0205–Injector Circuit –Cylinder 5 P.13B-520

CIRCUIT OPERATION

- Refer to DTC P0201–Injector Circuit –Cylinder 1 P.13B-474, P0203–Injector Circuit –Cylinder 3 P.13B-497, P0205–Injector Circuit –Cylinder 5 P.13B-520

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or the PCM <A/T> checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

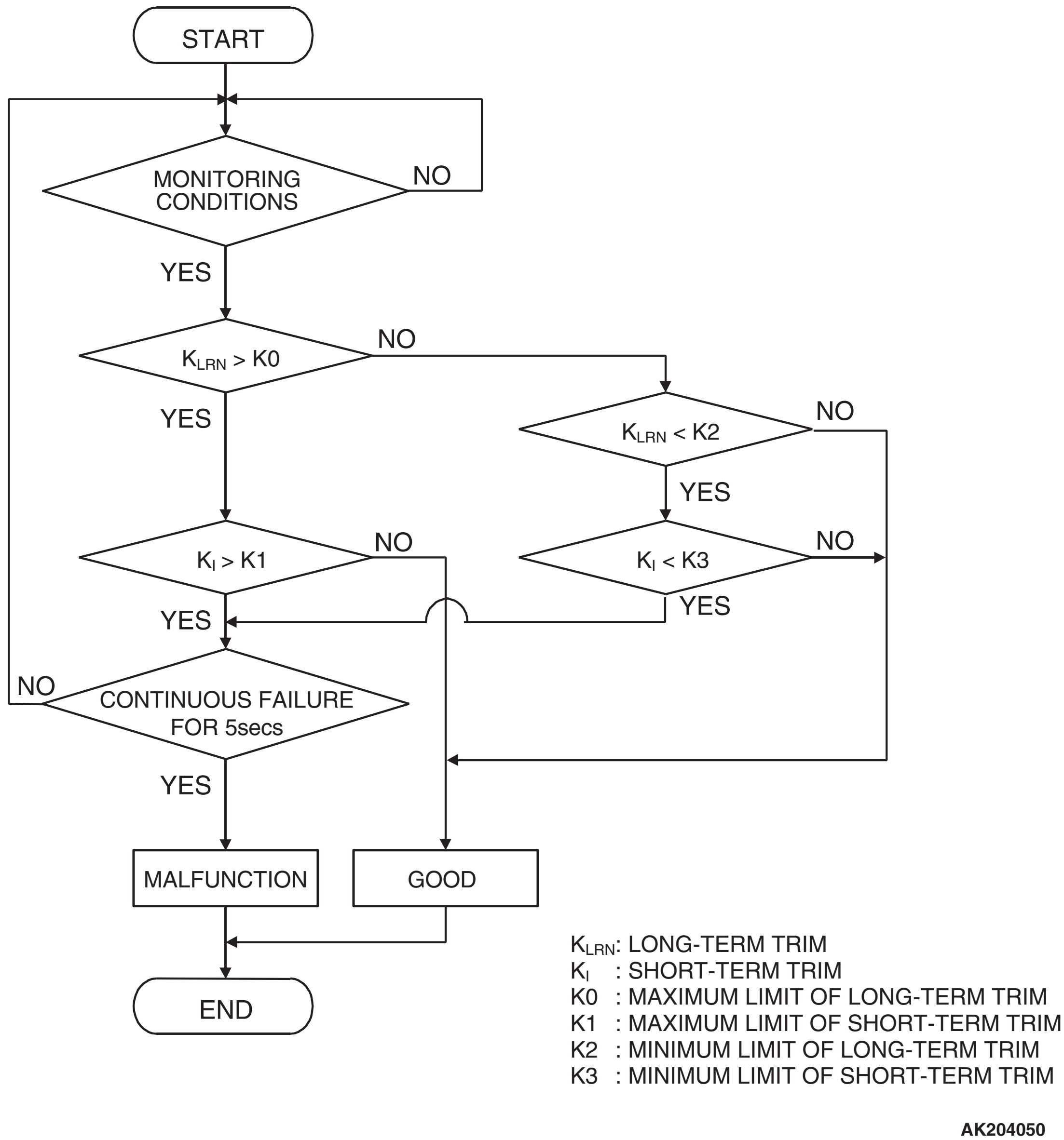
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

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

or
- Short-term fuel trim has continued to be lower than –5.5 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be lower than –6.6 percent for 5 seconds. <M/T>

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

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

or
- Short-term fuel trim has continued to be lower than –10.5 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be lower than 11.7 percent for 5 seconds. <M/T>

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.

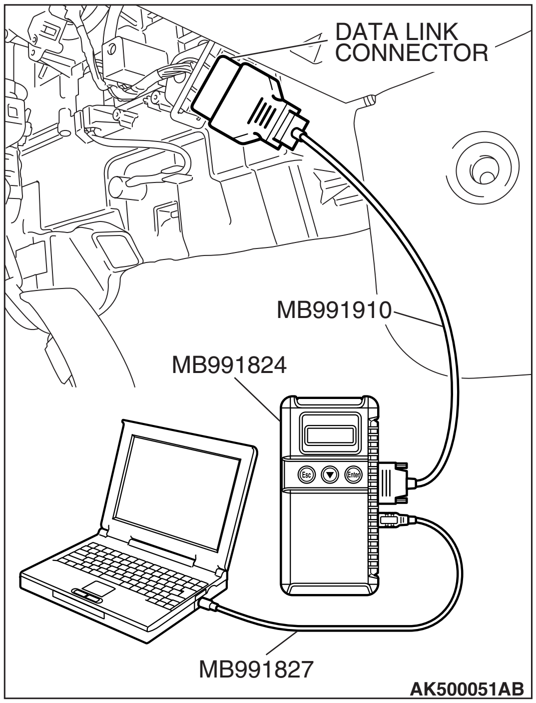
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13B-6.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in right bank injector circuit, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

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



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

⚠ CAUTION

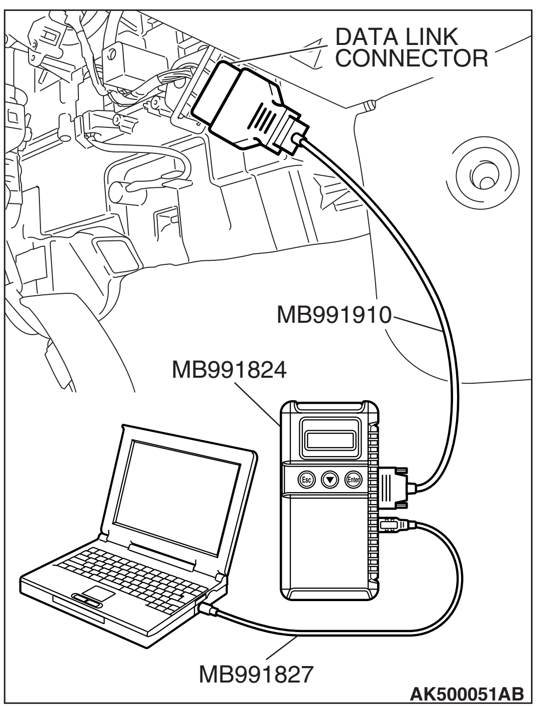
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- When idling, between 1,360 and 1,650 millivolts.
- When 2,500 r/min, between 1,760 and 2,090 millivolts.

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-131, DTC P0102 –Mass Airflow Circuit Low Input P.13B-142, DTC P0103 –Mass Airflow Circuit High Input P.13B-152.



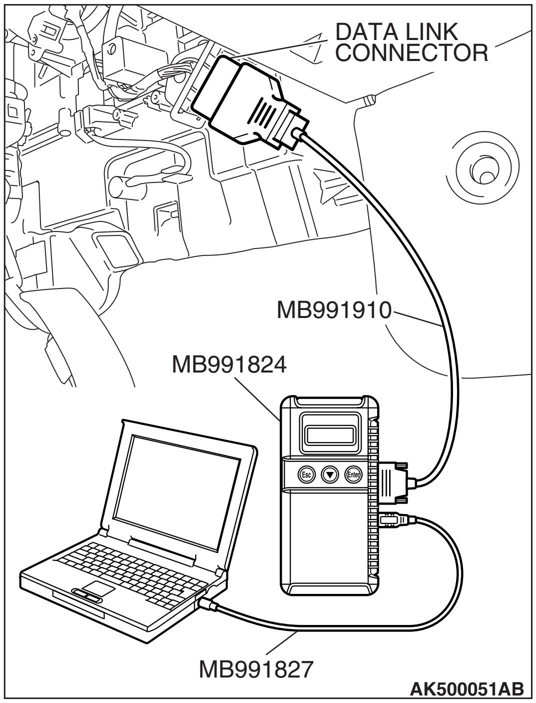
STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-195, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-204, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-211.



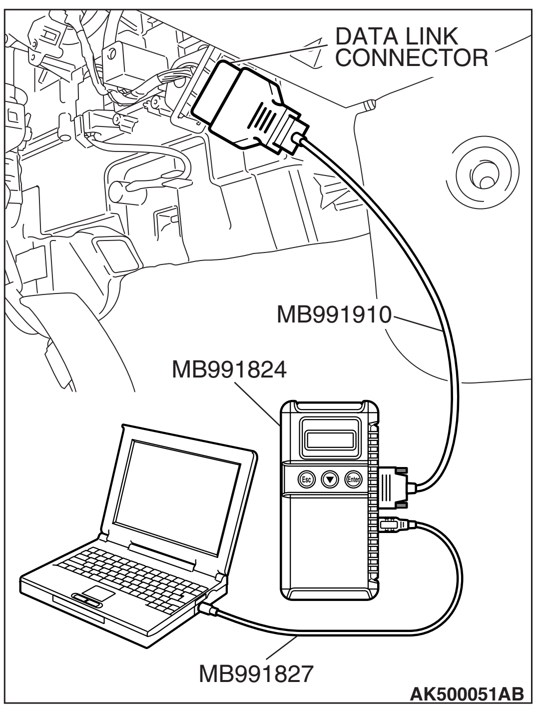
STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance ProblemP.13B-221, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-230, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-237.



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

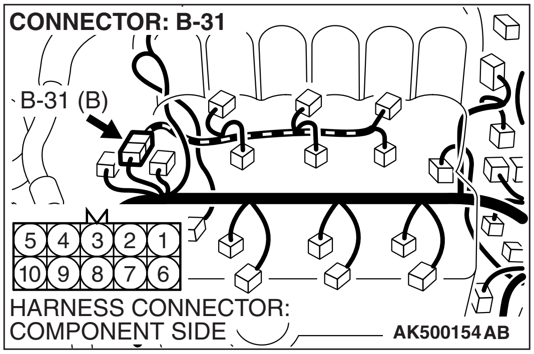
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-159, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13B-174, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13B-186.

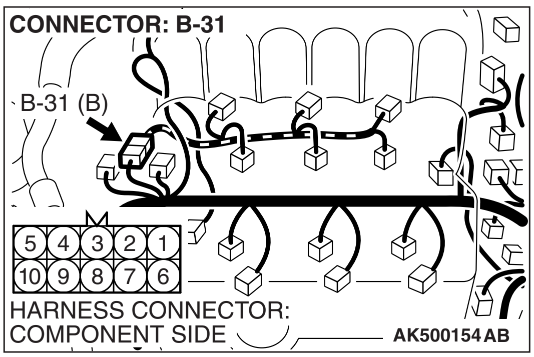


STEP 5. Check harness connector B-31 at intermediate connector for damage.

Q: Is the harness connector in good condition?

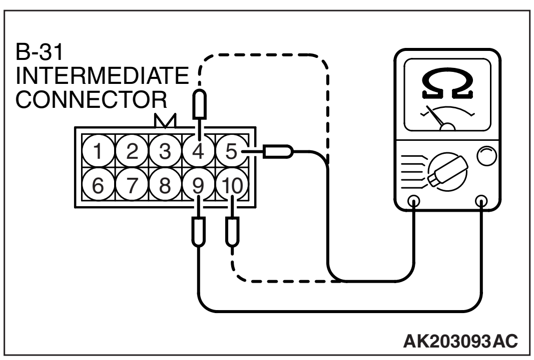
YES : Go to Step 6.

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-31.

(1) Disconnect the intermediate connector B-31.

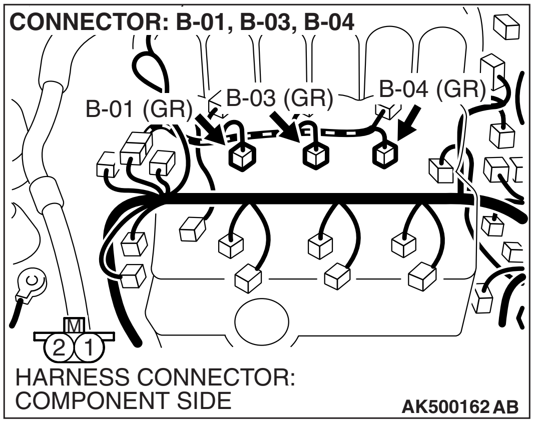


(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal No. 5 and No. 9 at No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 9 and No. 10 at No. 3 cylinder injector.
   c. Measure the resistance between terminal No.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

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

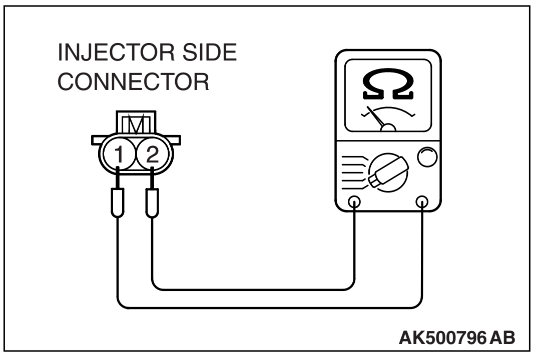
YES : Go to Step 8.

NO : Go to Step 7.



STEP 7. Check the right bank injector.

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



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

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

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

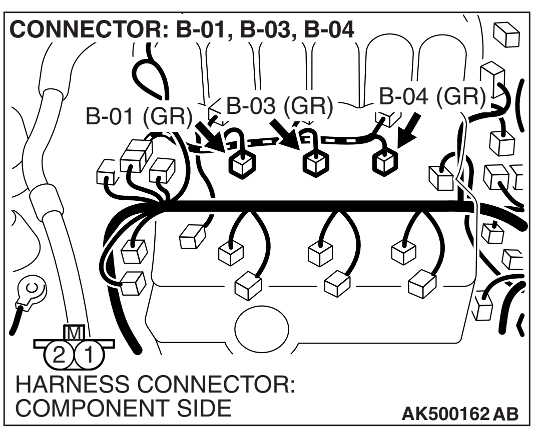
YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 10.
NO : Replace the injector. Then go to Step 10.

STEP 8. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1280.

Q: Is the fuel pressure normal?

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



STEP 9. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 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 20 P.13B-6.

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

Q: Is DTC P0172 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0174: System too Lean (bank 2)

⚠ CAUTION

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

Fuel Trim Circuit

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-486, P0204–Injector Circuit –Cylinder 4 P.13B-509, P0206–Injector Circuit –Cylinder 6 P.13B-532

CIRCUIT OPERATION

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-486, P0204–Injector Circuit –Cylinder 4 P.13B-509, P0206–Injector Circuit –Cylinder 6 P.13B-532

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or the PCM <A/T> 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)

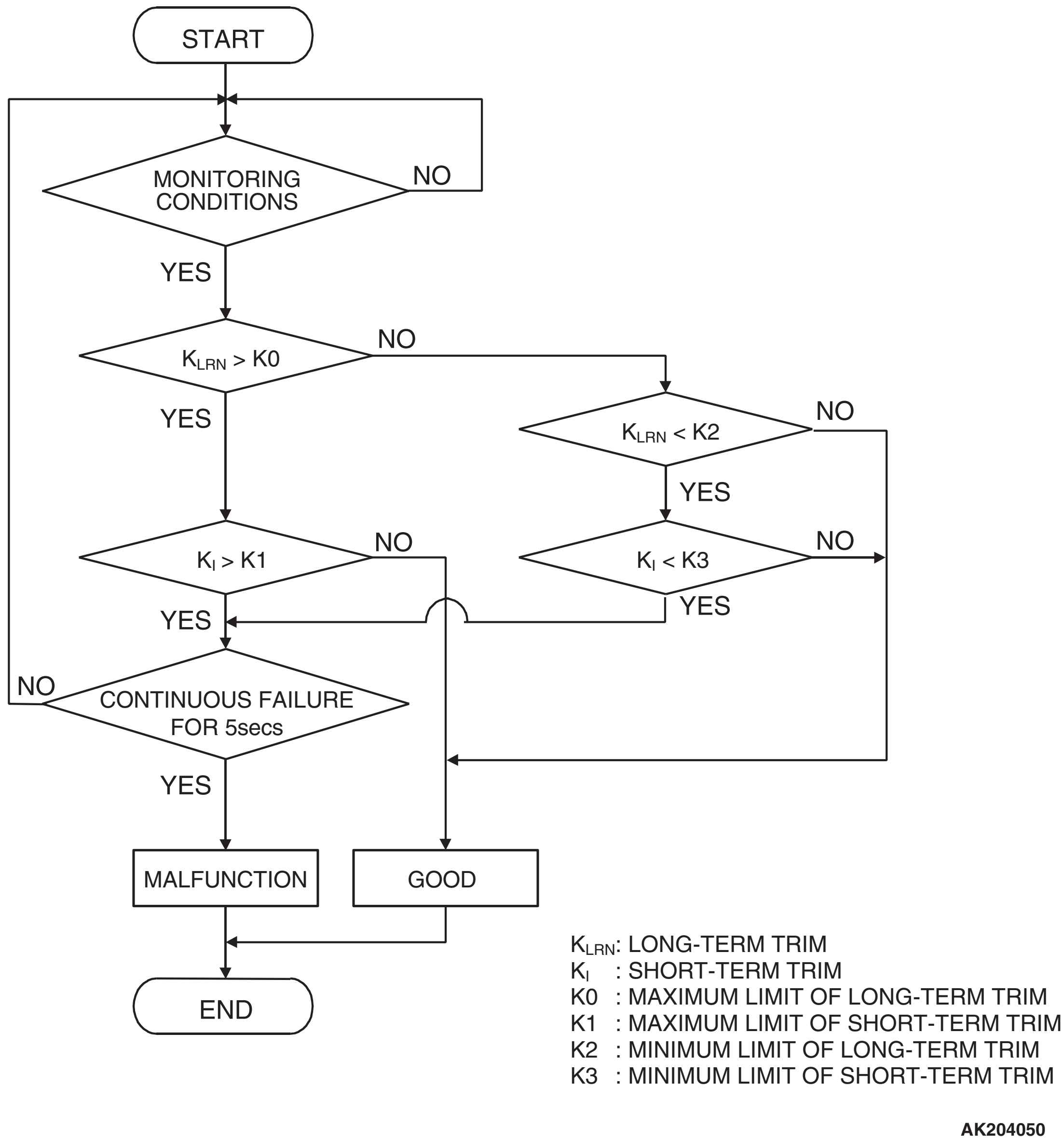
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +17.2 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +27.3 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +27.3 percent for 5 seconds. <M/T>

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be higher than +32.0 percent for 5 seconds. <M/T>

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 20 P.13B-6.

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

- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in left bank injector circuit or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

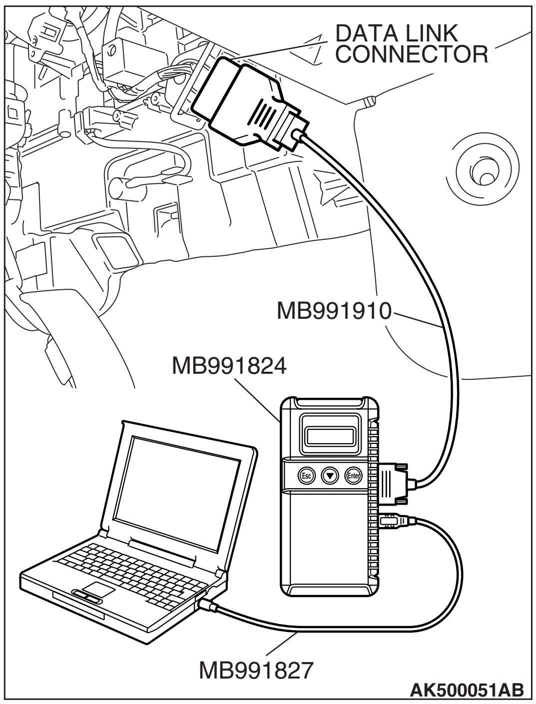
YES : Repair it. Then go to Step 14.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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

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



⚠ CAUTION

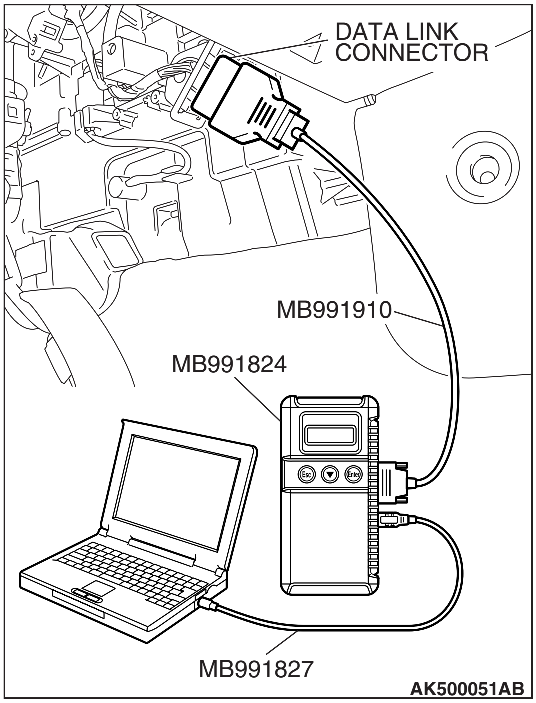
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- When idling, between 1,360 and 1,650 millivolts.
- When 2,500 r/min, between 1,760 and 2,090 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-131, DTC P0102 –Mass Airflow Circuit Low Input P.13B-142, DTC P0103 –Mass Airflow Circuit High Input P.13B-152.



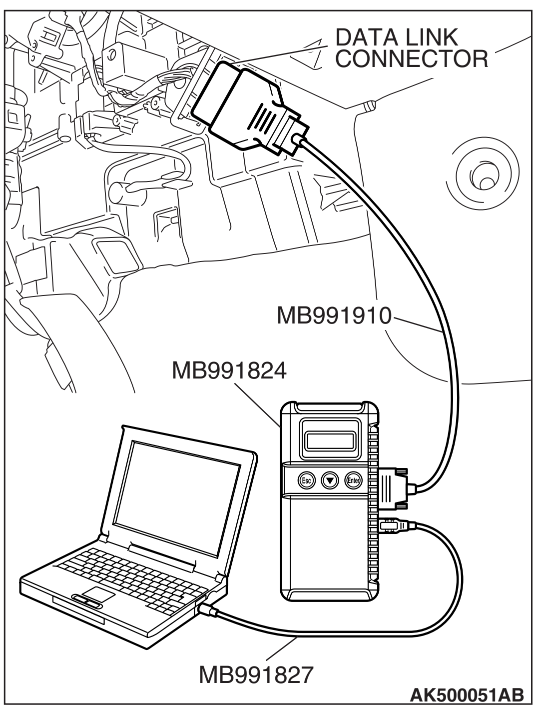
STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-195, DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-204, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-211.



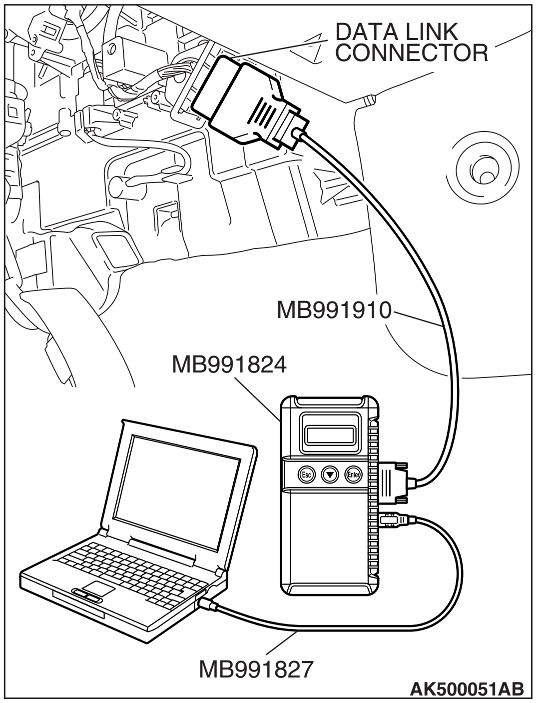
STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-221, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-230, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-237.



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

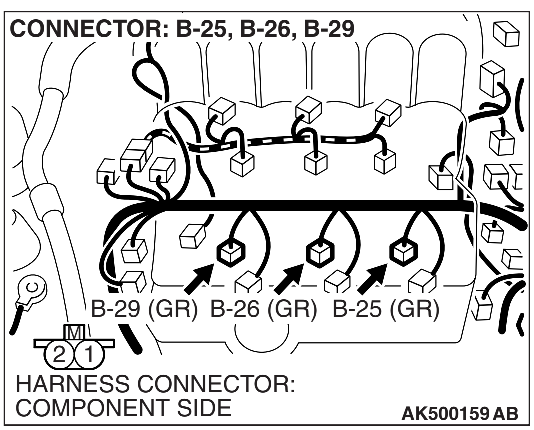
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

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

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

Q: Is the sensor operating properly?

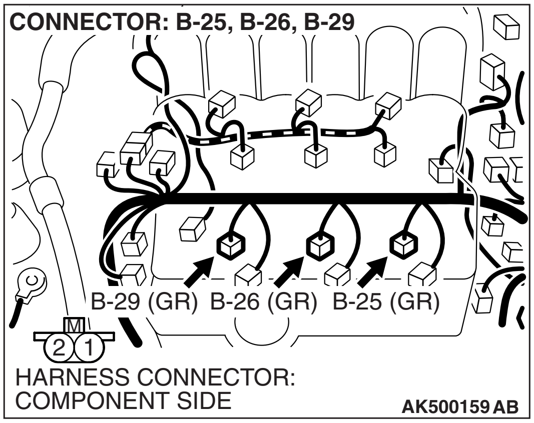
YES : Go to Step 7.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance Problem P.13B-159, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13B-174, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13B-186.



STEP 7. Check harness connector B-26, B-25, B-29 at left bank injector for damage.

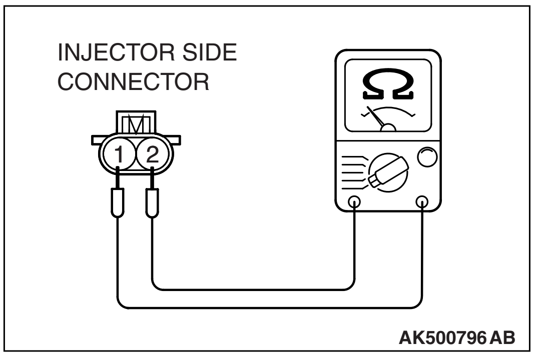
Q: Is the harness connector in good condition?

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



STEP 8. Check the left bank injector.

(1) Disconnect the left bank injector connector B-26, B-25, B-29.



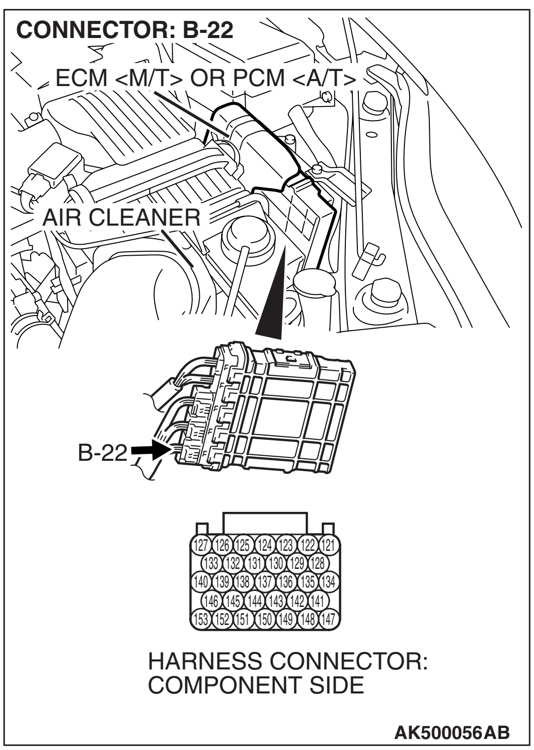
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 9.

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

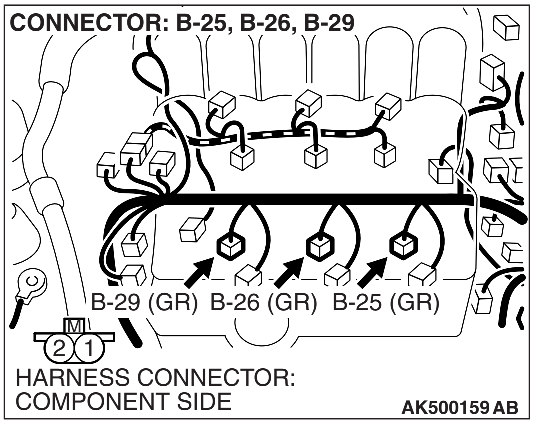


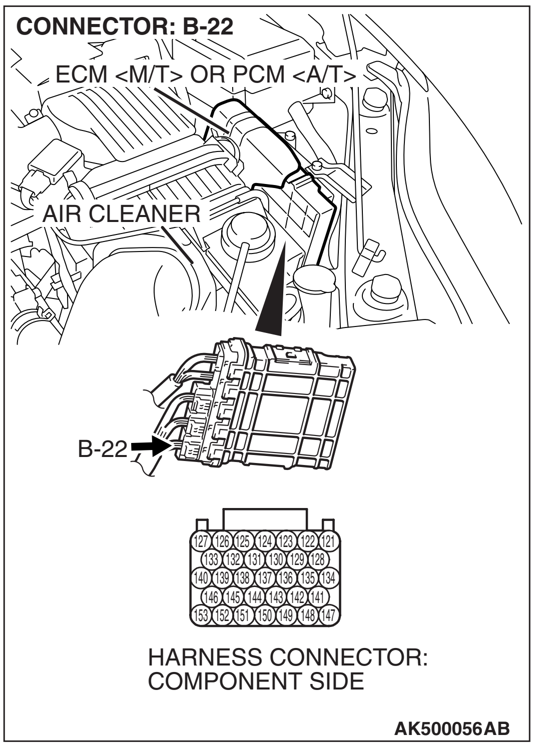
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check for harness damage between left bank injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between injector connector B-29 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 146) at No. 2 cylinder injector.
b. Check the harness wire between injector connector B-26 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 139) at No. 4 cylinder injector.
c. Check the harness wire between injector connector B-25 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 127) at No. 6 cylinder injector.

Q: Is the harness wire in good condition?

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

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1280.

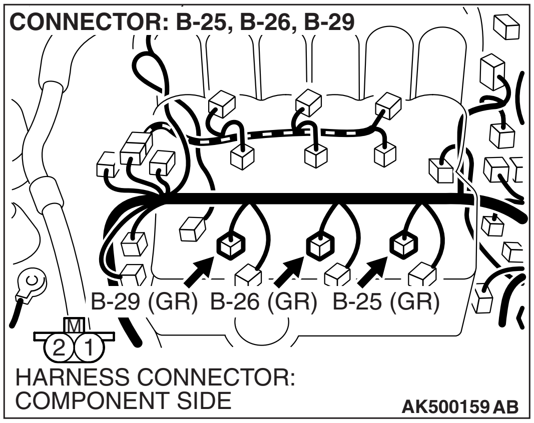
Q: Is the fuel pressure normal?

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

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

Q: Are there any abnormalities?

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



STEP 13. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

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

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0174 set?

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

DTC P0175: System too Rich (bank 2)

⚠ CAUTION

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

Fuel Trim Circuit

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-486, P0204–Injector Circuit –Cylinder 4 P.13B-509, P0206–Injector Circuit –Cylinder 6 P.13B-532.

CIRCUIT OPERATION

- Refer to DTC P0202–Injector Circuit –Cylinder 2 P.13B-486, P0204–Injector Circuit –Cylinder 4 P.13B-509, P0206–Injector Circuit –Cylinder 6 P.13B-532.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or the PCM <A/T> checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

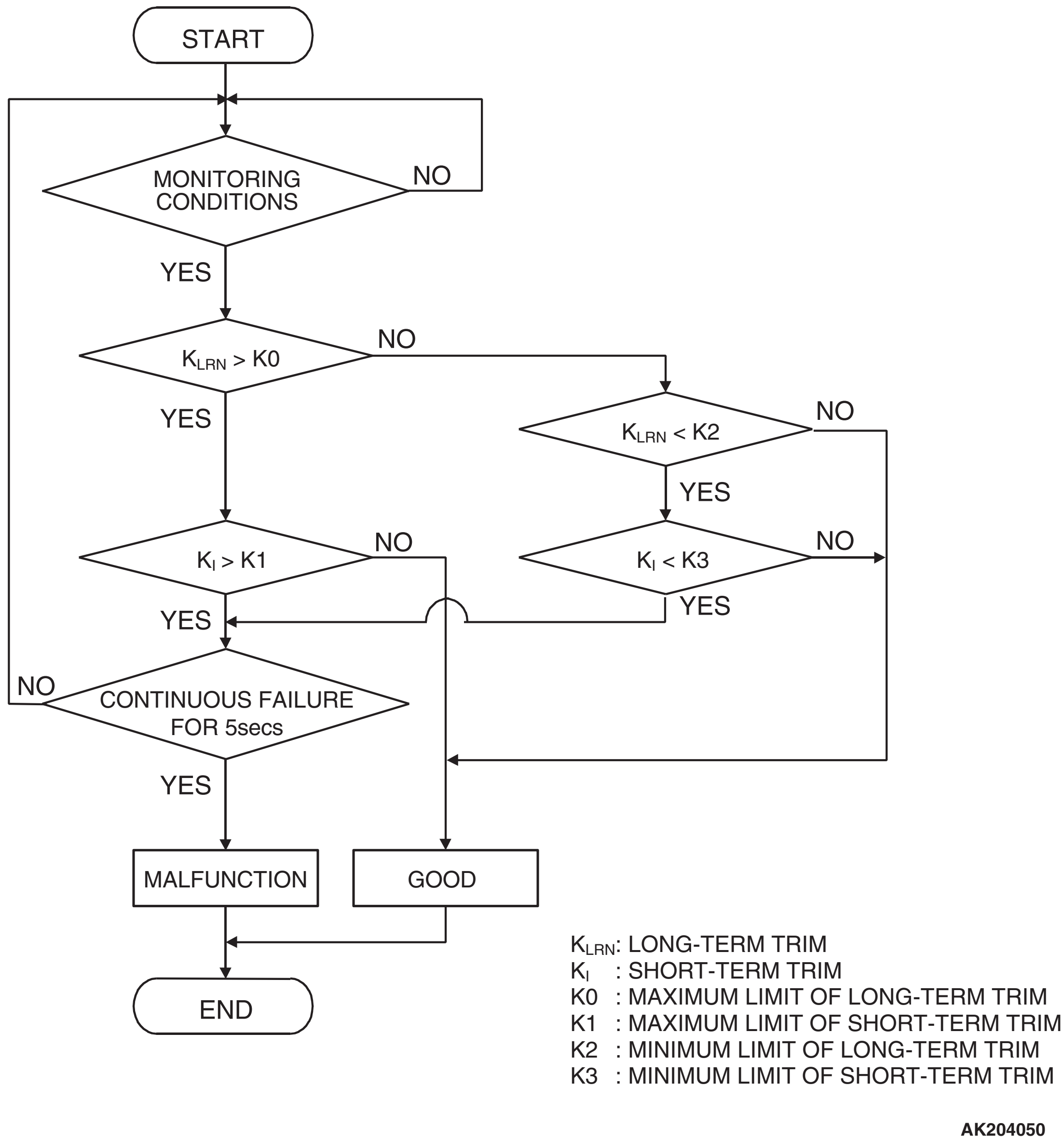
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or more.

Judgement Criteria

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

or

- Short-term fuel trim has continued to be lower than –5.5 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be lower than –6.6 percent for 5 seconds. <M/T>

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 15 g/sec or less.

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

or
- Short-term fuel trim has continued to be lower than –10.5 percent for 5 seconds. <A/T>
- Short-term fuel trim has continued to be lower than 11.7 percent for 5 seconds. <M/T>

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.

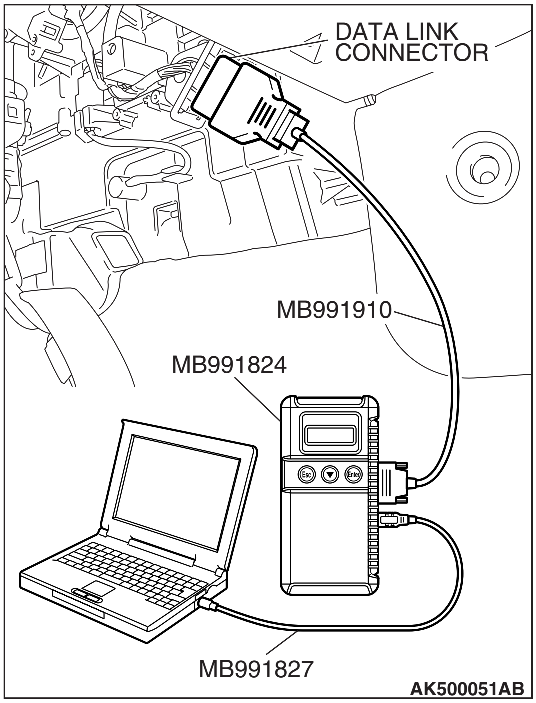
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Harness damage in left bank injector circuit or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

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



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

⚠ **CAUTION**

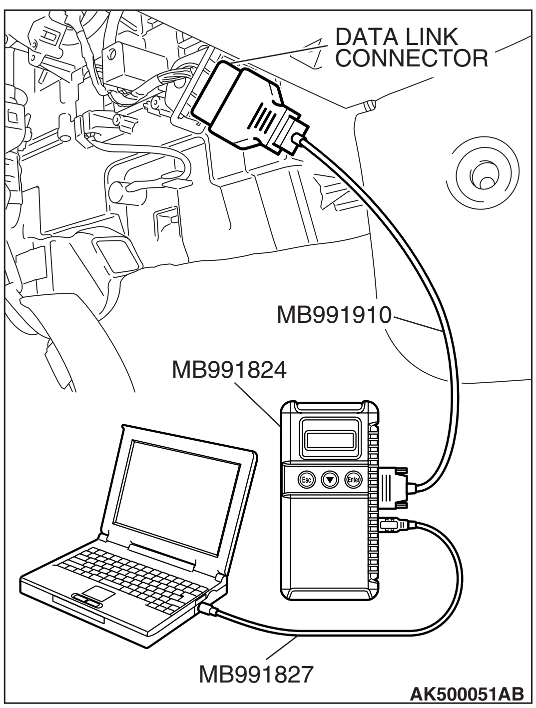
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- When idling, between 1,360 and 1,650 millivolts.
- When 2,500 r/min, between 1,760 and 2,090 millivolts.

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

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13B-131, DTC P0102 –Mass Airflow Circuit Low Input P.13B-142, DTC P0103 –Mass Airflow Circuit High Input P.13B-152.



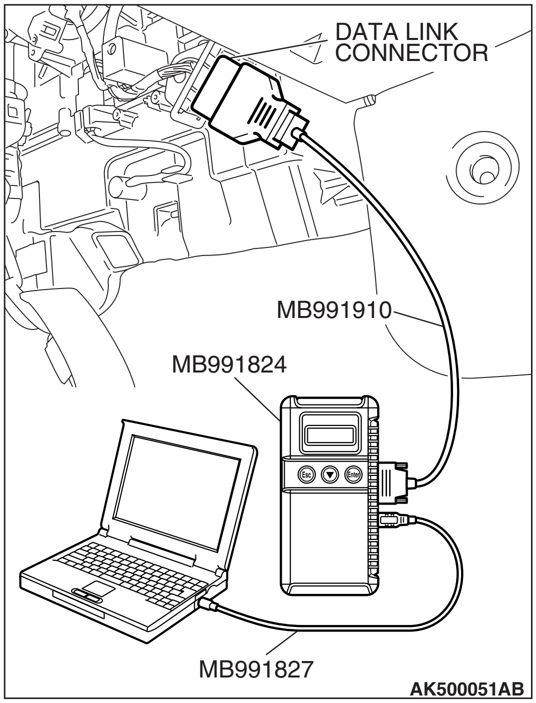
STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13B-195 DTC P0112 –Intake Air Temperature Circuit Low Input P.13B-204, DTC P0113 –Intake Air Temperature Circuit High Input P.13B-211.



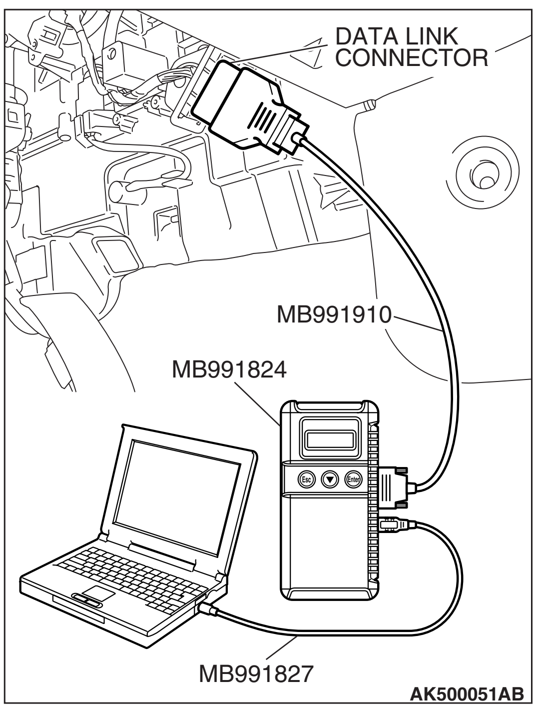
STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

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

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance Problem P.13B-221, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13B-230, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13B-237.



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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

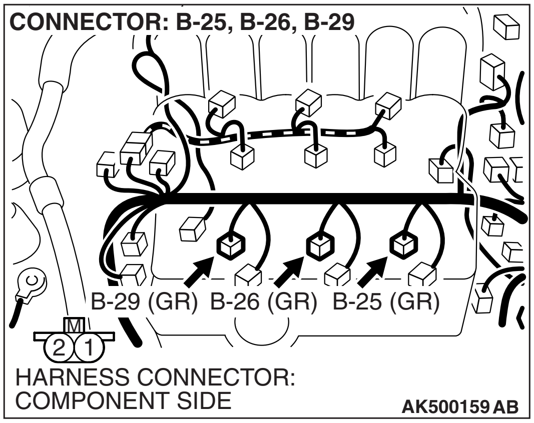
(4) Start the engine.
- When the engine is idling, 16 – 36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

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

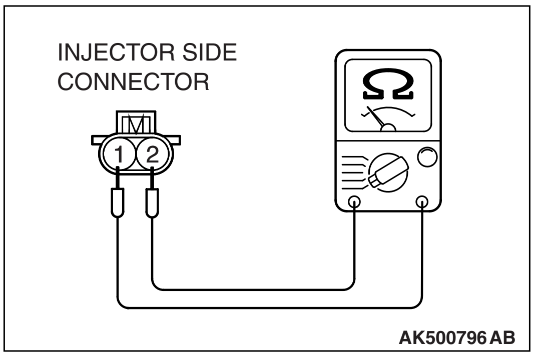
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range / Performance ProblemP.13B-159, DTC P0107 –Manifold Absolute Pressure Circuit Low InputP.13B-174, DTC P0108 – Manifold Absolute Pressure Circuit High InputP.13B-186.

STEP 5. Check the left bank injector.



(1) Disconnect the left bank injector connector B-29, B-26, B-25.



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

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

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

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

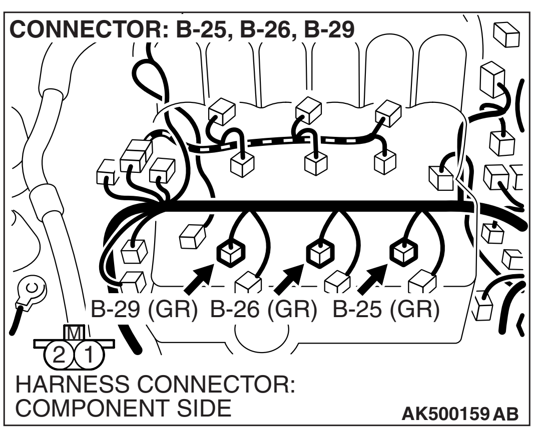
STEP 6. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13B-1280.

Q: Is the fuel pressure normal?

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

STEP 7. Replace the left bank injector.



(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0175 set?

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

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13B-6.

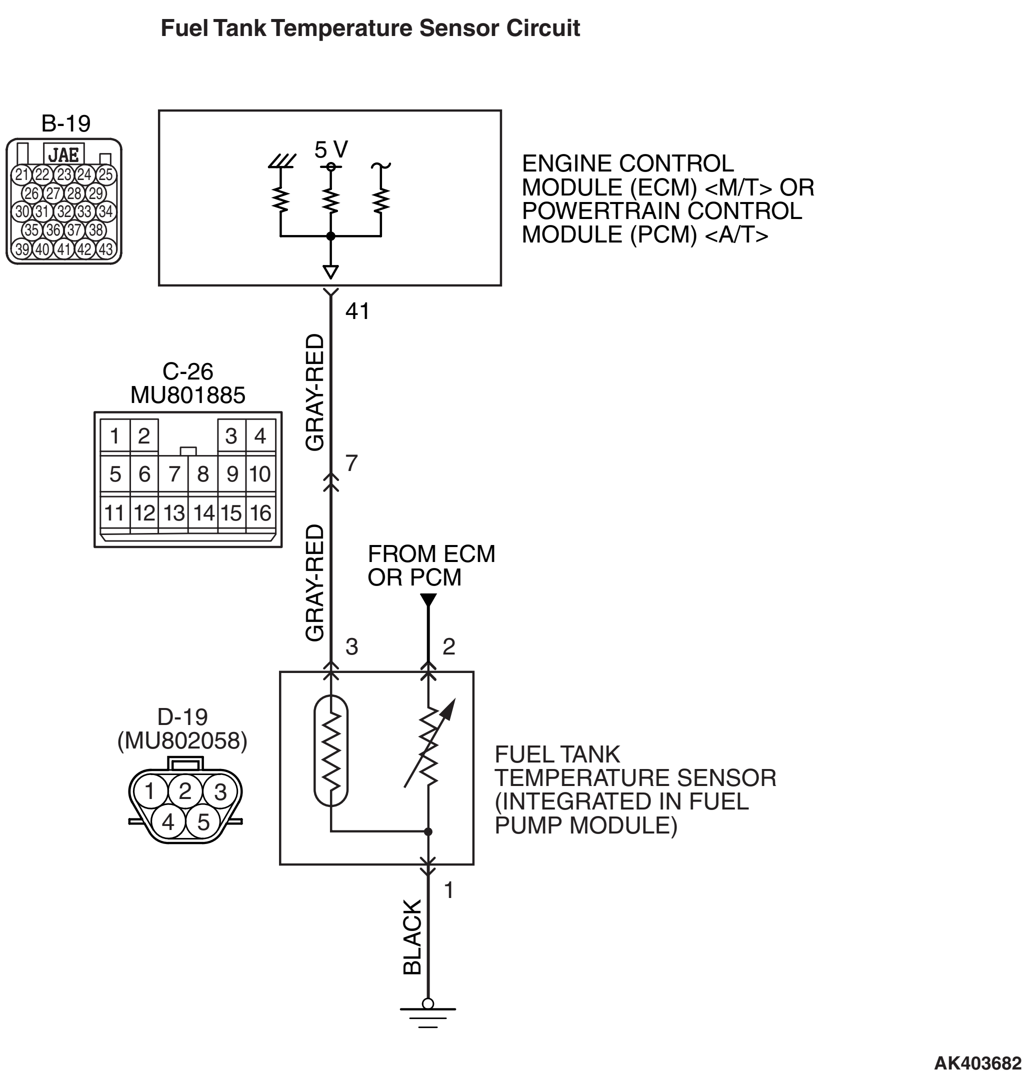
(2) Check the diagnostic trouble code (DTC).

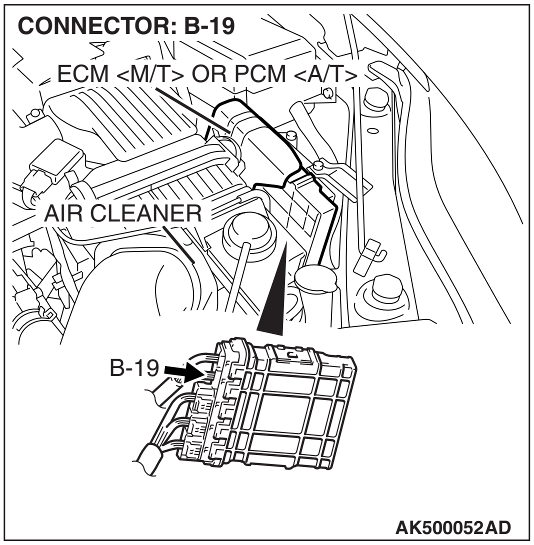
Q: Is DTC P0175 output?

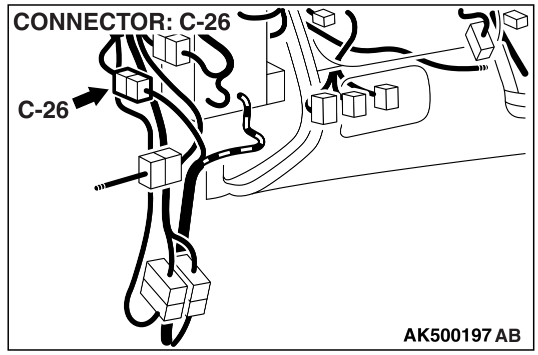
YES : Retry the troubleshooting.

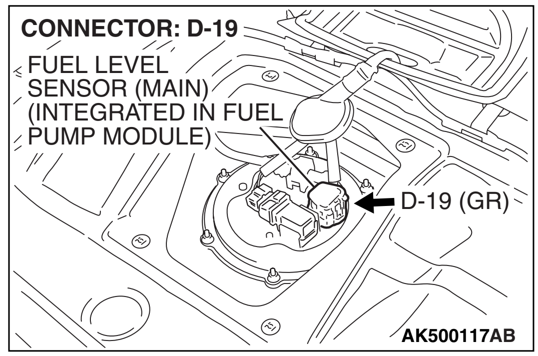
NO : The inspection is complete.

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance









CIRCUIT OPERATION

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

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM <M/T> or the PCM <A/T> detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

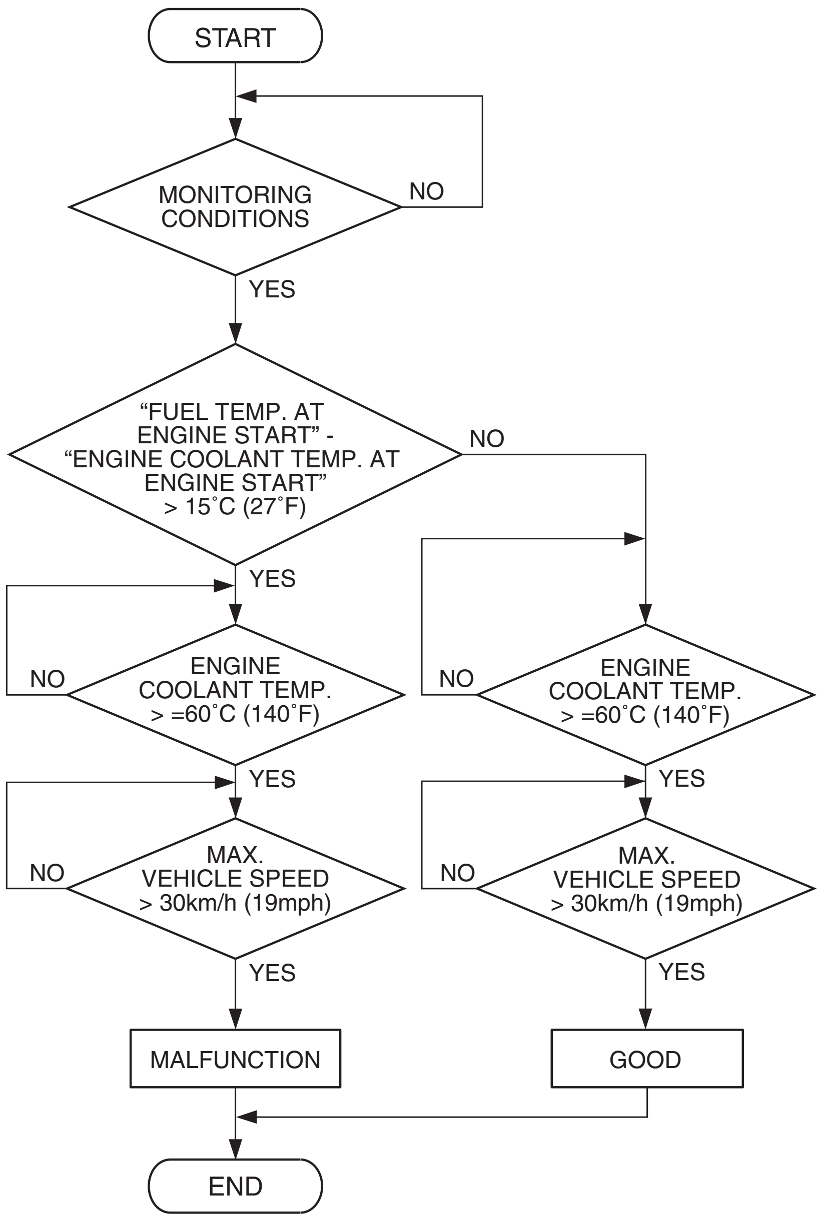
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 14 P.13B-6.

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

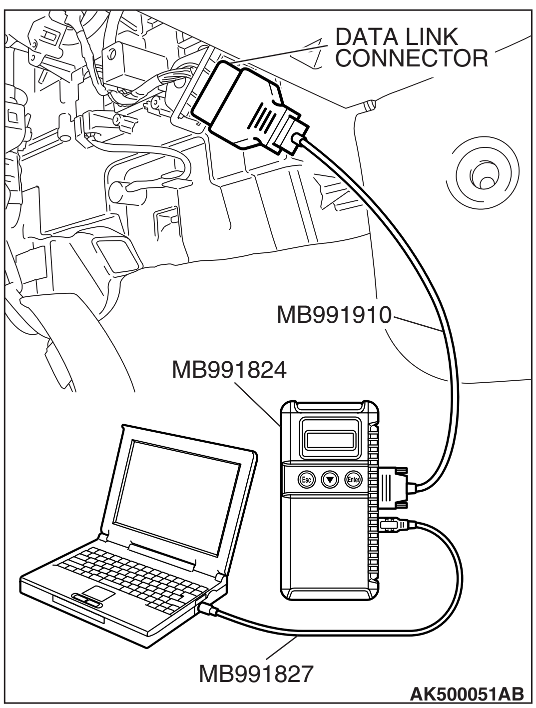
- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

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
  - MB991910: Main Harness A
- MB991923: Power Plant ECU Check Harness



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

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

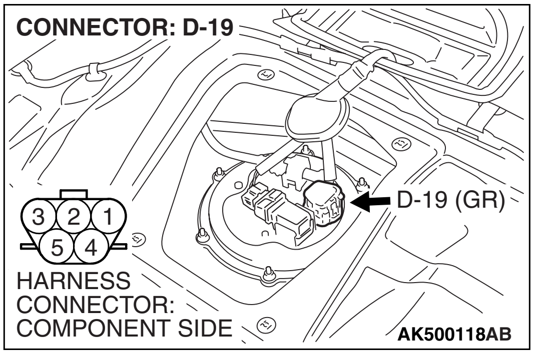
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.

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

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

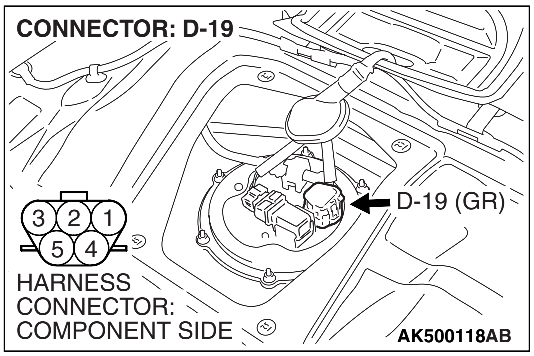


STEP 2. Check harness connector D-19 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

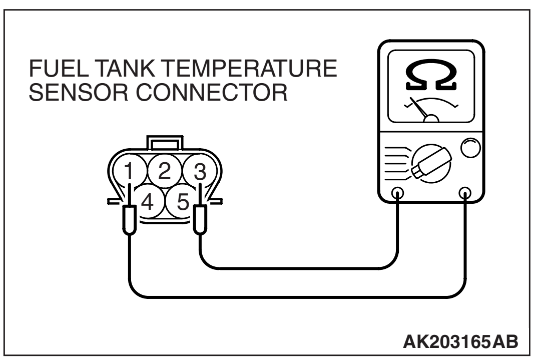
YES : Go to Step 3.

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



STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-19.



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

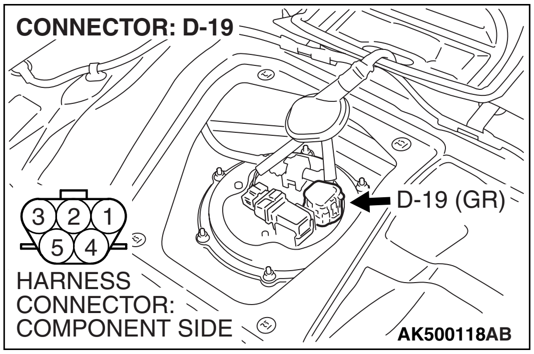
Standard value:
0.5 – 12.0 kΩ

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

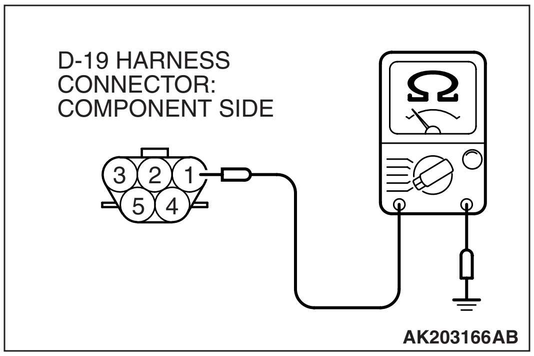
YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 12.

STEP 4. Check the continuity at fuel tank temperature sensor harness side connector D-19.



(1) Disconnect the connector D-19 and measure at the harness side.

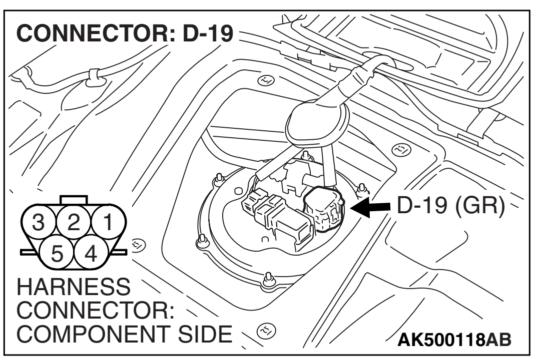


(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

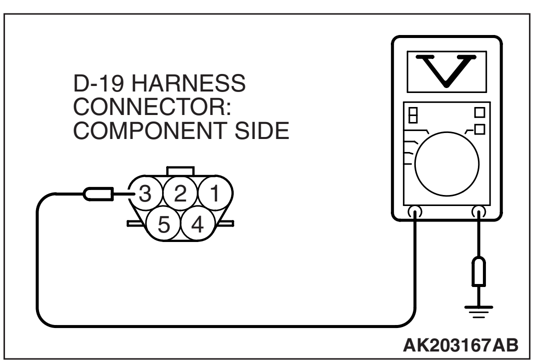
Q: Does continuity exist?

YES : Go to Step 5.
NO : Repair harness wire between fuel tank temperature sensor connector D-19 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 12.

STEP 5. Measure the sensor supply voltage at fuel tank temperature sensor harness side connector D-19.



(1) Disconnect the connector D-19 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

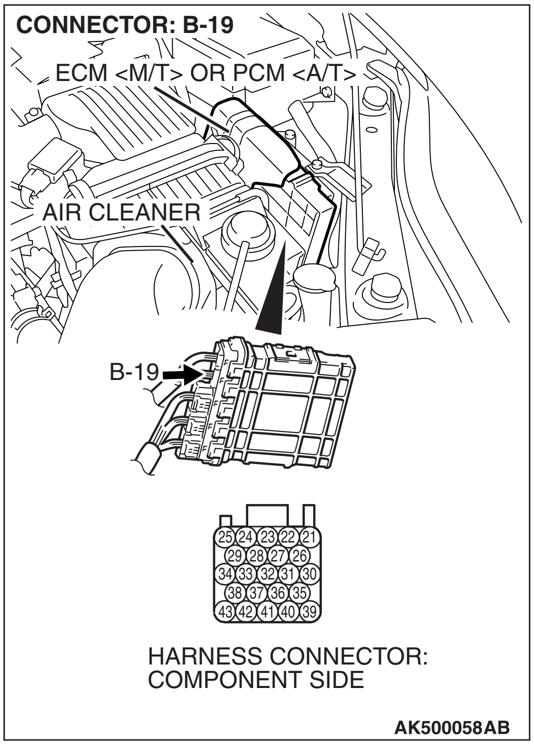


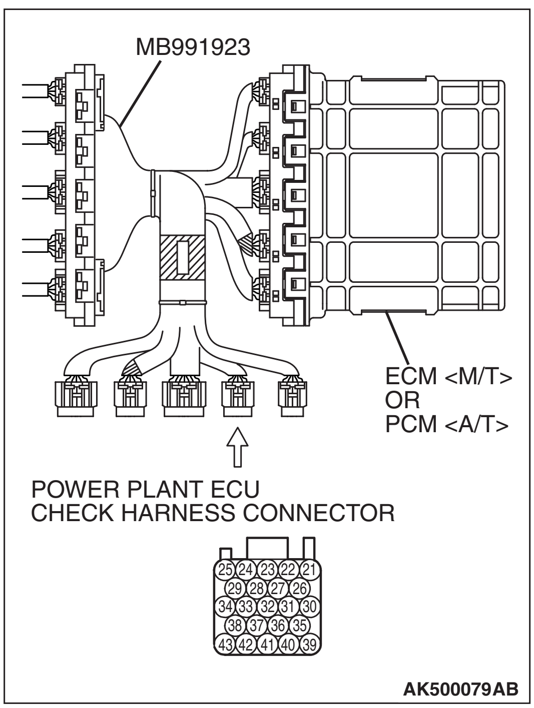
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts

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

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

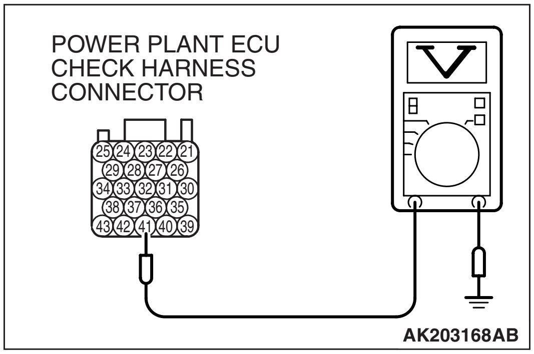
YES : Go to Step 6.
NO : Go to Step 10.





STEP 6. Measure the sensor supply voltage at ECM <M/T> or PCM <A/T> connector B-19 by using power plant ECU check harness special tool MB991923.

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



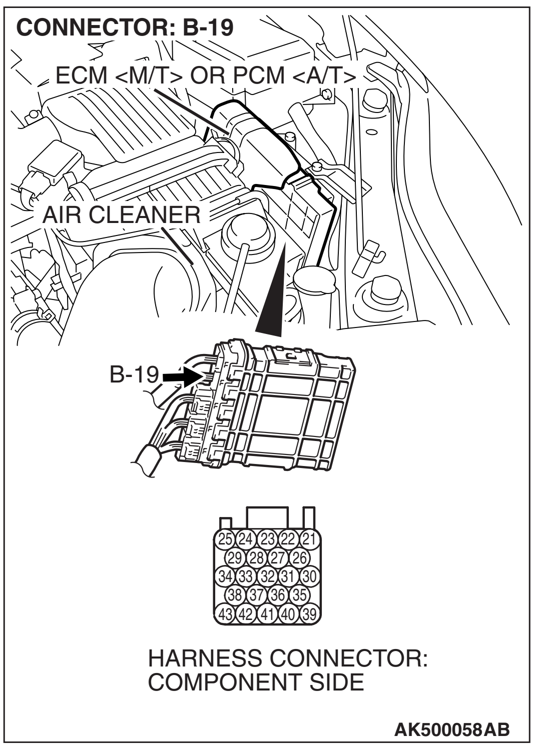
(3) Measure the voltage between terminal No. 41 and ground.

- When fuel tank temperature is 0° C (32° F), voltage should be between 2.7 and 3.1 volts.
- When fuel tank temperature is 20° C (68° F), voltage should be between 2.1 and 2.5 volts.
- When fuel tank temperature is 40° C (104° F), voltage should be between 1.6 and 2.0 volts.
- When fuel tank temperature is 80° C (176° F), voltage should be between 0.8 and 1.2 volts.

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

Q: Is the measured voltage normal?

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

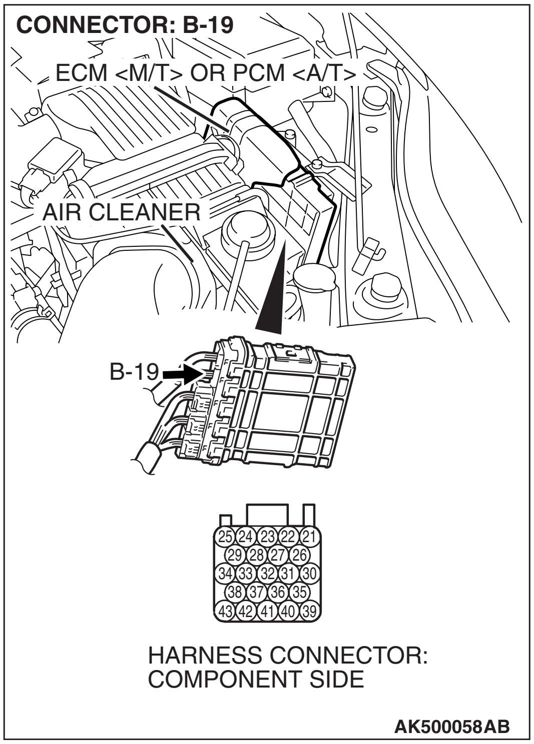


STEP 7. Check harness connector B-19 at PCM for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector C-26 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 D-19 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 41) because of open circuit. Then go to Step 12.

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



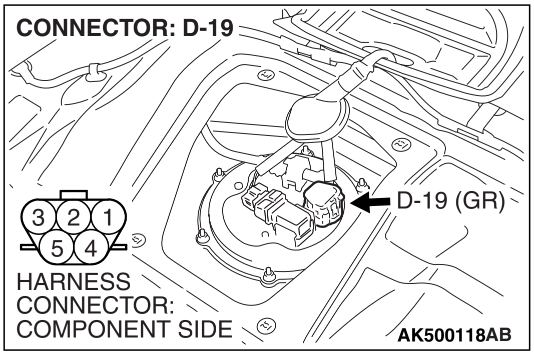
STEP 8. Check harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

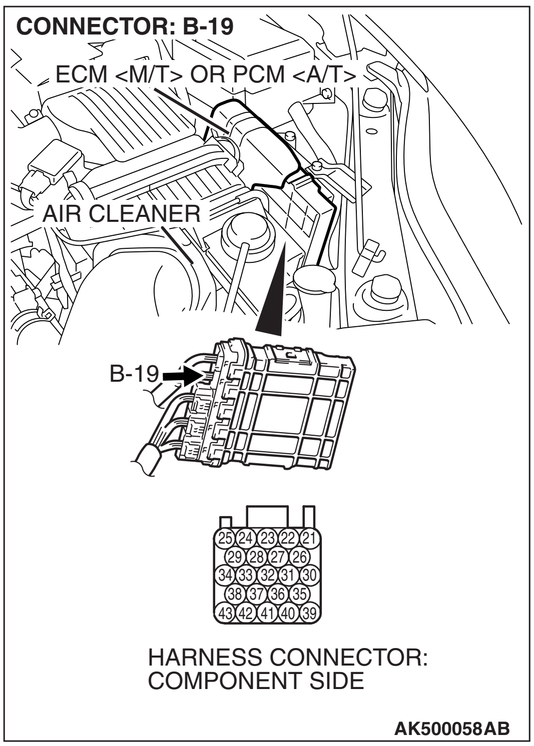
Q: Is the harness connector in good condition?

YES : Go to Step 9.

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

STEP 9. Check for short circuit to ground between fuel tank temperature sensor connector D-19 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 41).



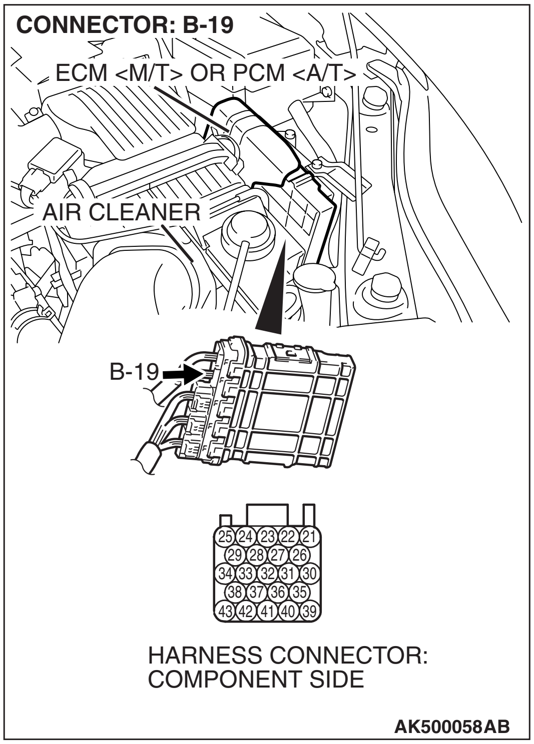


NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.



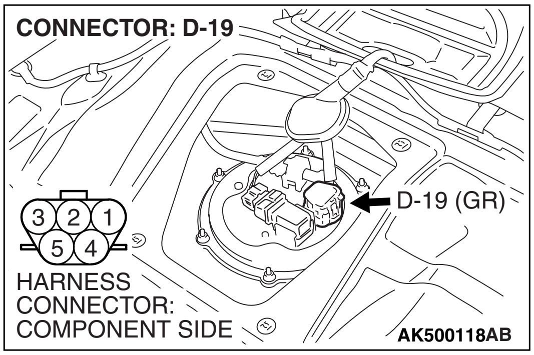
STEP 10. Check harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

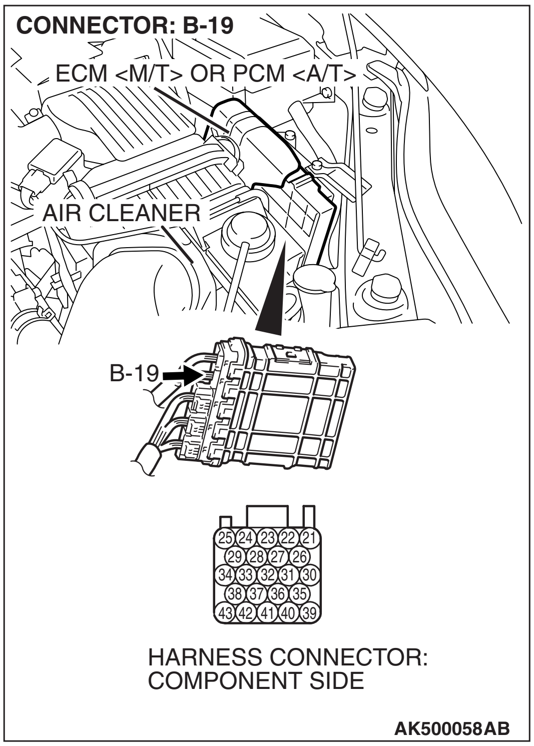
Q: Is the harness connector in good condition?

YES : Go to Step 11.

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

STEP 11. Check for harness damage between fuel tank temperature sensor connector D-19 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 41).





NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 14 P.13B-6.

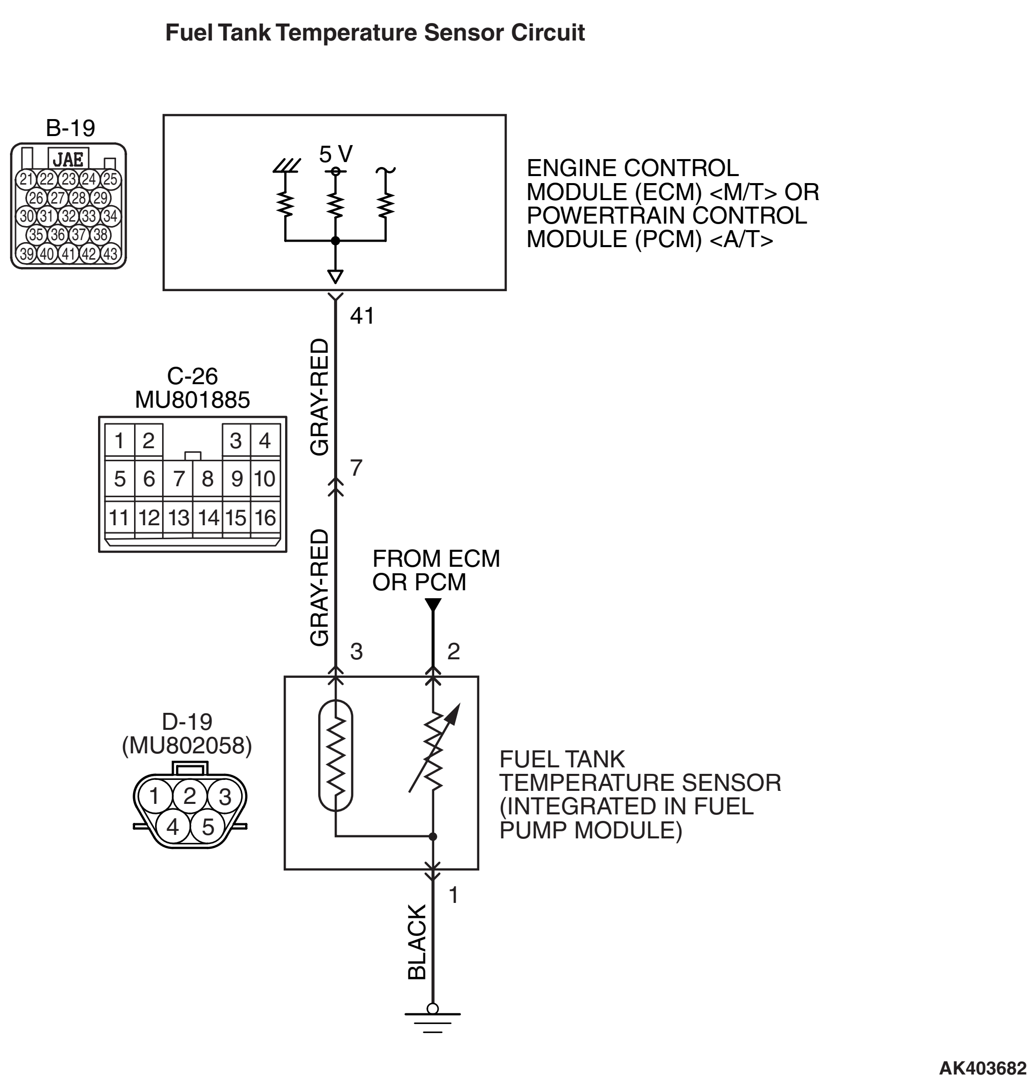
(2) Check the diagnostic trouble code (DTC).

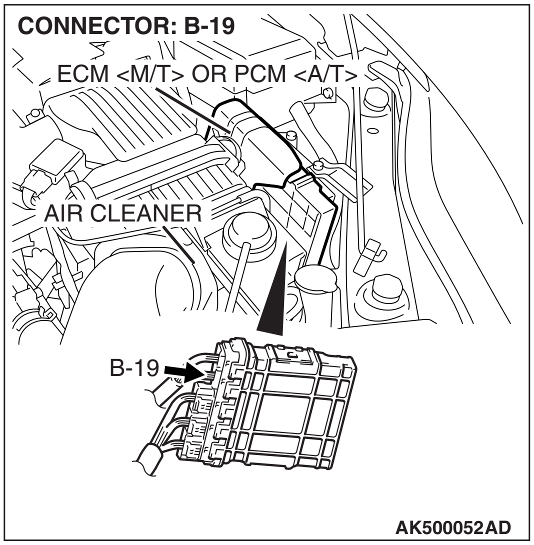
Q: Is DTC P0181 set?

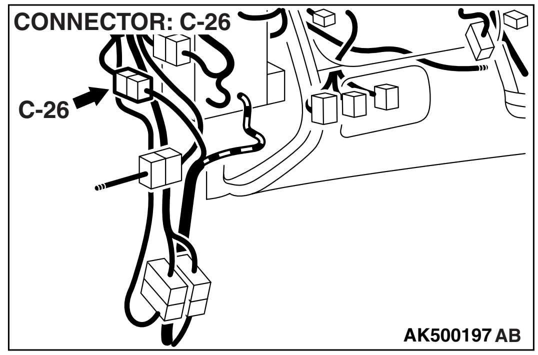
YES : Retry the troubleshooting.

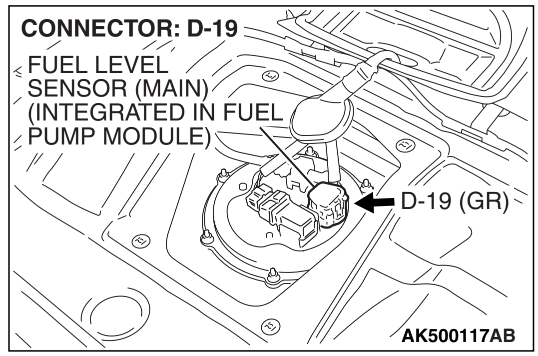
NO : The inspection is complete.

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input









CIRCUIT OPERATION

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

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM <M/T> or the PCM <A/T> 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)

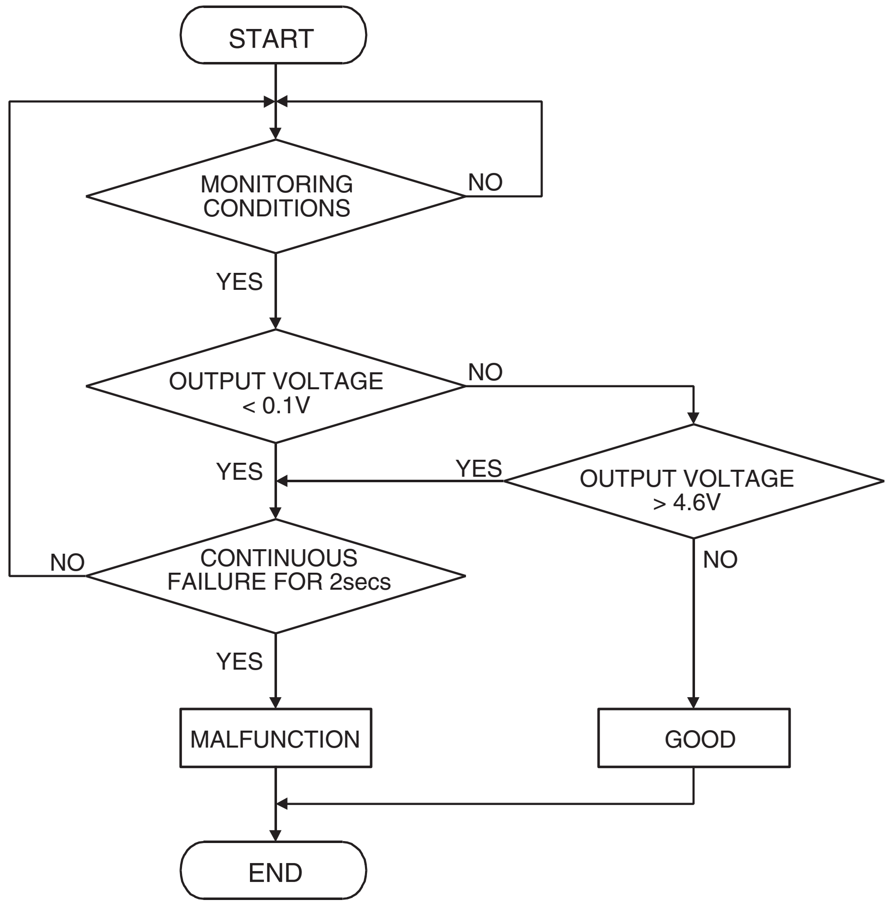
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

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

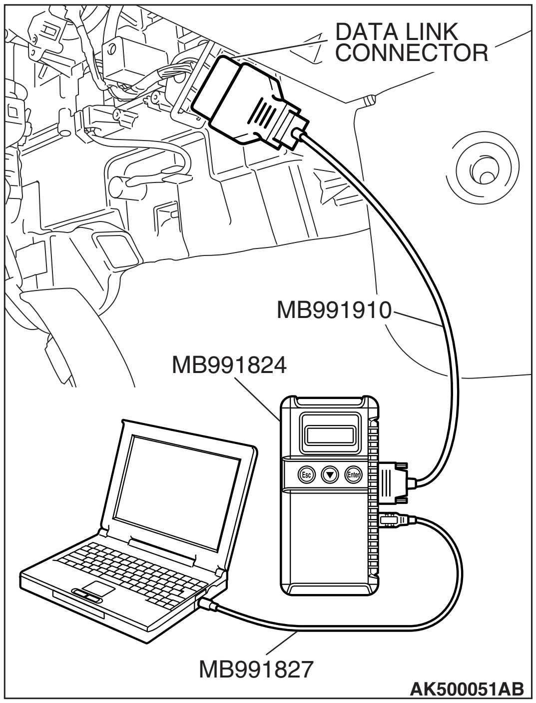
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

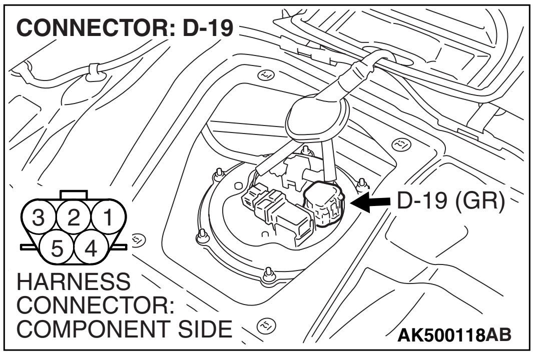
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

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

Q: Is the sensor operating properly?

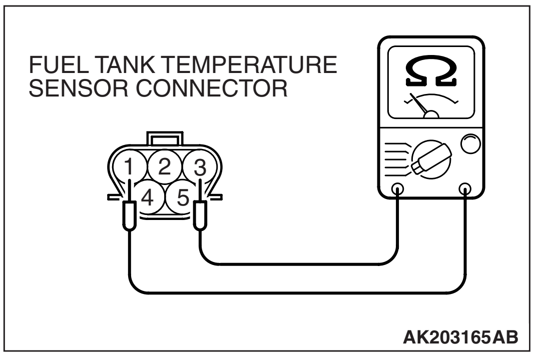
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-19.

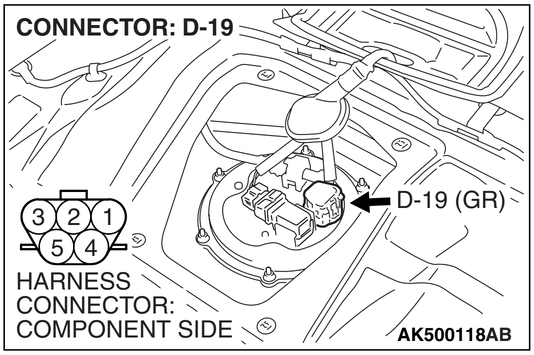


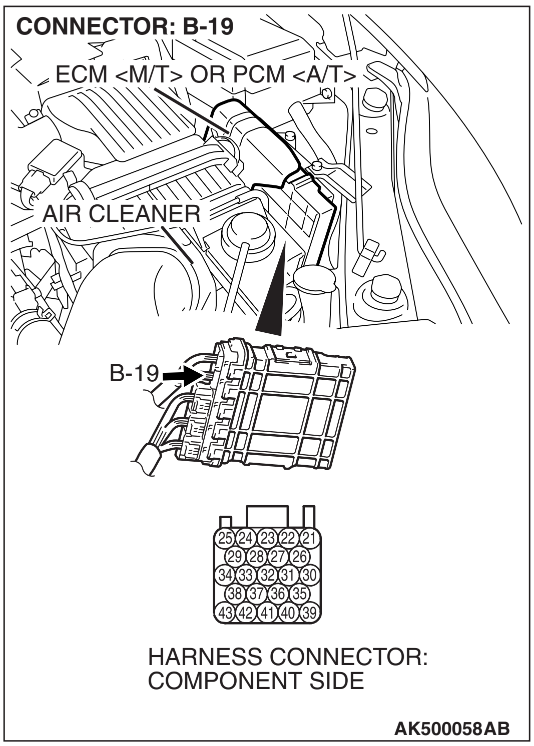
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kΩ

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

YES : Go to Step 3.
NO : Replace the fuel tank temperature sensor. Then go to Step 5.





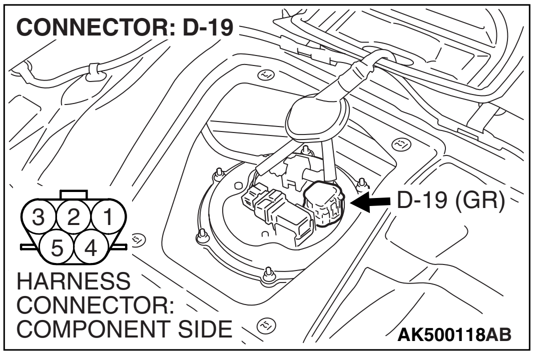
STEP 3. Check harness connector D-19 at the fuel tank temperature sensor and harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

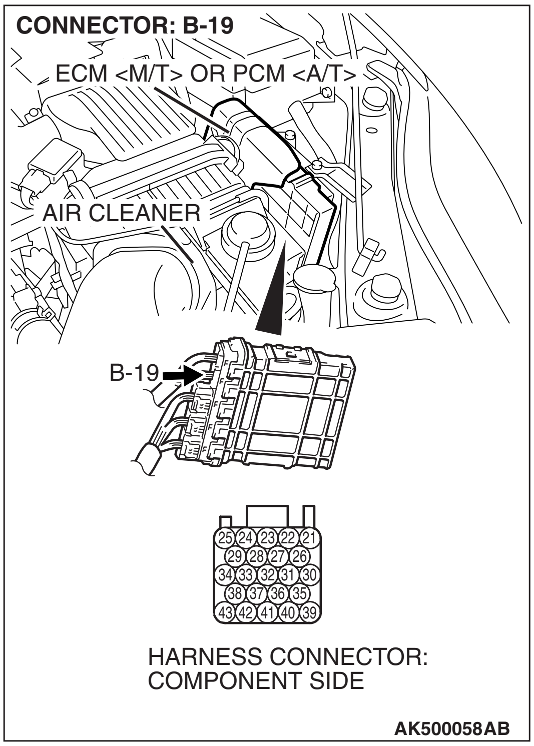
Q: Is the harness connector in good condition?

YES : Go to Step 4.

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

STEP 4. Check for short circuit to ground between fuel tank temperature sensor connector D-19 and ECM <M/T> or PCM <A/T> connector B-19.





NOTE: Check harness after checking intermediate connector C-26. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.

NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

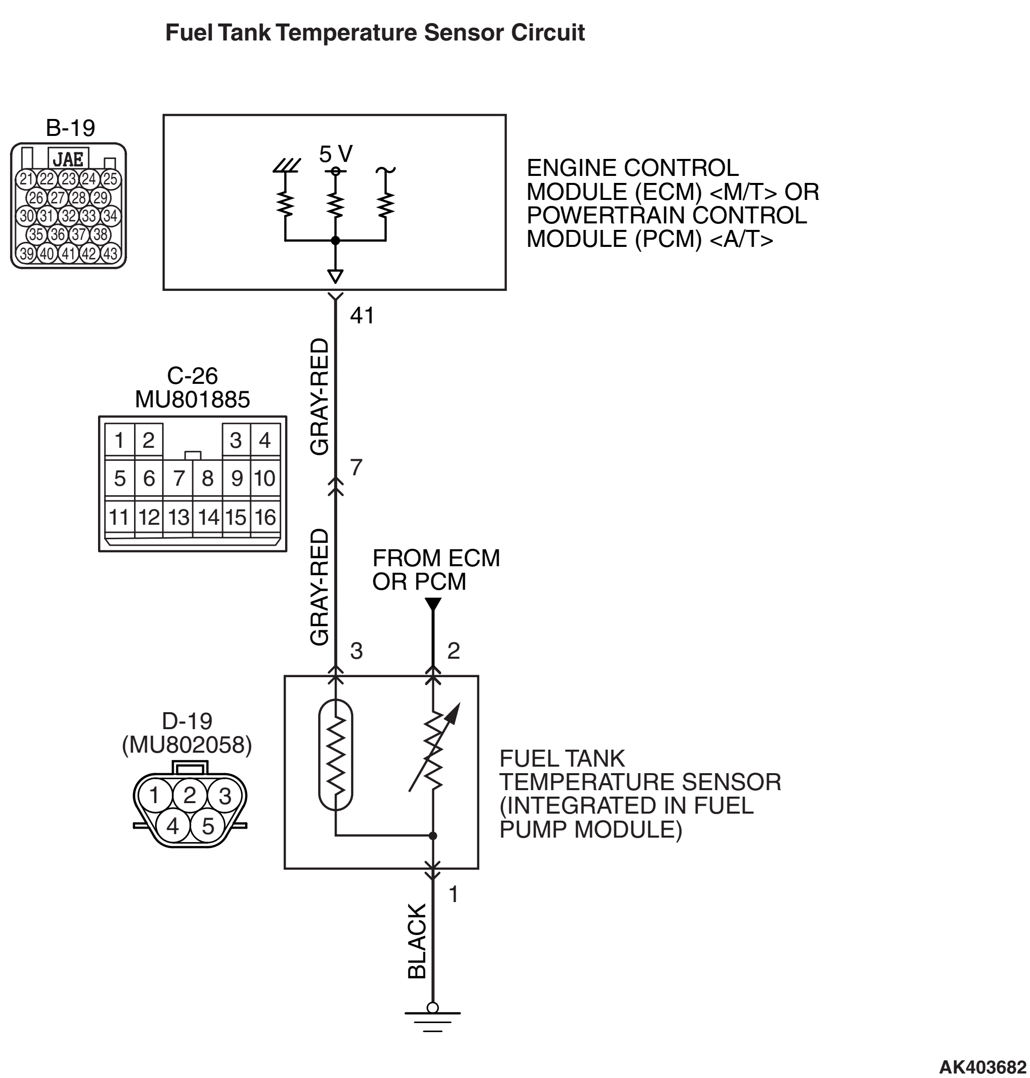
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.

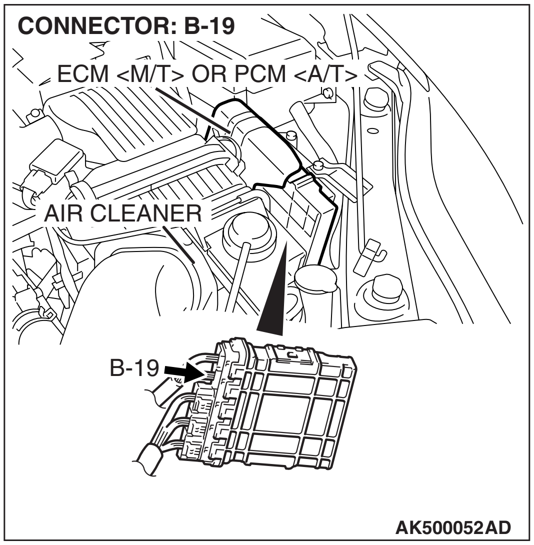
(2) Check the diagnostic trouble code (DTC).

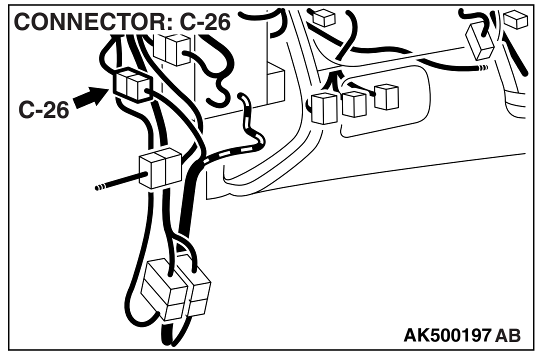
Q: Is DTC P0182 set?

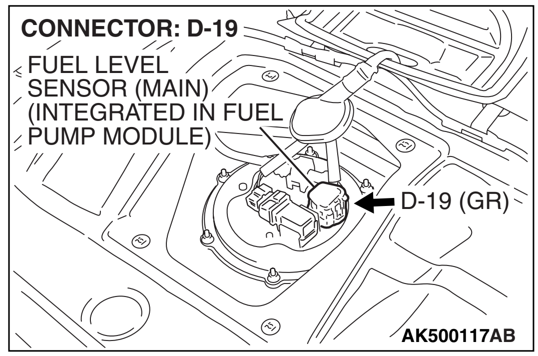
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input









CIRCUIT OPERATION

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

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM <M/T> or the PCM <A/T> 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)

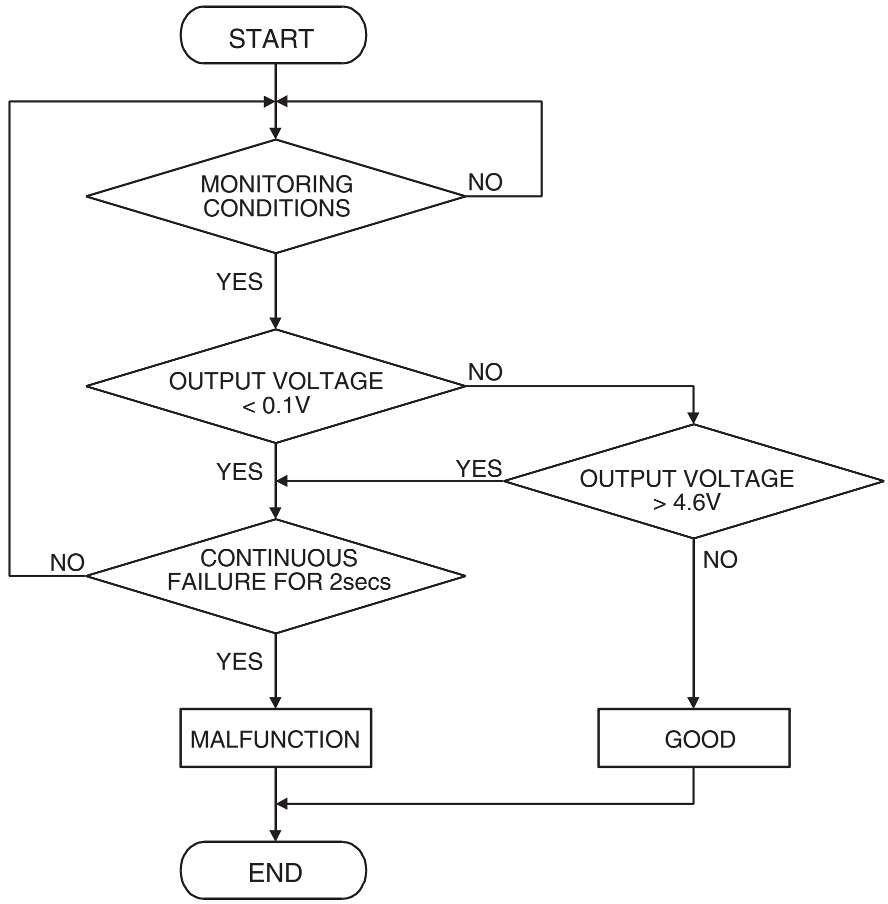
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

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

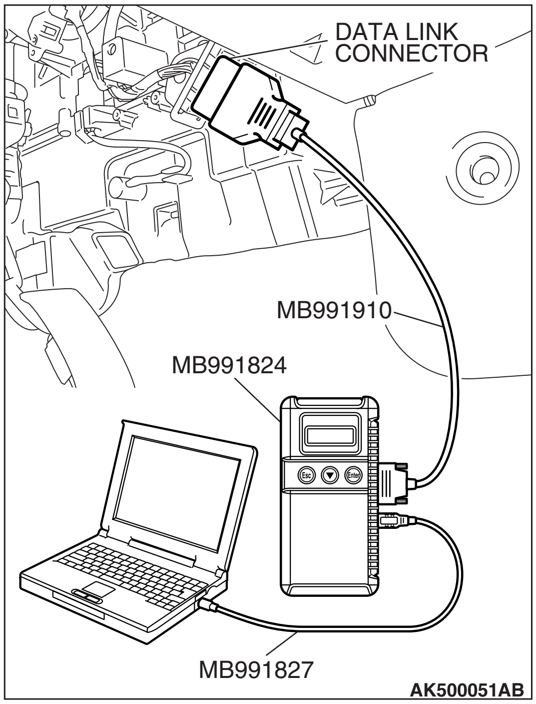
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Open fuel tank temperature sensor circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

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

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



⚠ CAUTION

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

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

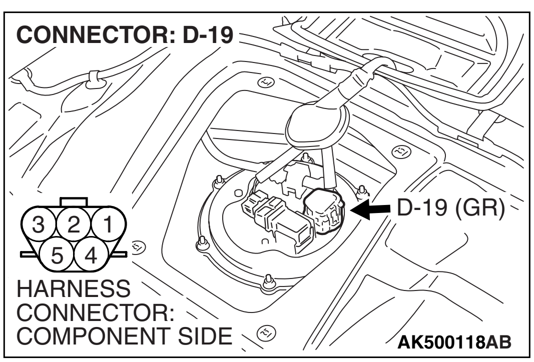
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

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

NO : Go to Step 2.

STEP 2. Check harness connector D-19 at the fuel tank temperature sensor for damage.

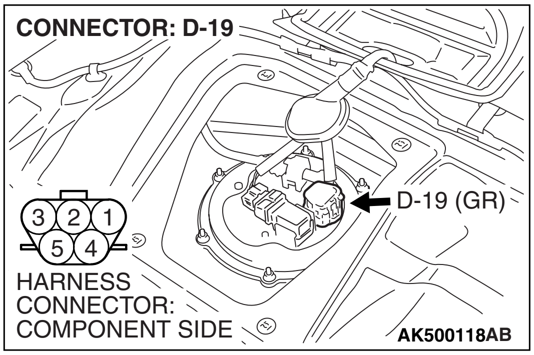


Q: Is the harness connector in good condition?

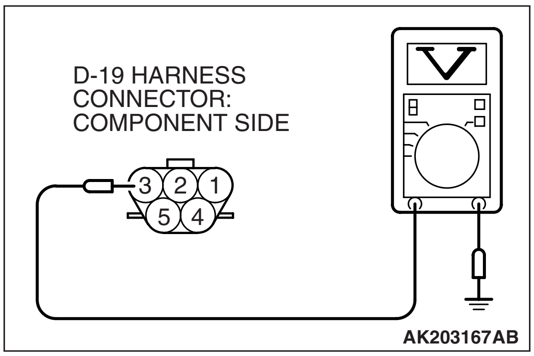
YES : Go to Step 3.

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

STEP 3. Check the fuel tank temperature sensor.



(1) Disconnect the fuel tank temperature sensor connector D-19.



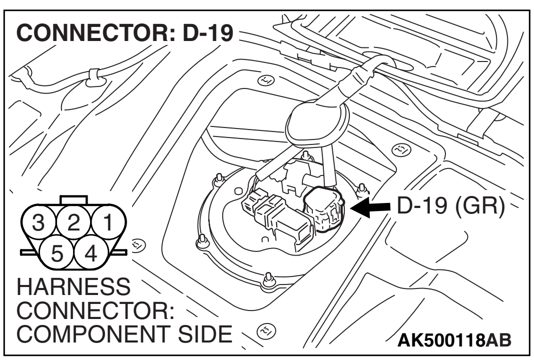
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 – 12.0 kΩ

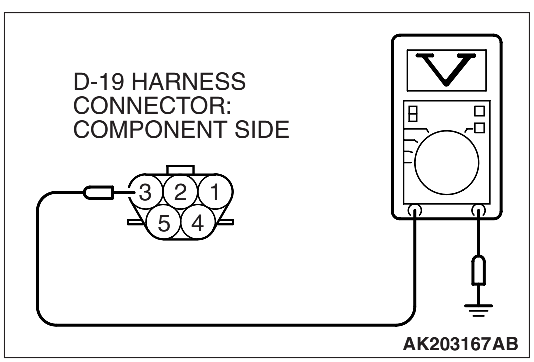
Q: Is the measured resistance between 0.5 and 12.0 kΩ?

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

STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector D-19.



(1) Disconnect the connector D-19 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.

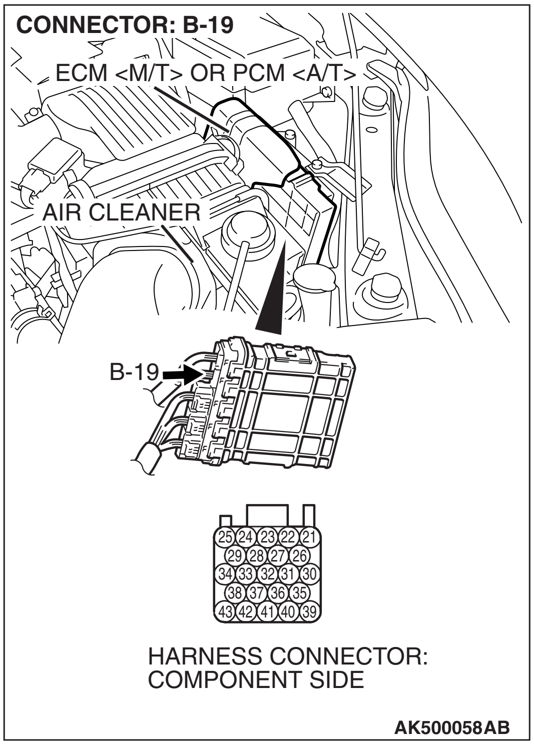
(4) Turn the ignition switch to the "LOCK" (OFF) position.

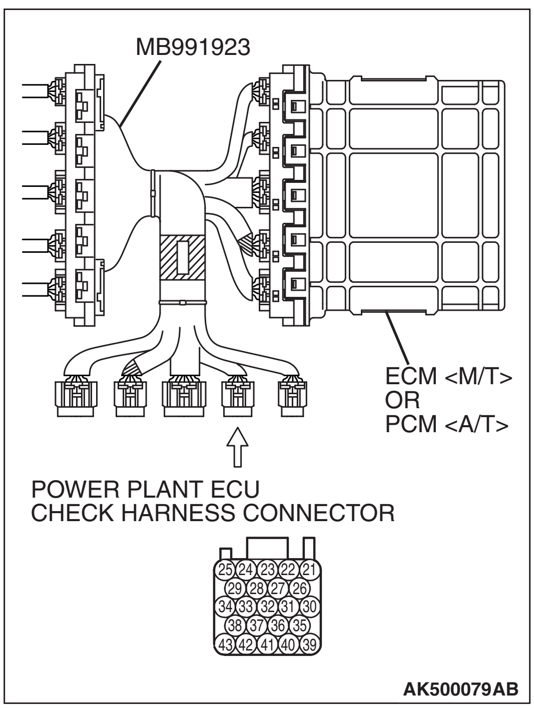
Q: Is the measured voltage between 4.5 and 4.9 volts?

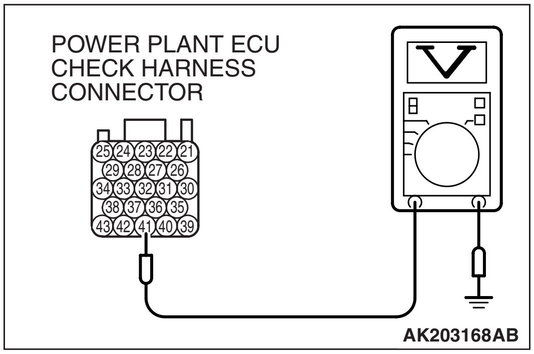
YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Check the sensor supply voltage at ECM <M/T> or PCM <A/T> connector B-19 by using power plant ECU check harness special tool MB991923.

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the fuel tank temperature sensor connector D-19.
(3) Turn the ignition switch to the "ON" position.







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

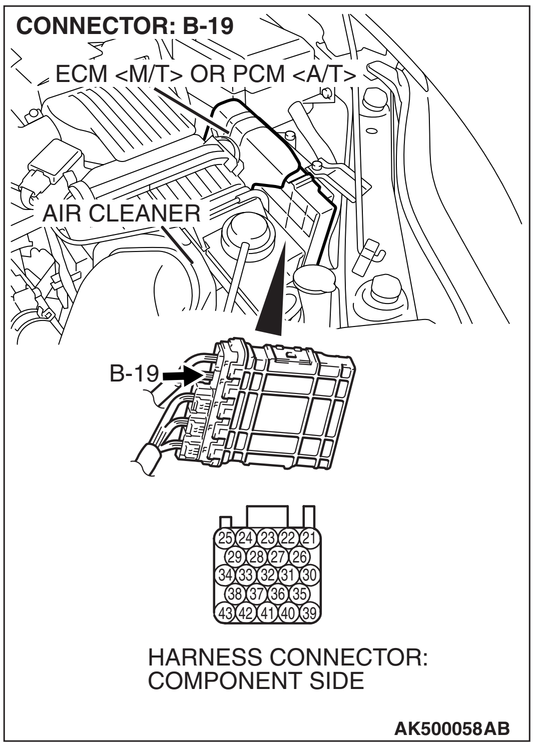
(5) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 6.

NO : Go to Step 7.

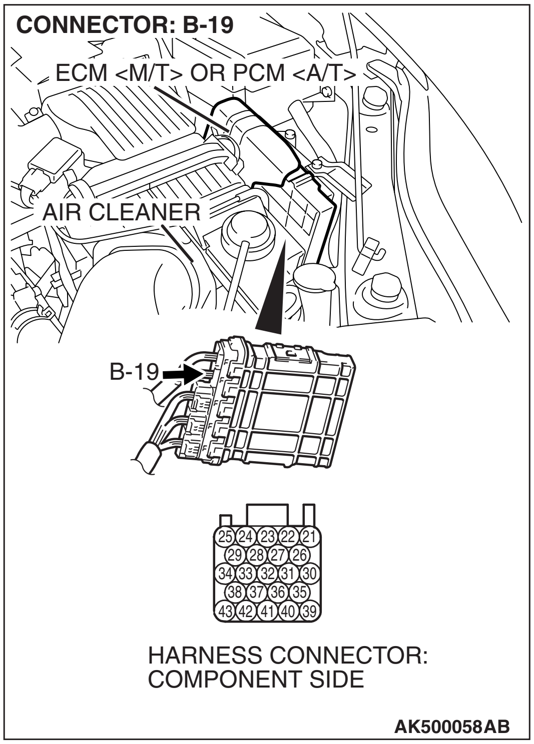
STEP 6. Check harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.



Q: Is the harness connector in good condition?

YES : Check harness connector C-26 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between fuel tank temperature sensor connector D-19 and ECM <M/T> or PCM <A/T> connector B-19 because of open circuit. Then go to Step 11.

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

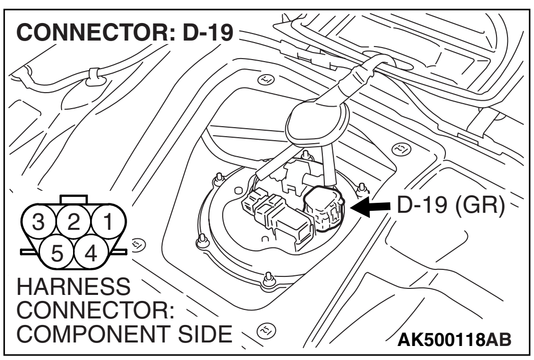


STEP 7. Check harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

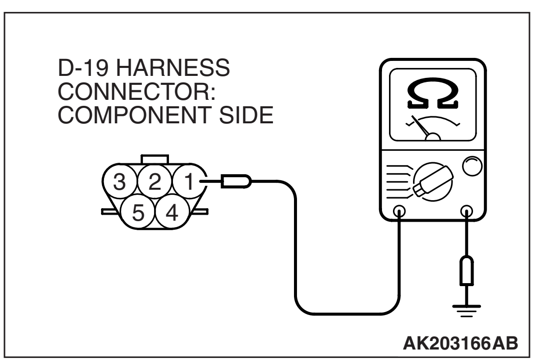
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 11.

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



STEP 8. Check the continuity at fuel tank temperature sensor harness side connector D-19.

(1) Disconnect the connector D-19 and measure at the harness side.

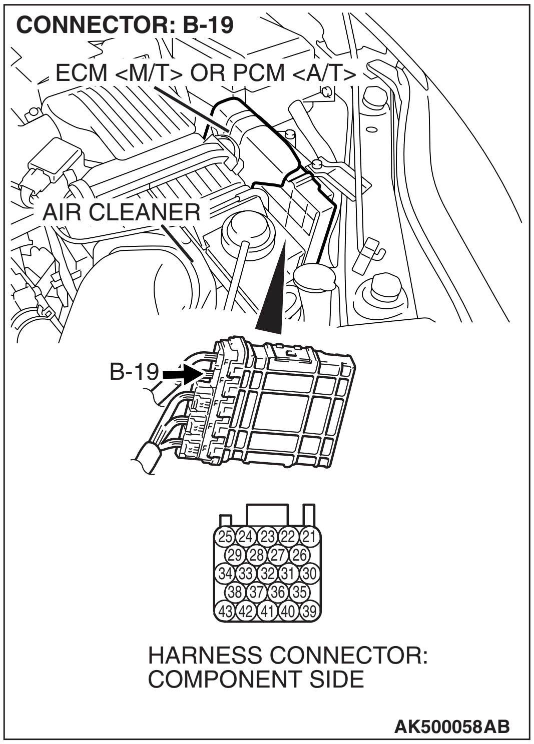


(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 9.

NO : Repair harness wire between fuel tank temperature sensor connector D-19 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 11.



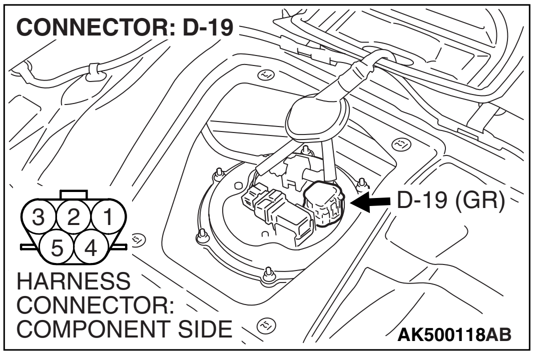
STEP 9. Check harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

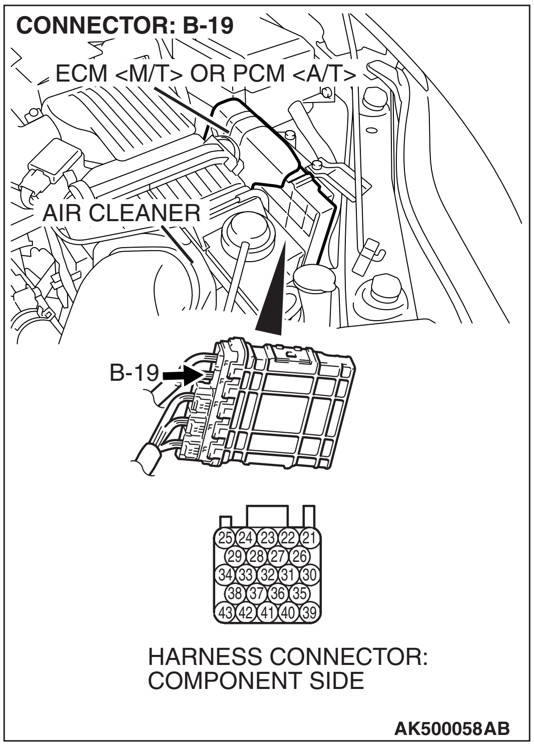
Q: Is the harness connector in good condition?

YES : Go to Step 10.

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

STEP 10. Check for open circuit and harness damage between fuel tank temperature sensor connector D-19 and ECM <M/T> or PCM <A/T> connector B-19.





NOTE: Check harness after checking intermediate connector C-26. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.00E-2.

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

Q: Is DTC P0183 set?

YES : Retry the troubleshooting.

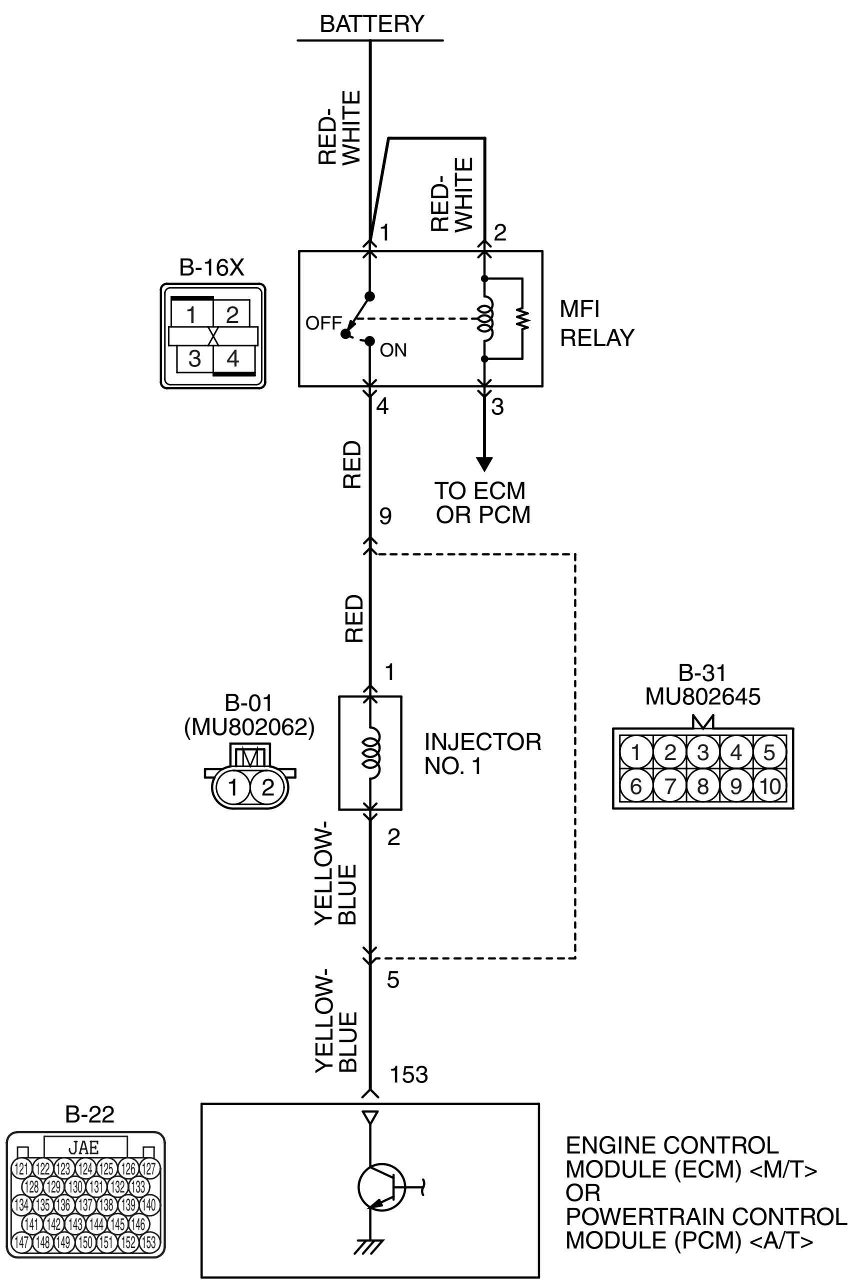
NO : The inspection is complete.

DTC P0201: Injector Circuit Malfunction - Cylinder 1

⚠ CAUTION

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

Injector Circuit - Cylinder 1



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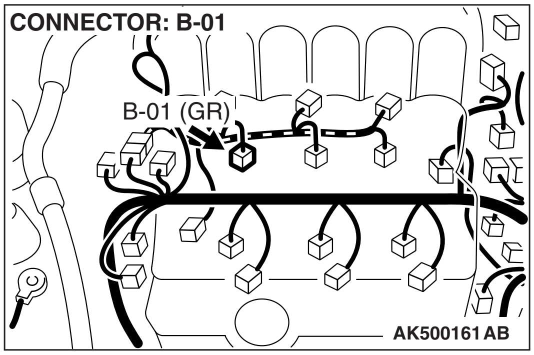
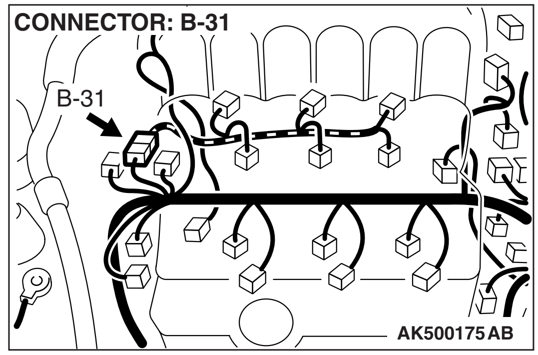
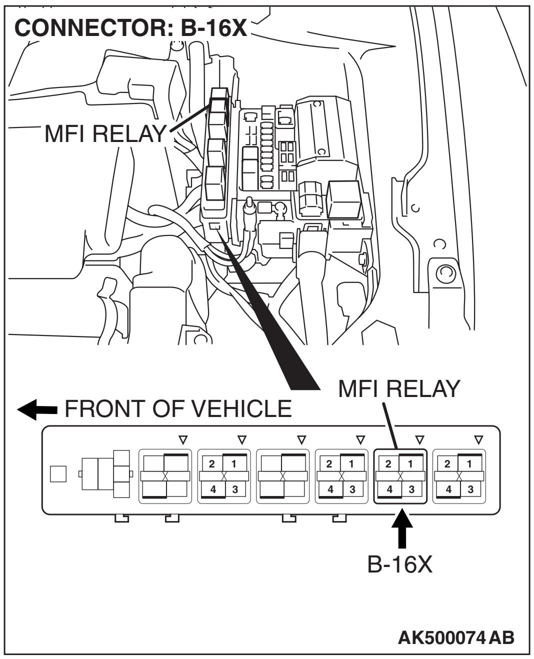
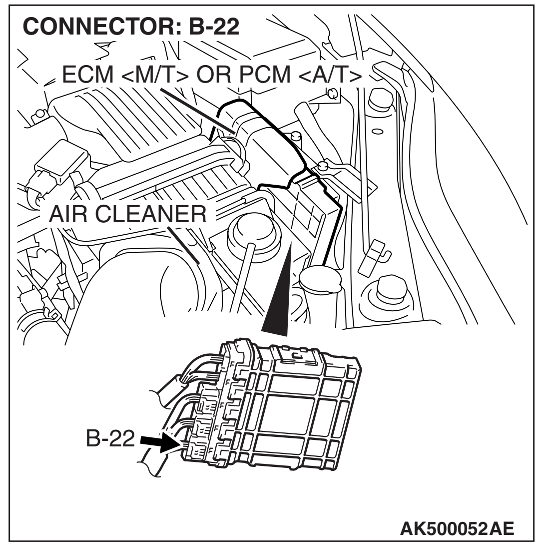








CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or the PCM <A/T> "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 ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

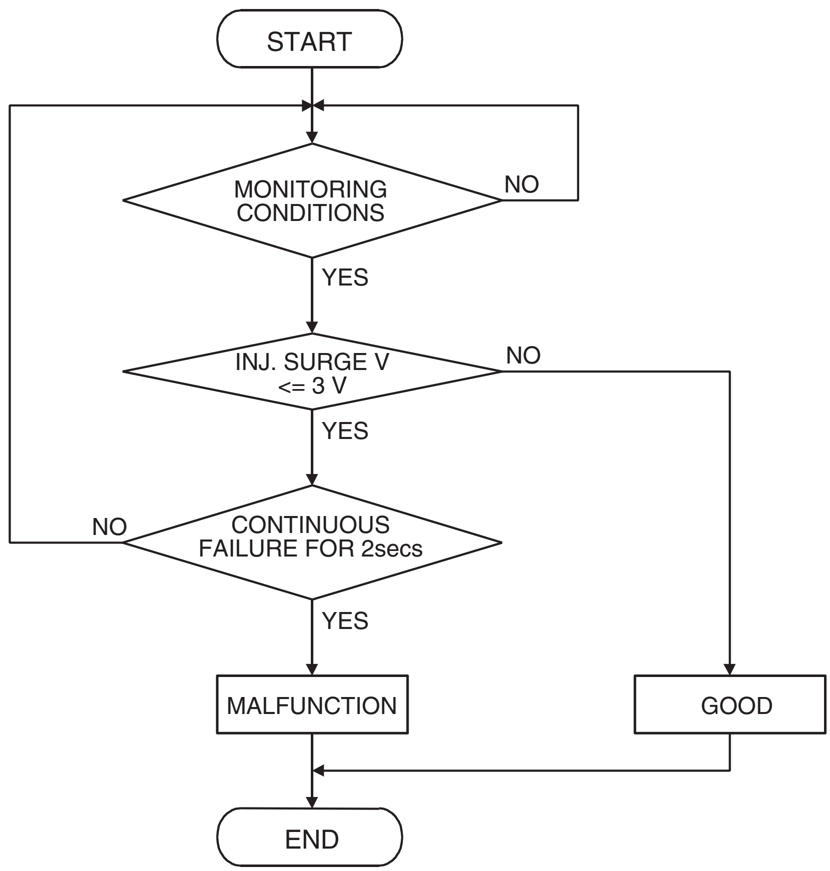
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



AK401614

Check Condition

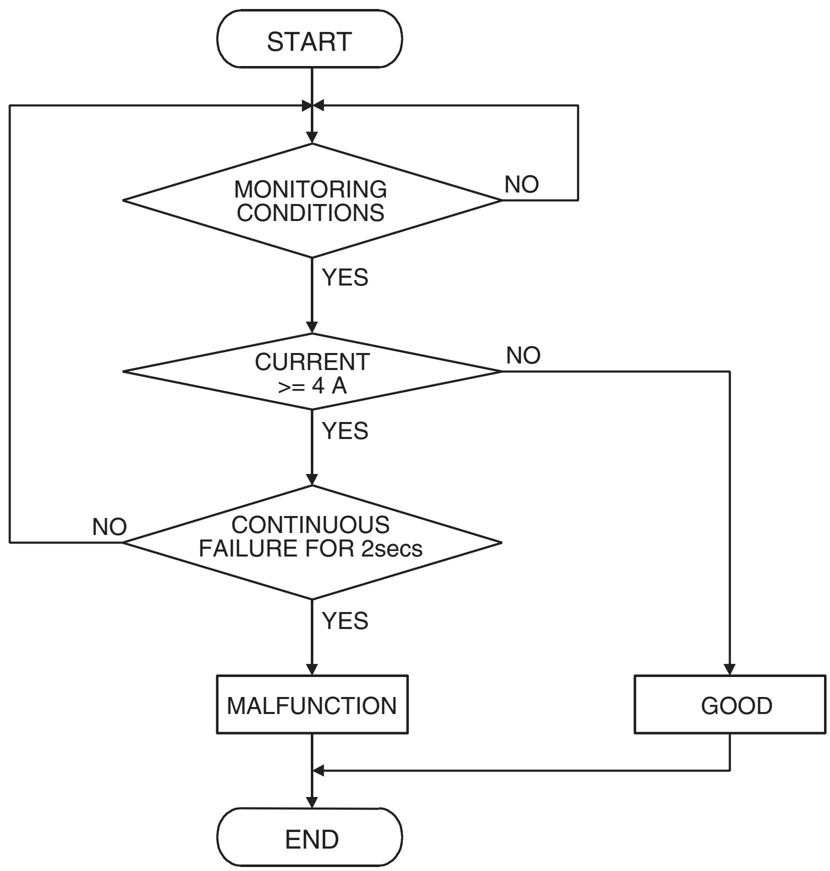
- Engine is running.

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 22 P.13B-6.

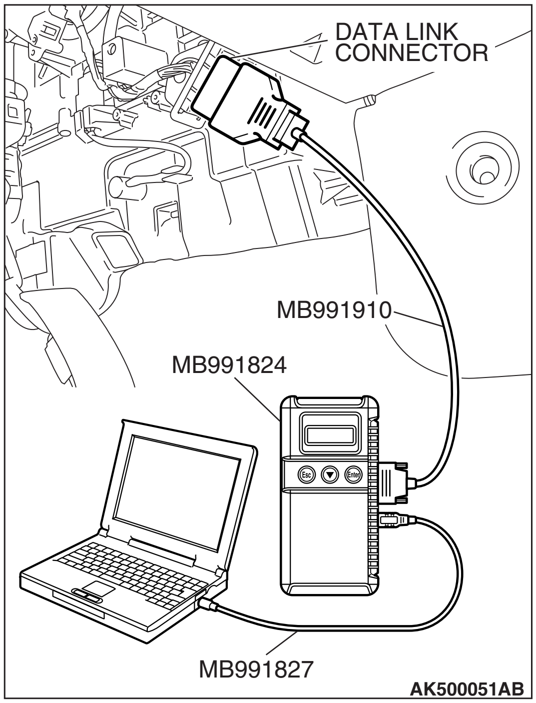
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 1 cylinder injector failed.
- Open or shorted No.1cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



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

⚠ **CAUTION**

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

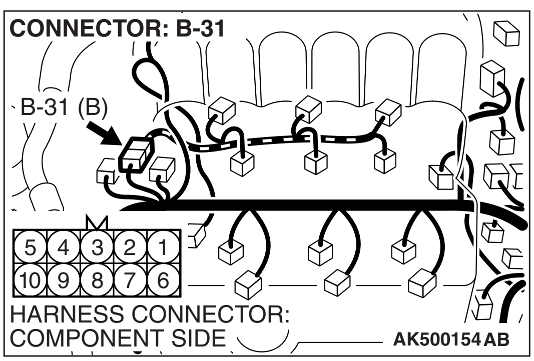
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 1, No. 1 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly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

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.



STEP 2. Check harness connector B- 31 at intermediate connector for damage.

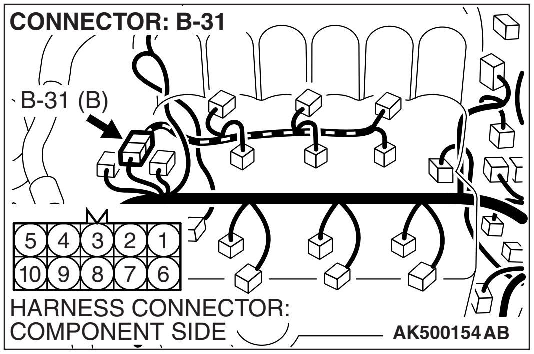
Q: Is the harness connector in good condition?

YES : Go to Step 3.

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

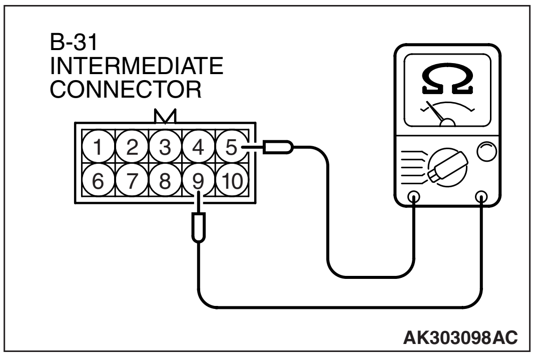
STEP 3. Check the No. 1 cylinder injector resistance at intermediate connector B-31.

(1) Disconnect the intermediate connector B-31.



(2) Measure the resistance between terminal No. 5 and No. 9.

- Resistance should be between 10.5 and 13.5 ohms.



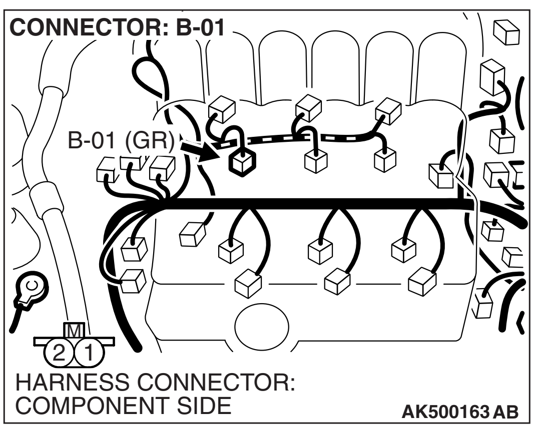
Q: Is the measured resistance between 10.5 and 13.5 ohms?

YES : Go to Step 6.

NO : Go to Step 4.

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

Remove the intake manifold.



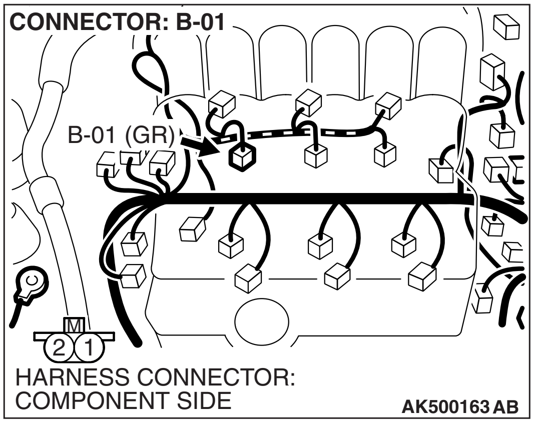
Q: Is the harness connector in good condition?

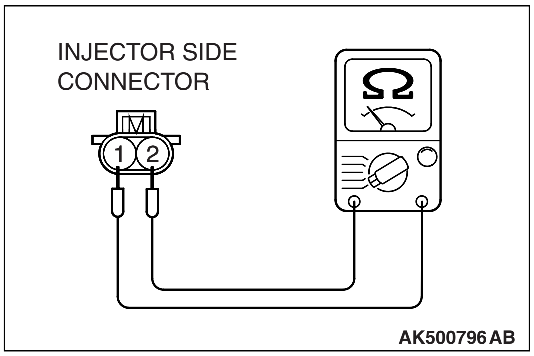
YES : Go to Step 5.

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

STEP 5. Check the No. 1 cylinder injector B-01.

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





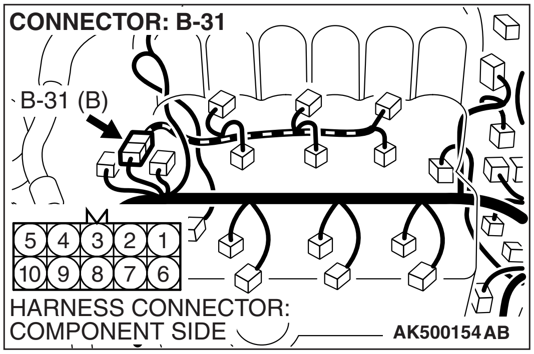
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

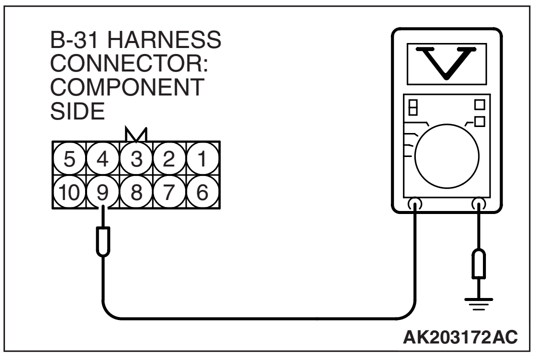
YES : Repair harness wire between intermediate connector B-31 (terminal No. 9) and injector connector B-01 (terminal No. 1) and harness wire between No.1 cylinder injector connector B-01 (terminal No. 2) and intermediate connector B-31 (terminal No. 5) because of open circuit or short circuit to ground or harness damage.
Then go to Step 12.

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



STEP 6. Measure the power supply voltage at intermediate connector B-31.

(1) Disconnect the connector B-31 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.

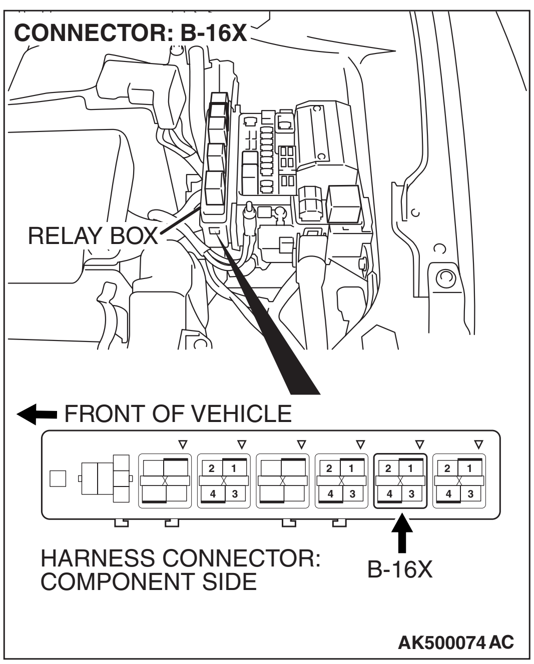


(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

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

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

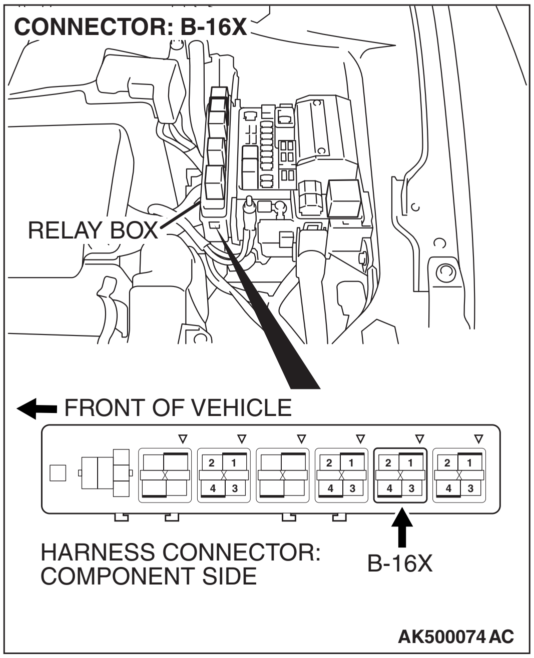
YES : Go to Step 8.
NO : Go to Step 7.

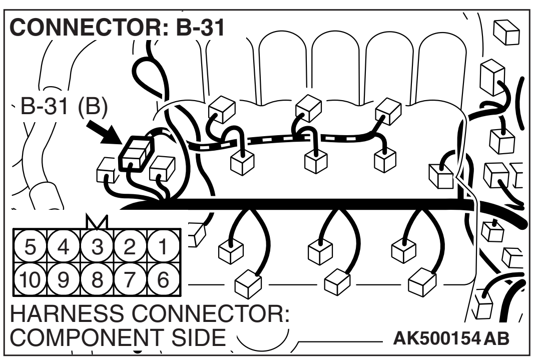


STEP 7. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



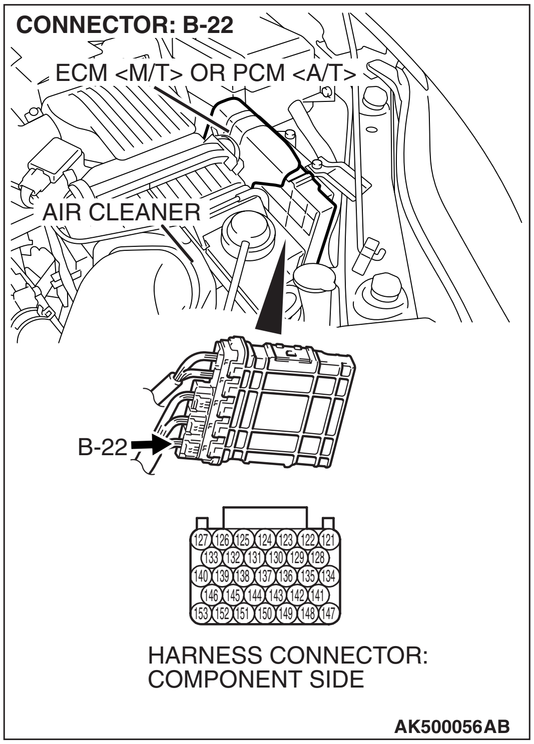


STEP 8. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

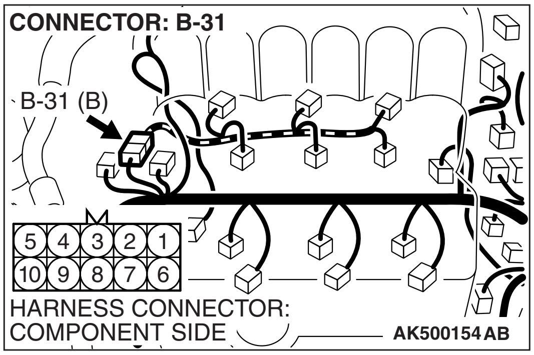


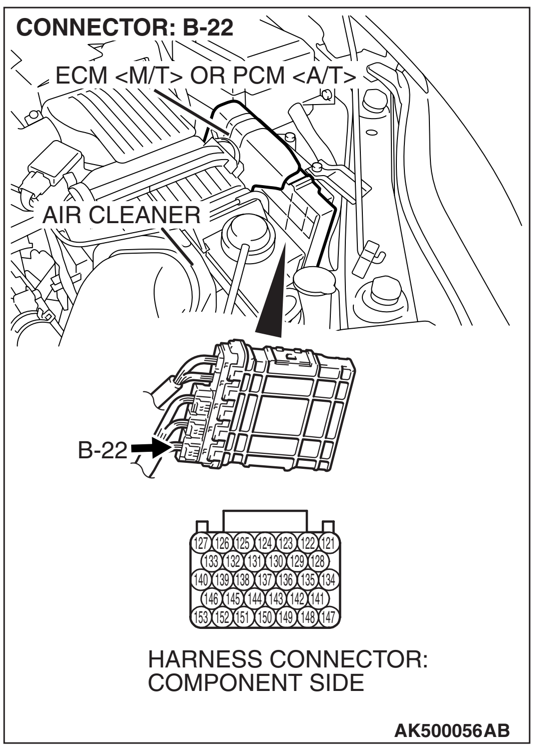
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





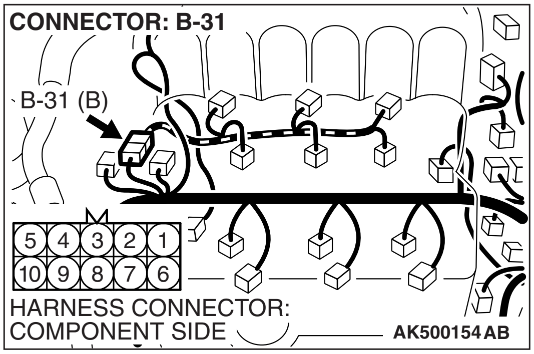
STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-31 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 153).

Q: Is the harness wire in good condition?

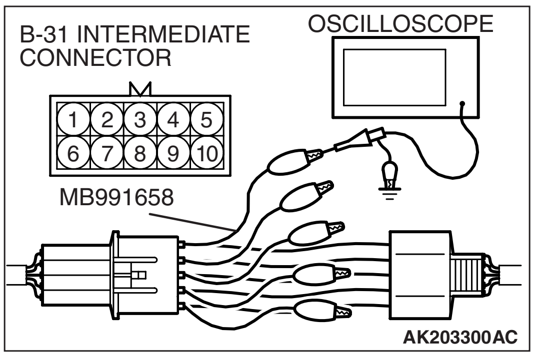
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

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



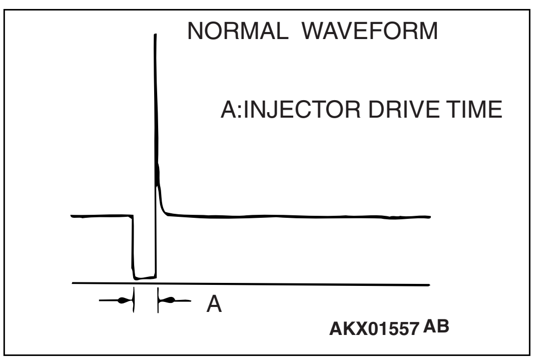
(1) Disconnect the intermediate connector B-31 and connect the test harness MB991658 between the separated connectors.



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

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Then connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No.153.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

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

STEP 12. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0201 set?

YES : Retry the troubleshooting.

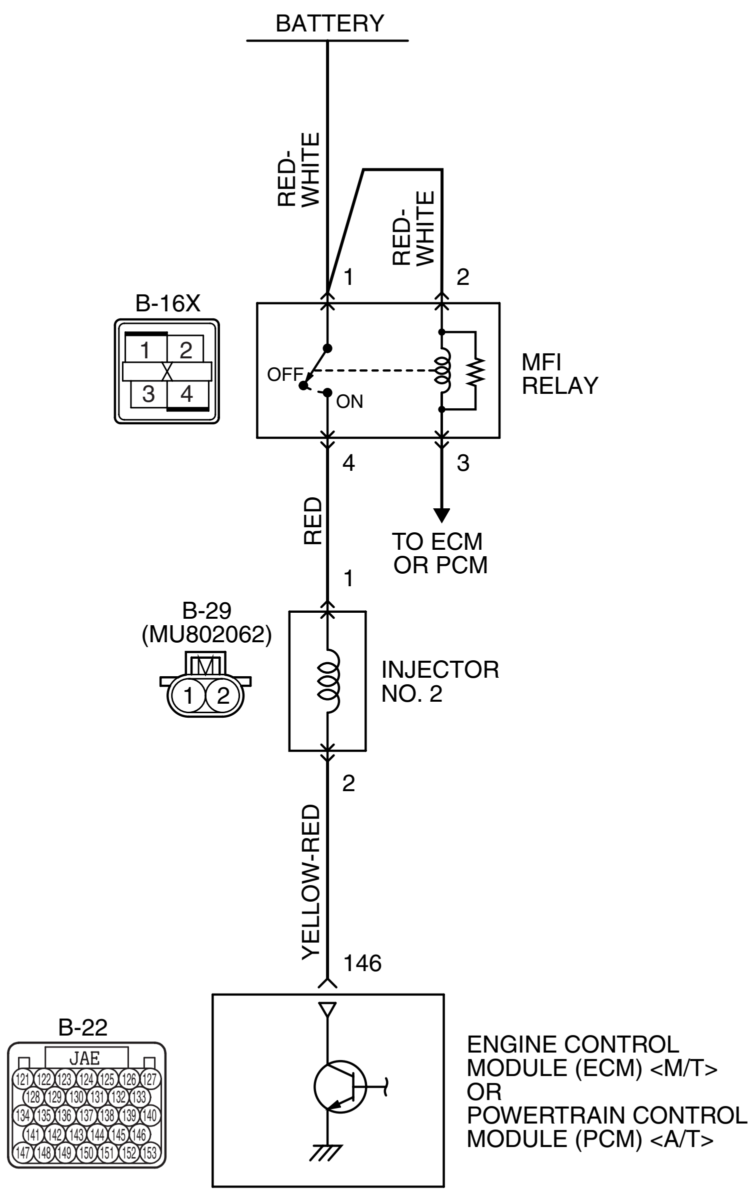
NO : The inspection is complete.

DTC P0202: Injector Circuit Malfunction - Cylinder 2

⚠ CAUTION

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

Injector Circuit-Cylinder 2



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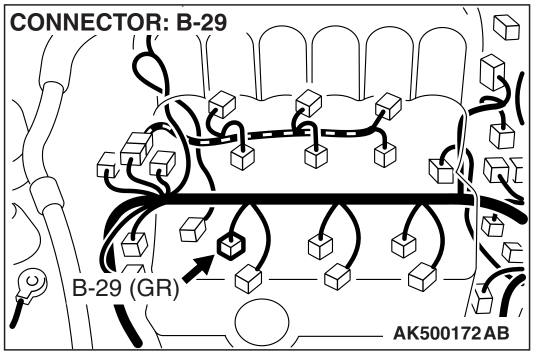
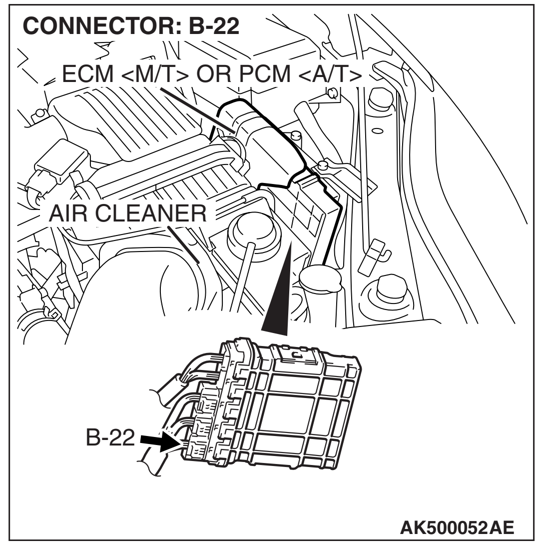
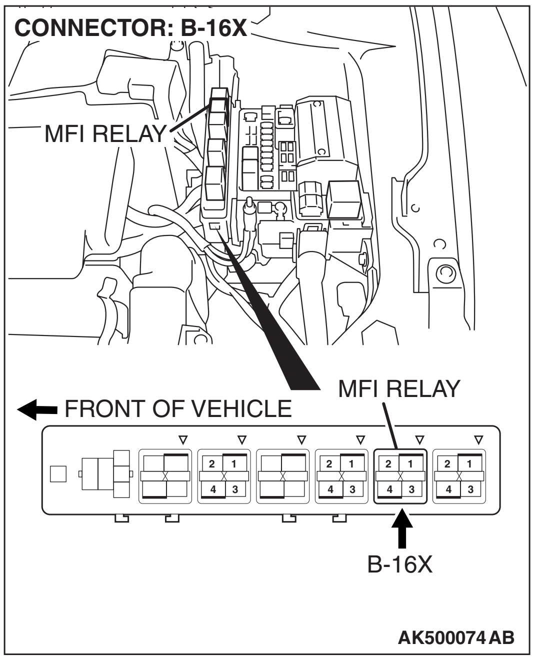






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or the PCM <A/T> "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 ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

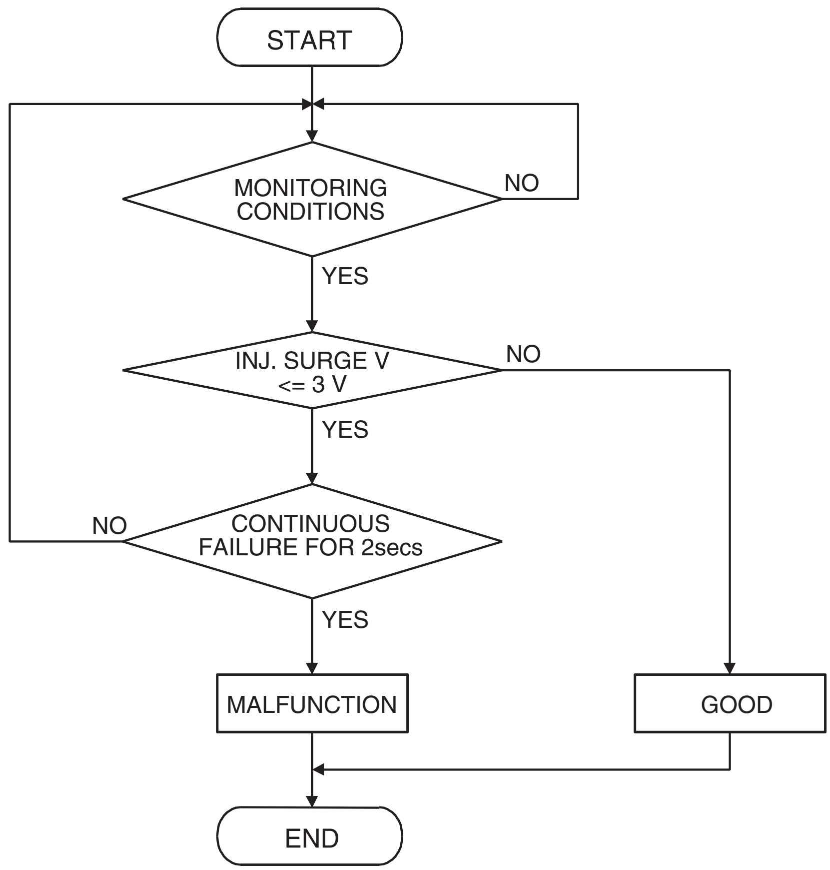
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



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Check Condition

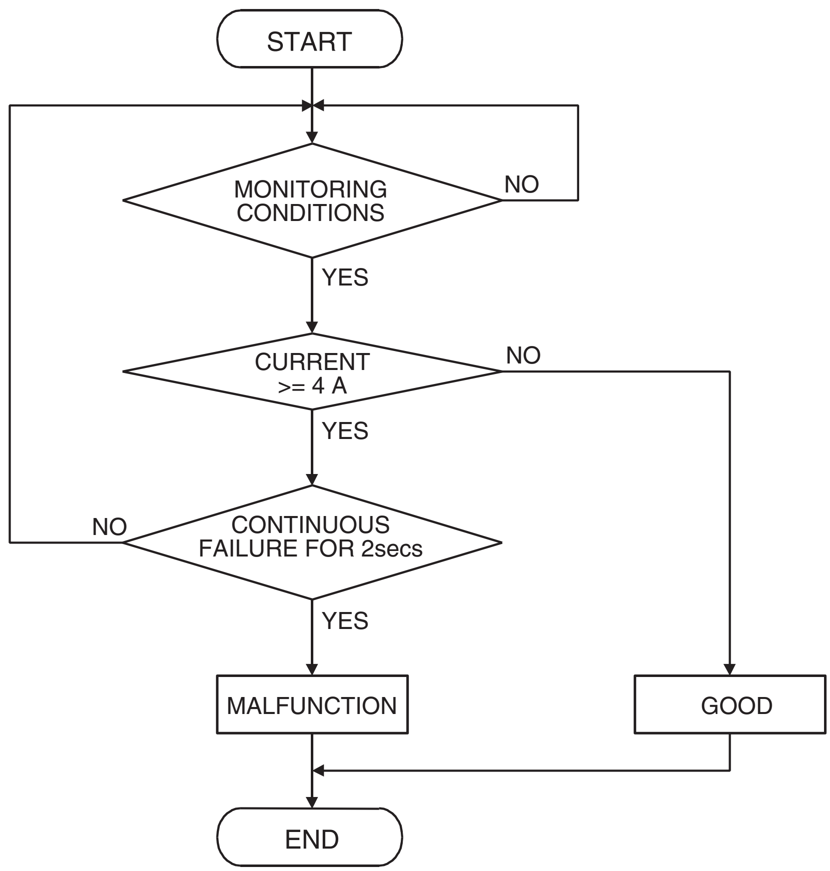
- Engine is running.

Judgement Criterion

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

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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Check Condition

- Engine is running.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

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

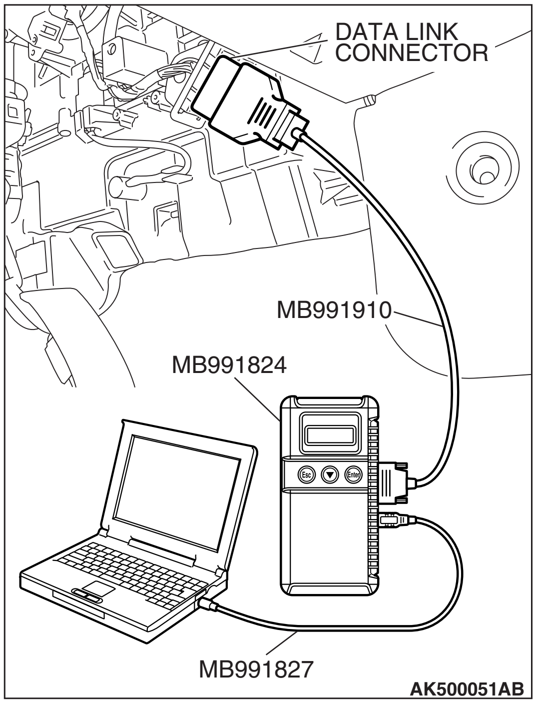
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

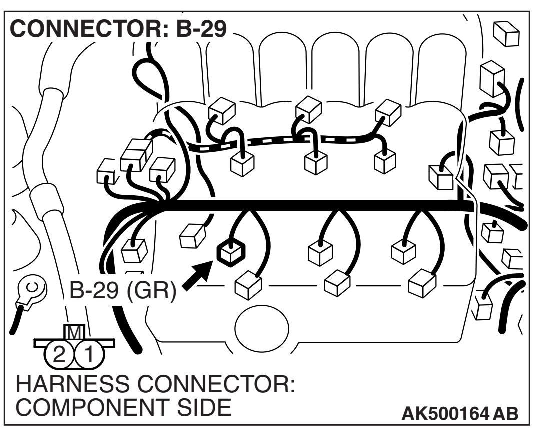
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 2, No. 2 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly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

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.



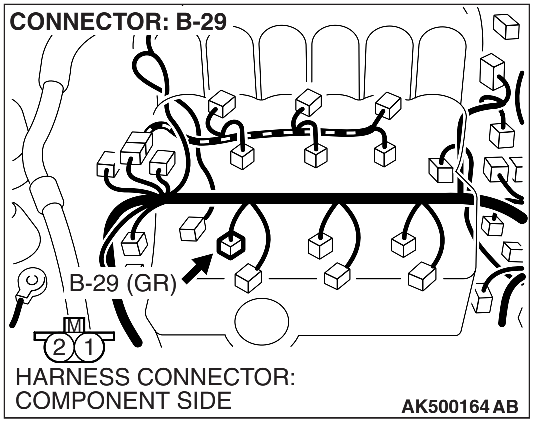
STEP 2. Check the harness connector B-29 at No. 2 cylinder injector for damage.

Q: Is the harness connector in good condition?

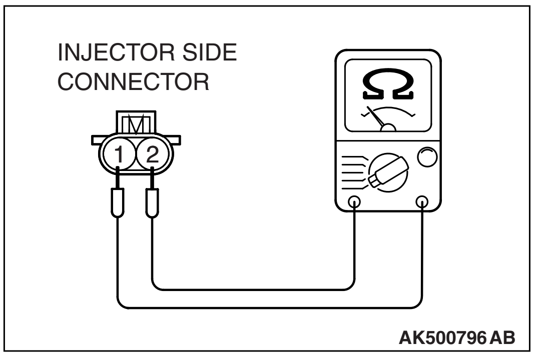
YES : Go to Step 3.

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

STEP 3. Check the No. 2 cylinder injector.



(1) Disconnect the No. 2 cylinder injector connector B-29.



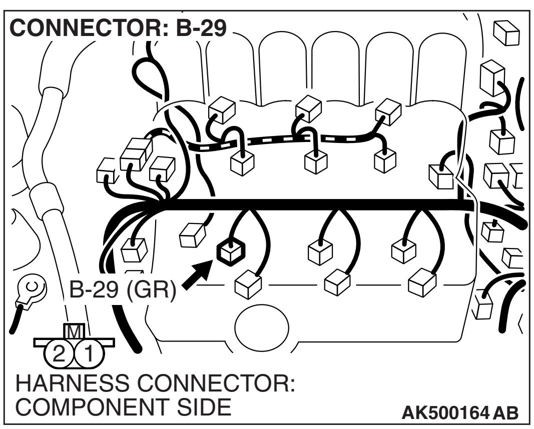
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

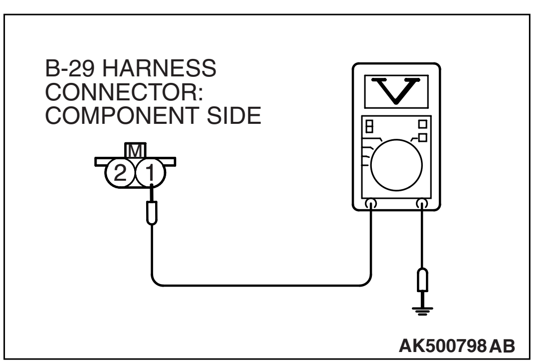
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 4.
NO : Replace the No. 2 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No.2 cylinder injector connector B-29.



(1) Disconnect connector B-29 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

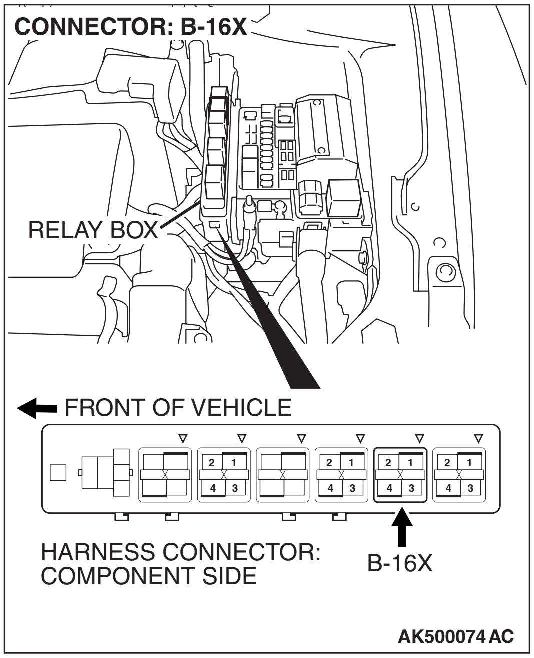


(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

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

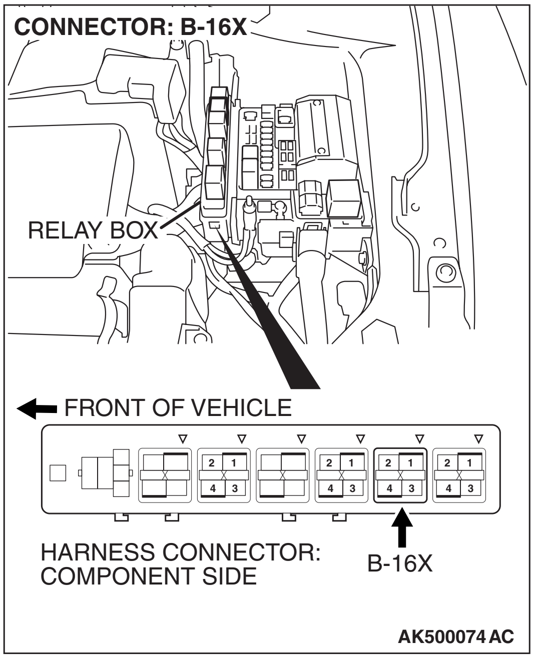


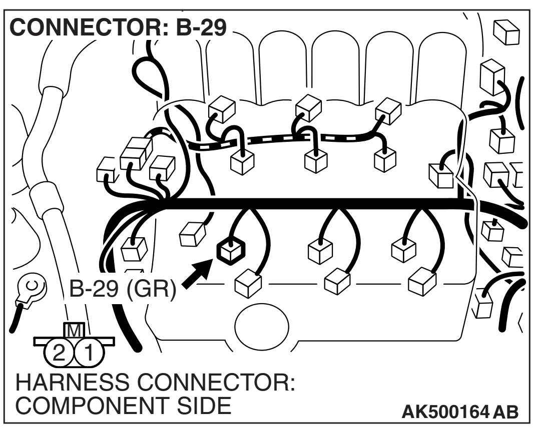
STEP 5. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and No. 2 cylinder injector connector B-29 (terminal No. 1) because of open circuit or short circuit to ground.
Then go to Step 10.

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



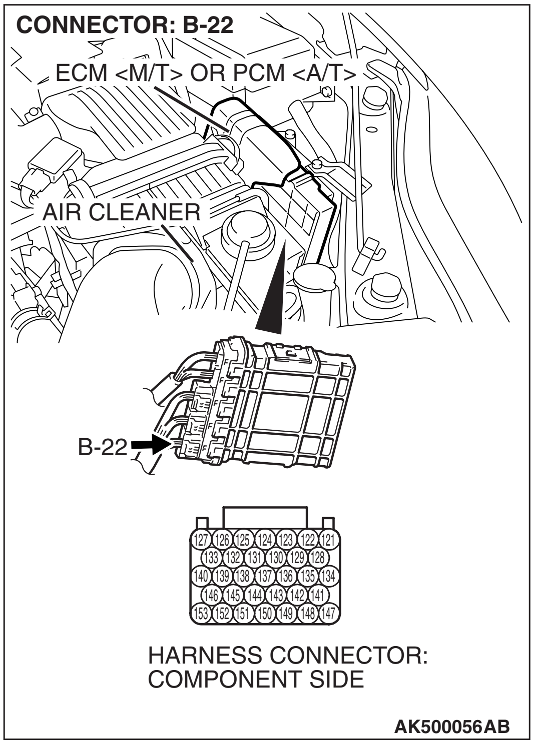


STEP 6. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and No. 2 cylinder injector connector B-29 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.



STEP 7. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the connector in good condition?

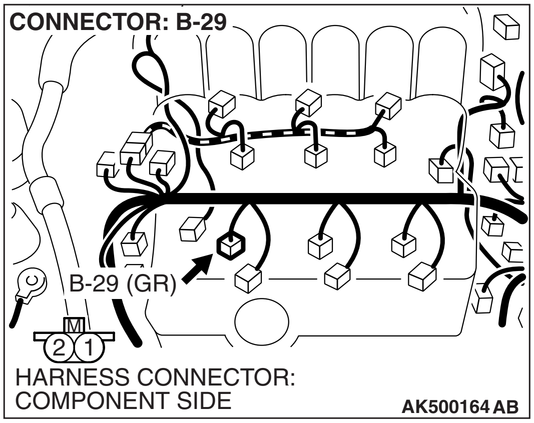
YES : Go to Step 8.

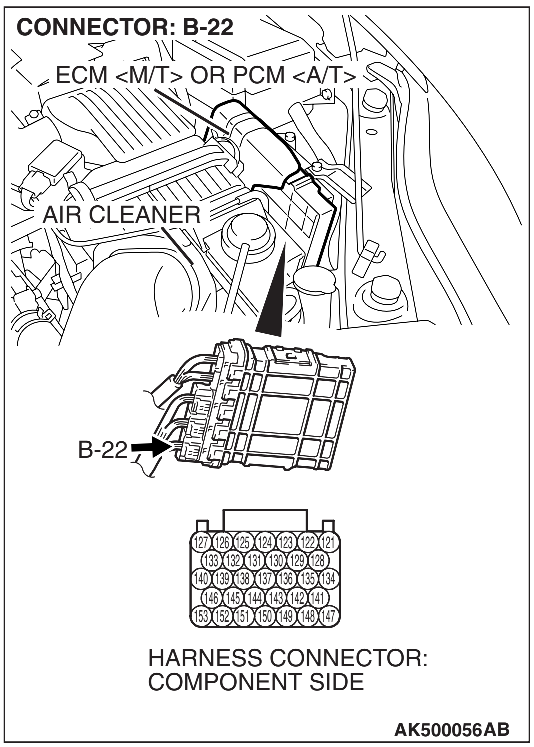
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

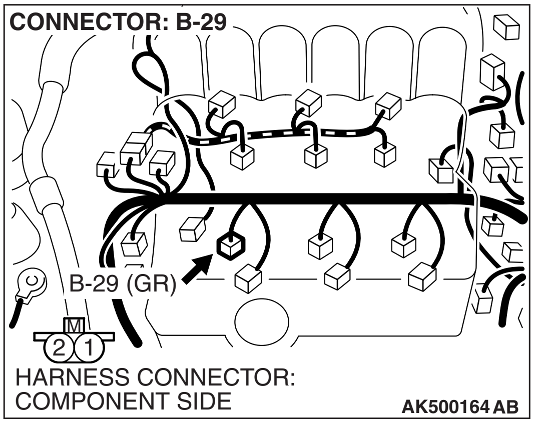
STEP 8. Check for open circuit and short circuit to ground and harness damage between No.2 cylinder injector connector B-29 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 146).

Q: Is the harness wire in good condition?

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

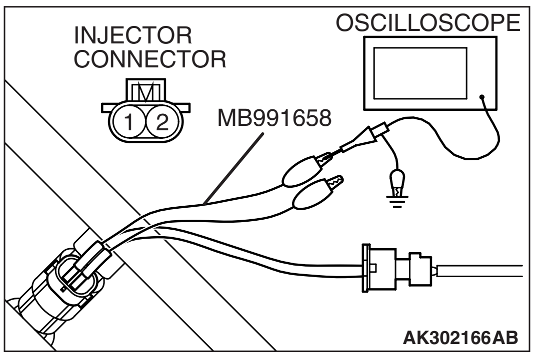






STEP 9. Using the oscilloscope, check the No.2 cylinder injector.

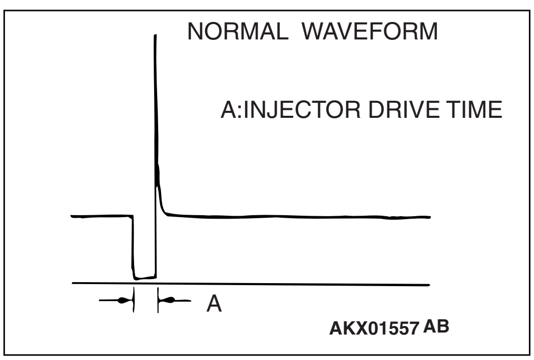
(1) Disconnect the No. 2 cylinder injector connector B-29 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



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

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

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0202 set?

YES : Retry the troubleshooting.

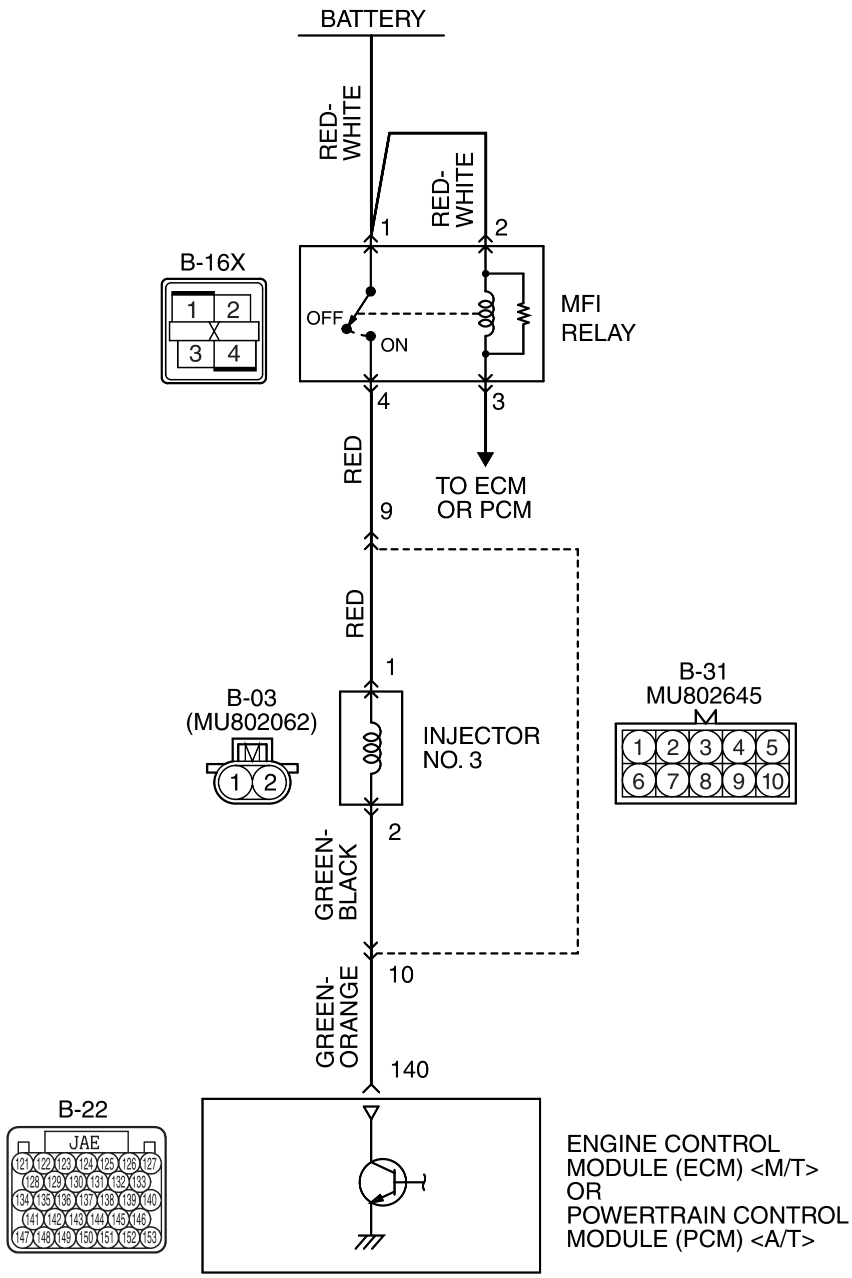
NO : The inspection is complete.

DTC P0203: Injector Circuit Malfunction - Cylinder 3

⚠ CAUTION

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

Injector Circuit - Cylinder 3



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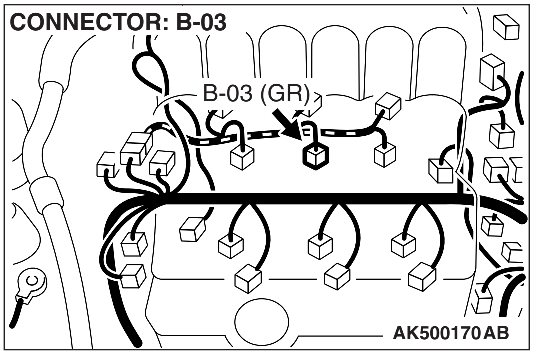
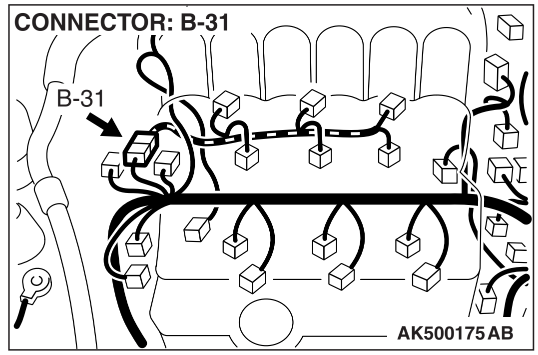
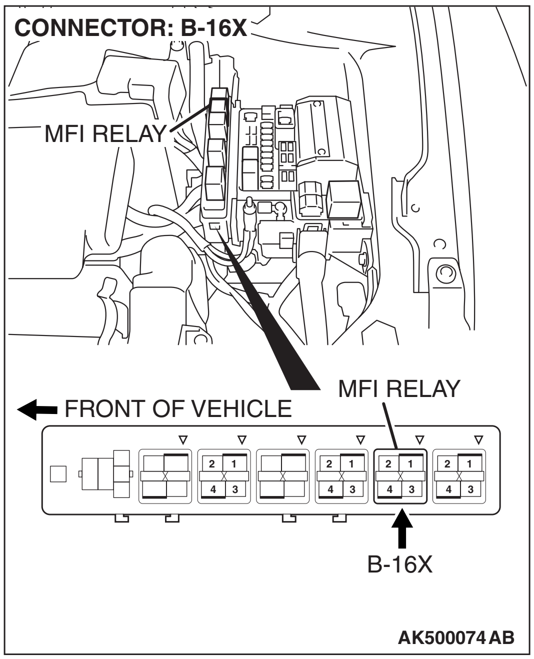
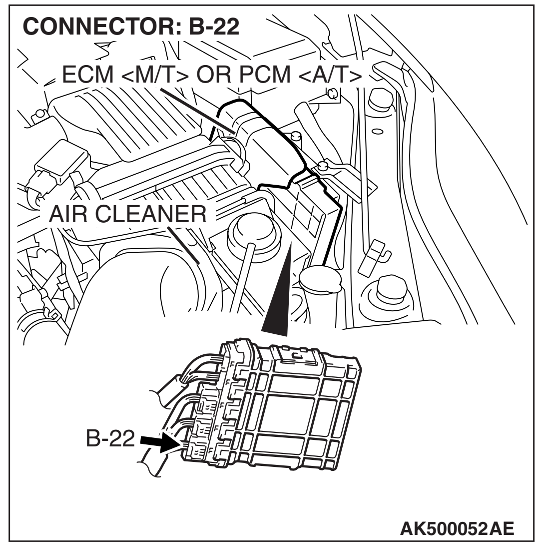








CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or the PCM <A/T> "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 ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

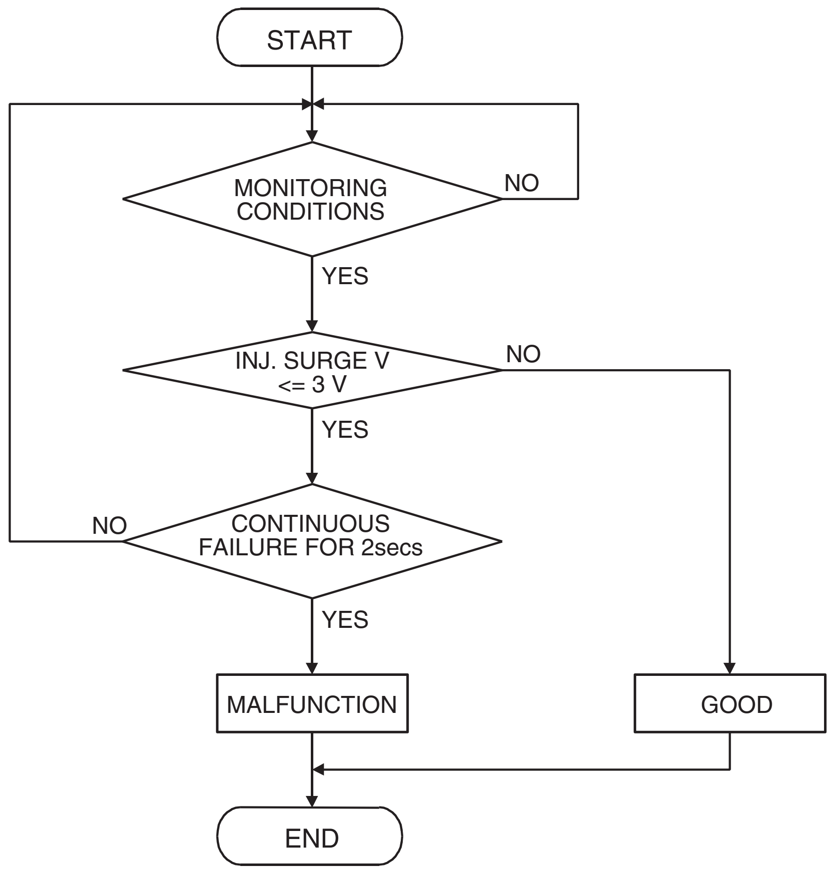
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



Check Condition

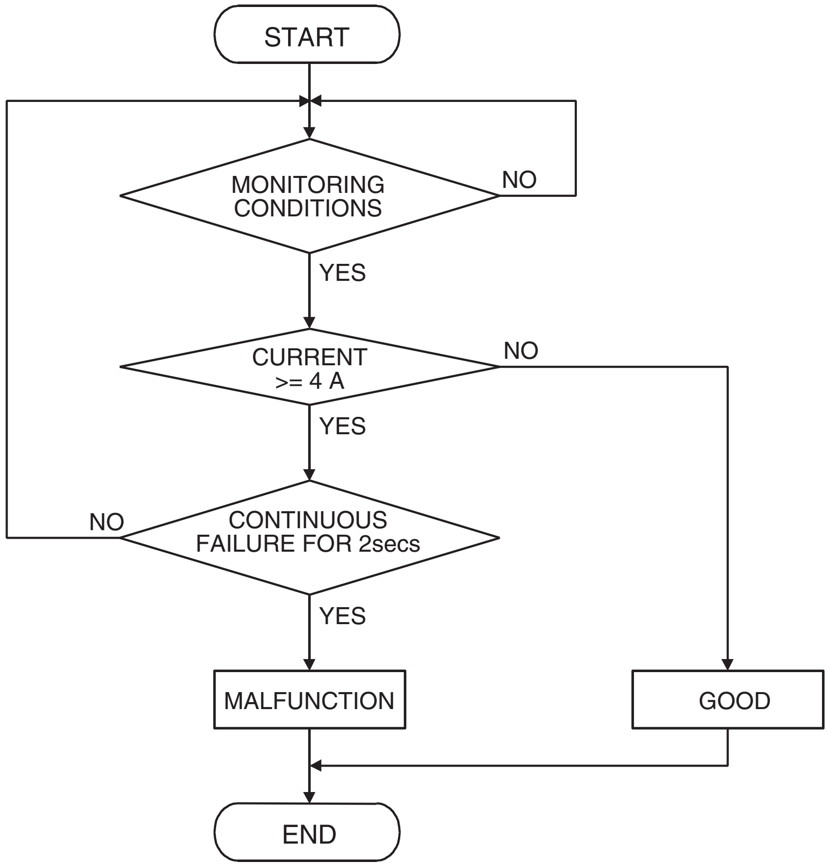
- Engine is running.

Judgement Criterion

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

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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Check Condition

- Engine is running.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

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

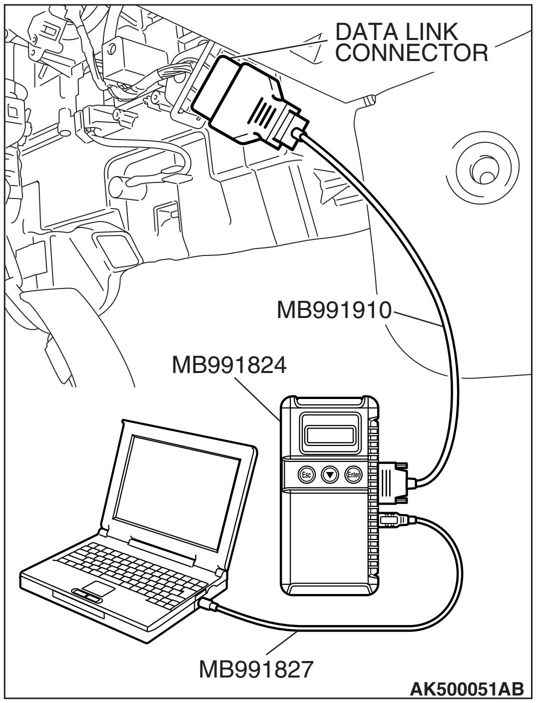
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



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

⚠ CAUTION

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

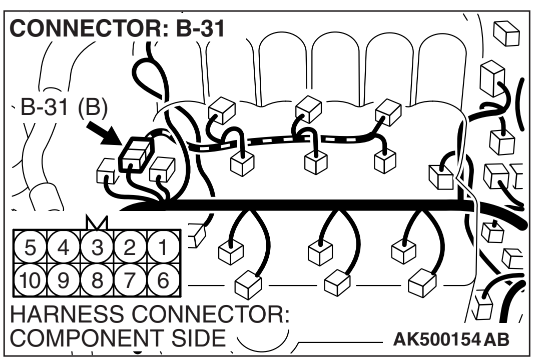
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 3, No. 3 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly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

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.



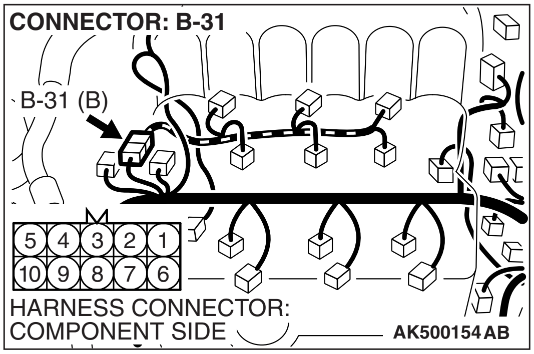
STEP 2. Check harness connector B-31 at intermediate connector for damage.

Q: Is the harness connector in good condition?

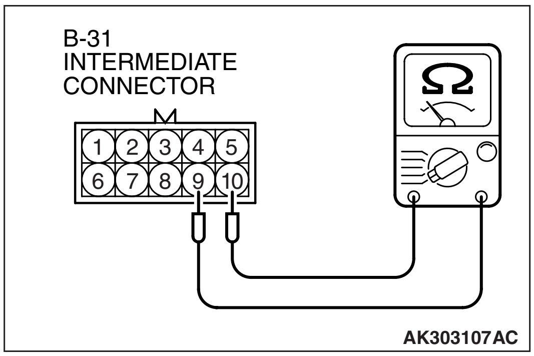
YES : Go to Step 3.

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

STEP 3. Check the No. 3 cylinder injector resistance at intermediate connector B-31.



(1) Disconnect the intermediate connector B-31.

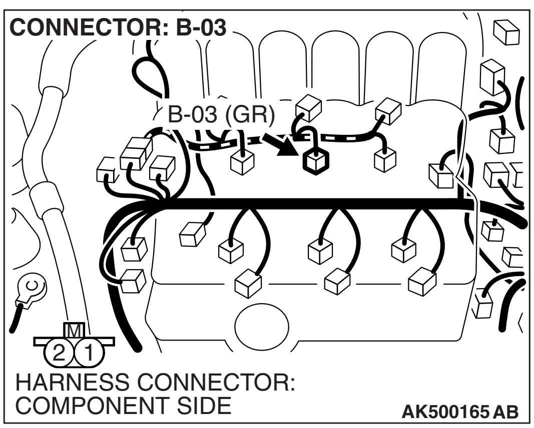


(2) Measure the resistance between terminal No. 9 and No. 10.
- Resistance should be between 10.5 and 13.5 ohms.

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

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

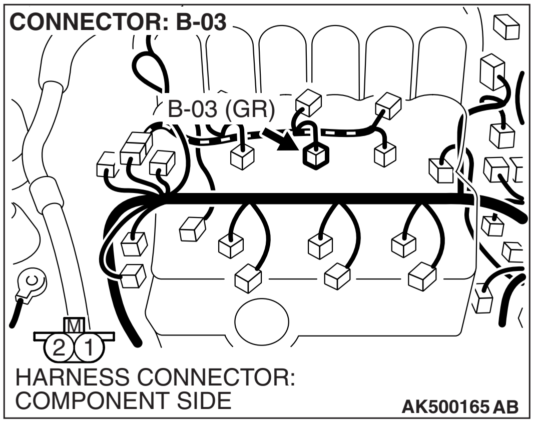
STEP 4. Check the connector B-03 at No. 3 cylinder injector for damage.



Remove the intake manifold.

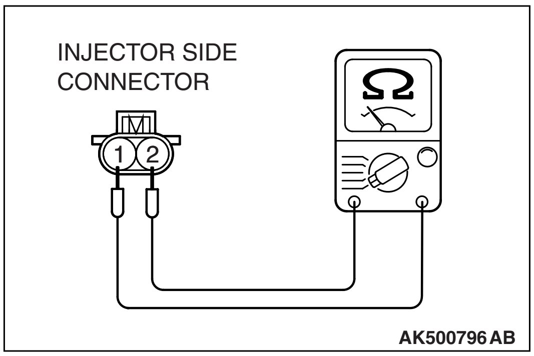
Q: Is the harness connector in good condition?

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



STEP 5. Check the No. 3 cylinder injector.

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



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

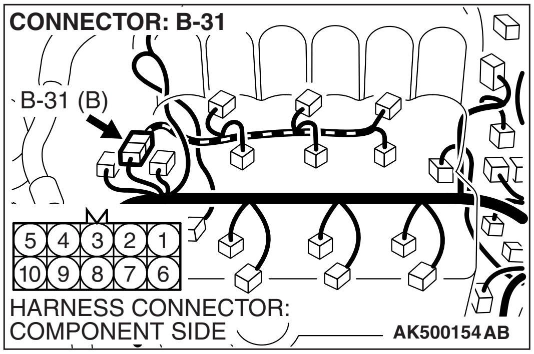
Standard value: 10.5 – 13.5 ohms [at 20° C (68° F)]

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

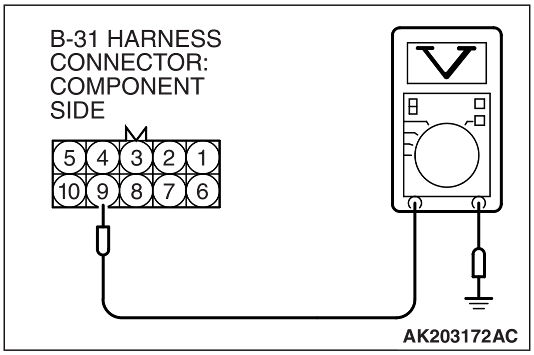
YES : Repair harness wire between intermediate connector B-31 (terminal No. 9) and injector connector B-03 (terminal No. 1) and harness wire between No.3 cylinder injector connector B-03 (terminal No. 2) and intermediate connector B-31 (terminal No. 10) because of open circuit or short circuit to ground or harness damage.
Then go to Step 12.

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

STEP 6. Measure the power supply voltage at intermediate connector B-31.



(1) Disconnect the connector B-31 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.



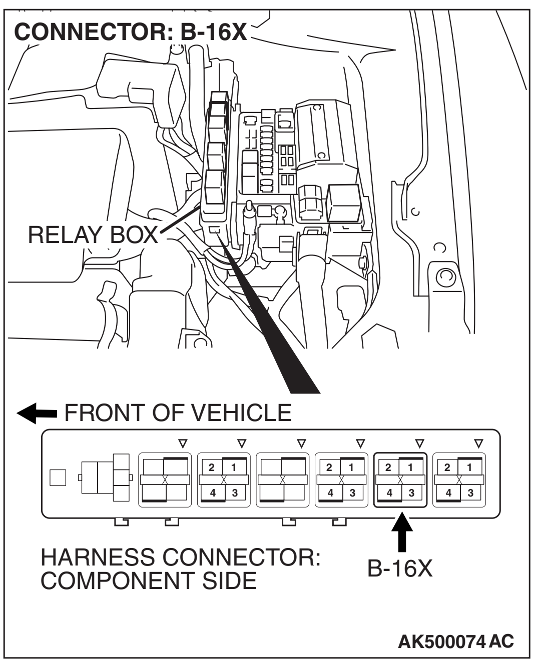
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

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

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

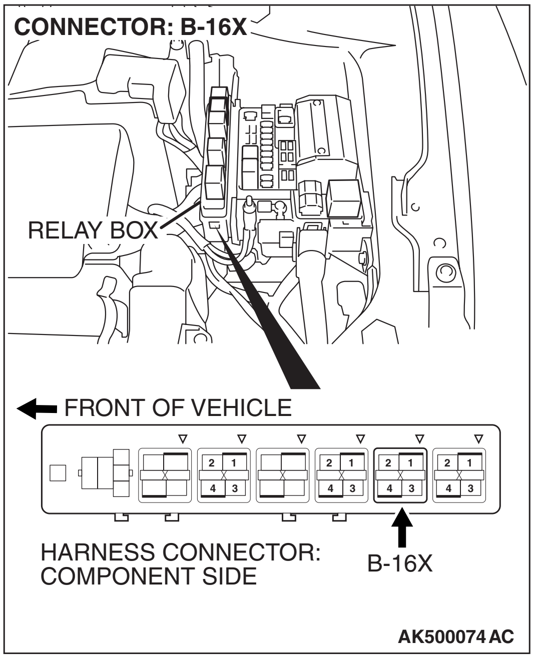
YES : Go to Step 8.
NO : Go to Step 7.

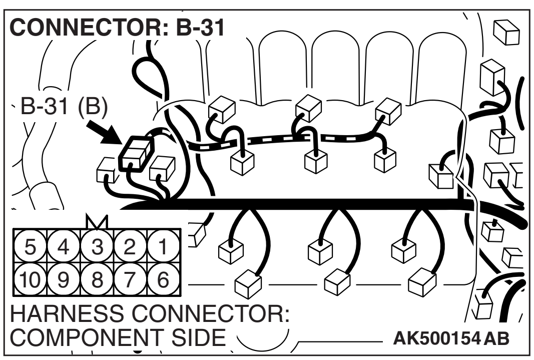
STEP 7. Check harness connector B-16X at MFI relay for damage.



Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



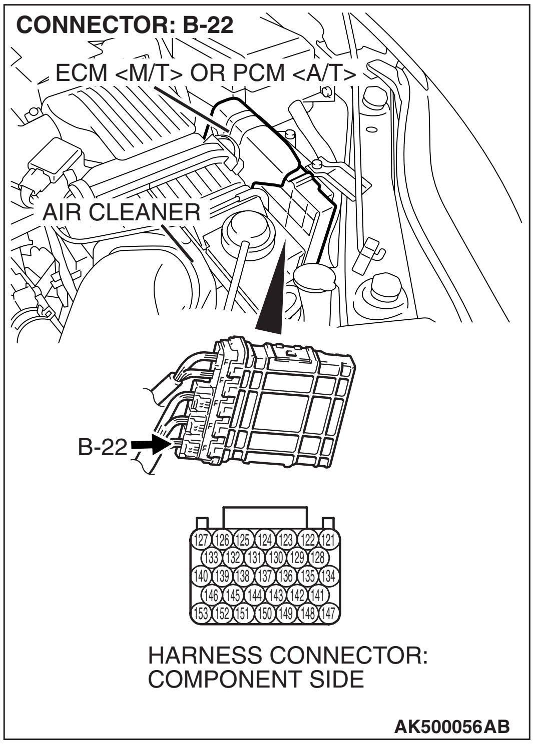


STEP 8. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

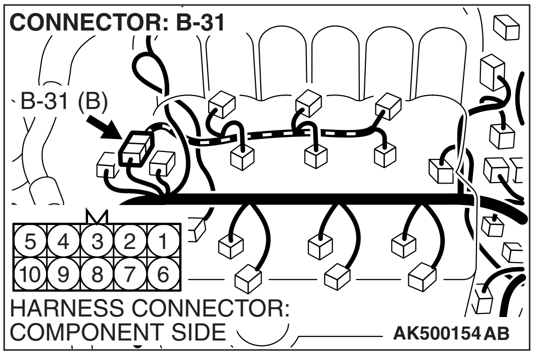


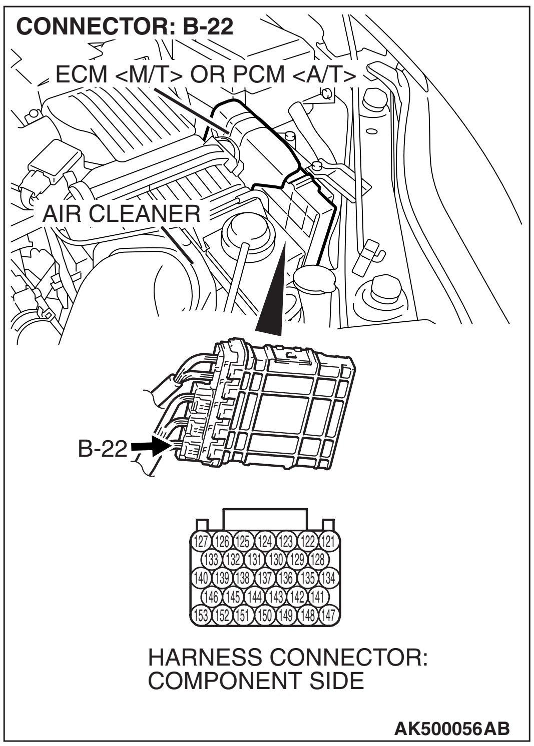
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





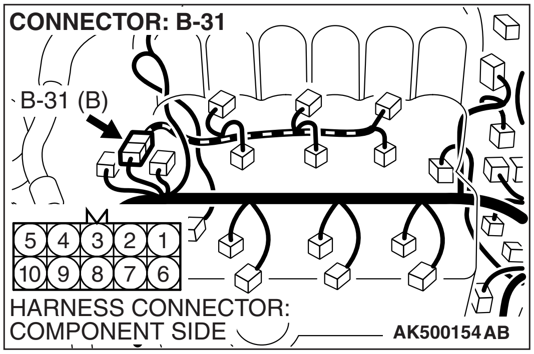
STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-31 (terminal No. 10) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 140).

Q: Is the harness wire in good condition?

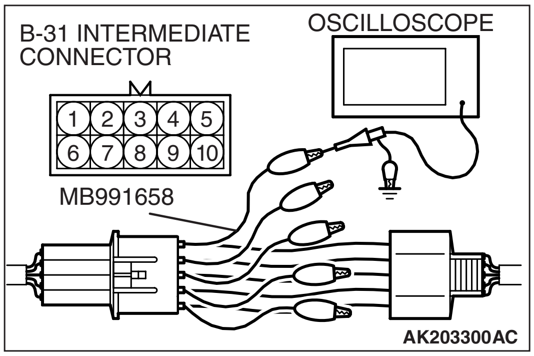
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Using the oscilloscope, check the No. 3 cylinder injector.



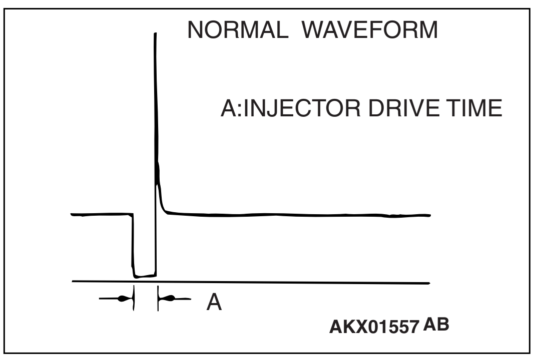
(1) Disconnect the intermediate connector B-31 and connect the test harness MB991658 between the separated connectors.



(2) Connect the oscilloscope probe to injector intermediate connector terminal No. 10.

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 140.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

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

STEP 12. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0203 set?

YES : Retry the troubleshooting.

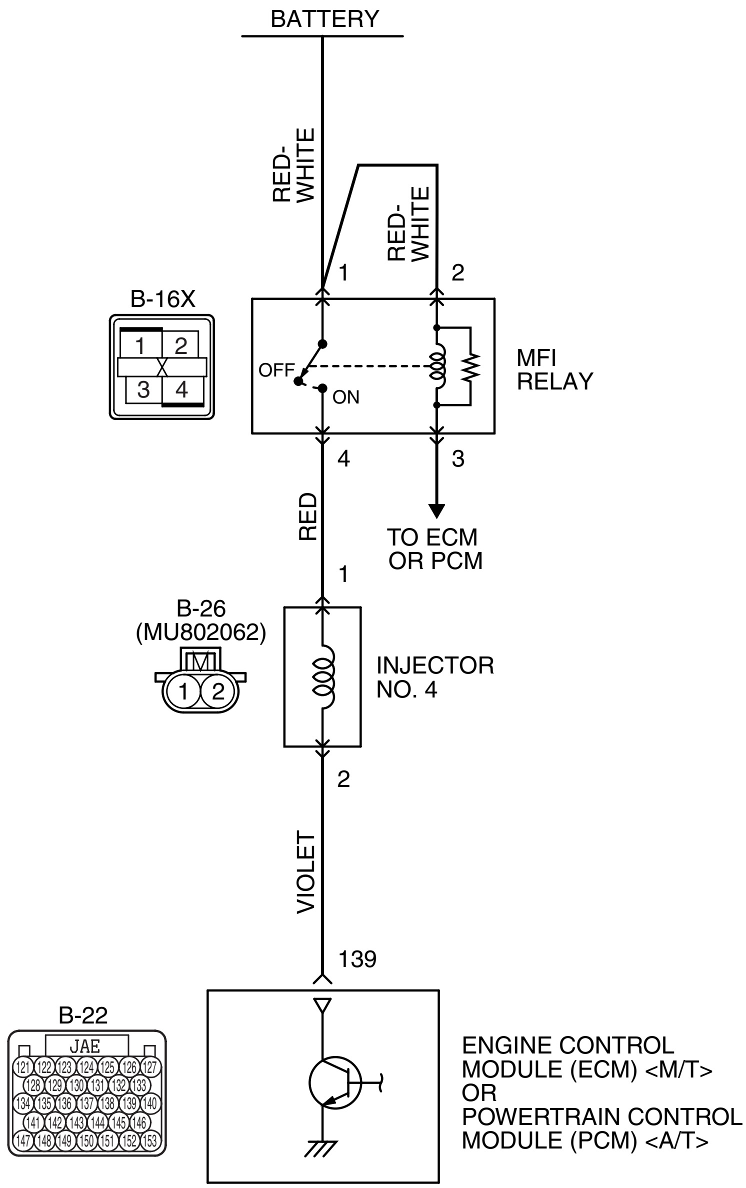
NO : The inspection is complete.

DTC P0204: Injector Circuit Malfunction - Cylinder 4

⚠ CAUTION

If DTC P0204 has been set, TCL related DTC U1120 is also set. After P0204 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit-Cylinder 4



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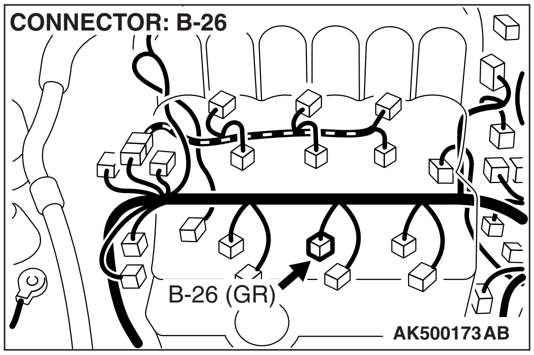
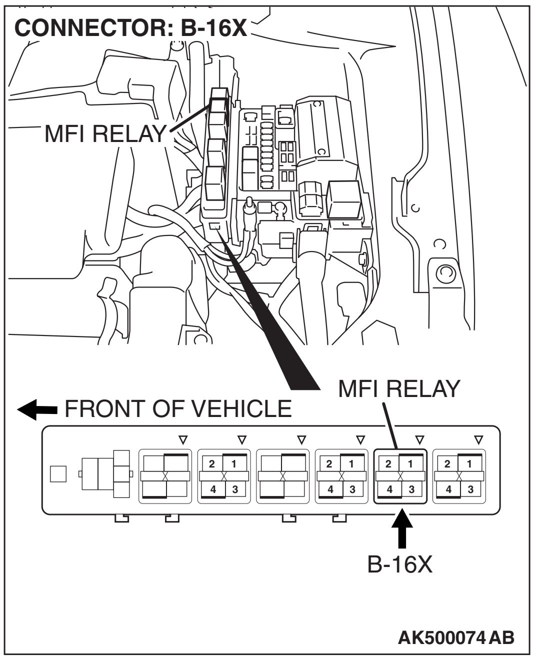
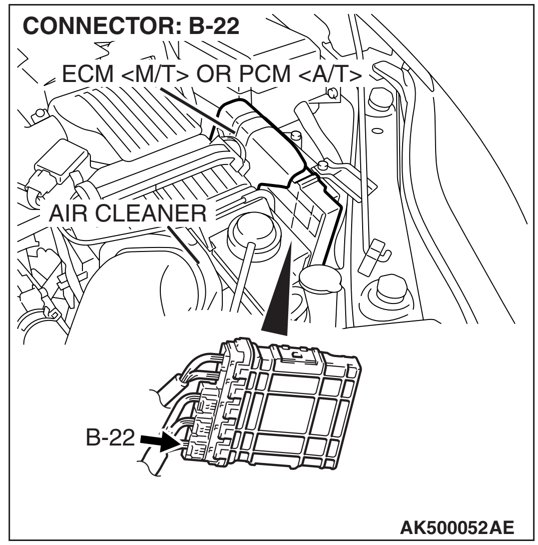






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or the PCM <A/T> "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 ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

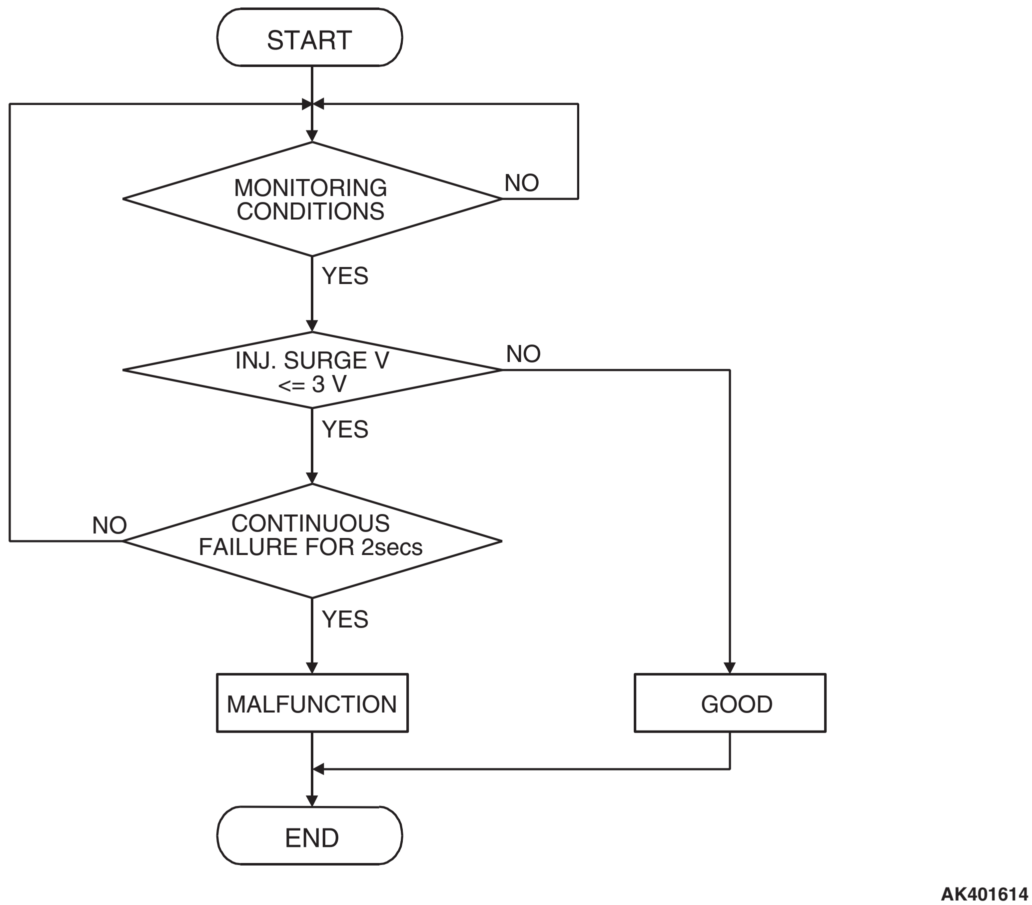
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart

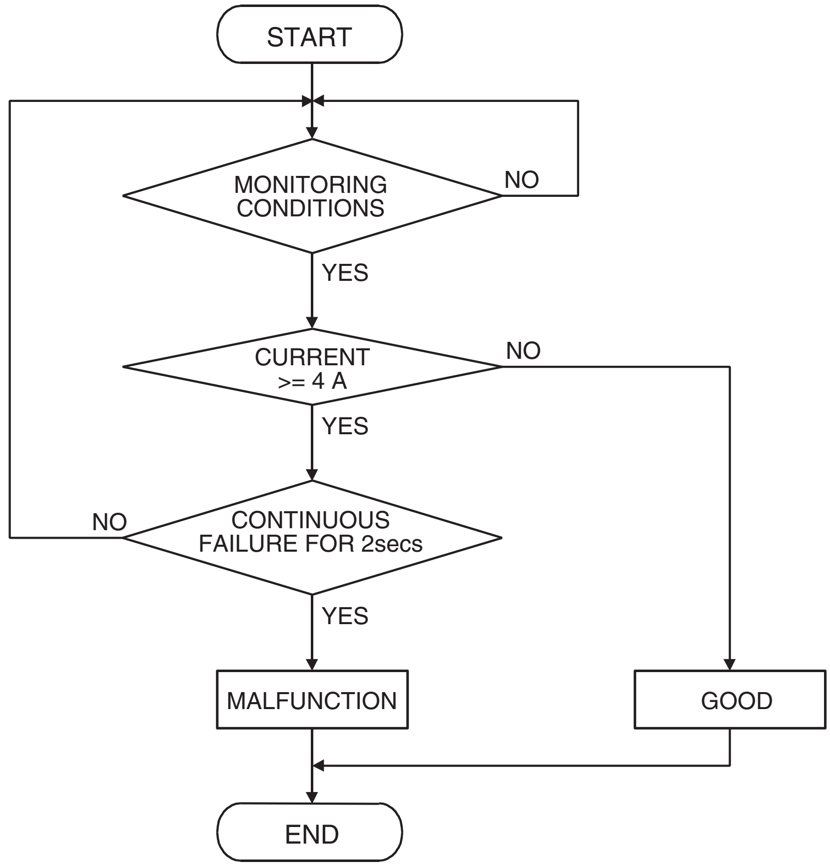


Check Condition
- Engine is running.

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

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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 22 P.13B-6.

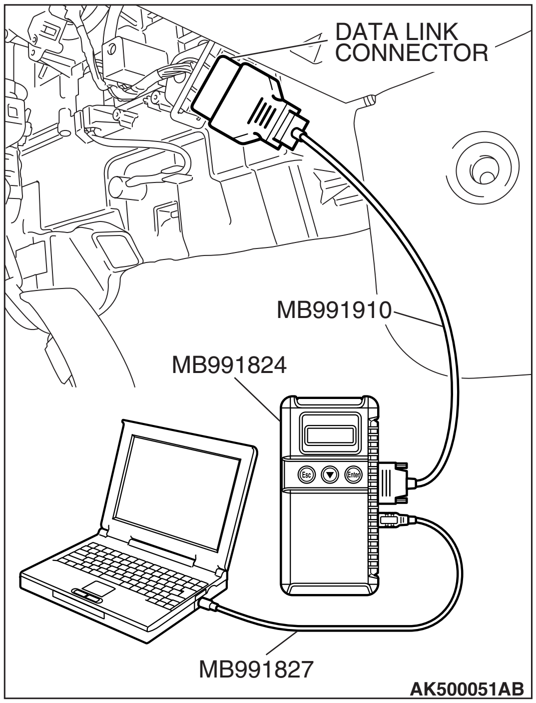
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No.4 cylinder injector failed.
- Open or shorted No.4 cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check actuator test item 4: No. 4 injector.

⚠ CAUTION

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

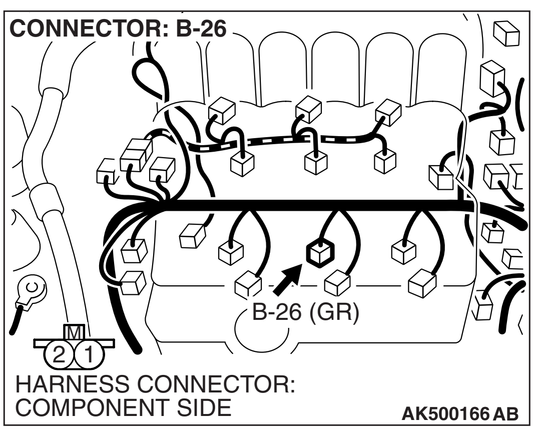
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 4, No. 4 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly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

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

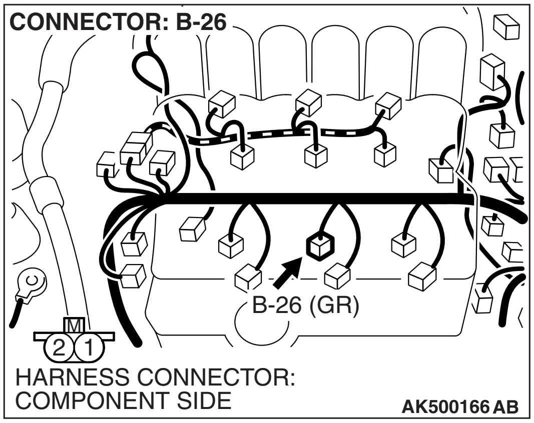


STEP 2. Check the harness connector B-26 at No. 4 cylinder injector for damage.

Q: Is the harness connector in good condition?

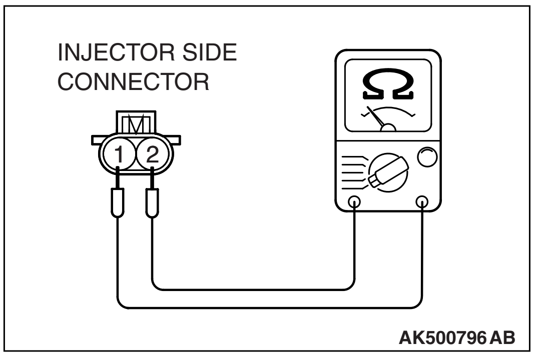
YES : Go to Step 3.

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



STEP 3. Check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-26.



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

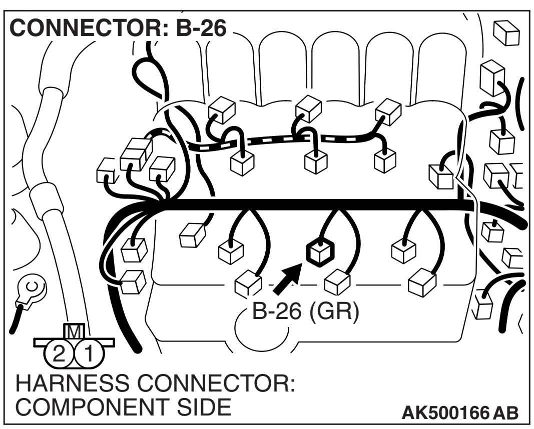
Standard value: 10.5 – 13.5 ohms [at 20° C (68° F)]

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

YES : Go to Step 4.

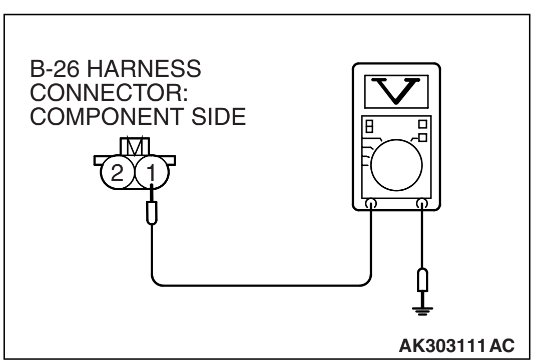
NO : Replace the No. 4 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 4 cylinder injector connector B-26.



(1) Disconnect connector B-26 and measure at the harness side.

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



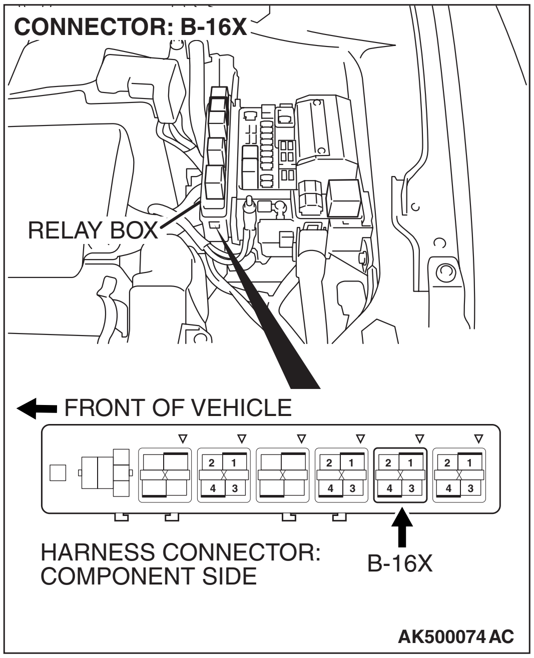
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 6.

NO : Go to Step 5.

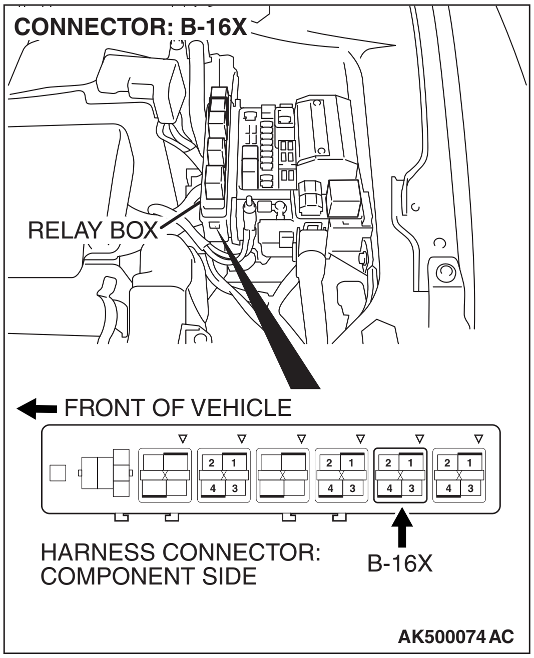


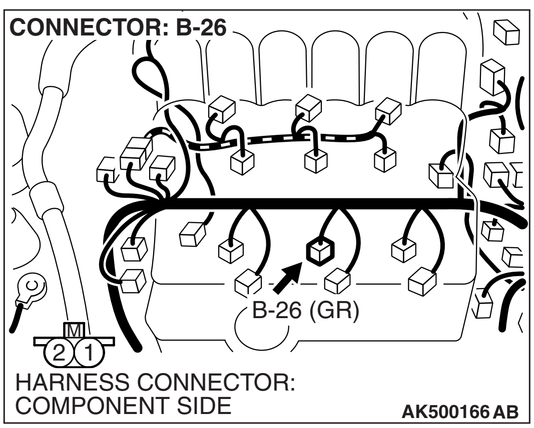
STEP 5. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and No. 4 cylinder injector connector B-26 (terminal No. 1) because of open circuit or short circuit to ground.
Then go to Step 10.

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



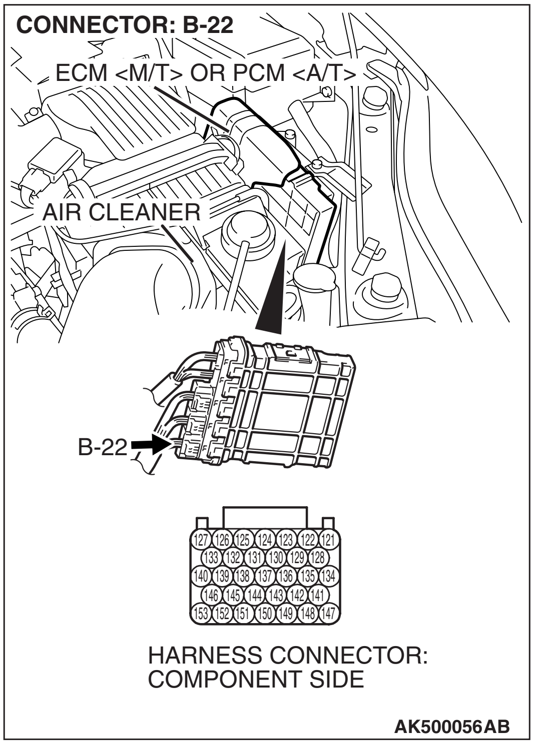


STEP 6. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and No. 4 cylinder injector connector B-26 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

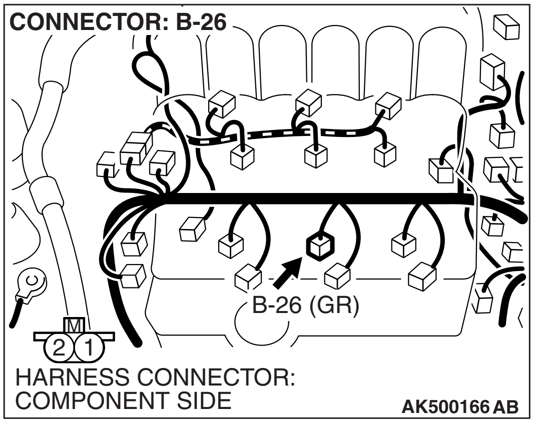


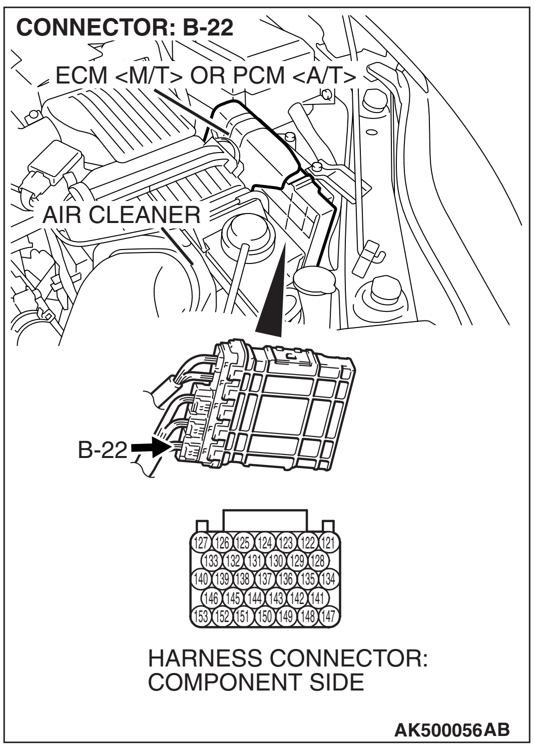
STEP 7. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

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



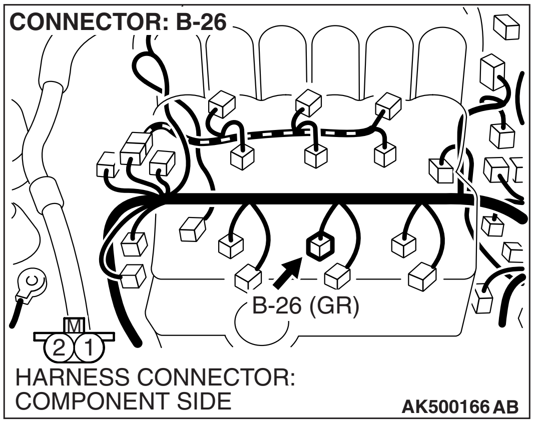


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 4 cylinder injector connector B-26 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 139).

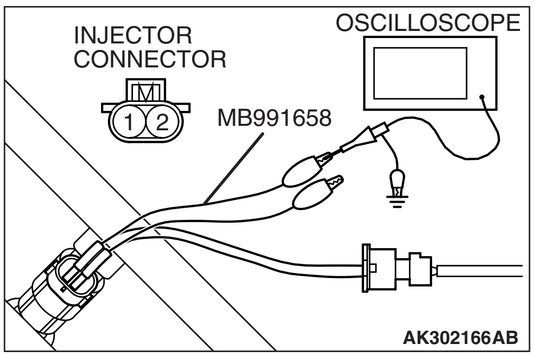
Q: Is the harness wire in good condition?

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

STEP 9. Using the oscilloscope, check the No. 4 cylinder injector.



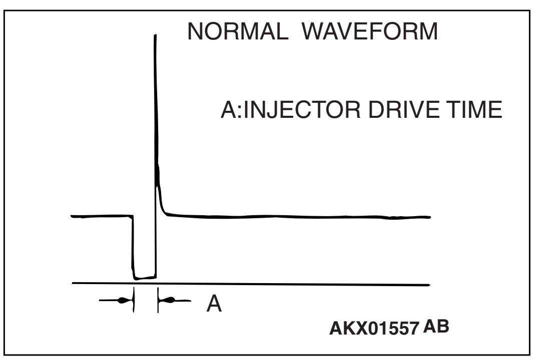
(1) Disconnect the No. 4 cylinder injector B-26 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



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

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 139.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0204 set?

YES : Retry the troubleshooting.

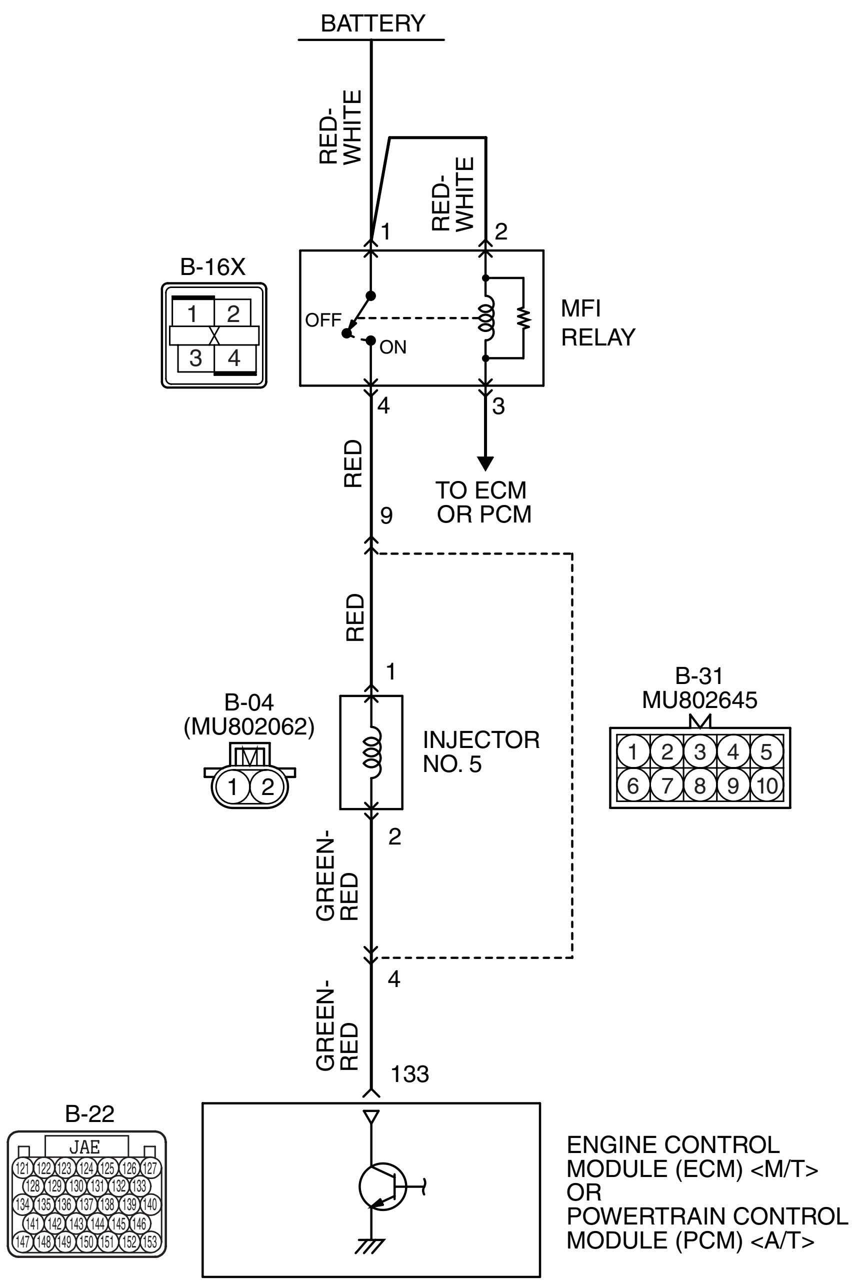
NO : The inspection is complete.

DTC P0205: Injector Circuit Malfunction - Cylinder 5

⚠ CAUTION

If DTC P0205 has been set, TCL related DTC U1120 is also set. After P0205 has been diagnosed, don't forget to erase DTC U1120.

Injector Circuit - Cylinder 5



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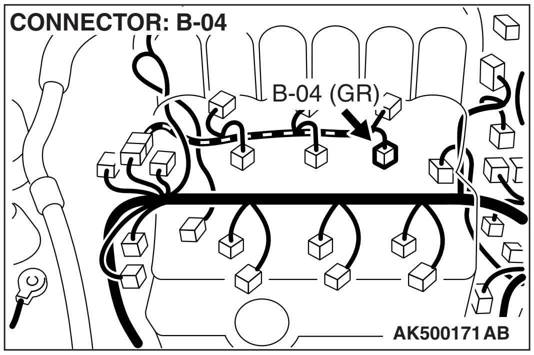
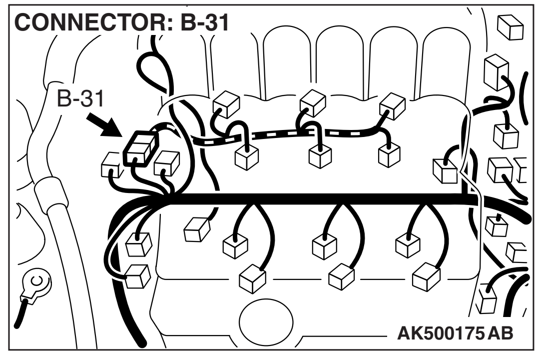
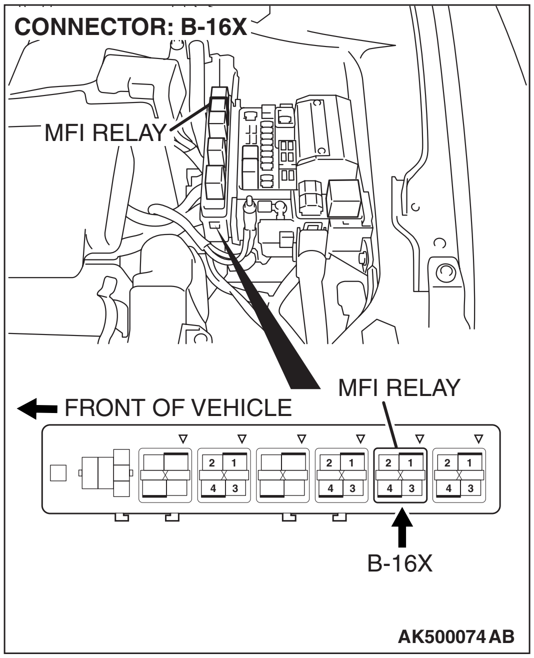
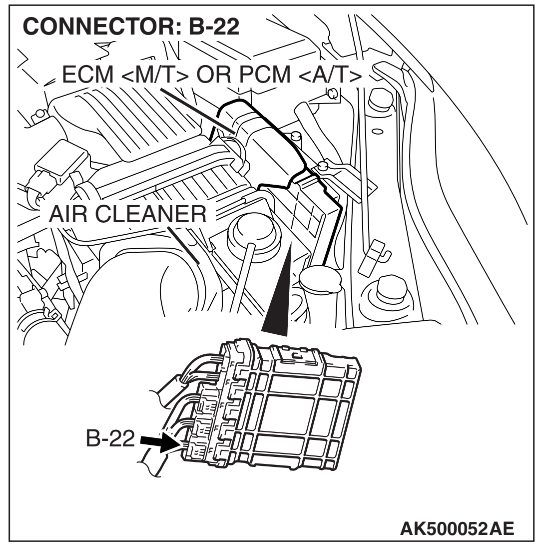








CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or the PCM <A/T> "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 ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

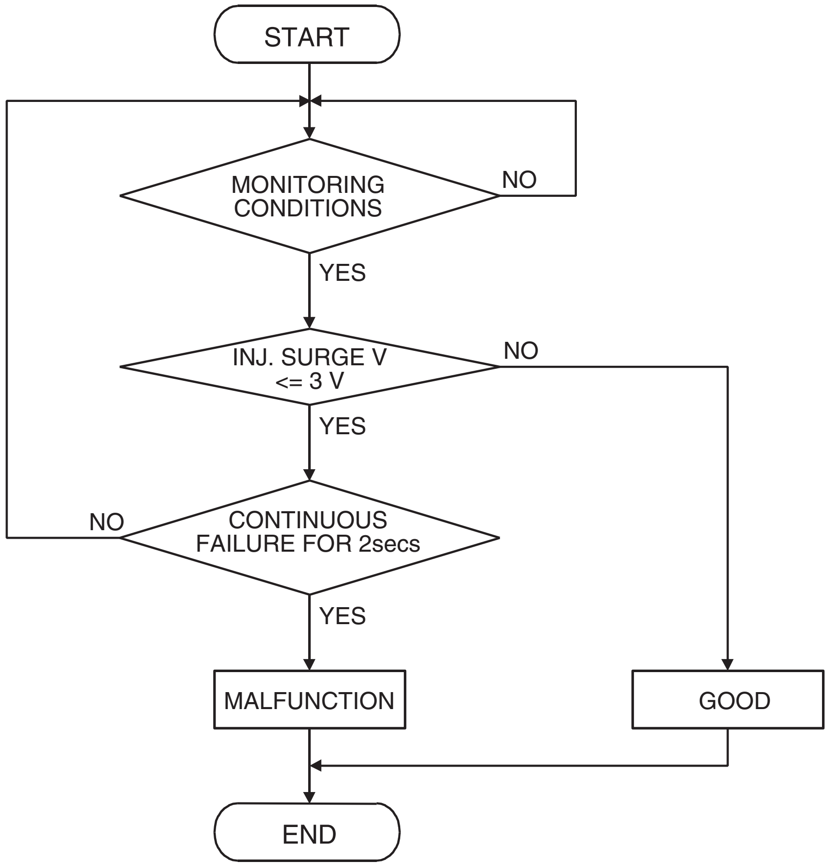
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



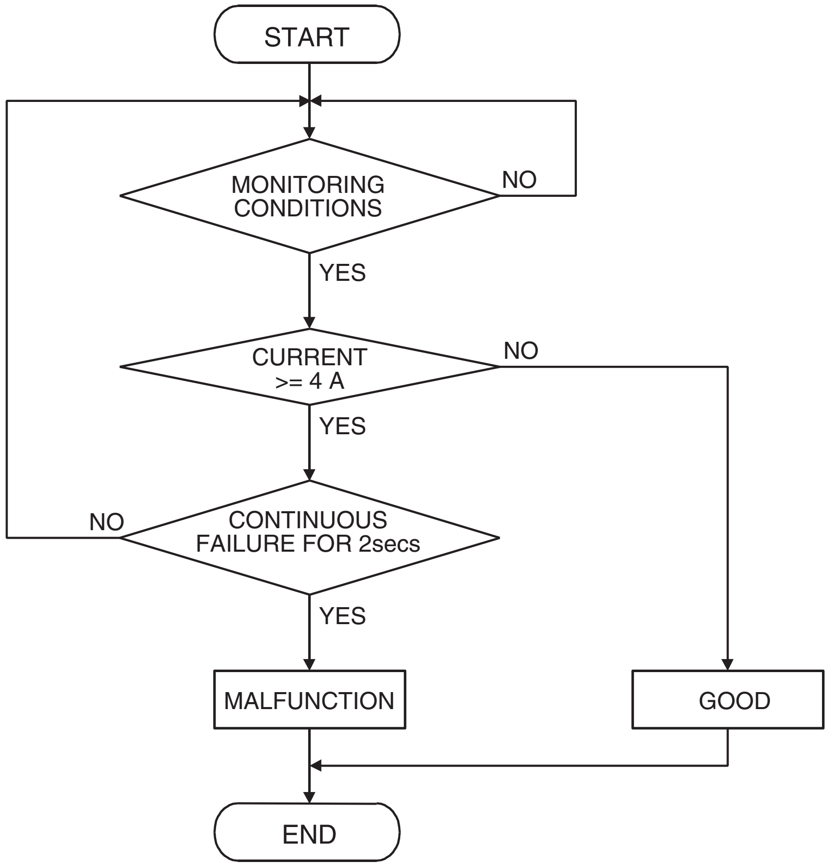
AK401614

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



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 22 P.13B-6.

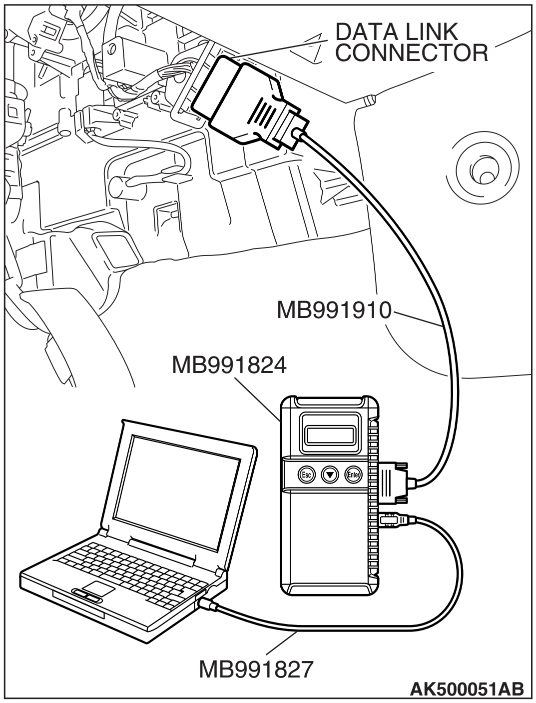
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 5 cylinder injector failed.
- Open or shorted No. 5 cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check actuator test item 5: No. 5 injector.

⚠ CAUTION

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

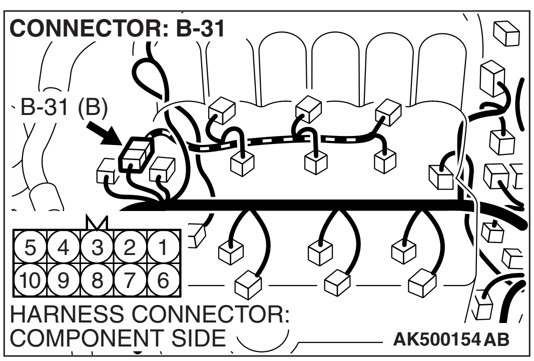
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 5 No. 5 cylinder injectors.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become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

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.

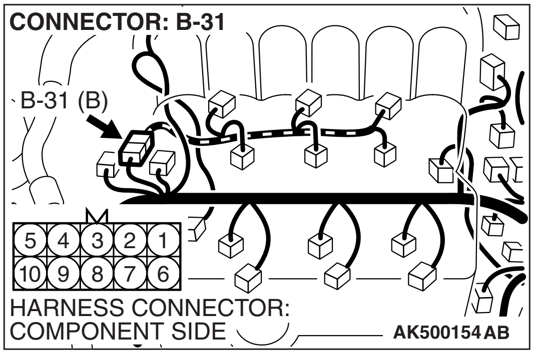


STEP 2. Check harness connector B-31 at intermediate connector for damage.

Q: Is the harness connector in good condition?

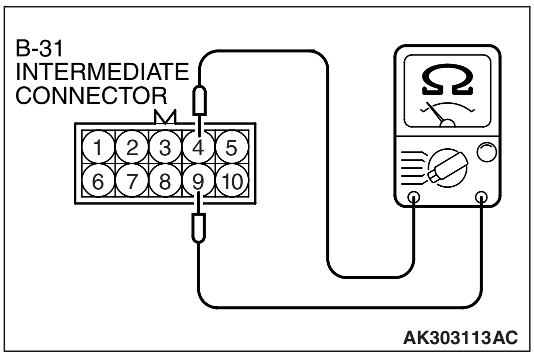
YES : Go to Step 3.

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



STEP 3. Check the No. 5 cylinder injector resistance at intermediate connector B-31.

(1) Disconnect the intermediate connector B-31.

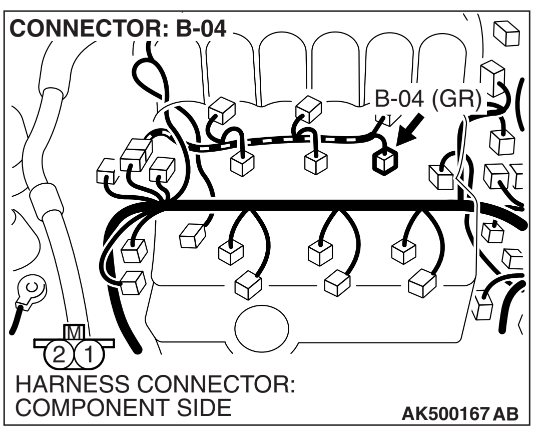


(2) Measure the resistance between terminal No. 4 and No. 9.

- Resistance should be between 10.5 and 13.5 ohms.

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

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



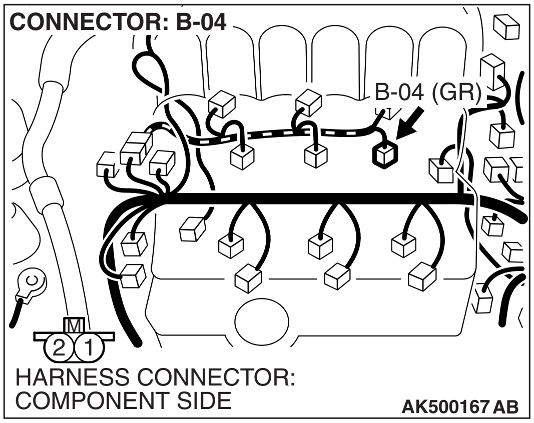
STEP 4. Check the harness connector B-04 at No. 5 cylinder injector for damage.

Remove the intake manifold.

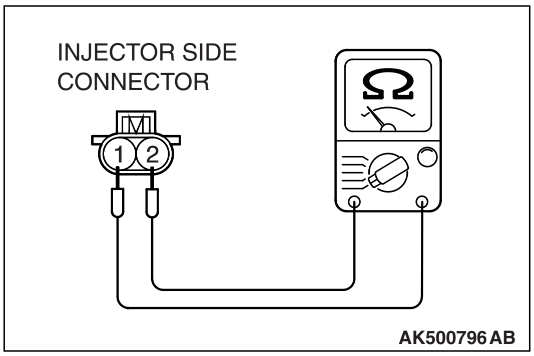
Q: Is the harness connector in good condition?

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

STEP 5. Check the No.5 cylinder injector.



(1) Disconnect the No. 5 cylinder injector connector B-04.



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

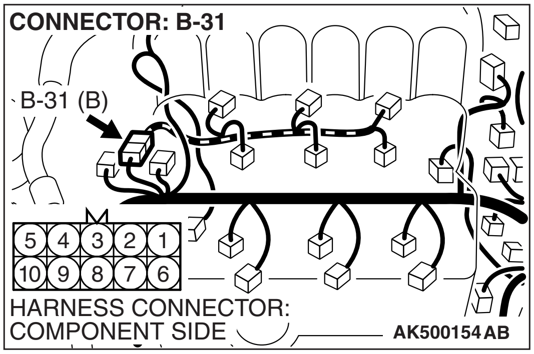
Standard value: 10.5 – 13.5 ohms [at 20° C (68° F)]

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

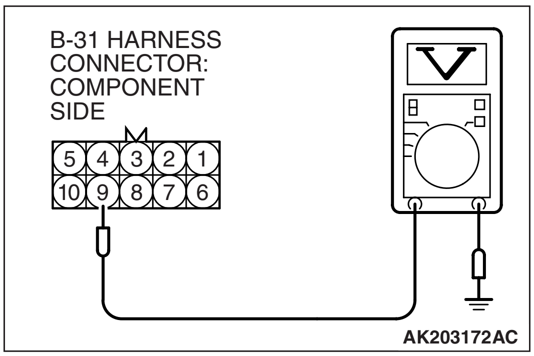
YES : Repair harness wire between intermediate connector B-31 (terminal No. 9) and injector connector B-04 (terminal No. 1) and harness wire between No. 5 cylinder injector connector B-04 (terminal No. 2) and intermediate connector B-31 (terminal No. 4) because of open circuit or short circuit to ground or harness damage.
Then go to Step 12.

NO : Replace the No. 5 cylinder injector. Then go to Step 12.

STEP 6. Measure the power supply voltage at intermediate connector B-31.



(1) Disconnect the connector B-31 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.



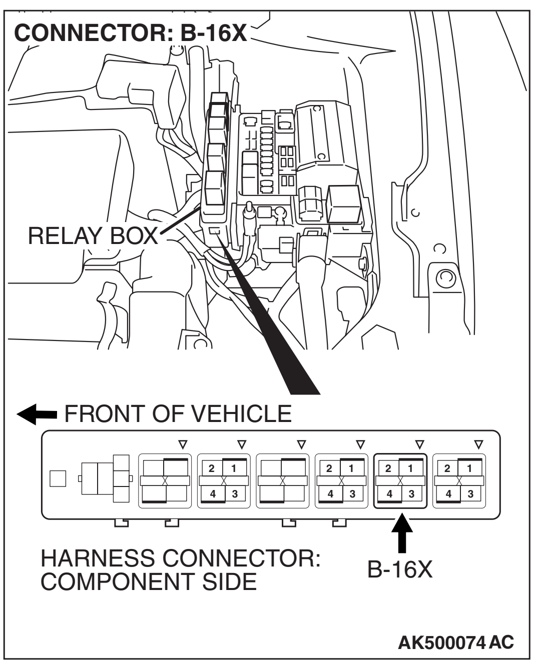
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

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

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

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

STEP 7. Check harness connector B-16X at MFI relay for damage.



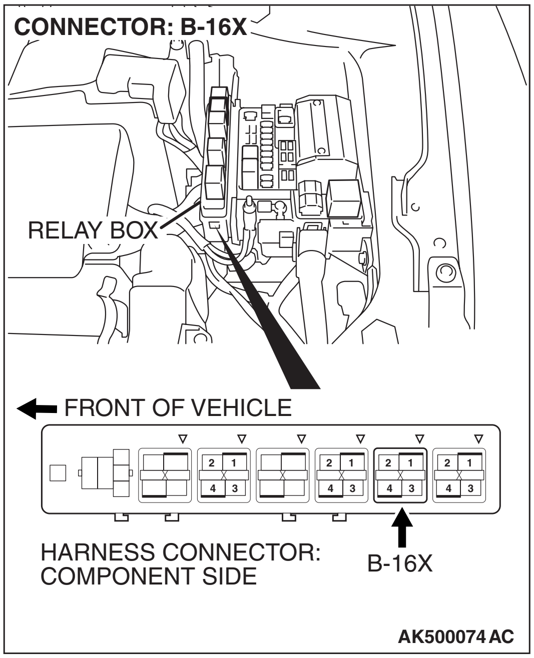
Q: Is the harness connector in good condition?

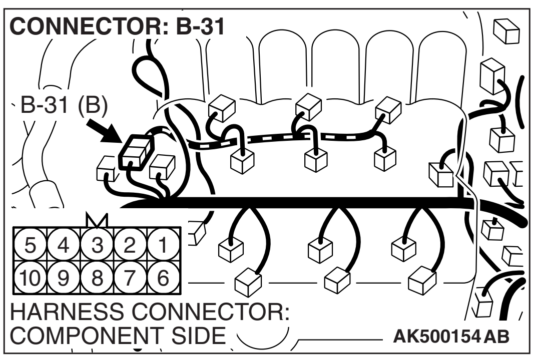
YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

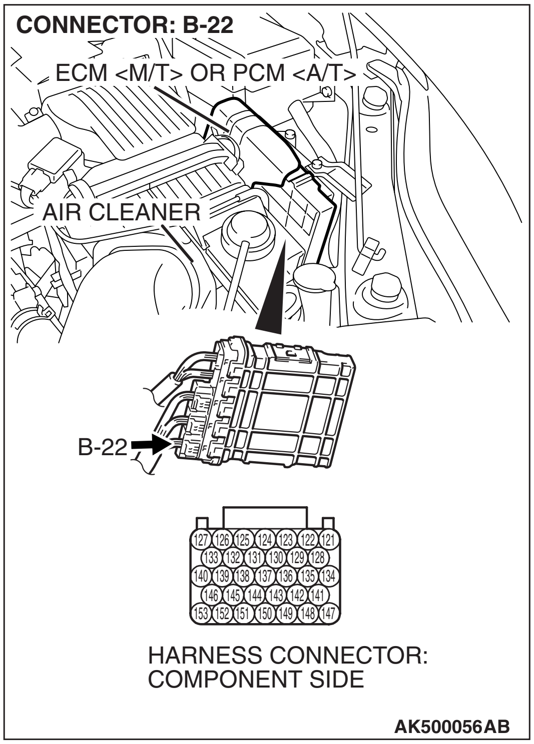
STEP 8. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and intermediate connector B-31 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 12.





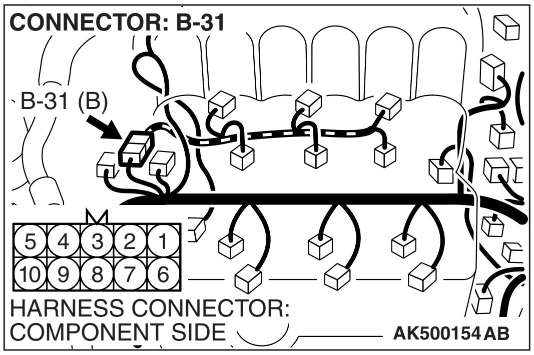


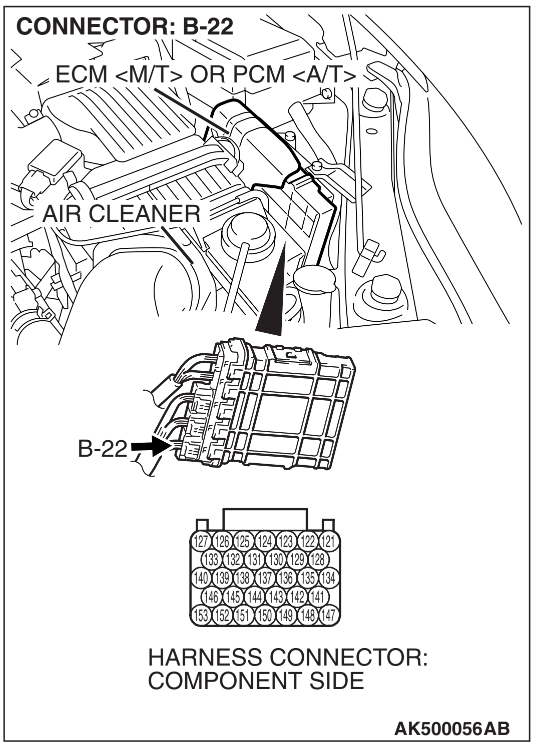
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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



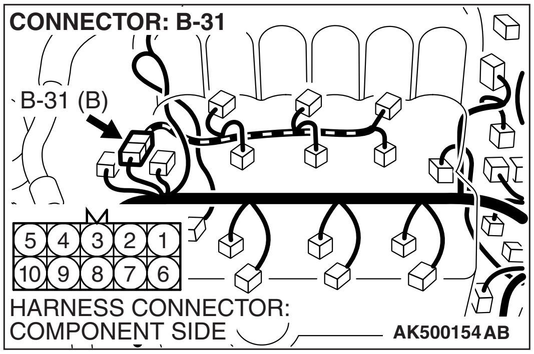


STEP 10. Check for open circuit and short circuit to ground and harness damage between intermediate connector B-31 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 133).

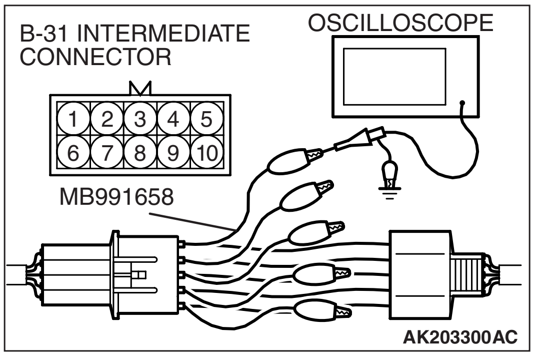
Q: Is the harness wire in good condition?

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

STEP 11. Using the oscilloscope, check the No. 5 cylinder injector.



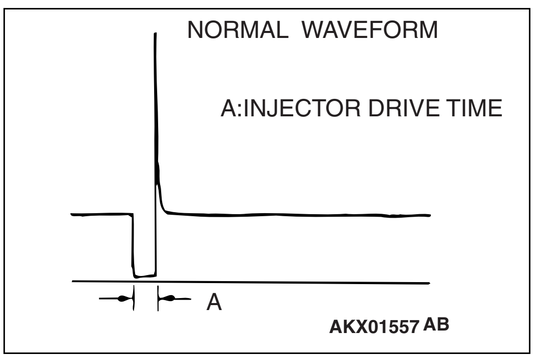
(1) Disconnect the intermediate connector B-31 and connect the test harness MB991658 between the separated connectors.



(2) Connect the oscilloscope probe to injector intermediate connector terminal No. 4.

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 133.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

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

STEP 12. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0205 set?

YES : Retry the troubleshooting.

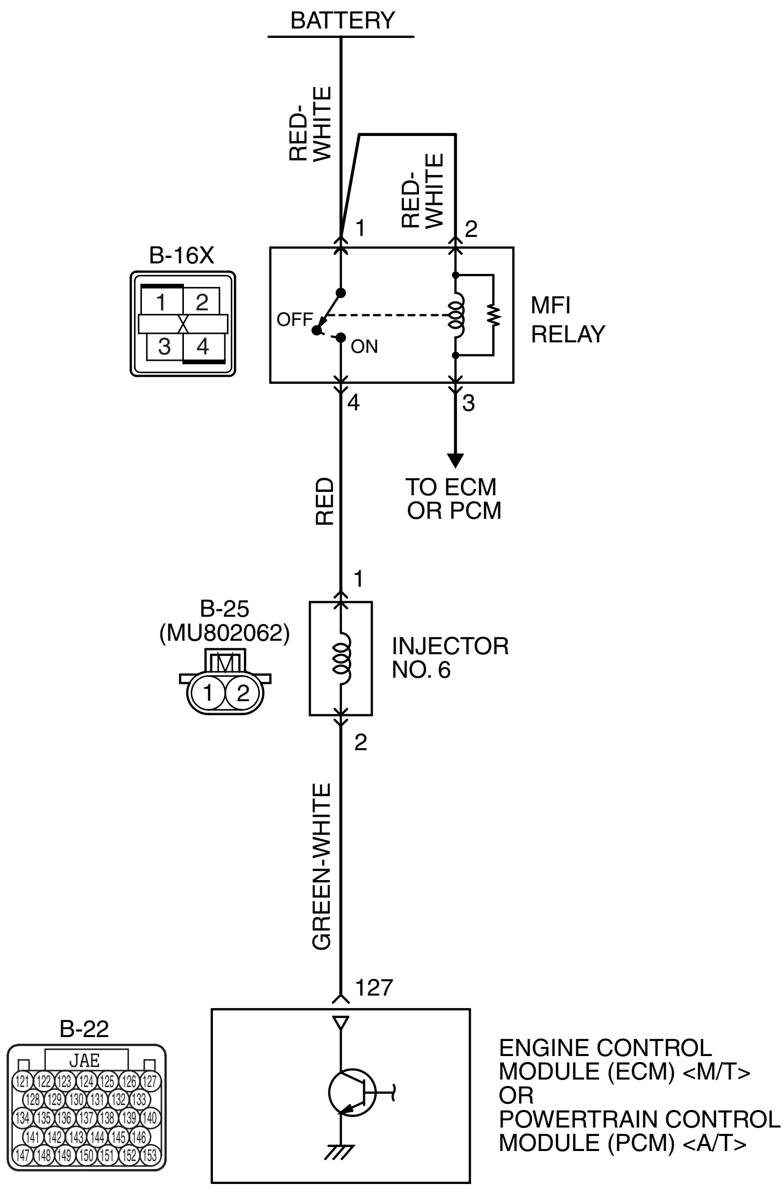
NO : The inspection is complete.

DTC P0206: Injector Circuit Malfunction - Cylinder 6

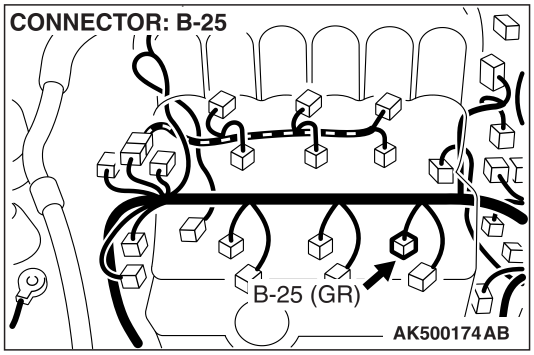
⚠ CAUTION

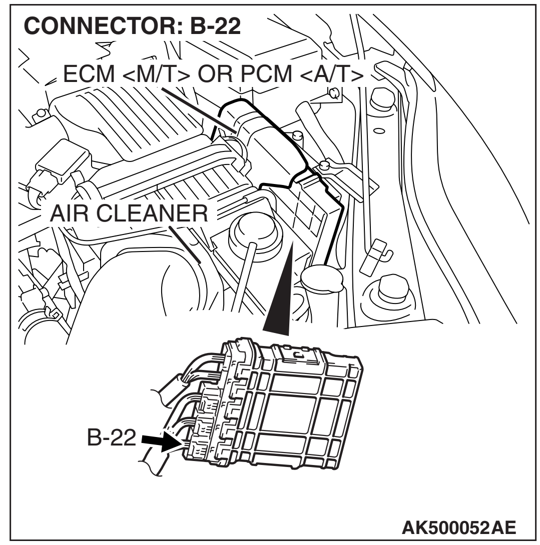
If DTC P0206 has been set, TCL related DTC U1120 is also set. After P0206 has been diagnosed, don't forget to erase DTC U1120.

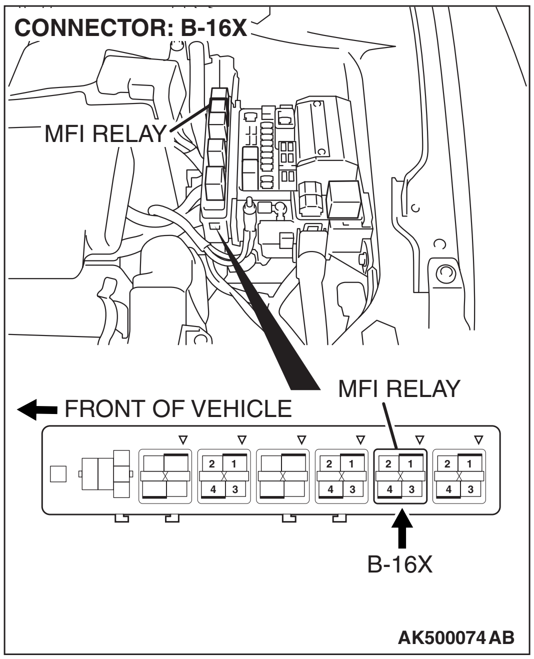
Injector Circuit - Cylinder 6



AK403719







CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the injector by turning the power transistor in the PCM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM <M/T> or the PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or the PCM <A/T> 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)

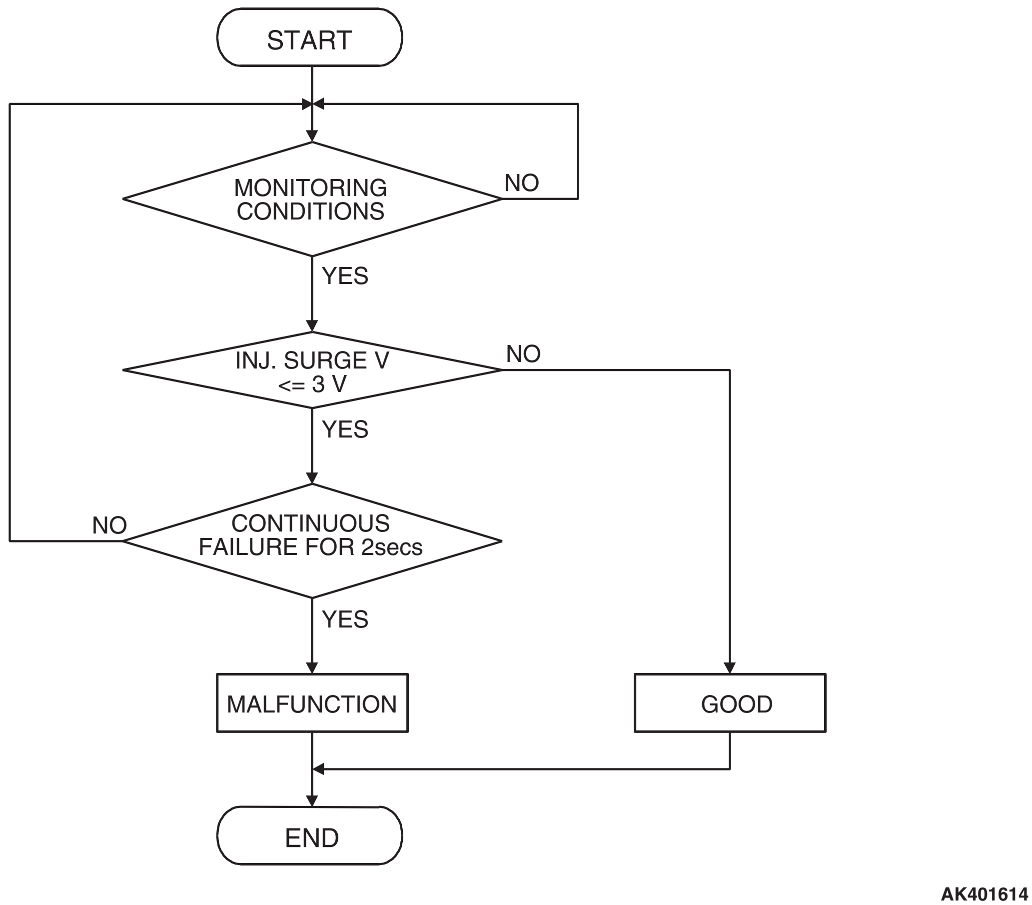
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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

Logic Flow Chart



Check Condition

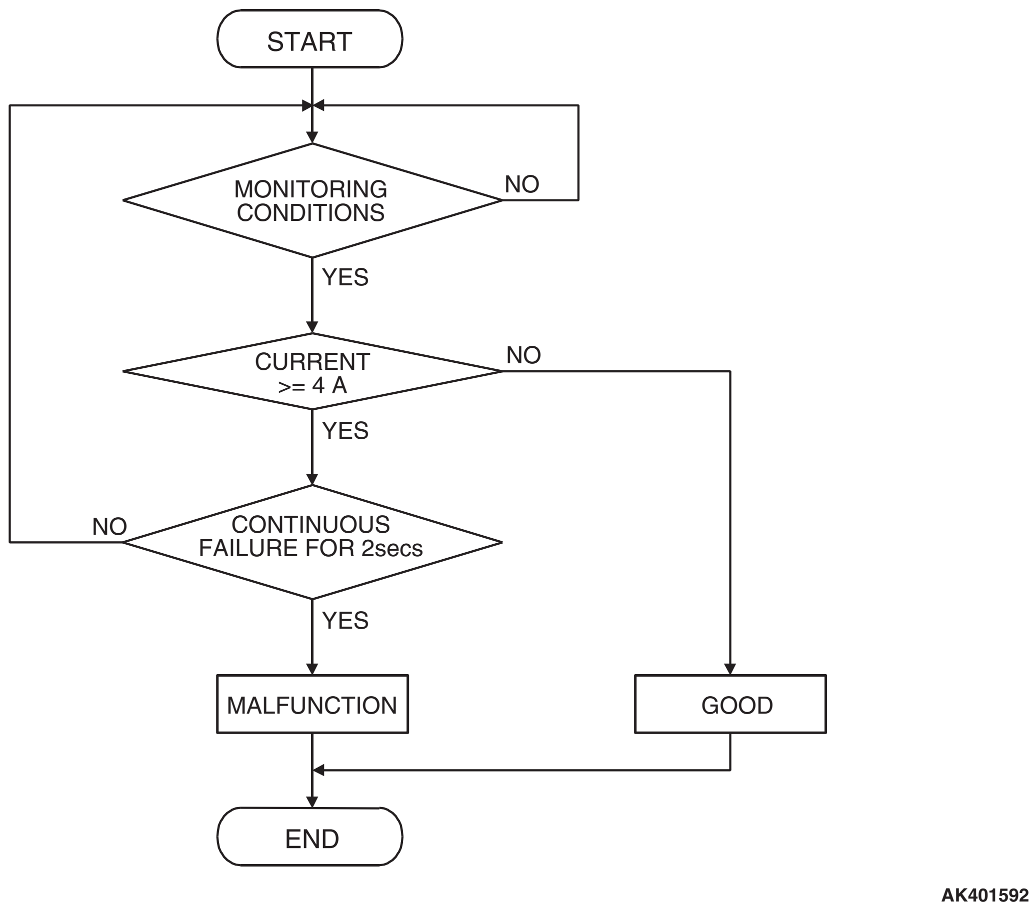
- Engine is running.

Judgement Criterion

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

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



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 22 P.13B-6.

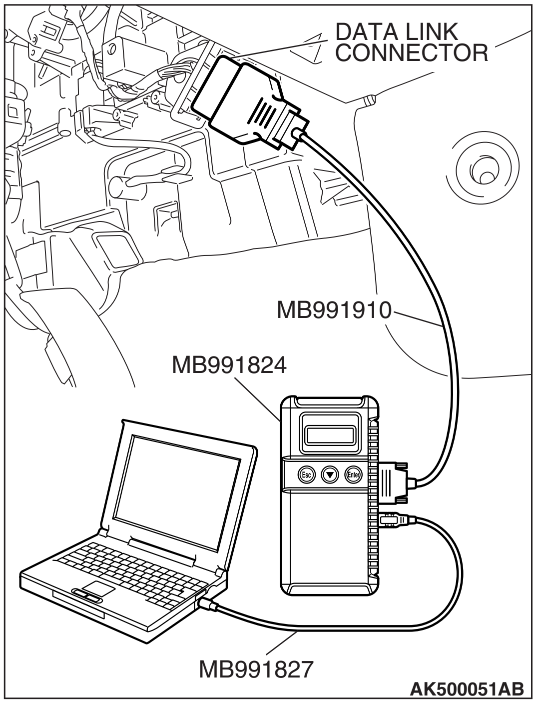
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 6 cylinder injector failed.
- Open or shorted No. 6 cylinder injector circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check actuator test item 6: No. 6 injector.

⚠ **CAUTION**

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

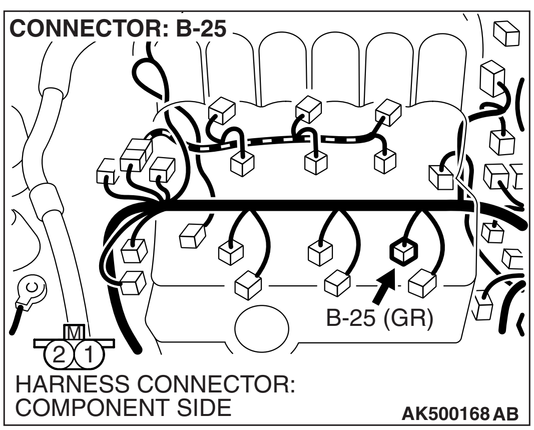
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 6, No. 6 Injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly rougher.

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

Q: Is the actuator operating properly?

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

NO : Go to Step 2.



STEP 2. Check the harness connector B-25 at No. 6 cylinder injector for damage.

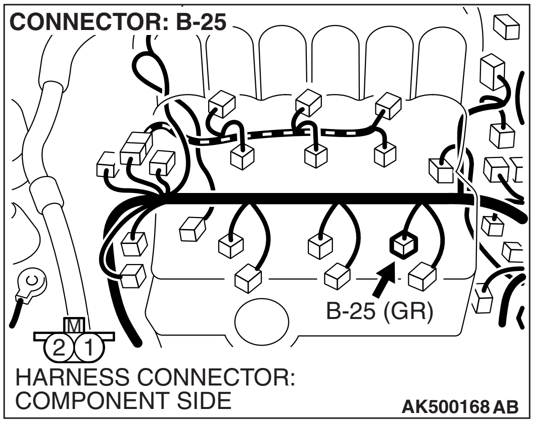
Q: Is the harness connector in good condition?

YES : Go to Step 3.

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

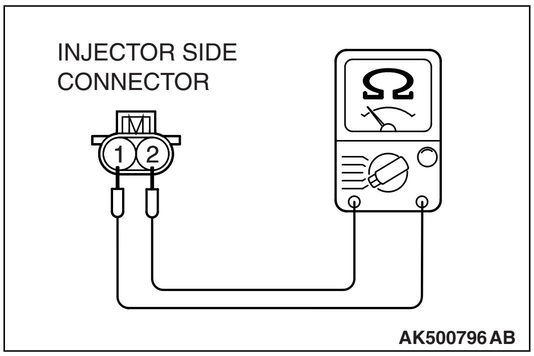
STEP 3. Check the No. 6 cylinder injector.

(1) Disconnect the No.6 cylinder injector connector B-25.



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

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



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

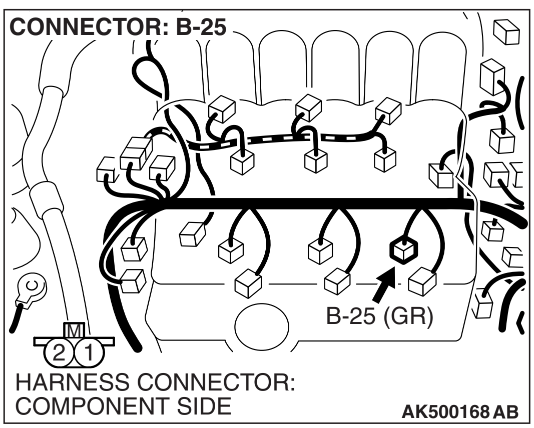
YES : Go to Step 4.

NO : Replace the No. 6 cylinder injector. Then go to Step 10.

STEP 4. Measure the power supply voltage at No. 6 cylinder injector connector B-25.

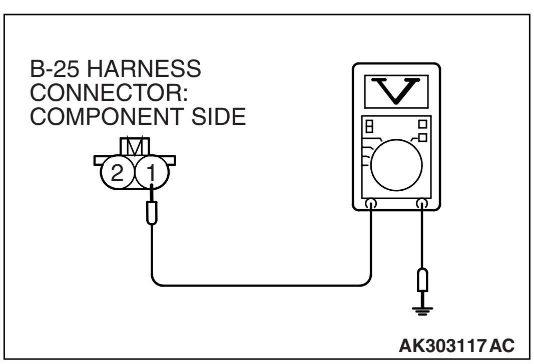
(1) Disconnect connector B-25 and measure at the harness side.

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



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

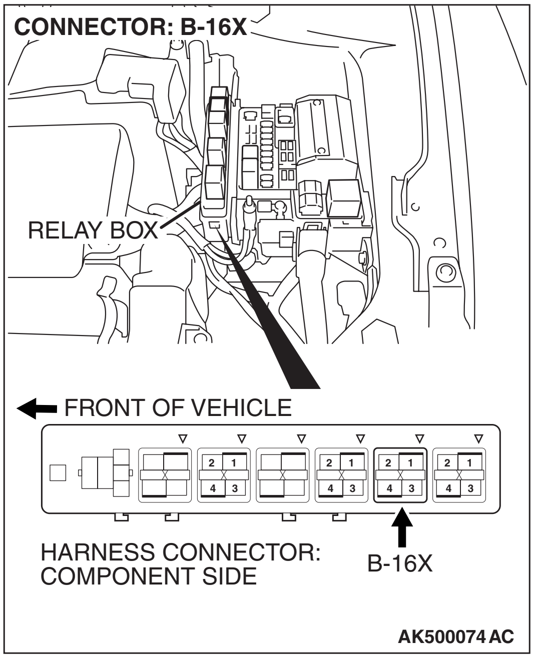
(4) Turn the ignition switch to the "LOCK" (OFF) position.



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

YES : Go to Step 6.

NO : Go to Step 5.

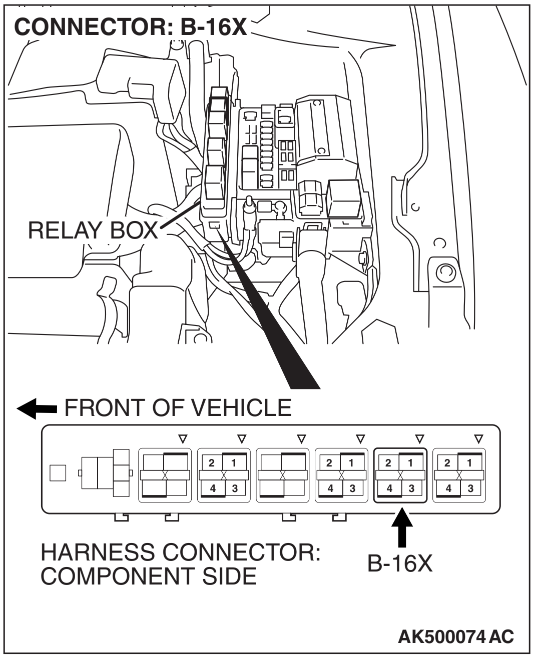


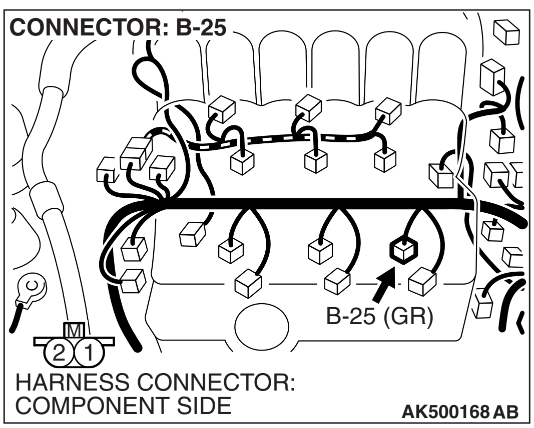
STEP 5. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and No. 6 cylinder injector connector B-25 (terminal No. 1) because of open circuit or short circuit to ground.
Then go to Step 10.

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



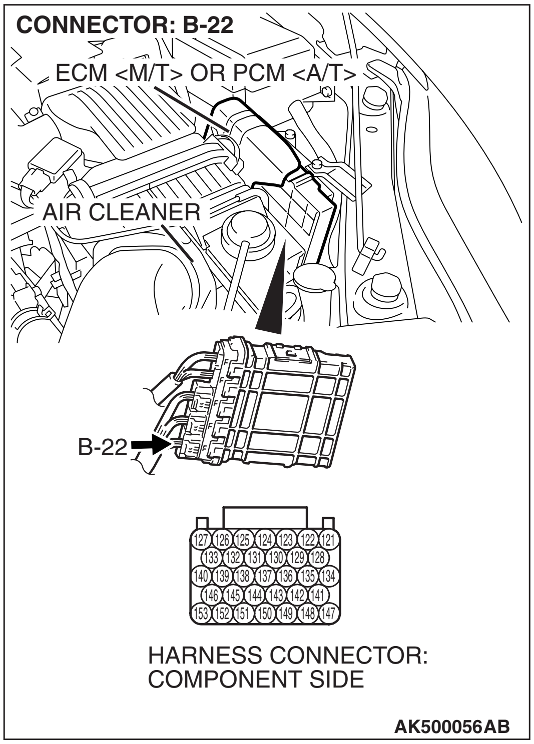


STEP 6. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and No. 6 cylinder injector connector B-25 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

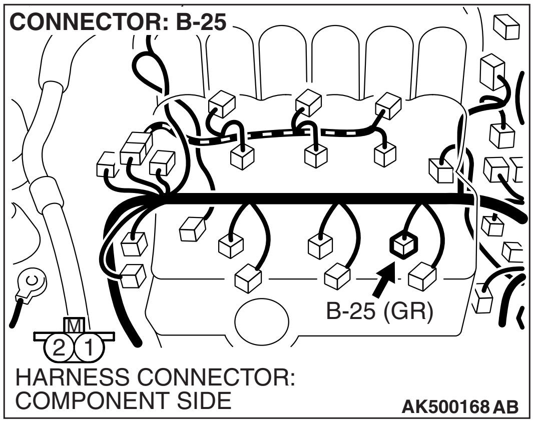


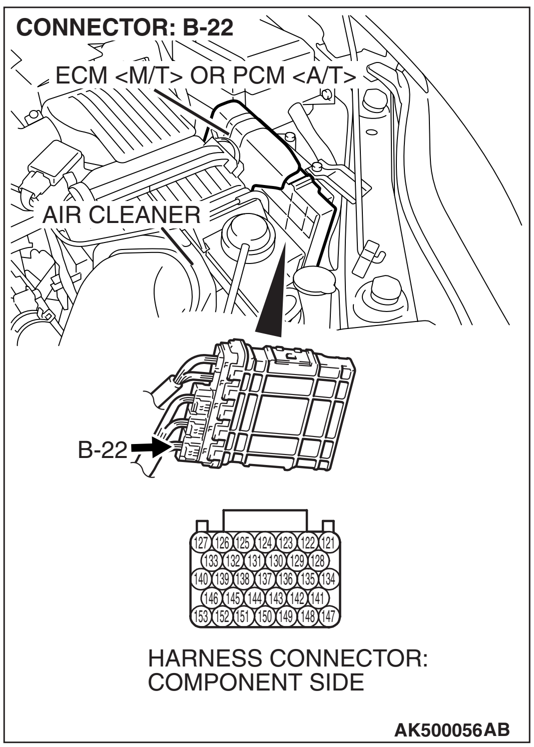
STEP 7. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

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



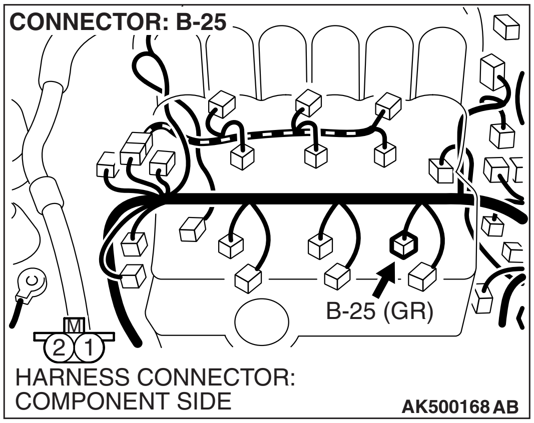


STEP 8. Check for open circuit and short circuit to ground and harness damage between No. 6 cylinder injector connector B-25 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 127).

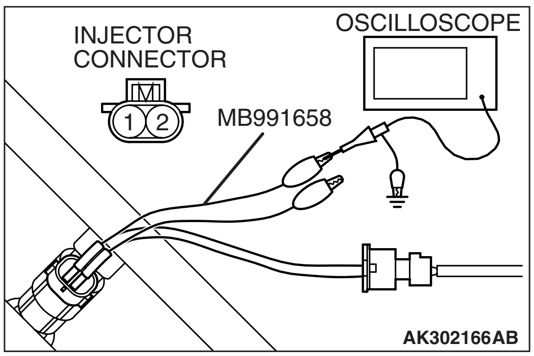
Q: Is the harness wire in good condition?

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

STEP 9. Using the oscilloscope, check the No. 6 cylinder injector.



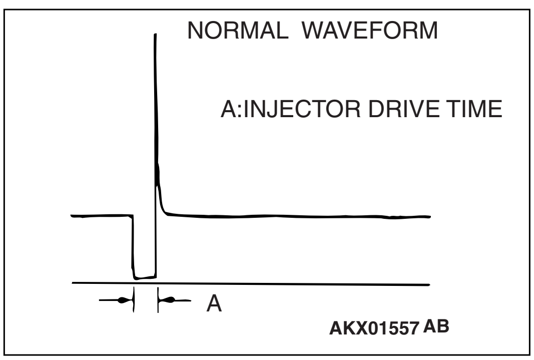
(1) Disconnect the No. 6 cylinder injector connector B-25 and connect the test harness special tool (MB991658) between the separated connectors. (All terminals should be connected)



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

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. Then connect an oscilloscope probe to the check harness connector terminal No. 127.

(3) Start the engine and run at idle.



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

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

Q: Is the waveform normal?

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

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0206 set?

YES : Retry the troubleshooting.

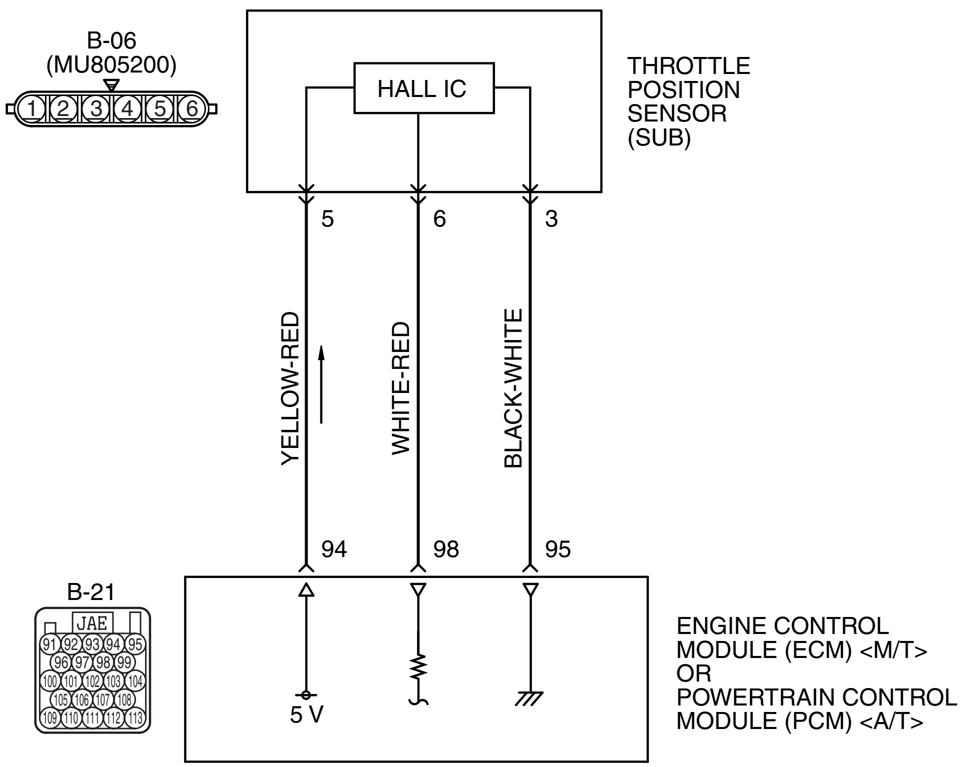
NO : The inspection is complete.

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

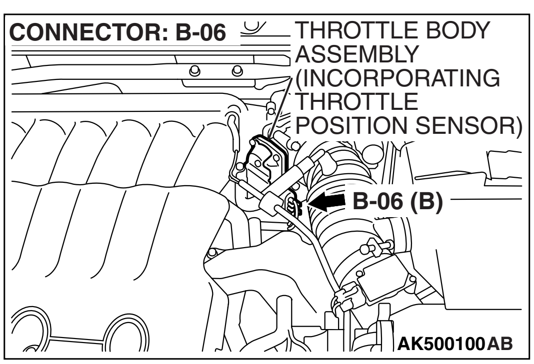
⚠ CAUTION

If DTC P0222 has been set, TCL related DTC U1120 is also set. After P0222 has been diagnosed, don't forget to erase DTC U1120.

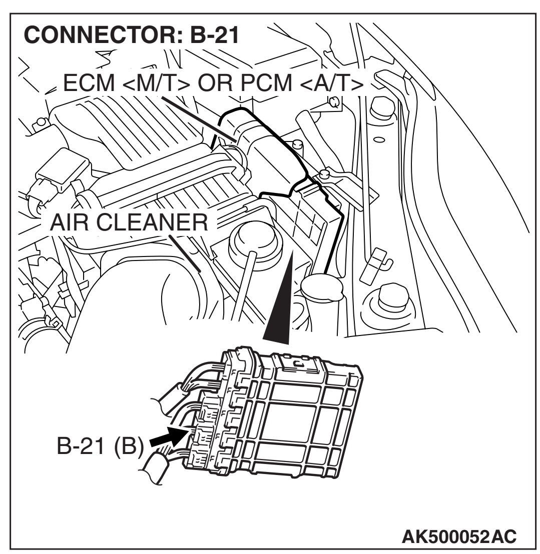
Throttle Position Sensor (sub) Circuit



AK403687



AK500100AB



AK500052AC

CIRCUIT OPERATION

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

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (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)

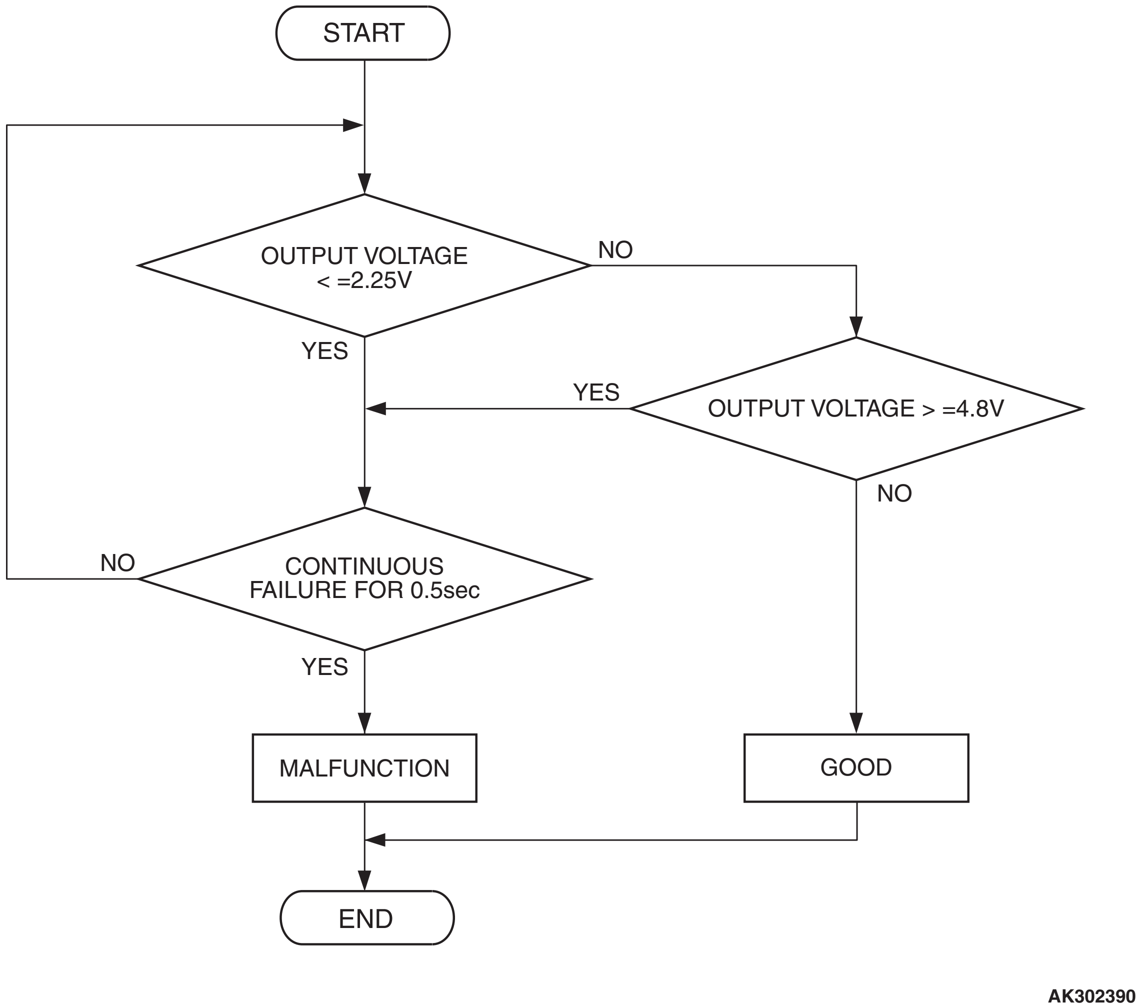
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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:)

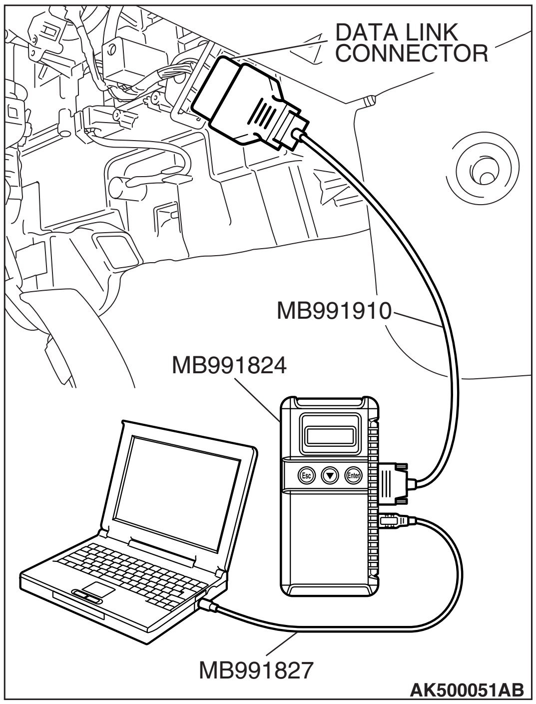
- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).



⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 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.

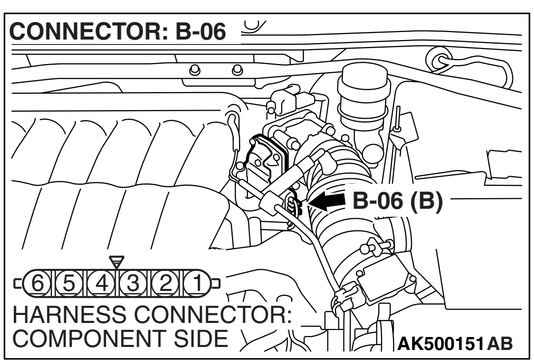
(7) Turn the ignition switch to the "LOCK"(OFF) position.

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.00-14.

NO : Go to Step 2.

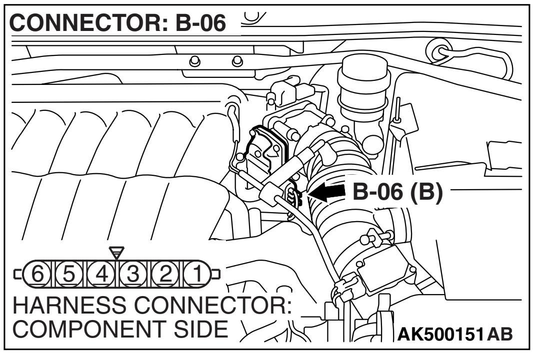
STEP 2. Check harness connector B-06 at throttle position sensor for damage.



Q: Is the harness connector in good condition?

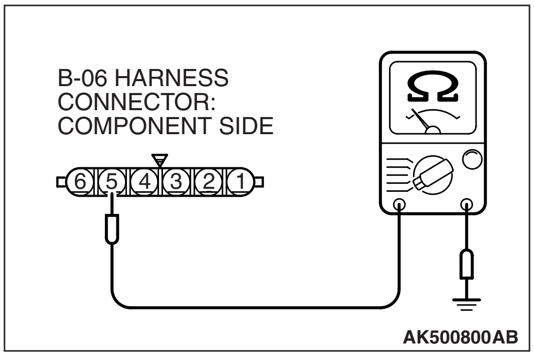
YES : Go to Step 3.

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



STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

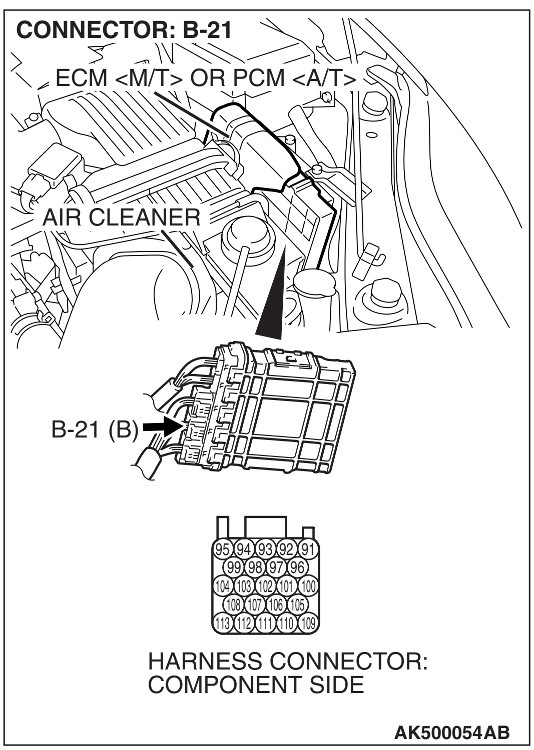


(3) Measure the voltage between terminal No. 5 and ground
- Voltage should be between 4.9 and 5.1 volts.

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

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

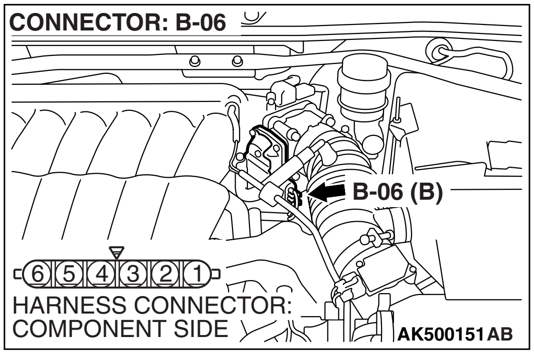
YES : Go to Step 7.
NO : Go to Step 4.

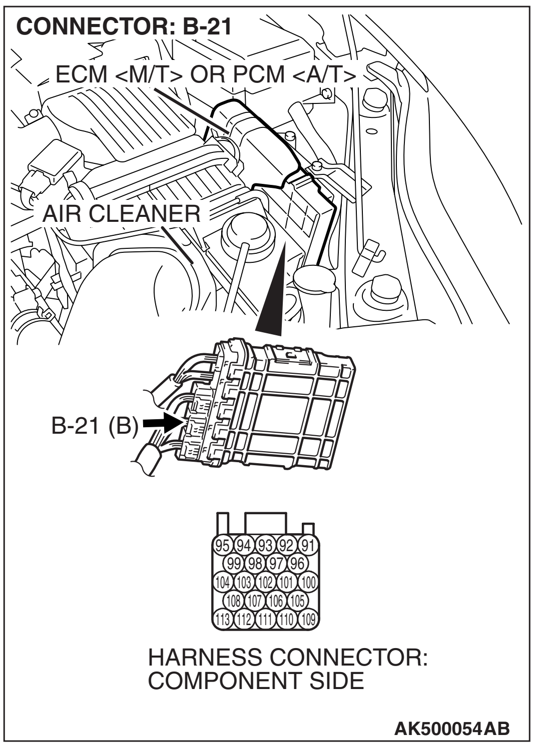


STEP 4. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

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

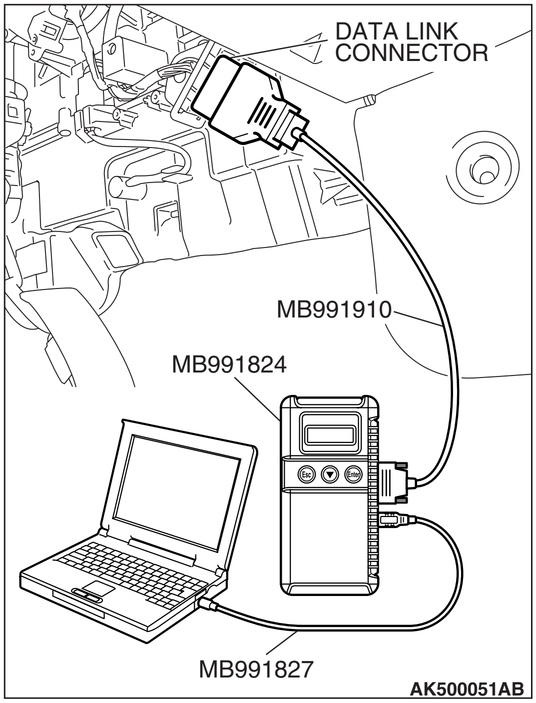




STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-06 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 94).

Q: Is the harness wire in good condition?

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



STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

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

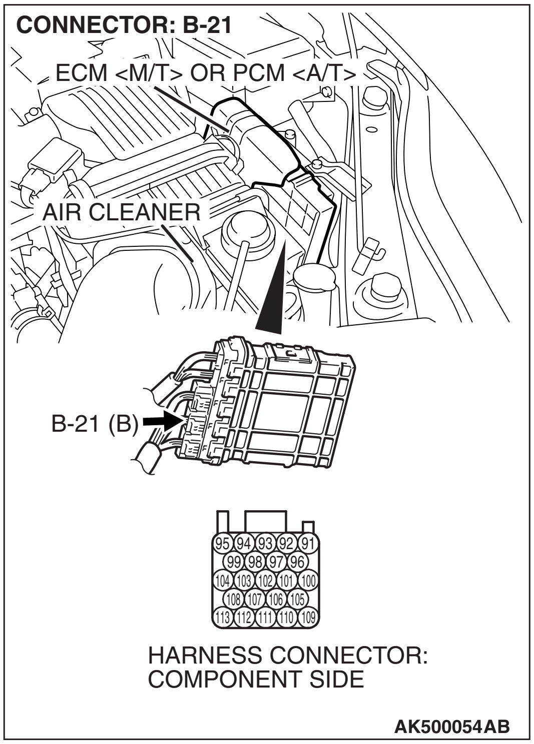
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 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.00-14.

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

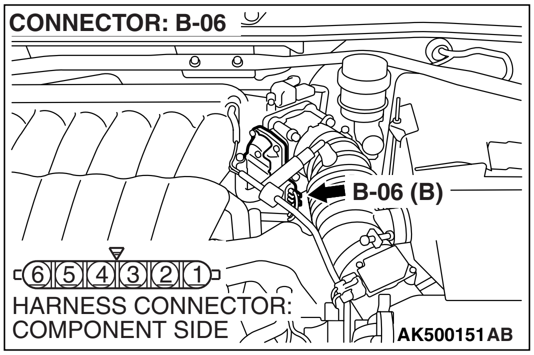


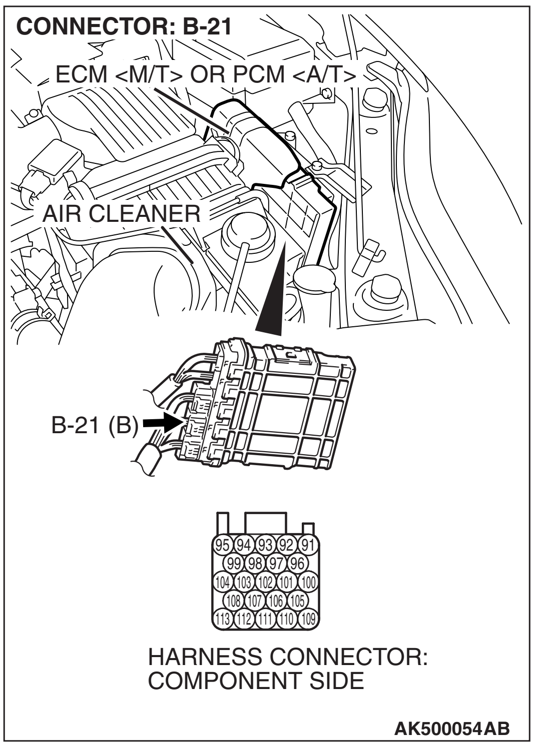
STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

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



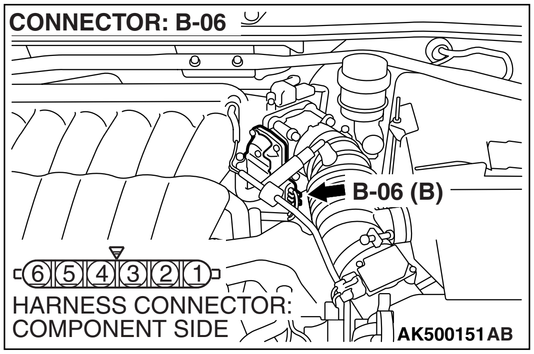


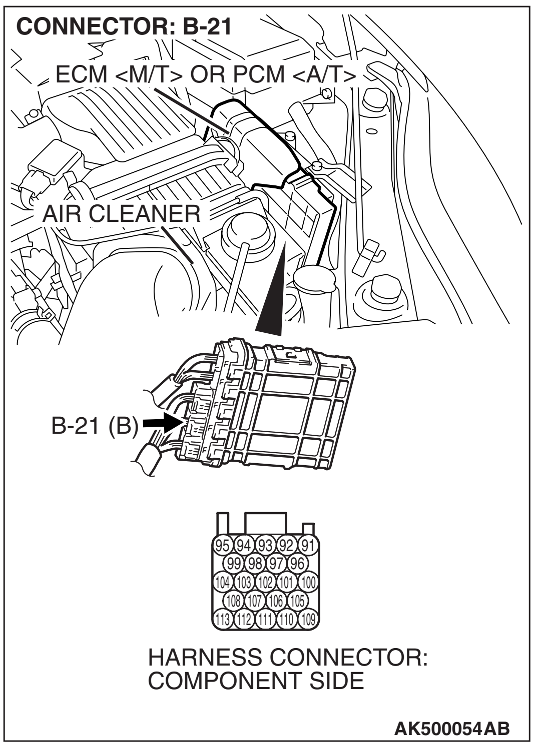
STEP 8. Check for harness damage between throttle position sensor connector B-06 (terminal No. 5) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 94).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

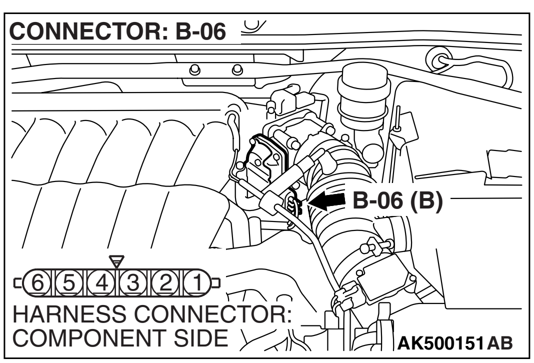




STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-06 (terminal No. 6) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 98).

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 11.

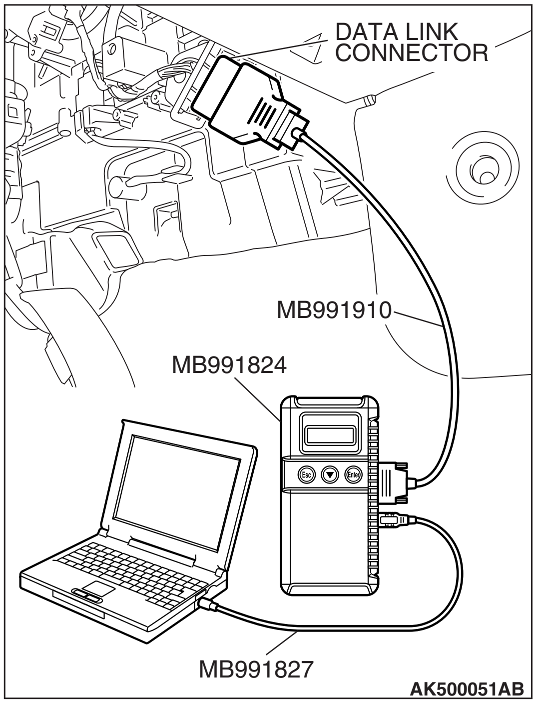


STEP 10. Replace the throttle body assembly.

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

Q: Is DTC P0222 set?

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



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

⚠ CAUTION

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

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

Q: Is DTC P0222 set?

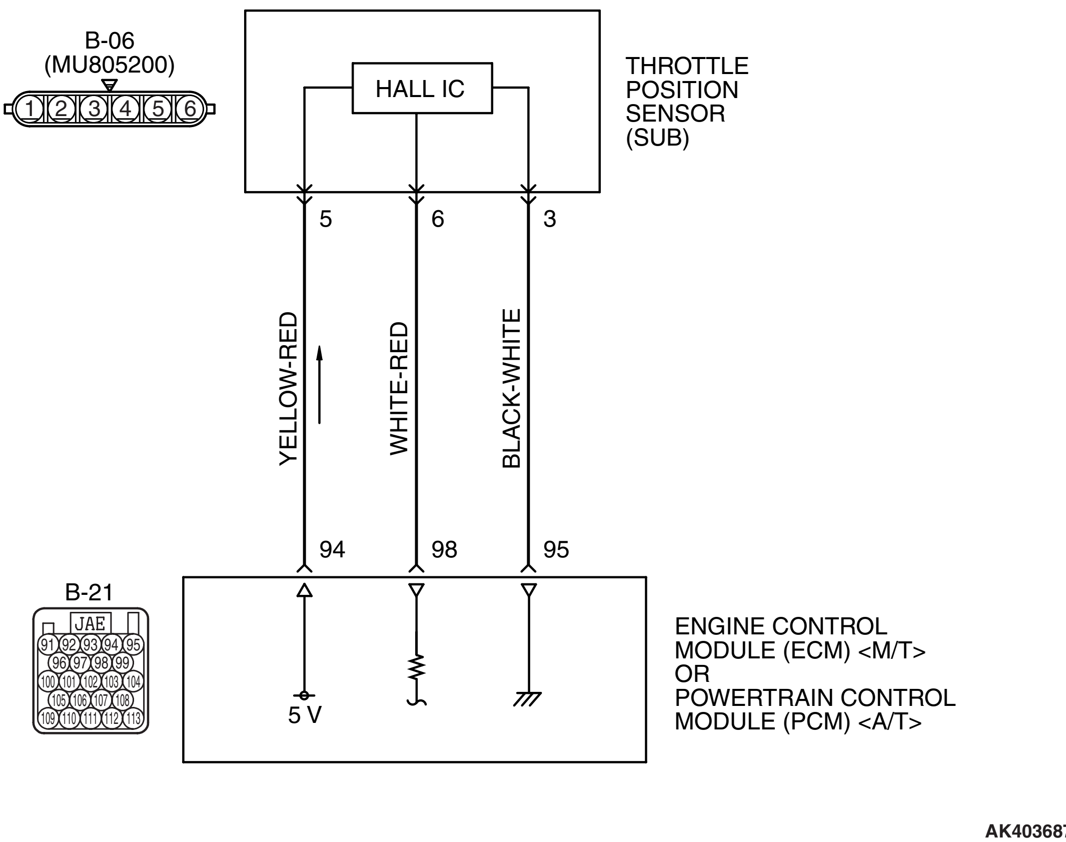
YES : Retry the troubleshooting.
NO : The inspection is complete.

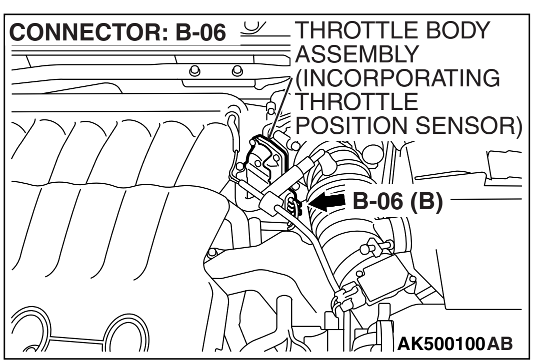
DTC P0223: Throttle Position Sensor (Sub) Circuit High Input

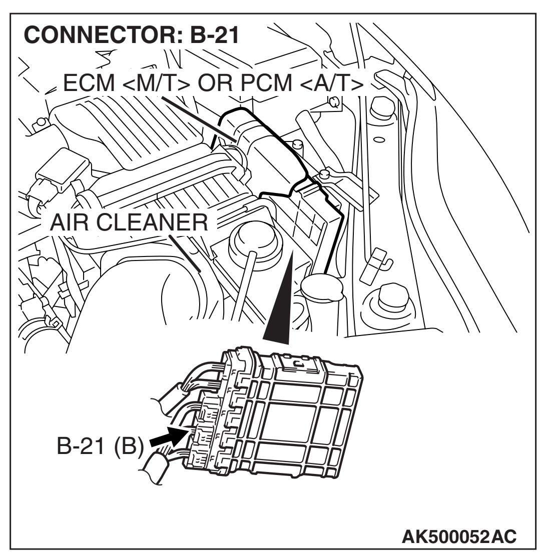
⚠ CAUTION

If DTC P0223 has been set, TCL related DTC U1120 is also set. After P0223 has been diagnosed, don't forget to erase DTC U1120.

Throttle Position Sensor (sub) Circuit







CIRCUIT OPERATION

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

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (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)

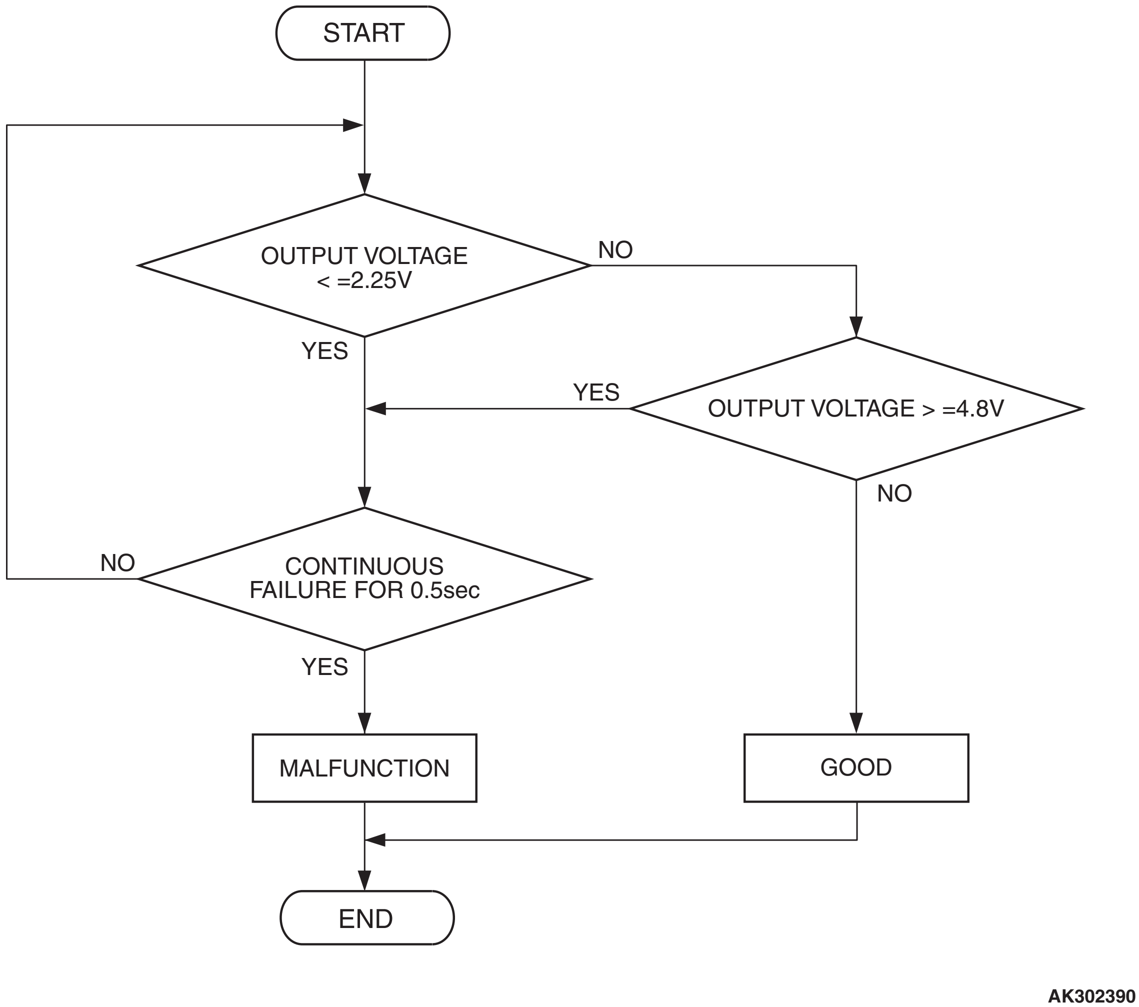
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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.

OBD-II DRIVE CYCLE PATTERN

None.

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

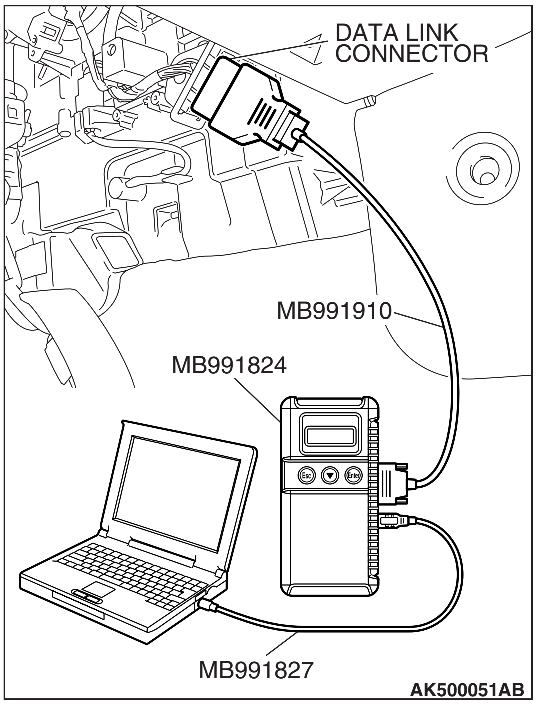
- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).



⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 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.

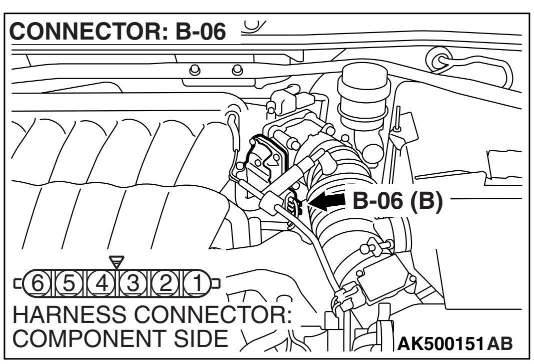
(7) Turn the ignition switch to the "LOCK"(OFF) position.

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.00-14.

NO : Go to Step 2.

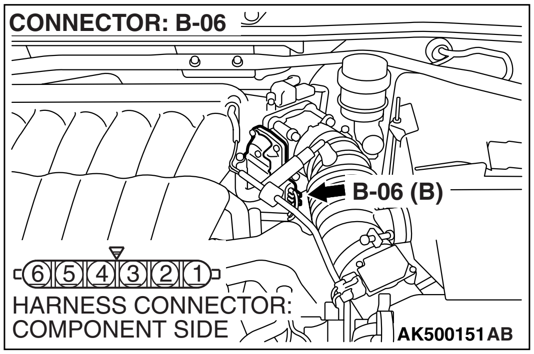
STEP 2. Check harness connector B-06 at throttle position sensor for damage.



Q: Is the harness connector in good condition?

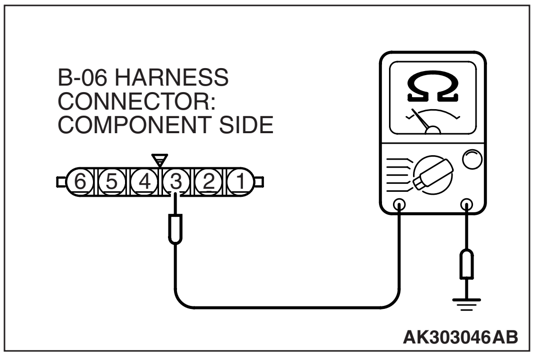
YES : Go to Step 3.

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



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

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

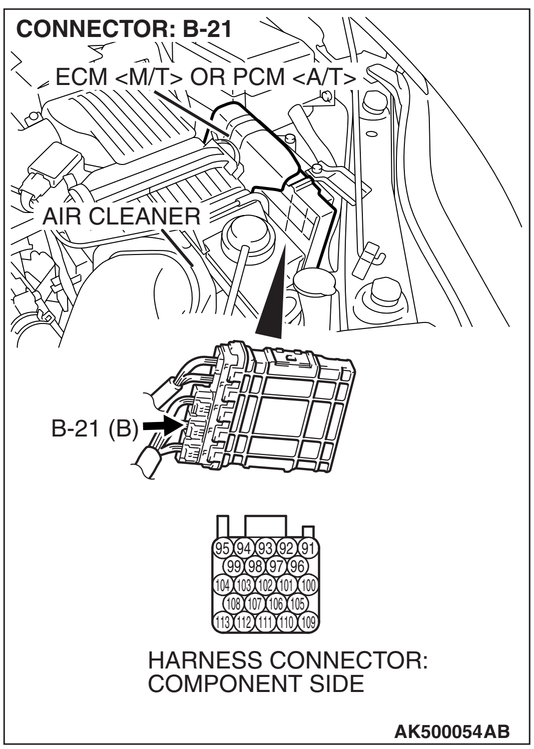


(2) Measure the continuity between terminal No. 3 and ground

- Should be less than 2 ohms.

Q: Does continuity exist?

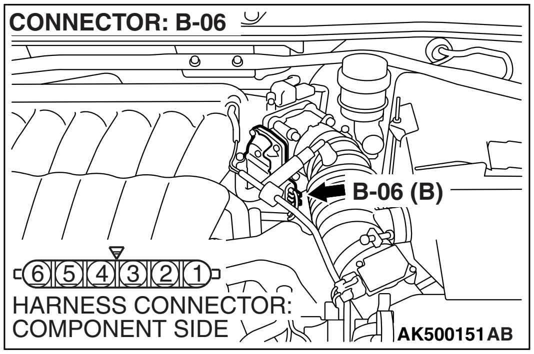
YES : Go to Step 7.
NO : Go to Step 4.

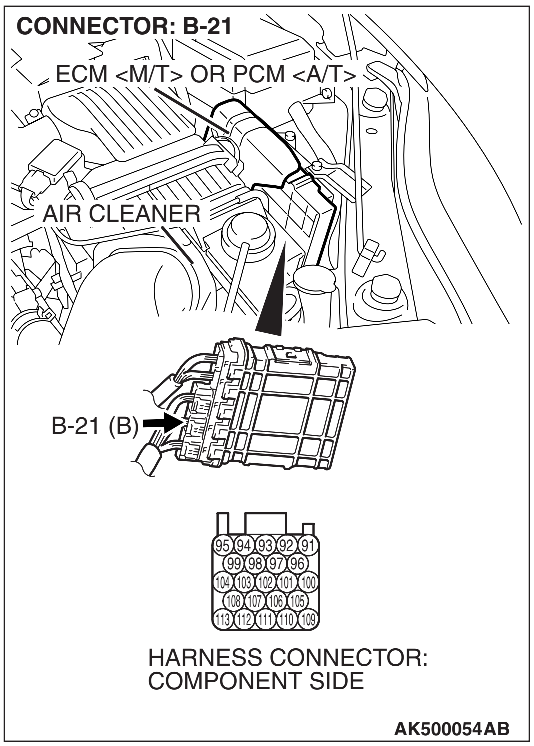


STEP 4. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

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



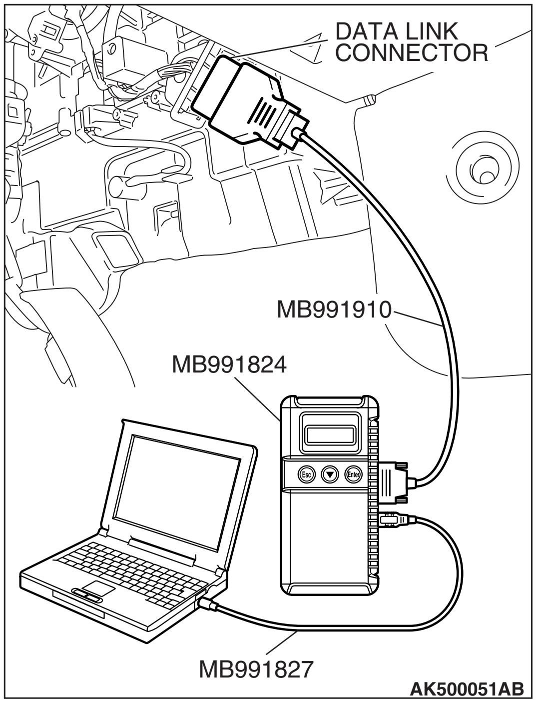


STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-06 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 95).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 8.



STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

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

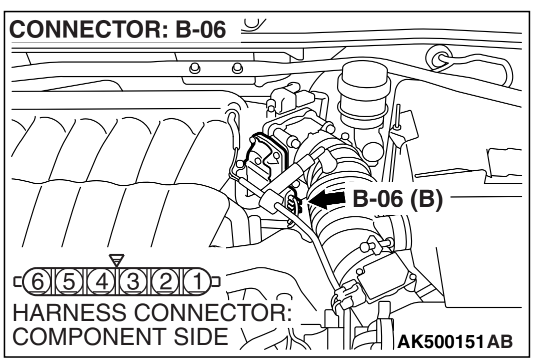
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be between 2.2 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.00-14.

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



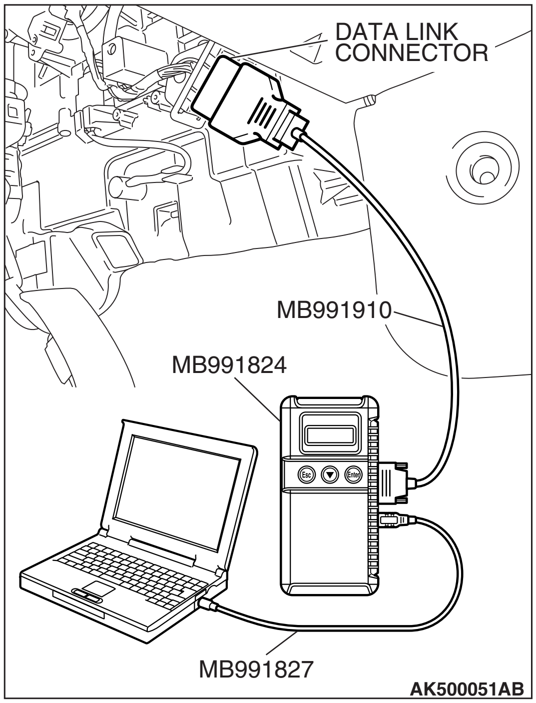
STEP 7. Replace the throttle body assembly.

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

Q: Is DTC P0223 set?

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

NO : The inspection is complete.



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

⚠ CAUTION

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

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

Q: Is DTC P0223 set?

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

DTC P0300: Random/Multiple Cylinder Misfire Detected

⚠ CAUTION

If DTC P0300 has been set, TCL related DTC U1120 is also set. After P0300 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

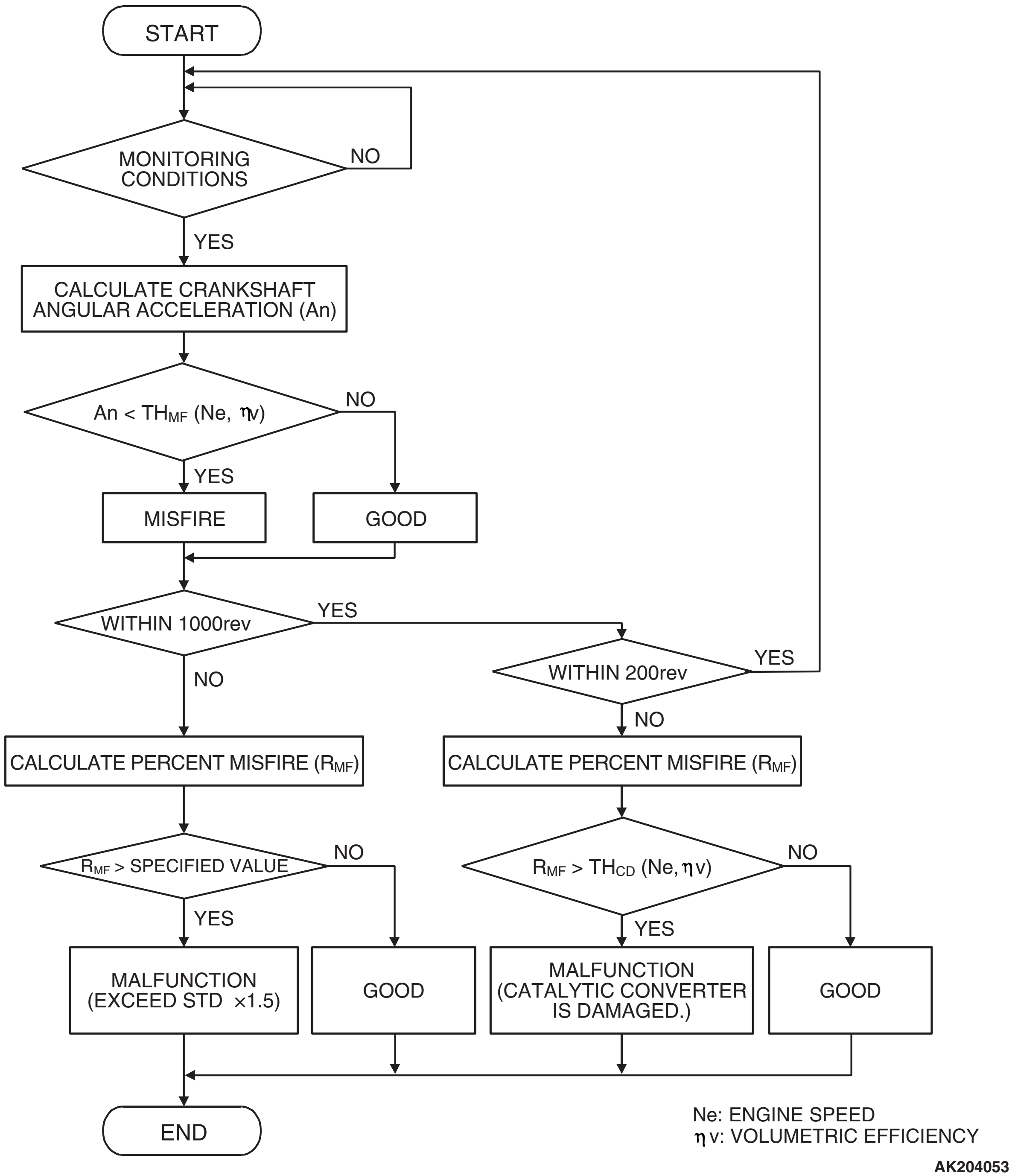
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

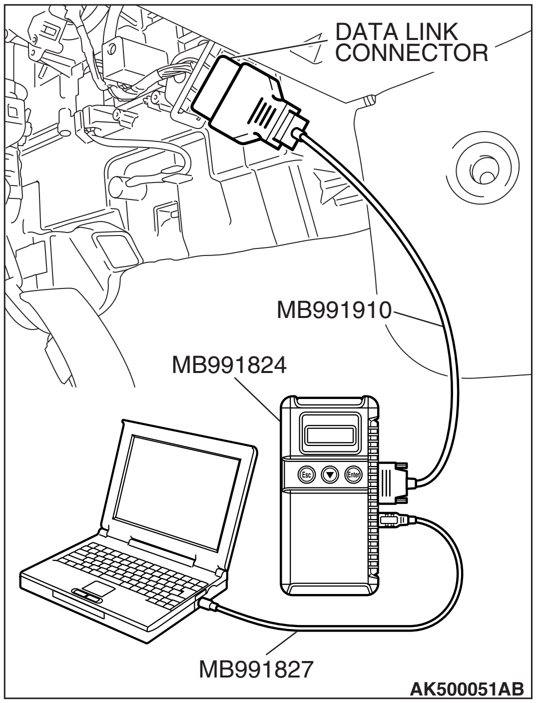
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

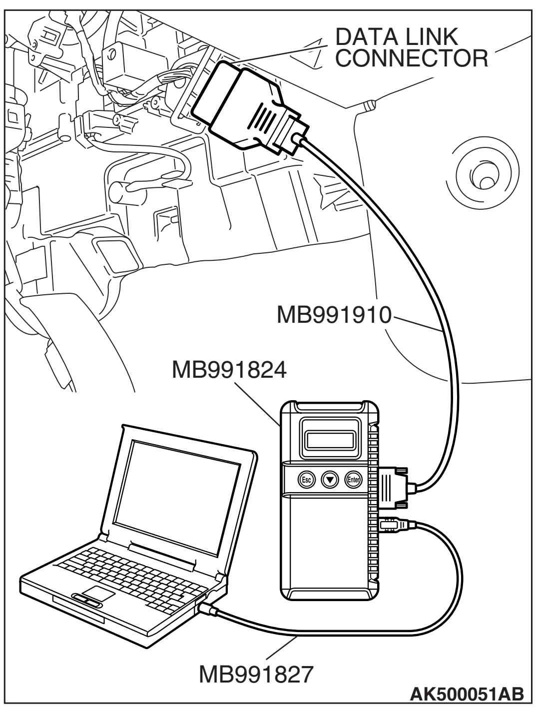
⚠ CAUTION

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

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit Malfunction. P.13B-597

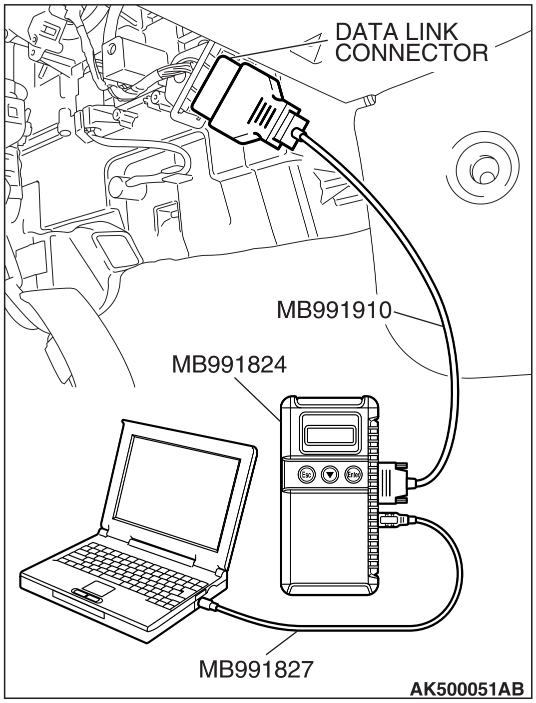


STEP 2. Using scan tool MB991958, check data list item 26 <bank 1> and 27 <bank2>: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 26<bank 1> and 27 <bank2>, Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to, DTC P0171 – System too Lean (bank 1) P.13B-414, DTC P0172 – System too Rich (bank 1) P.13B-423, DTC P0174 – System too Lean (bank 2) P.13B-430, DTC P0175 – System too Rich (bank 2) P.13B-438.

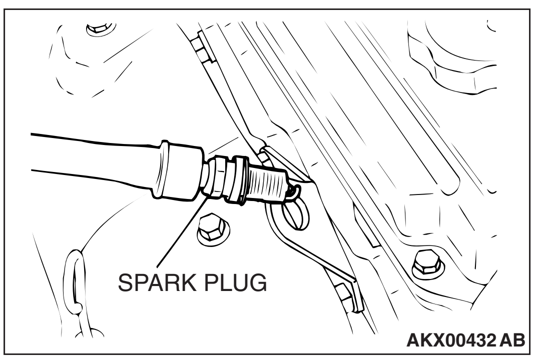


STEP 3. Using scan tool MB991958, check data list item 28 <bank 1> and 29 <bank2>: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28<bank 1> and 29 <bank2>, Short-Term Fuel Trim.
- The fuel trim should be between –30 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 – System too Lean (bank 1) P.13B-414, DTC P0172 – System too Rich (bank 1) P.13B-423, DTC P0174 – System too Lean (bank 2) P.13B-430, DTC P0175 – System too Rich (bank 2) P.13B-438.

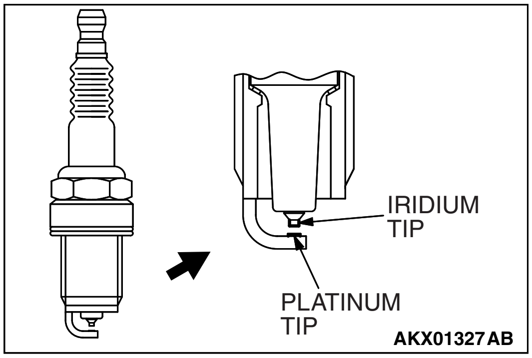


STEP 4. Check the each ignition coil spark.

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

Q: Did it spark?

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



STEP 5. Check the spark plugs.

⚠ CAUTION

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

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

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the faulty spark plug. Then go to Step 8.

STEP 6. Check the following items.

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

Q: Are there any abnormalities?

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

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

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

DTC P0301: Cylinder 1 Misfire Detected

⚠ CAUTION

If DTC P0301 has been set, TCL related DTC U1120 is also set. After P0301 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

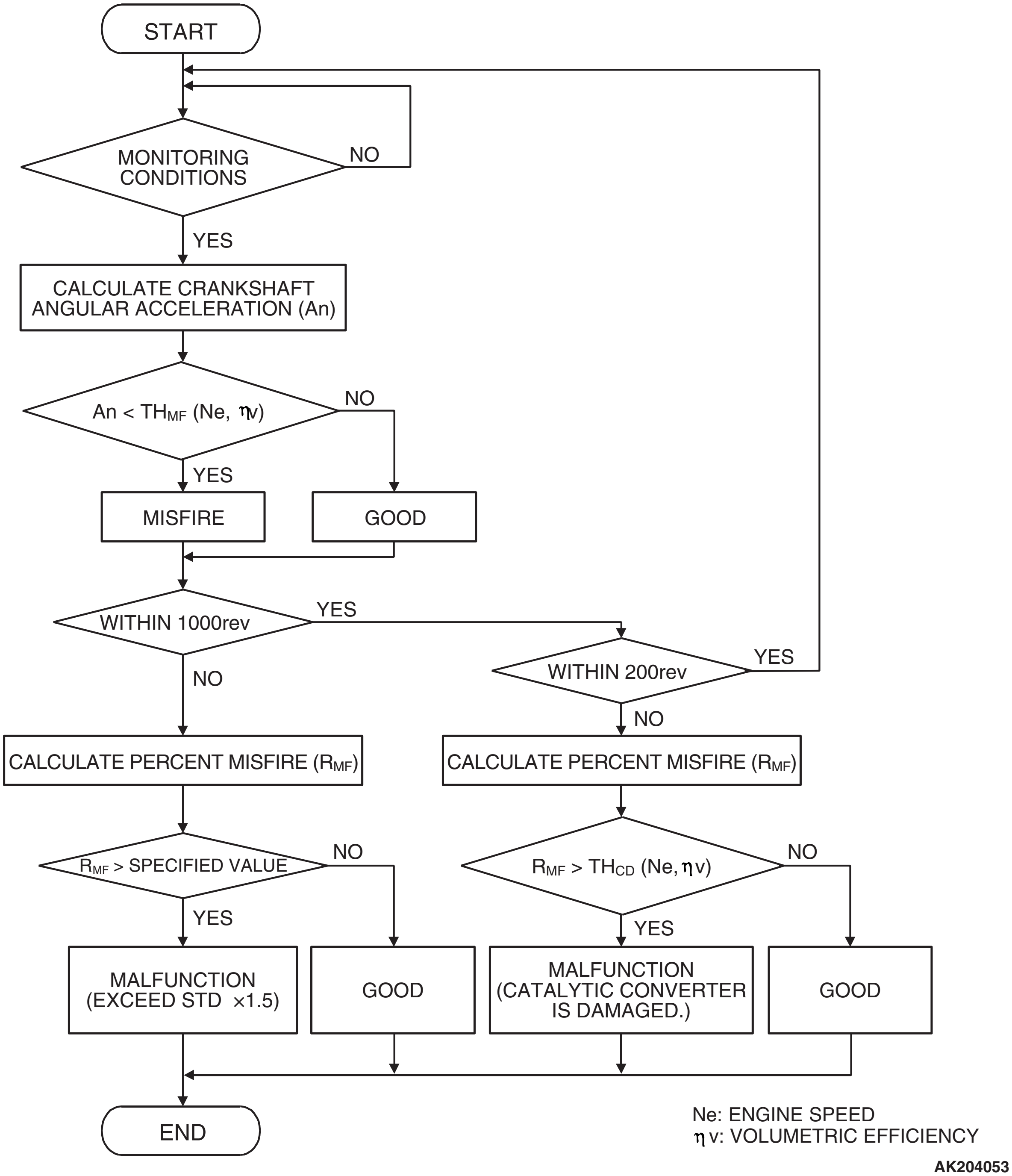
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

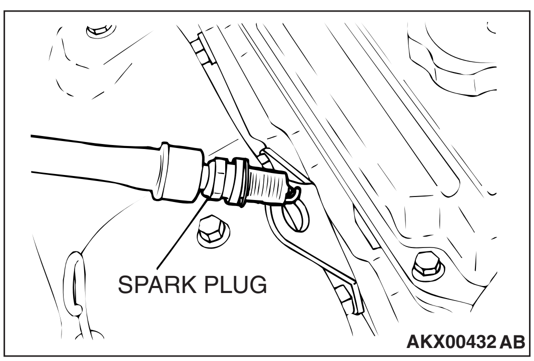
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



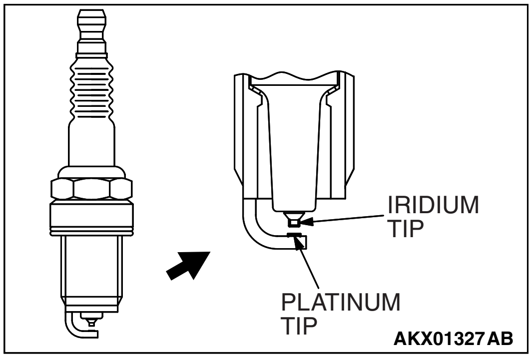
STEP 1. Check the No. 1 cylinder ignition coil spark.

(1) Remove the No. 1 cylinder intake manifold.
(2) Remove the No. 1 cylinder ignition coil.
(3) Remove the spark plug and connect to the No.1 cylinder ignition coil.
(4) Ground the spark plug side electrode securely.

- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 1 cylinder 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) 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: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

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

DTC P0302: Cylinder 2 Misfire Detected

⚠ CAUTION

If DTC P0302 has been set, TCL related DTC U1120 is also set. After P0302 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

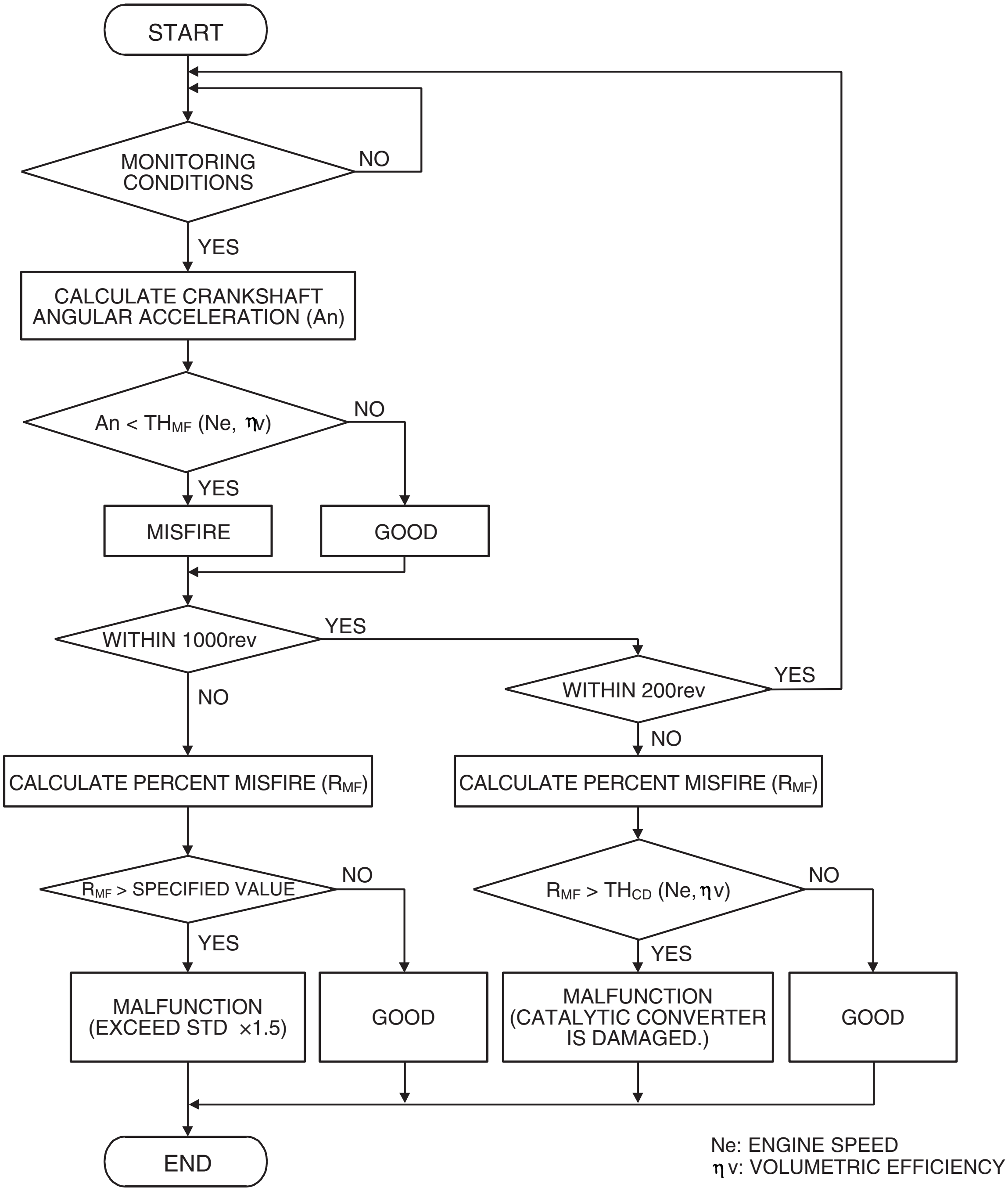
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

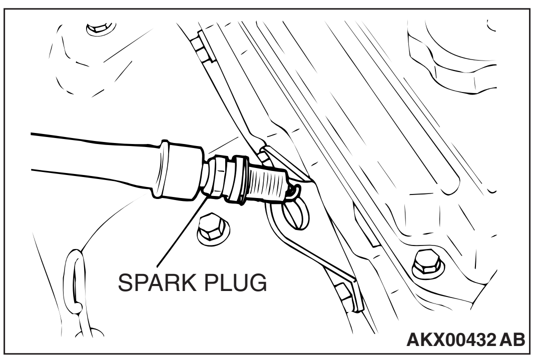
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



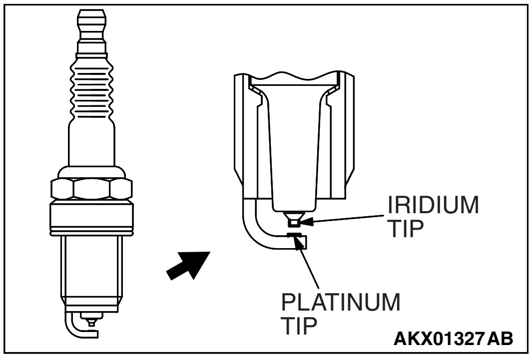
STEP 1. Check the No. 2 cylinder ignition coil spark.

(1) Remove the No. 2 cylinder ignition coil.
(2) Remove the No. 2 cylinder spark plug and connect to the ignition coil.
(3) Ground the No. 2 cylinder spark plug side electrode securely.

- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 2 cylinder 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.

Check the plug gap and replace if the limit is exceeded.

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

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

DTC P0303: Cylinder 3 Misfire Detected

⚠ **CAUTION**

If DTC P0303 has been set, TCL related DTC U1120 is also set. After P0303 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

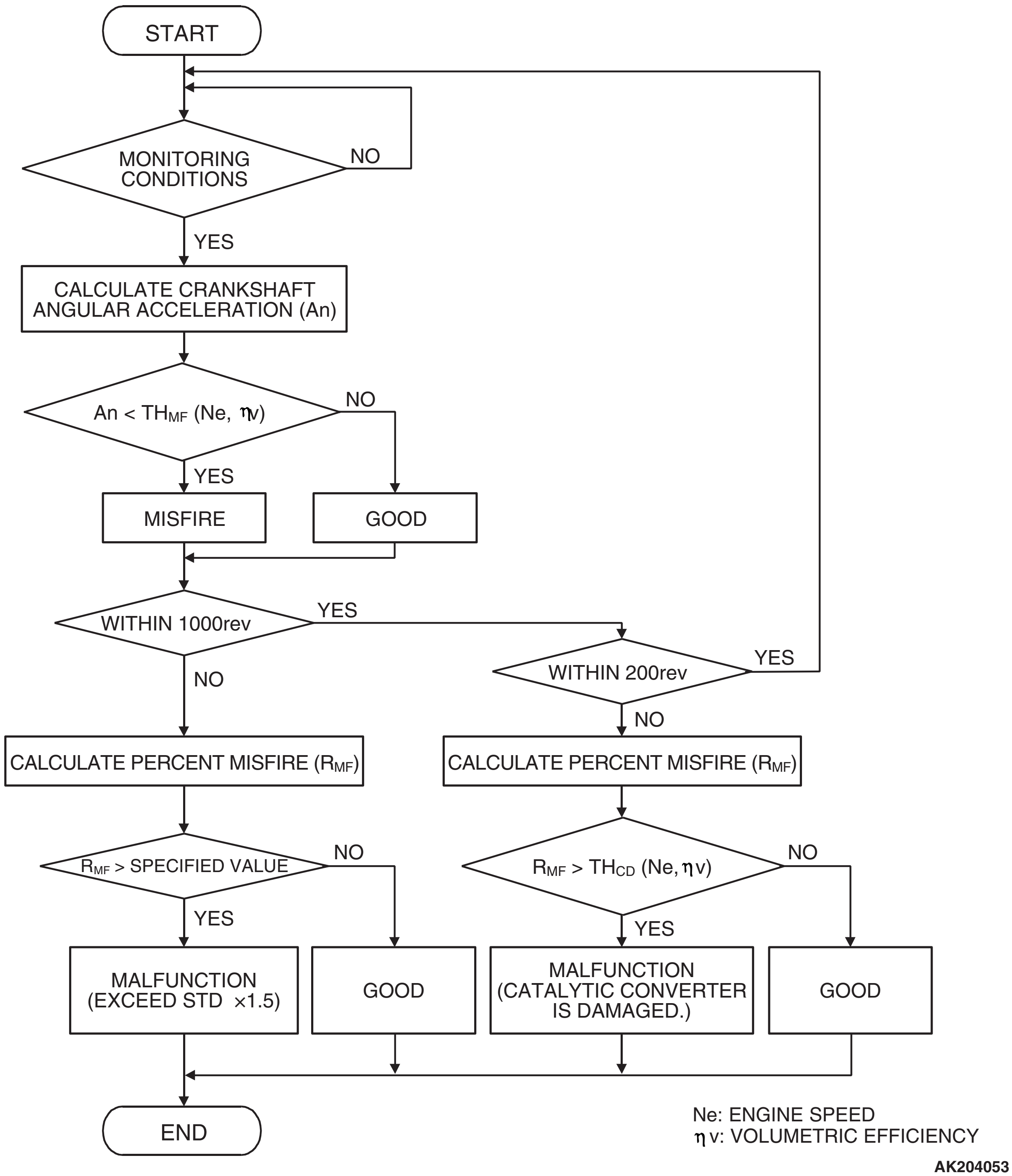
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13B-6.

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

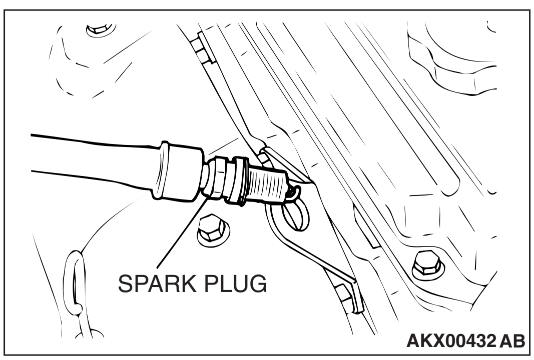
- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

STEP 1. Check the No. 3 cylinder ignition coil spark.

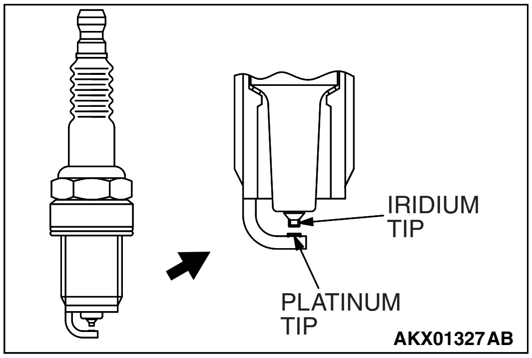
(1) Remove the No. 3 cylinder intake manifold.
(2) Remove the No. 3 cylinder ignition coil.
(3) Remove the spark plug and connect to the No.3 cylinder ignition coil.
(4) Ground the spark plug side electrode securely.

- When the engine is cranked, the spark plug should spark.



Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 3 cylinder 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) 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: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

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

DTC P0304: Cylinder 4 Misfire Detected

⚠ CAUTION
If DTC P0304 has been set, TCL related DTC U1120 is also set. After P0304 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

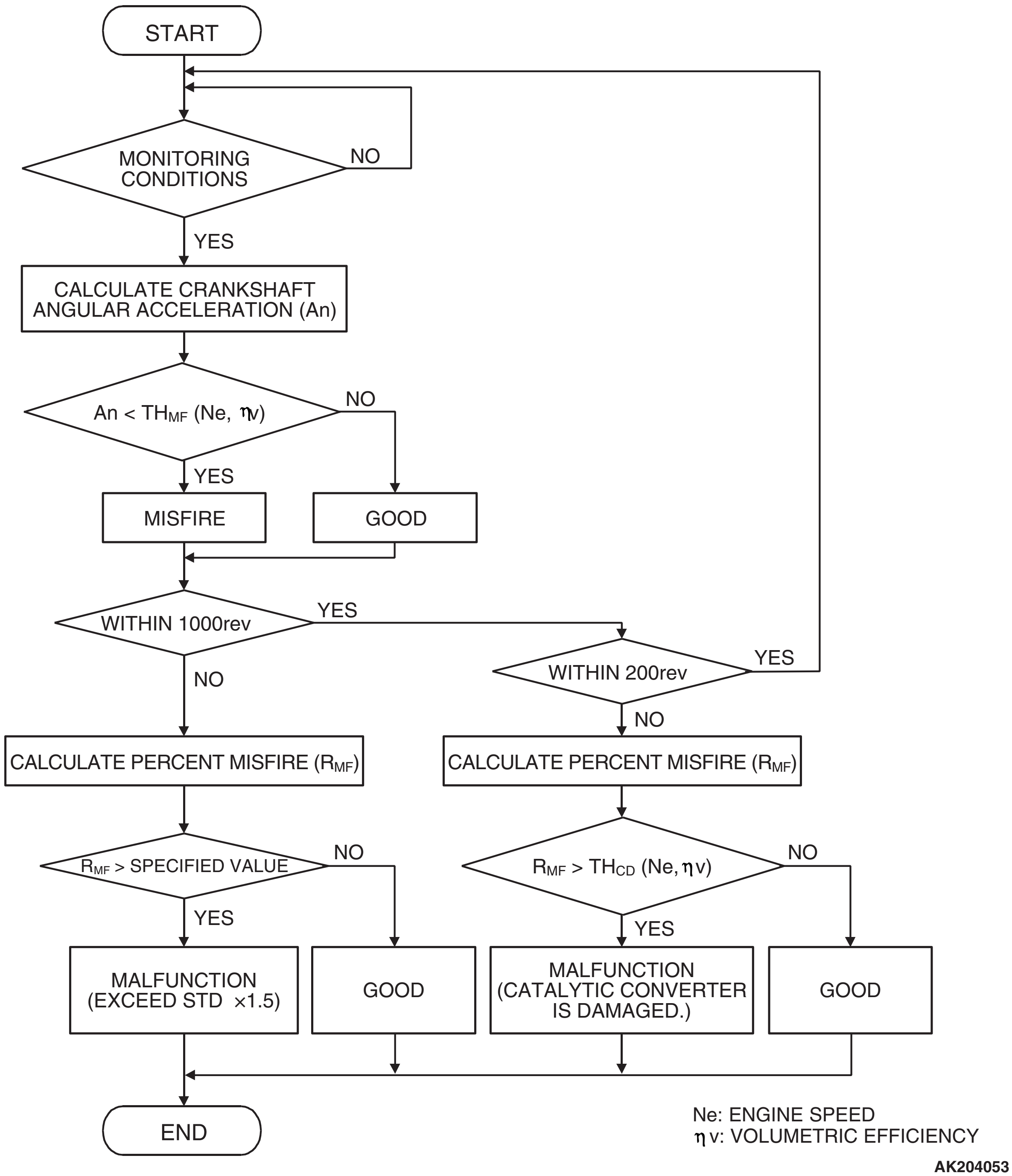
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

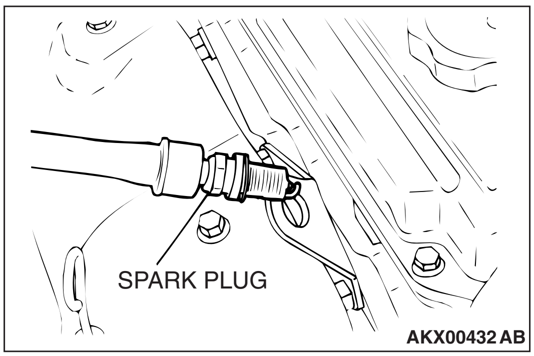
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

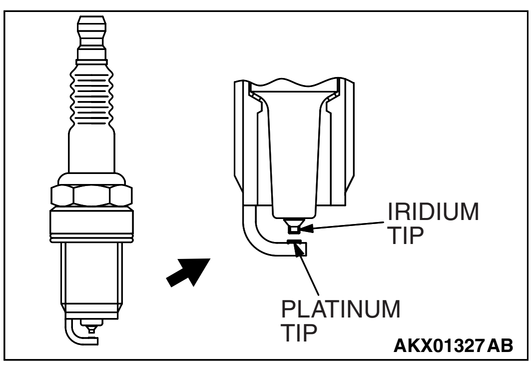


STEP 1. Check the No. 4 cylinder ignition coil spark.

(1) Remove the No. 4 cylinder ignition coil.
(2) Remove the No. 4 cylinder spark plug and connect to the ignition coil.
(3) Ground the No.4 cylinder spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 4 cylinder 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.

Check the plug gap and replace if the limit is exceeded.

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0304 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.

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

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0304 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0305: Cylinder 5 Misfire Detected

⚠ CAUTION

If DTC P0305 has been set, TCL related DTC U1120 is also set. After P0305 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

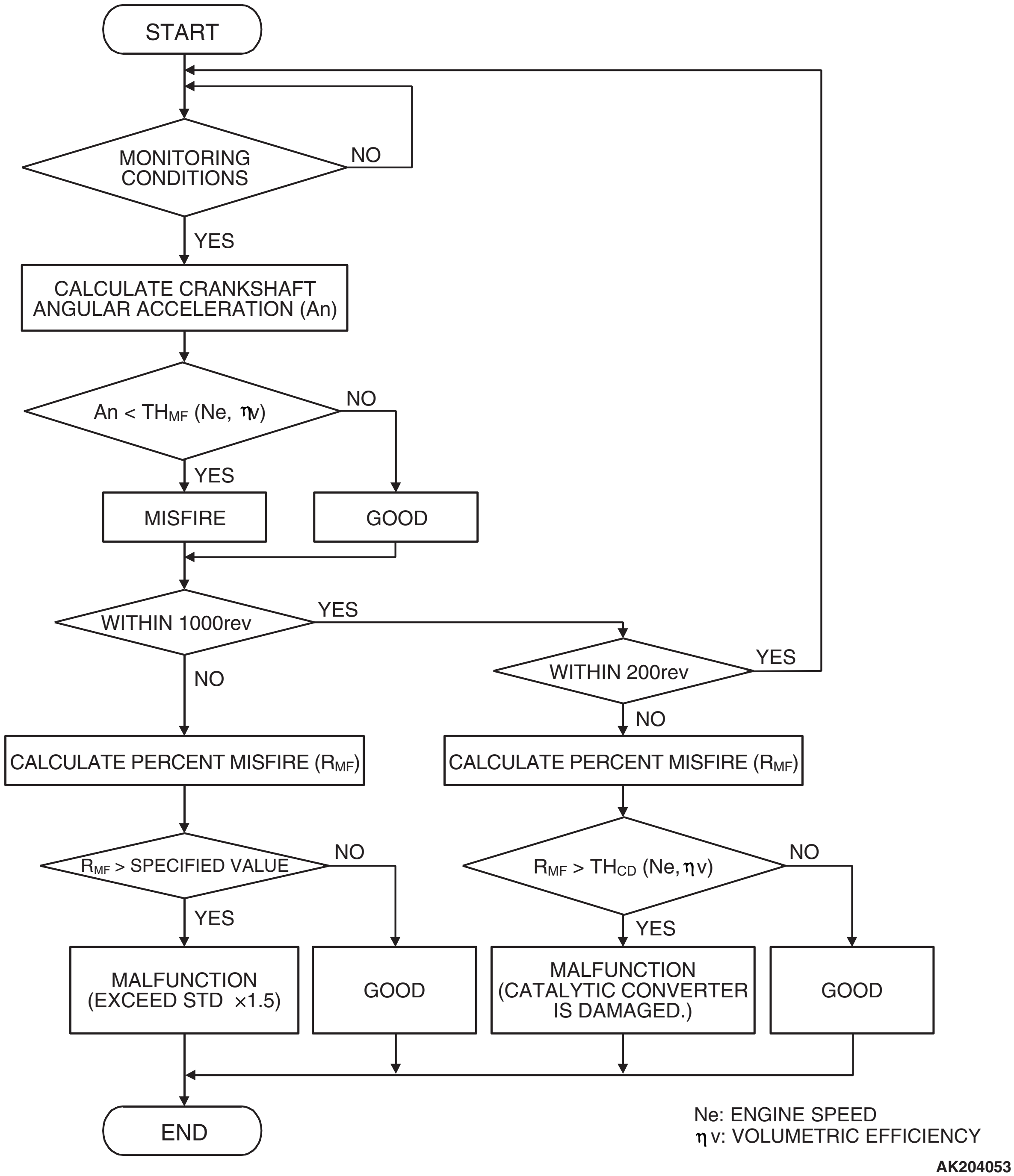
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

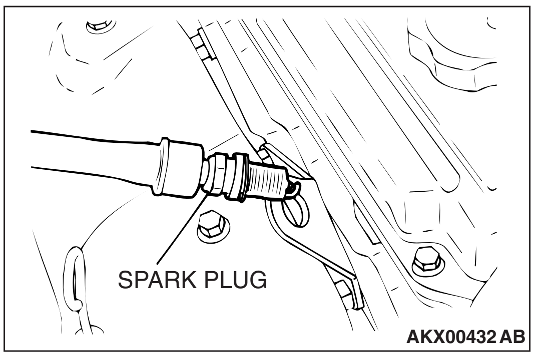
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



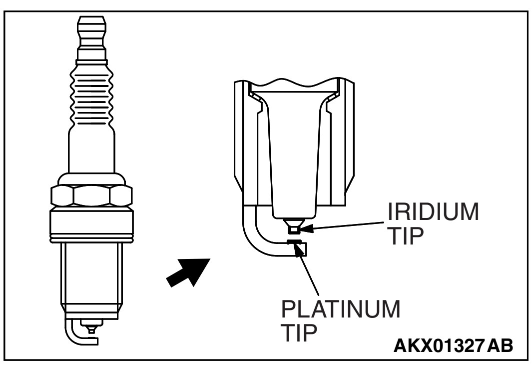
STEP 1. Check the No. 5 cylinder ignition coil spark.

(1) Remove the No. 5 cylinder intake manifold.
(2) Remove the No. 5 cylinder ignition coil.
(3) Remove the No. 5 cylinder spark plug and connect to the ignition coil.
(4) Ground the spark plug side electrode securely.

- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 5 cylinder 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) 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: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 5 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0305 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.

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

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0305 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0306: Cylinder 6 Misfire Detected

⚠ CAUTION

If DTC P0306 has been set, TCL related DTC U1120 is also set. After P0306 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or the PCM <A/T> checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

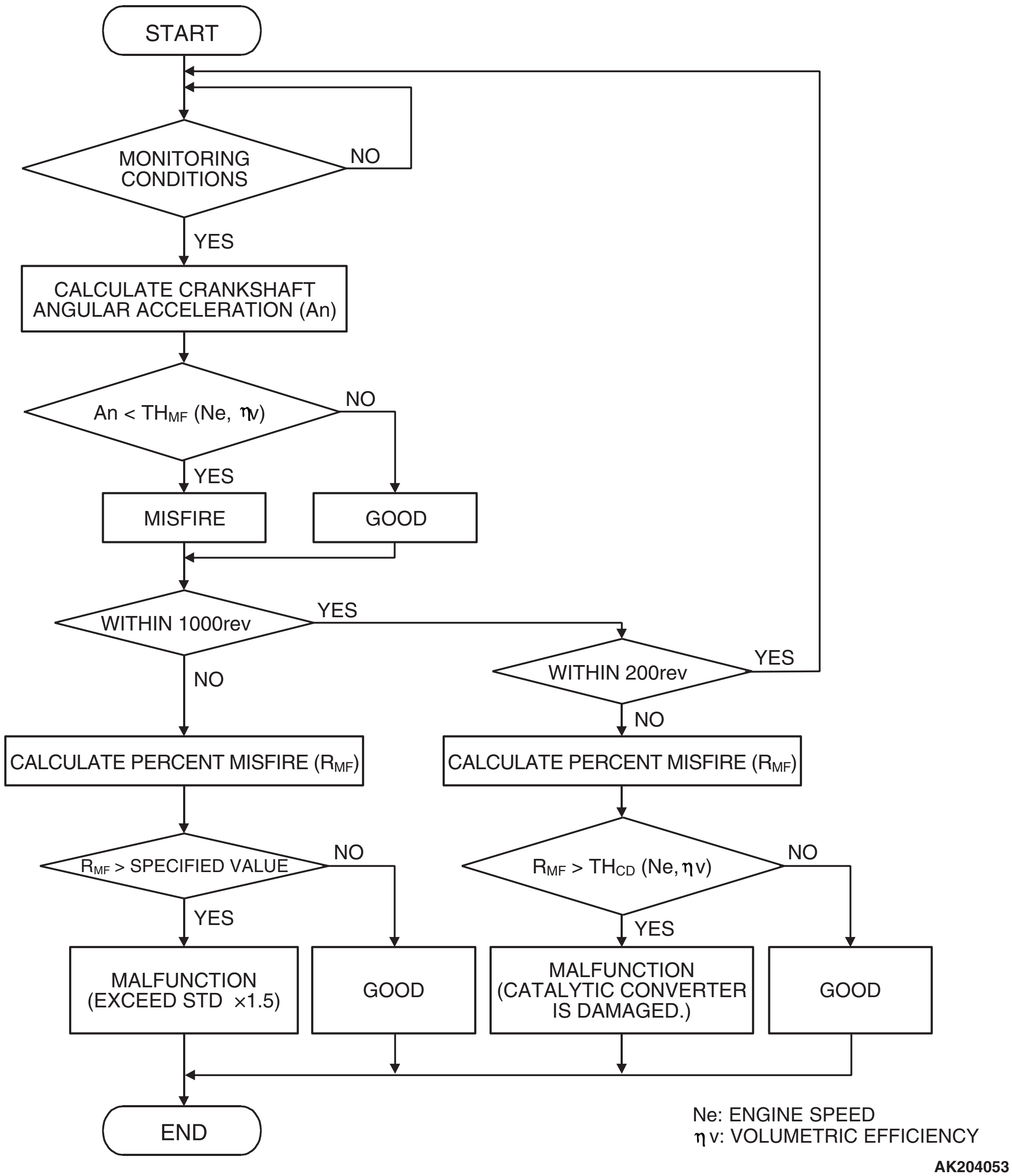
- Not applicable

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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/10 ms to +0.06 V/10 ms.

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

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

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

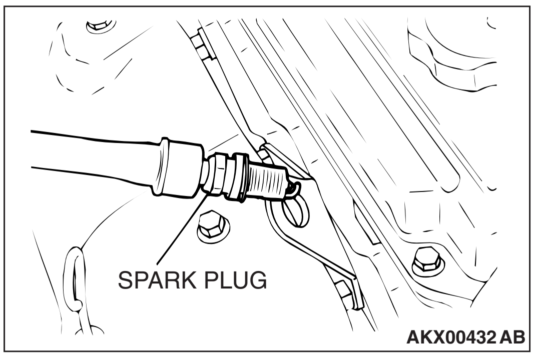
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

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

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



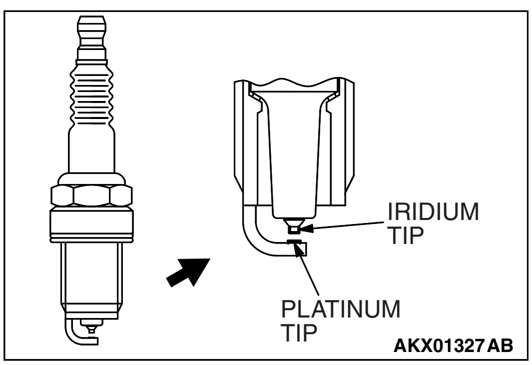
STEP 1. Check the No. 6 cylinder ignition coil spark.

(1) Remove the No. 6 cylinder ignition coil.
(2) Remove the No. 6 cylinder spark plug and connect to the No. 6 cylinder ignition coil.
(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 3.
NO : Go to Step 2.



STEP 2. Check the No. 6 cylinder 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.

Check the plug gap and replace if the limit is exceeded.

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)
Limit: 1.0 mm (0.039 inch)

Q: Is the plug gap at the standard value?

YES : Refer to, INSPECTION PROCEDURE 32 –Ignition Circuit System P.13B-1217.
NO : Replace the No. 6 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11C, On-Vehicle Service –Compression Pressure Check P.11C-17.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0306 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 5.

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

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13B-6.

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

Q: Is DTC P0306 set?

YES : Retry the troubleshooting.

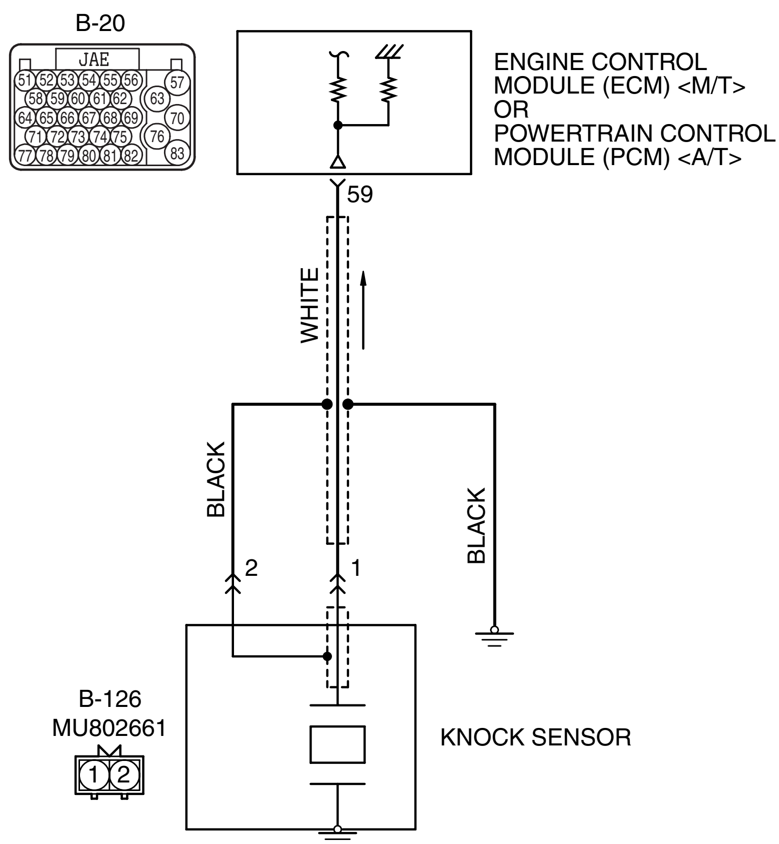
NO : The inspection is complete.

DTC P0325: Knock Sensor Circuit

⚠ CAUTION

If DTC P0325 has been set, TCL related DTC U1120 is also set. After P0325 has been diagnosed, don't forget to erase DTC U1120.

Knock Sensor Circuit



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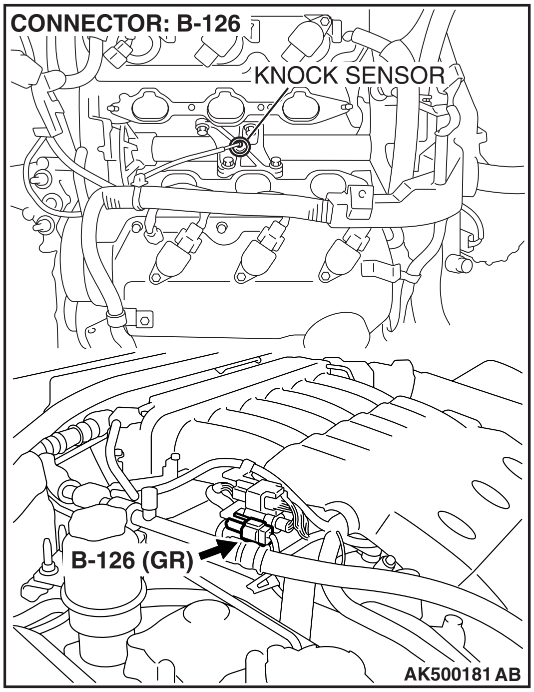
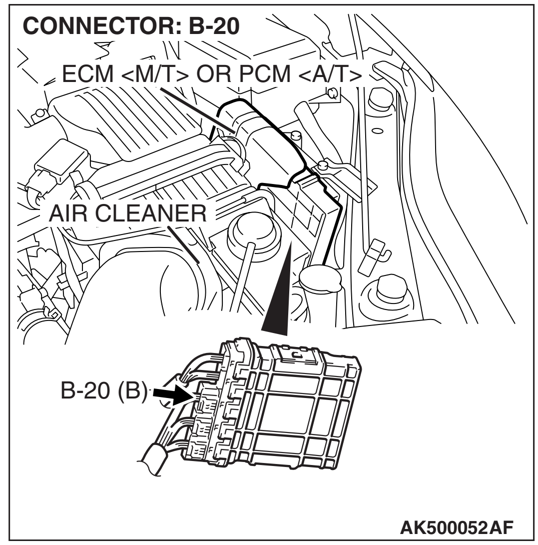




CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the ECM <M/T> or the PCM <A/T> (terminal No. 59).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM <M/T> or the PCM <A/T> checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Engine speed is higher than 2,500 r/min.
- Volumetric efficiency is 40 percent or higher.

Judgement Criterion

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

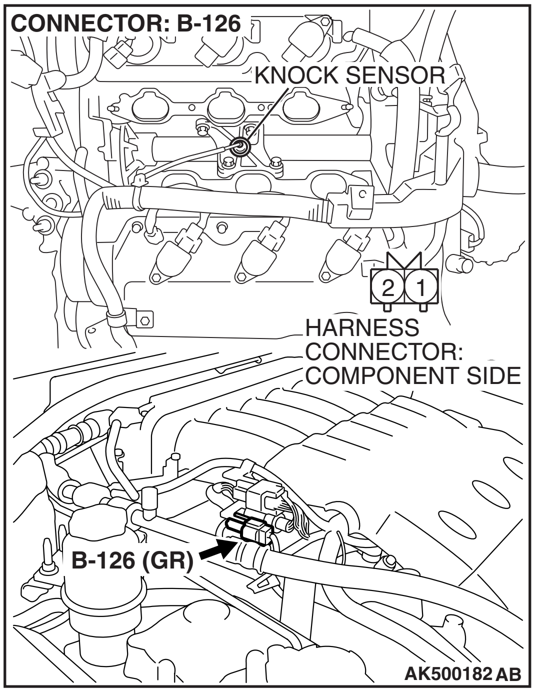
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit, or harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Check harness connector B-126 at the knock sensor for damage.

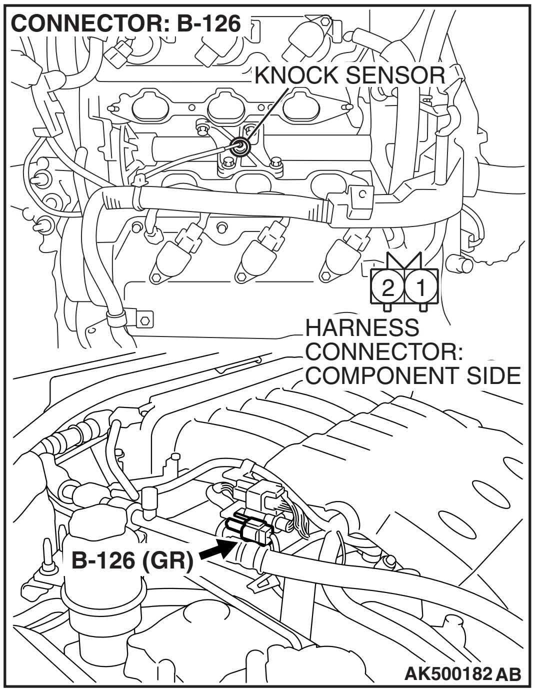
Q: Is the harness connector in good condition?

YES : Go to Step 2.

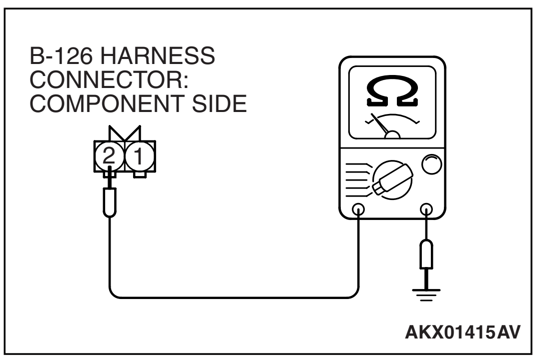
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 2. Check the continuity at knock sensor harness side connector B-126.

(1) Disconnect the connector B-126 and measure at the harness side.



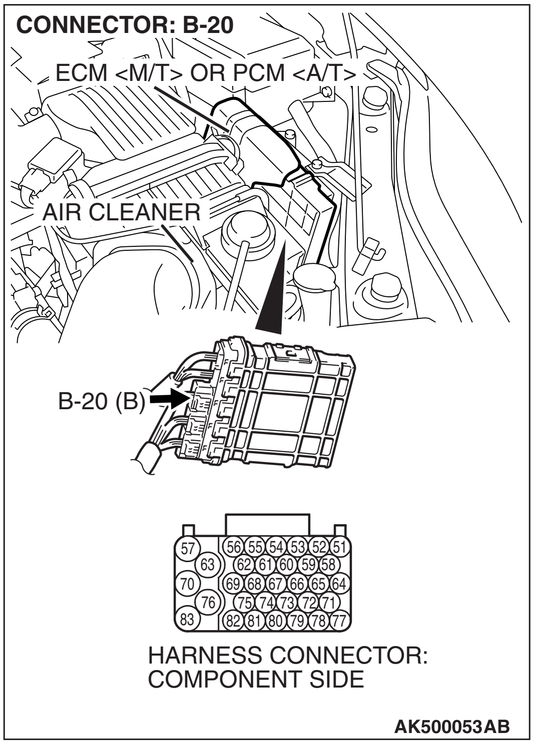
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.



Q: Does continuity exist?

YES : Go to Step 3.

NO : Repair an open circuit or harness damage between knock sensor connector B-126 (terminal No. 2) and ground. Then go to Step 6.



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

Q: Is the harness connector in good condition?

YES : Go to Step 4.

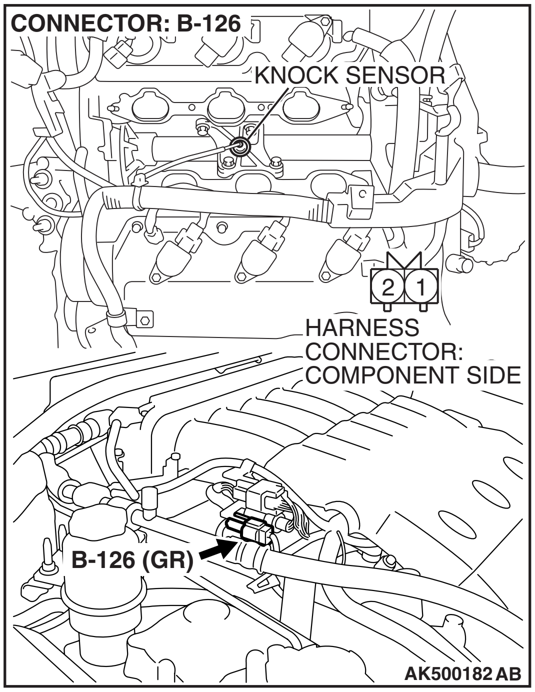
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

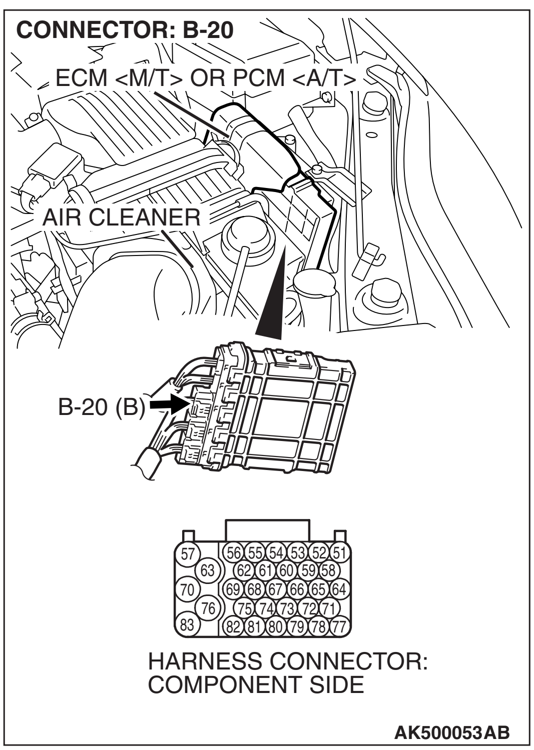
STEP 4. Check for open circuit, short circuit to ground and harness damage between knock sensor connector B-126 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 59).

Q: Is the harness wire in good condition?

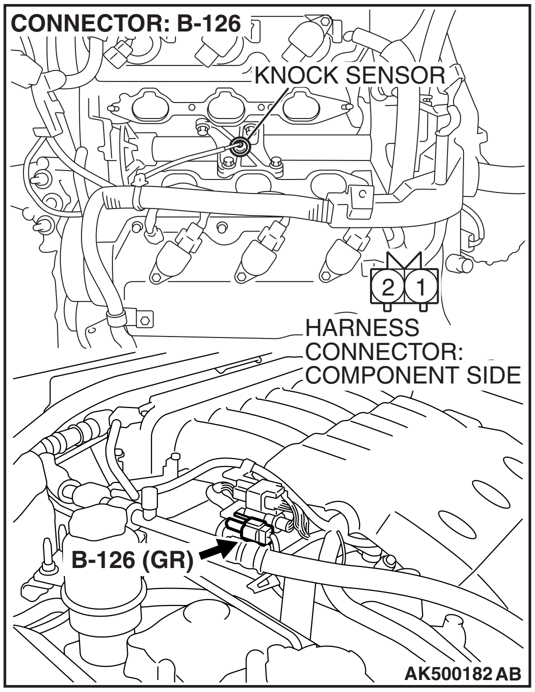
YES : Go to Step 5.

NO : Repair it. Then go to Step 6.

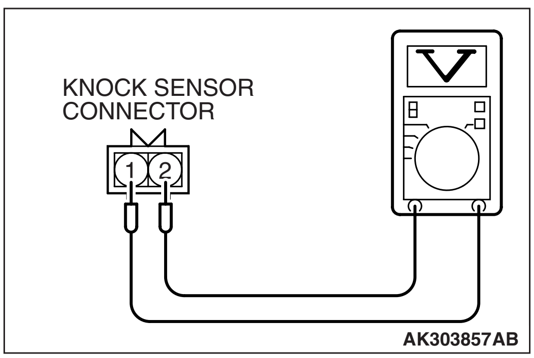




STEP 5. Check the knock sensor.



(1) Disconnect the knock sensor connector B-126.
(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?

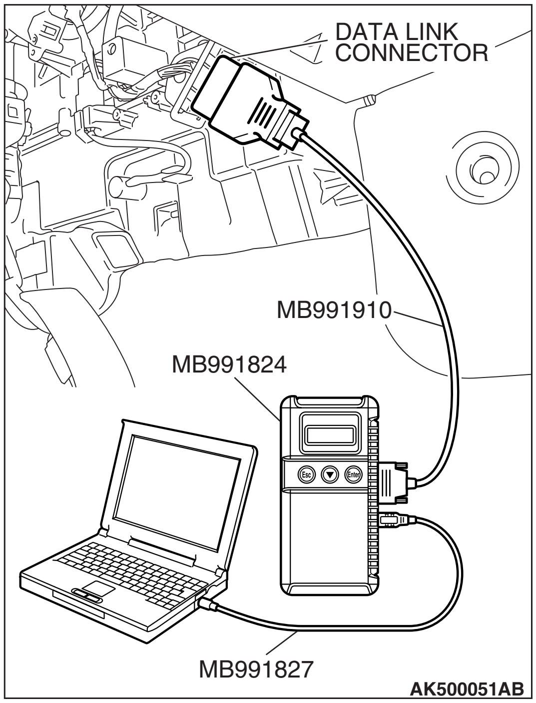
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 6.

NO : Replace the 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?

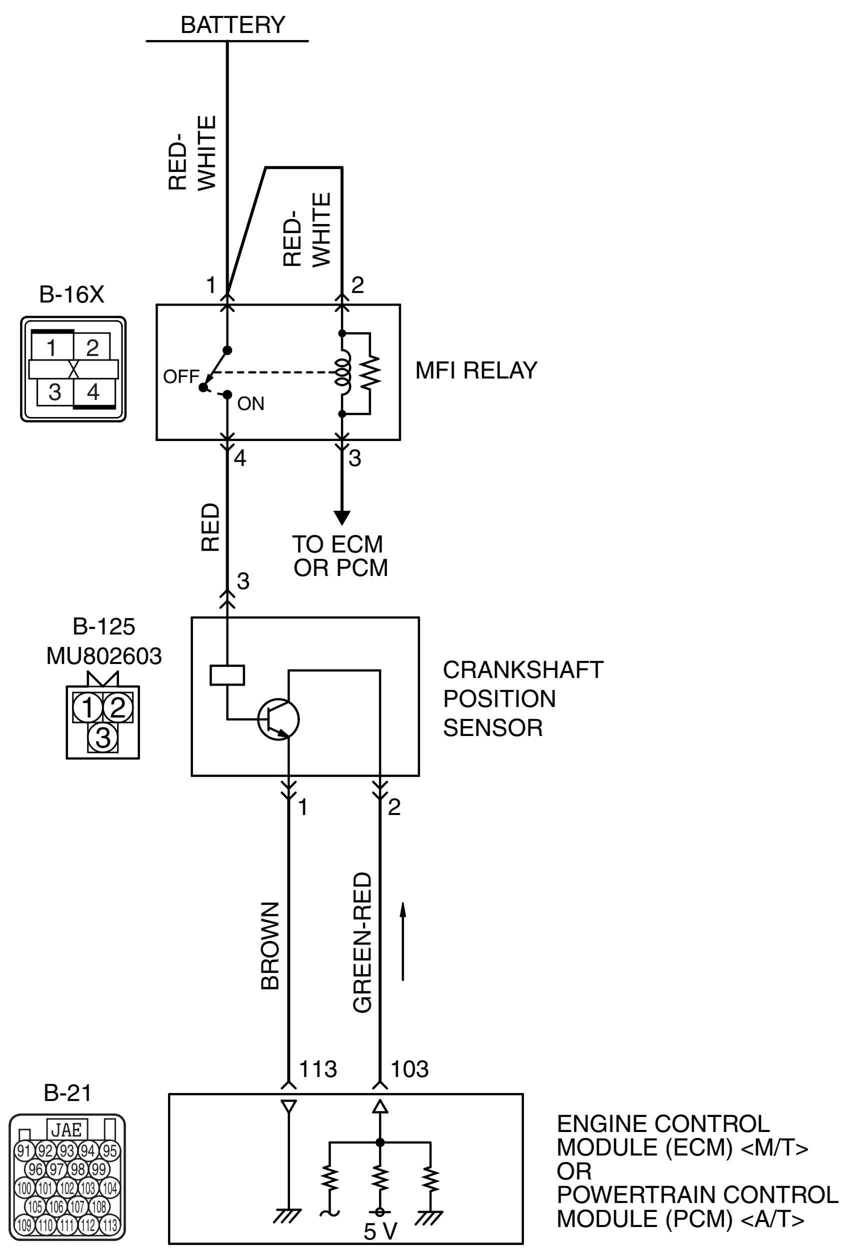
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit

⚠ CAUTION

If DTC P0335 has been set, TCL related DTC U1120 is also set. After P0335 has been diagnosed, don't forget to erase DTC U1120.

Crankshaft Position Sensor Circuit



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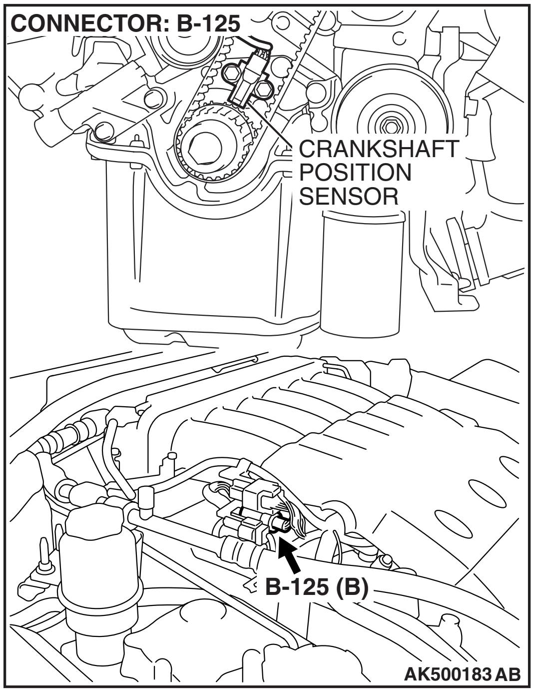
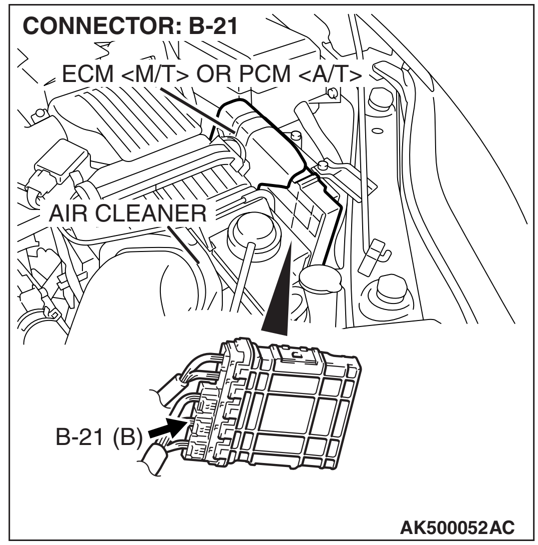
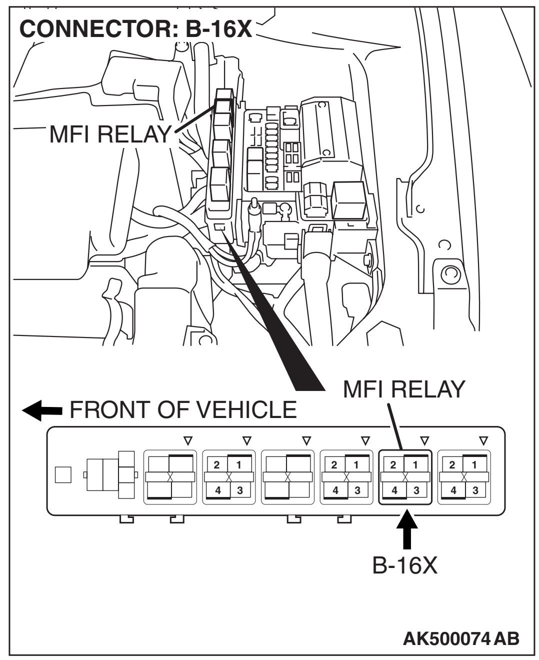






CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the crankshaft position sensor is grounded with ECM <M/T> or PCM <A/T> (terminal No. 113).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the ECM <M/T> or the PCM <A/T> (terminal No. 103). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, then which are input to the ECM <M/T> or the PCM <A/T>.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM <M/T> or the PCM <A/T> 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)

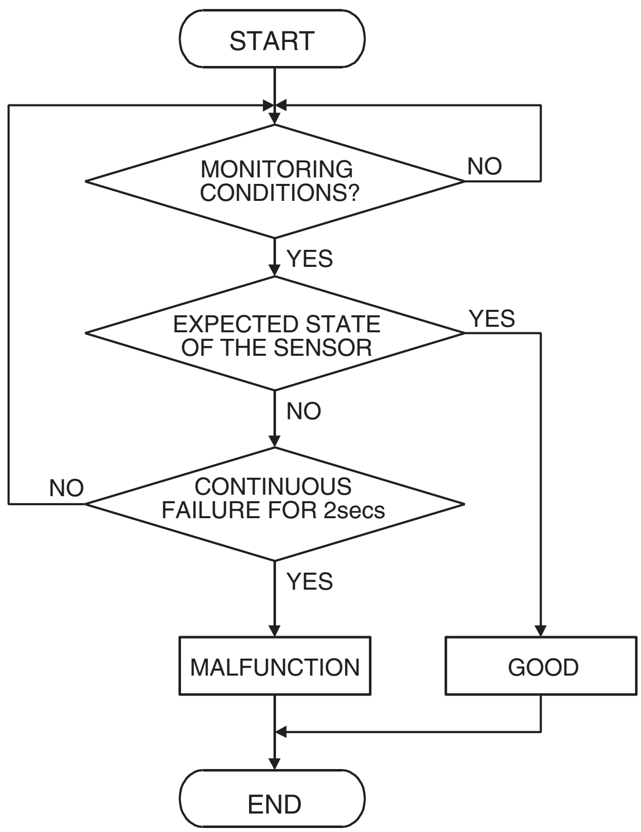
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem - Alignment>

Logic Flow Chart



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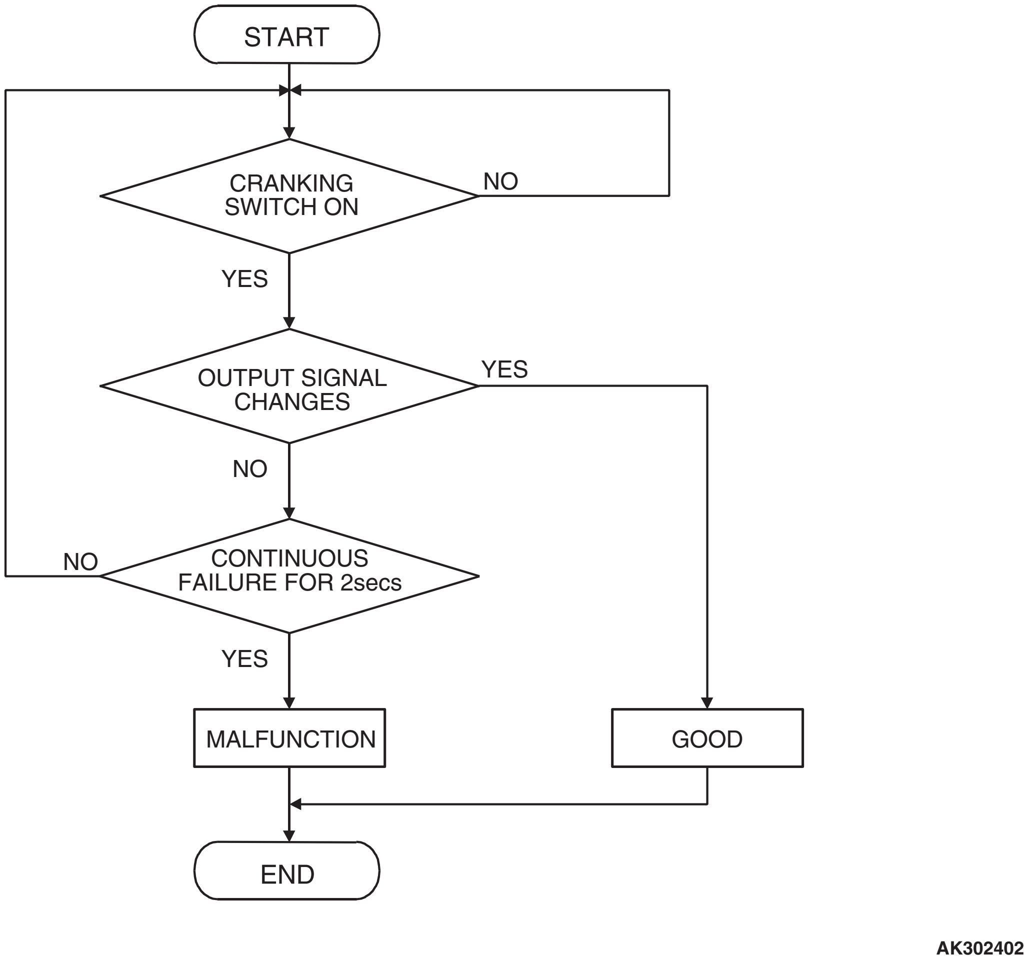
Check Condition, Judgement Criterion

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

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



Check Condition

- Engine is being cranked.

Judgement Criterion

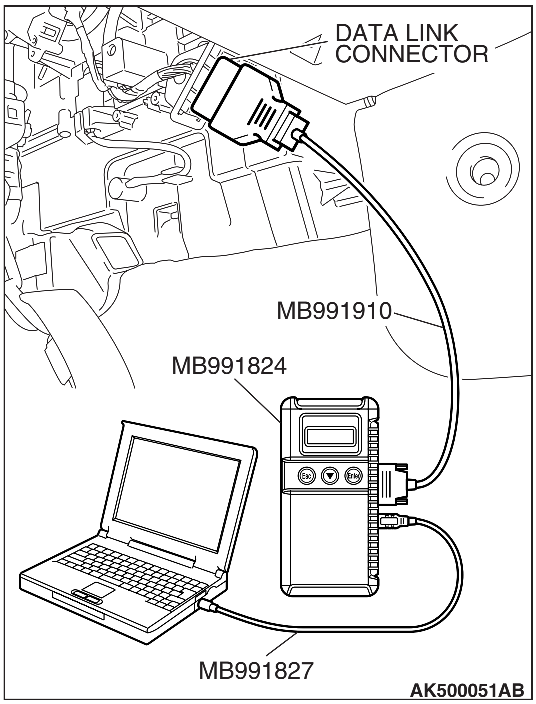
- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>



DIAGNOSIS

Required Special Tools:

- Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998478: Test Harness (3pin, triangle)
- MB991923: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

⚠ CAUTION

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

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

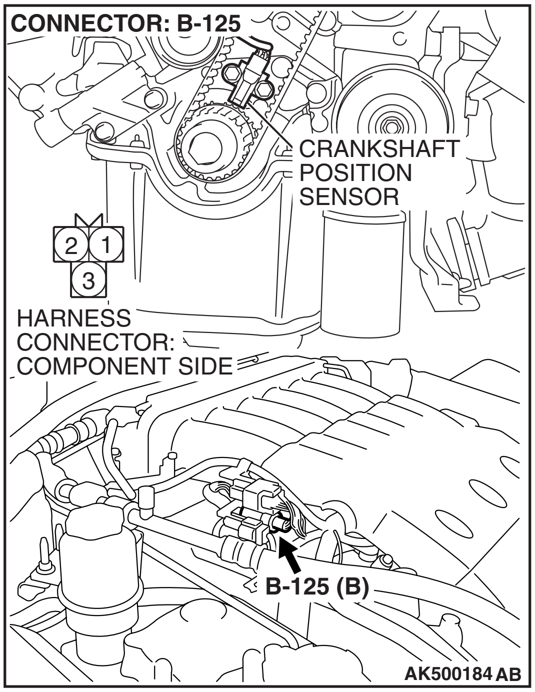
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

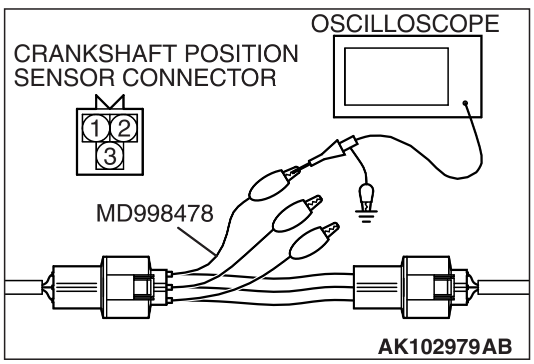
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

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



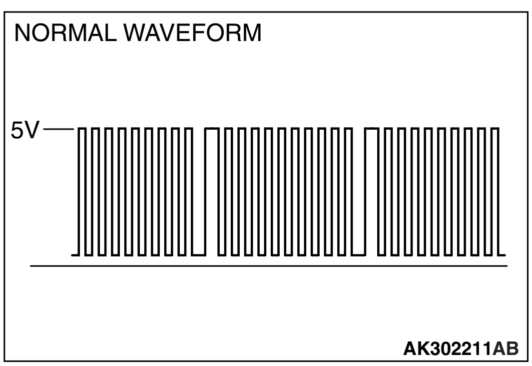
(1) Disconnect the crankshaft position sensor connector B-125, and connect the test harness special tool (MD998478) between the separated connectors.



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

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. then connector the oscilloscope probe to the check harness connector terminal No. 103.

(3) Start the engine and run at idle.

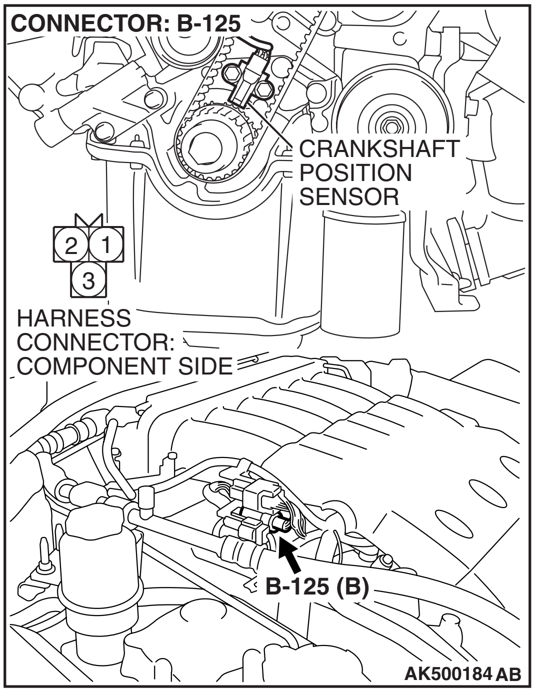


(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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

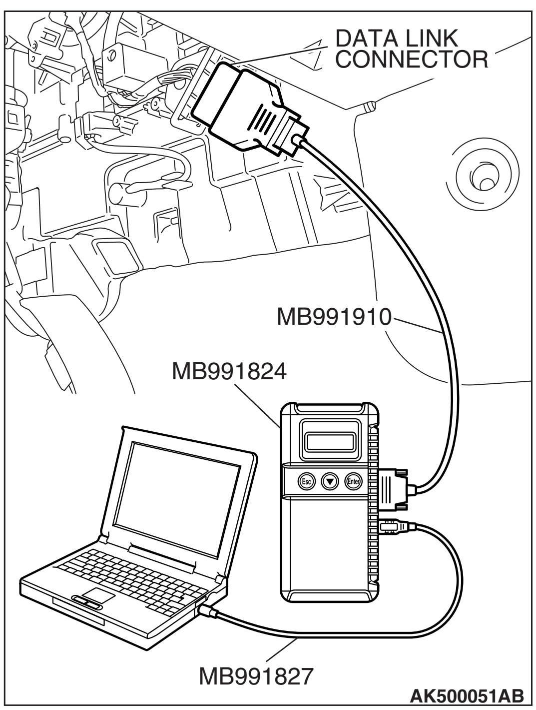


STEP 3. Check harness connector B-125 at the crankshaft position sensor for damage.

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 2: Crankshaft Position Sensor.

⚠ CAUTION

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

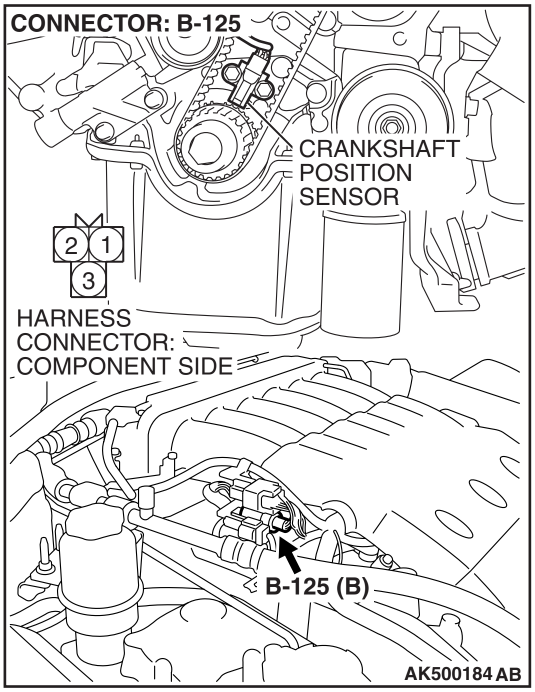
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

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

Q: Is the sensor operating properly?

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

NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

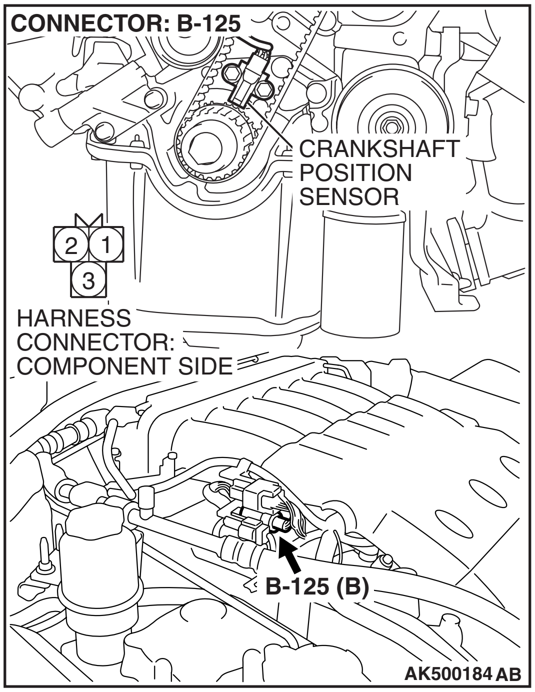


STEP 5. Check harness connector B-125 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

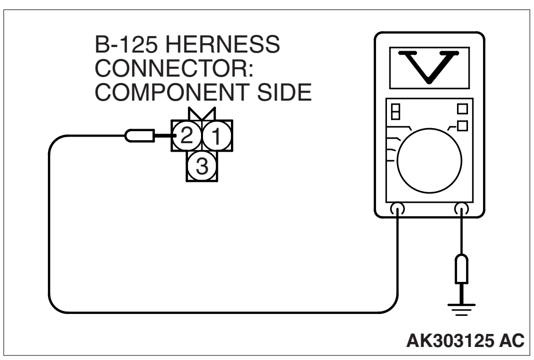
YES : Go to Step 6.

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-125.

(1) Disconnect the connector B-125 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.

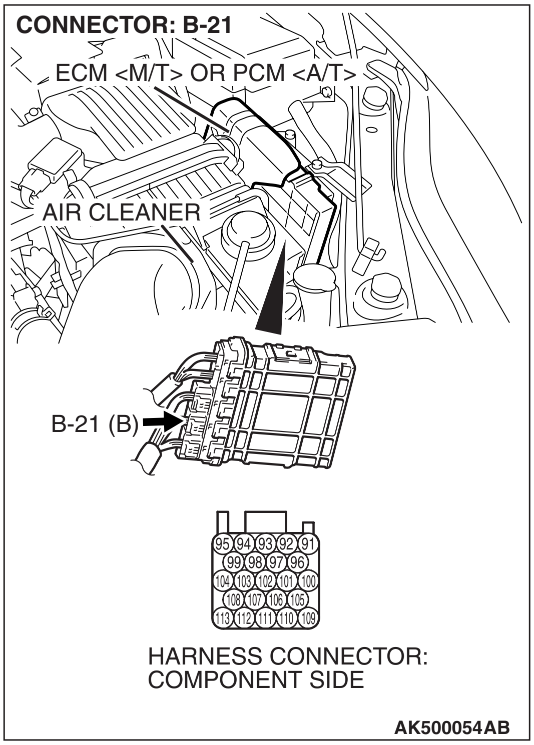
(4) Turn the ignition switch to the "LOCK" (OFF) position.

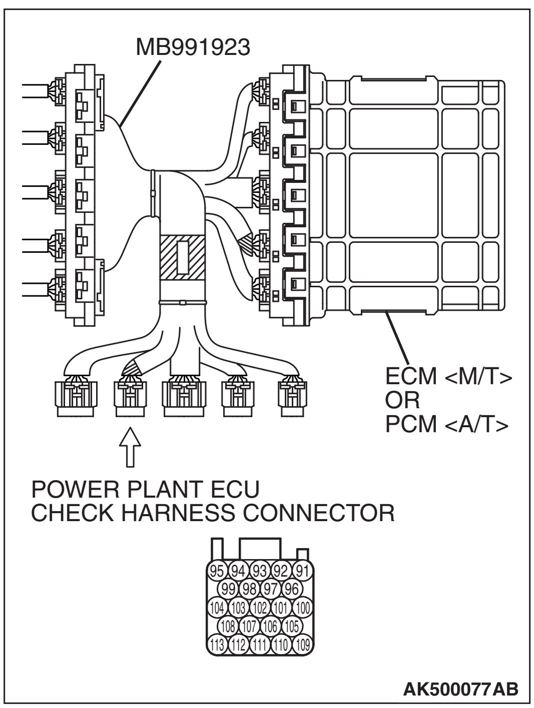
Q: Is the measured voltage between 4.9 and 5.1 volts?

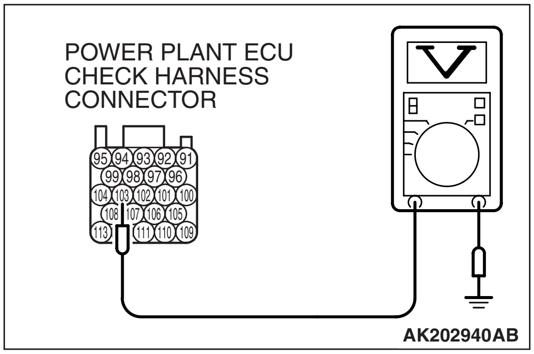
YES : Go to Step 11.
NO : Go to Step 7.

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

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the crankshaft position sensor connector B-125.
(3) Turn the ignition switch to the "ON" position.





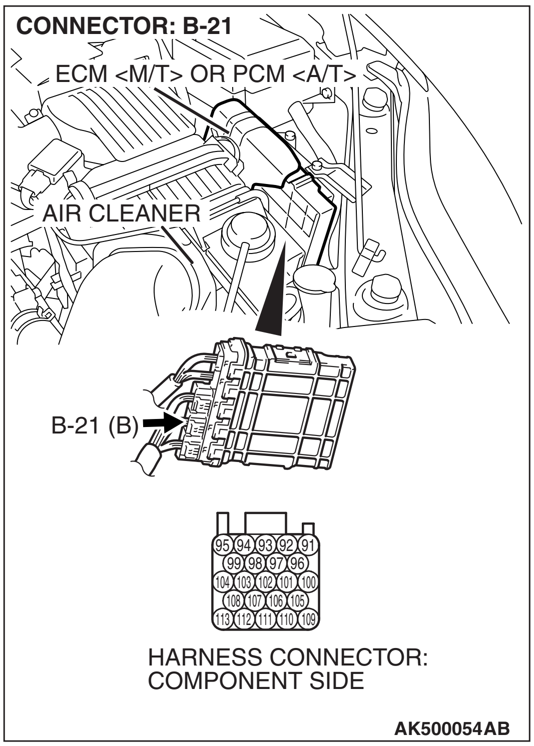


(4) Measure the voltage between terminal No. 103 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

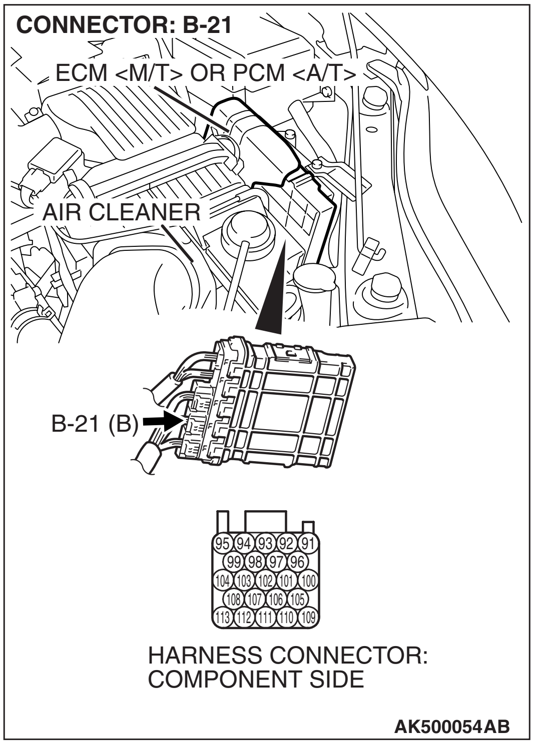
YES : Go to Step 8.
NO : Go to Step 9.



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

Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor connector B-125 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 103) 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.

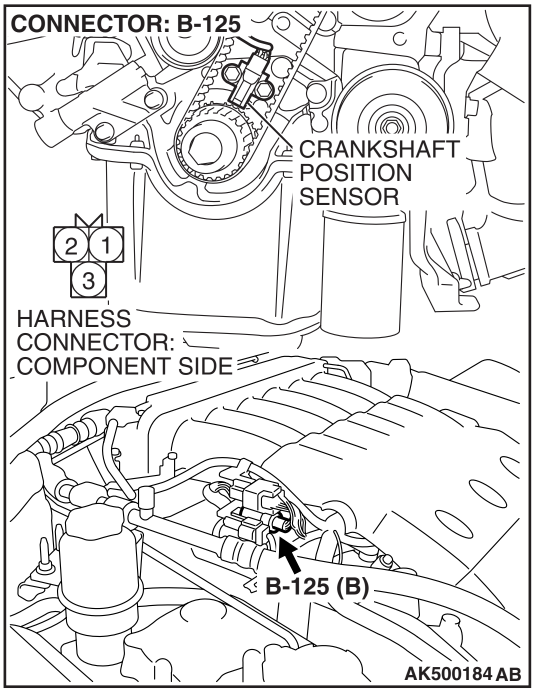


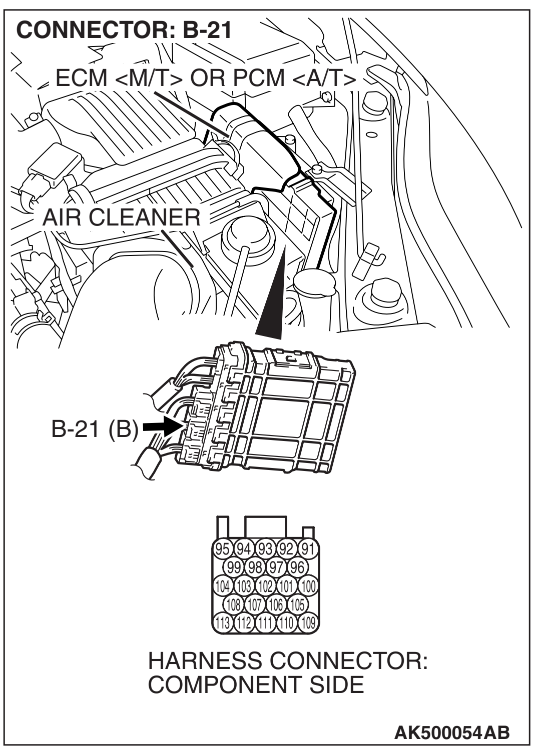
STEP 9. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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





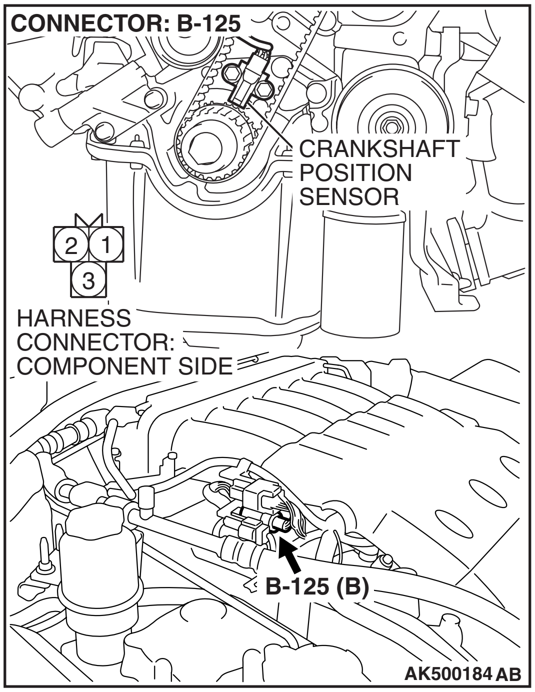
STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-125 (terminal No. 2) and PCM connector B-21 (terminal No. 103).

Q: Is the harness wire in good condition?

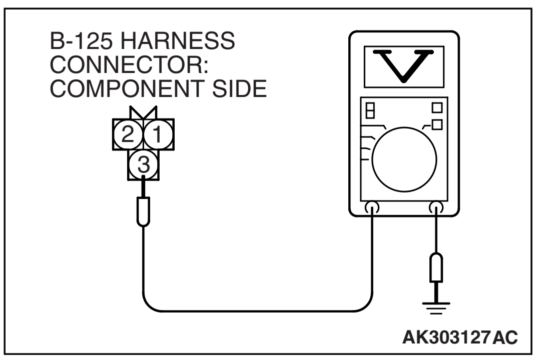
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-125.



(1) Disconnect the connector B-125 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

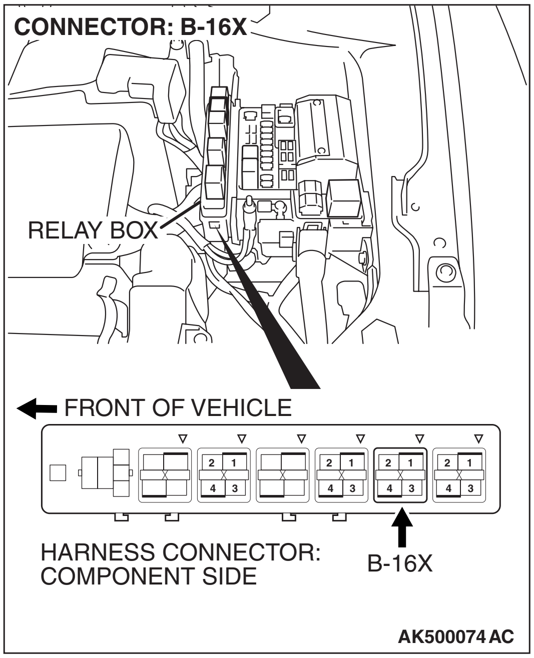


(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

(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.

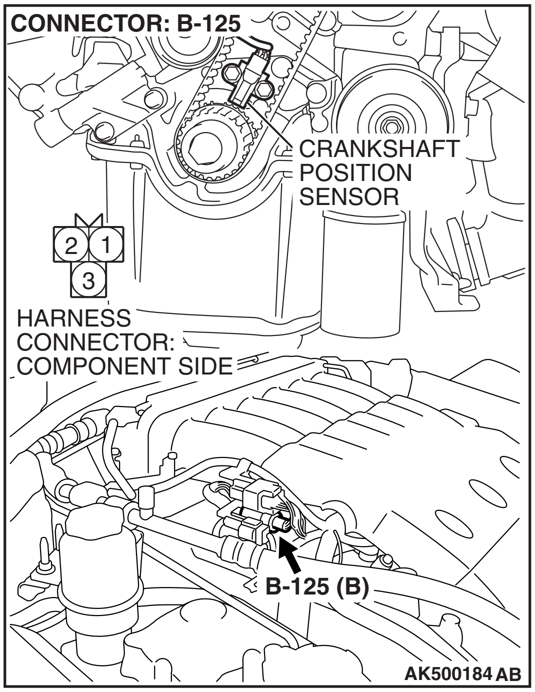


STEP 12. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

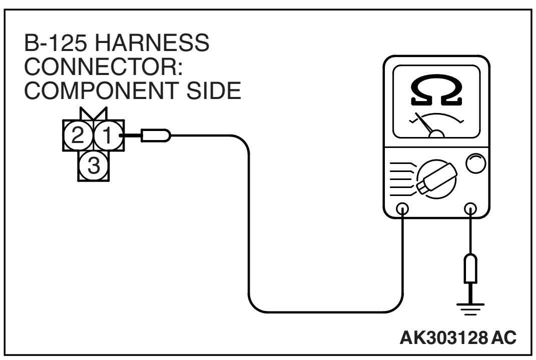
YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and crankshaft position sensor connector B-125 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.

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



STEP 13. Check for continuity at crankshaft position sensor harness side connector B-125.

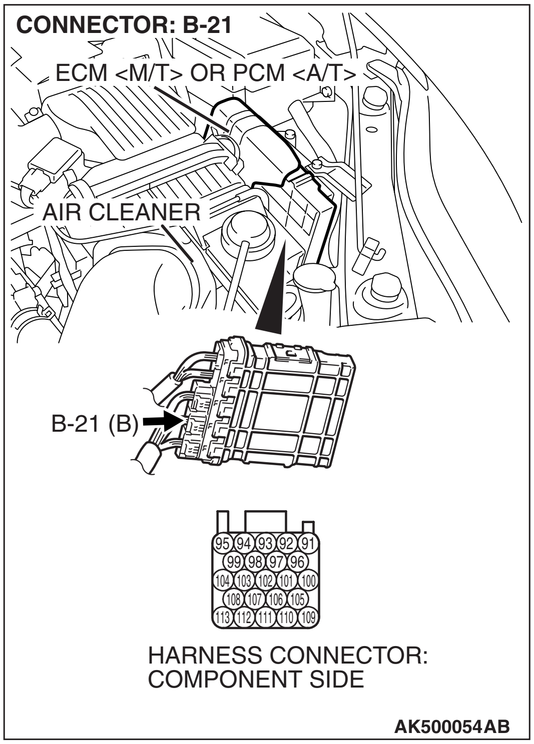
(1) Disconnect the connector B-125 and measure at the harness side.



(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.

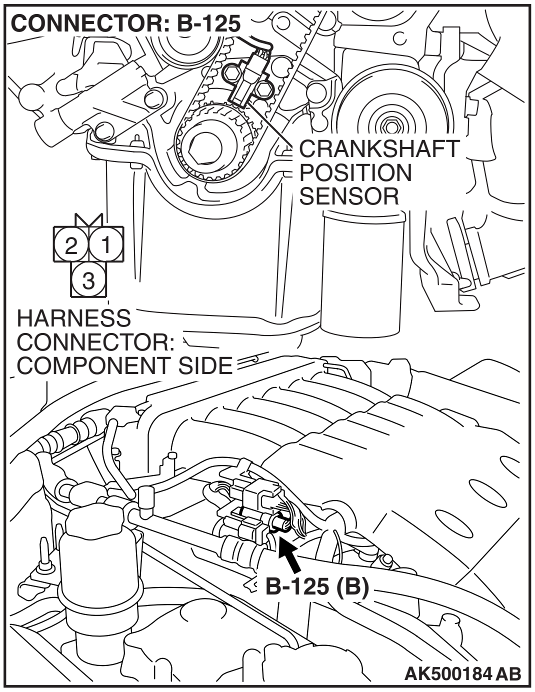


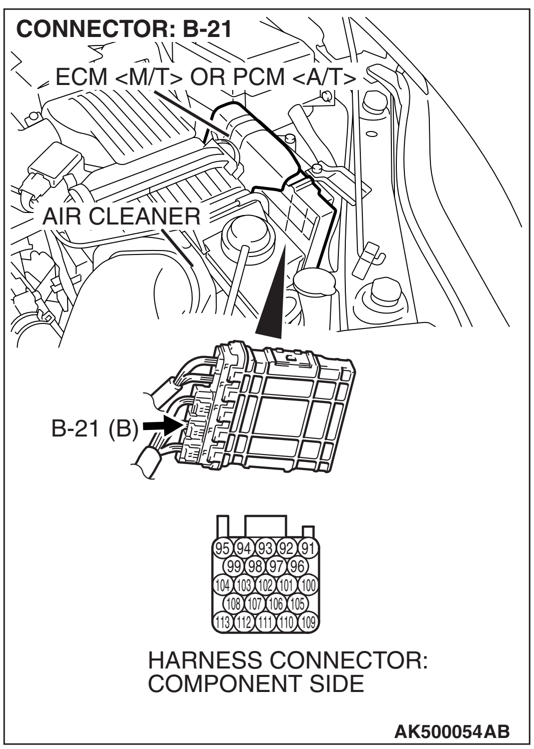
STEP 14. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.



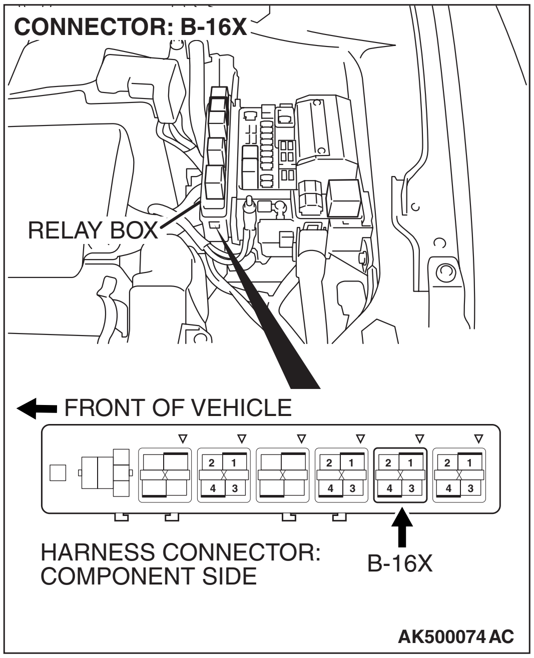


STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-125 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

NO : Repair it. Then go to Step 20.

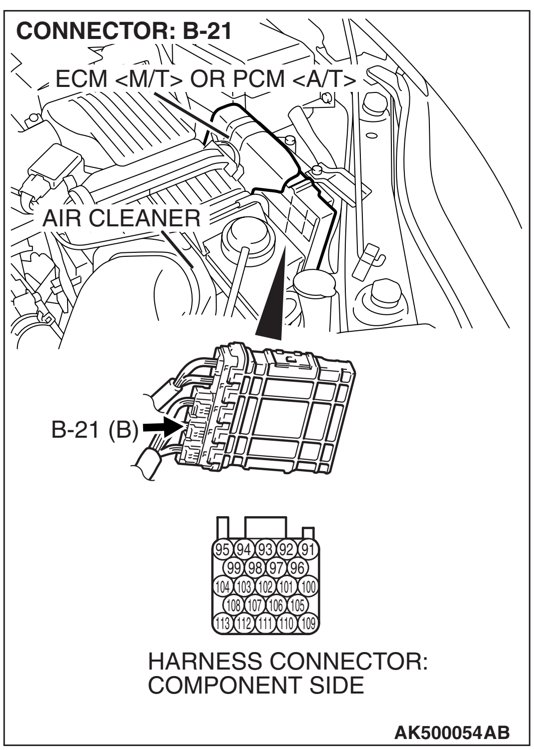


STEP 16. Check harness connector B-16X at the MFI relay for damage.

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.

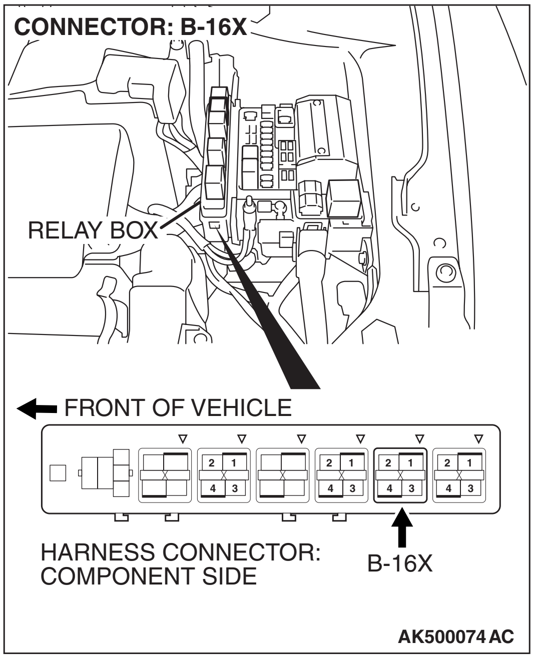


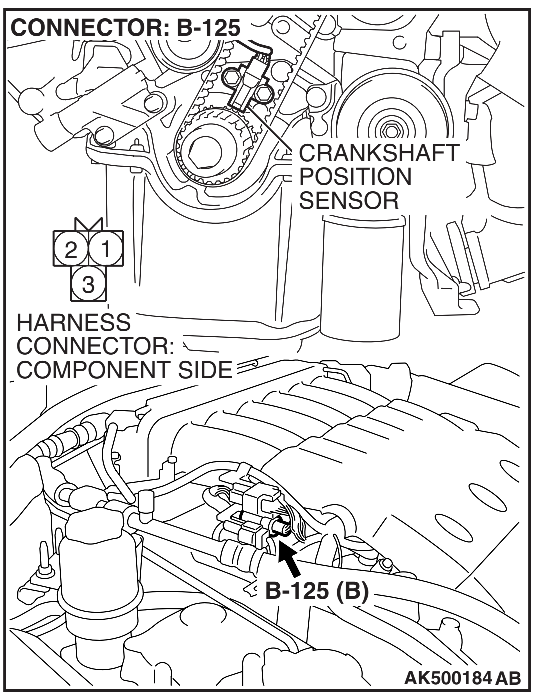
STEP 17. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.



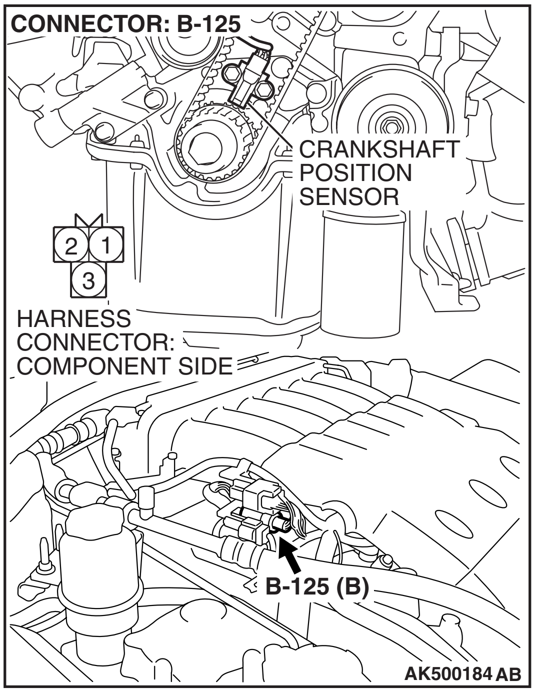


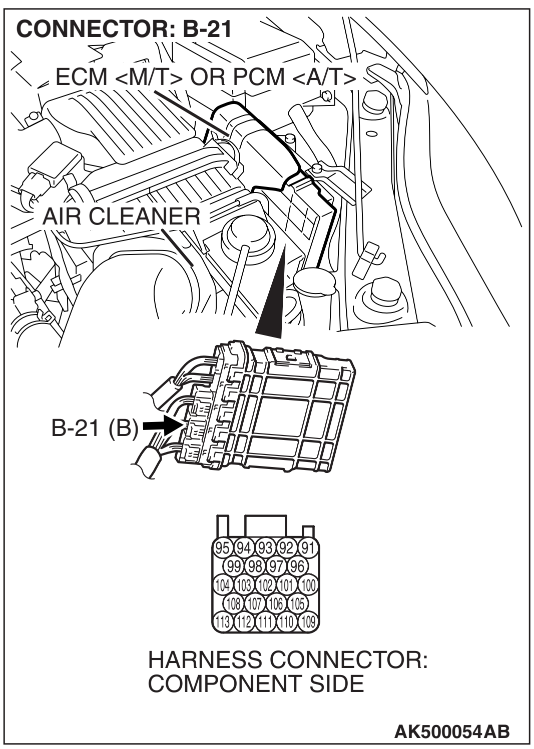
STEP 18. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and crankshaft position sensor connector B-125 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 20.





STEP 19. Check for harness damage between crankshaft position sensor connector B-125 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 103).

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

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

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

Q: Is DTC P0335 set?

YES : Retry the troubleshooting.

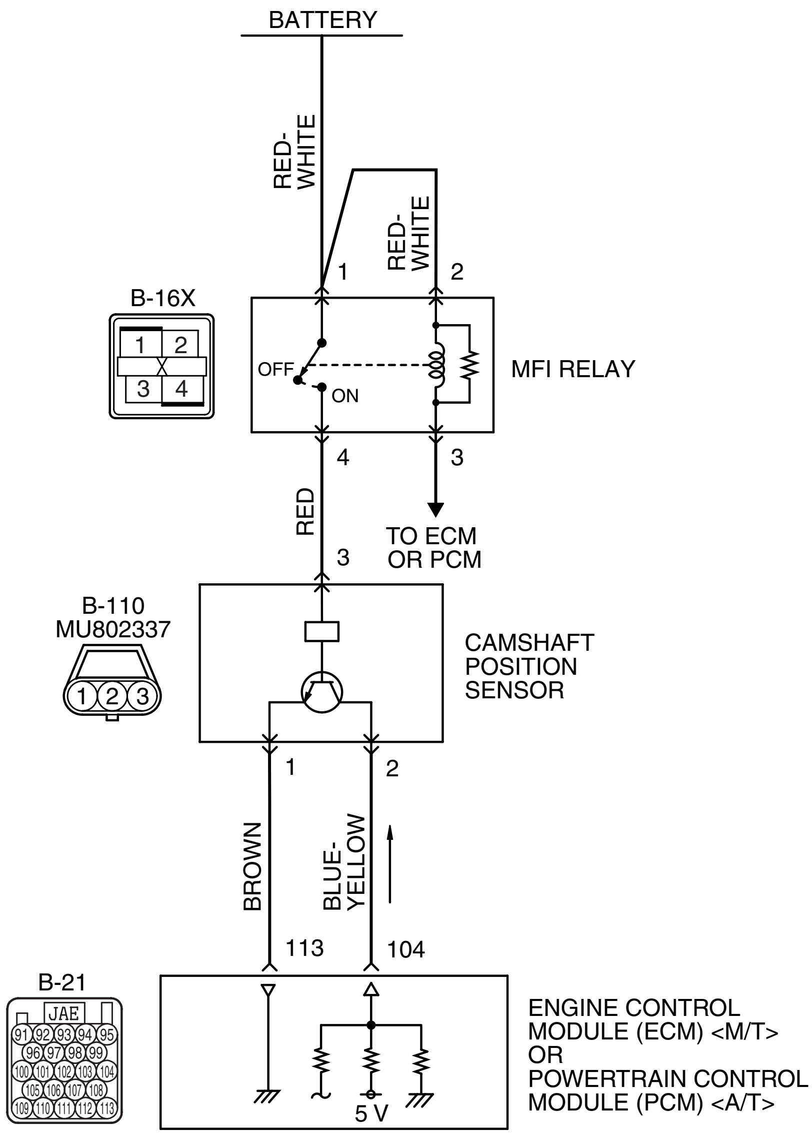
NO : The inspection is complete.

DTC P0340: Camshaft Position Sensor Circuit

⚠ CAUTION

If DTC P0340 has been set, TCL related DTC U1120 is also set. After P0340 has been diagnosed, don't forget to erase DTC U1120.

Camshaft Position Sensor Circuit



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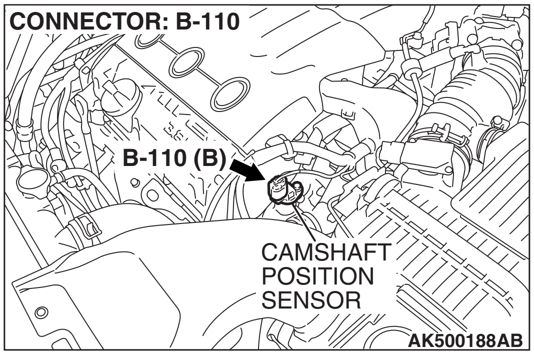
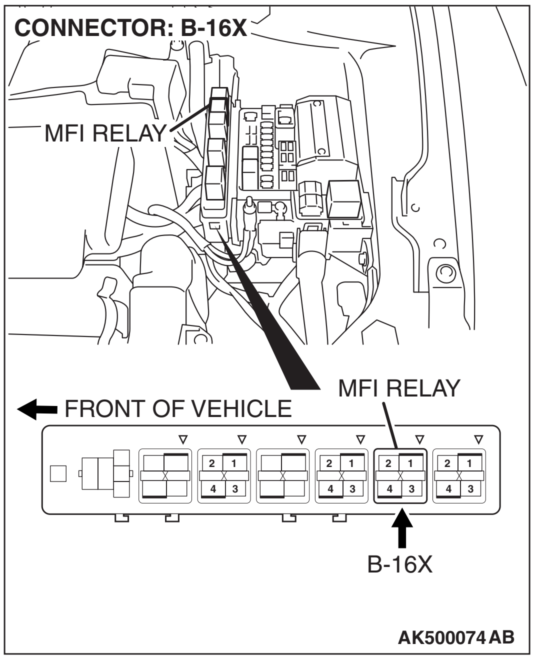
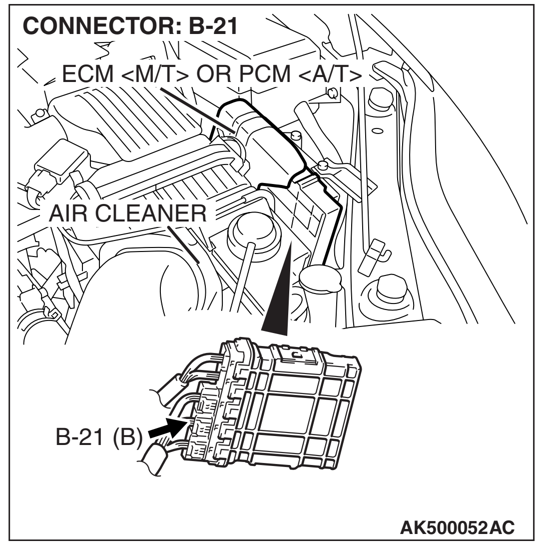






CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the camshaft position sensor is grounded with ECM <M/T> or PCM <A/T> (terminal No. 113).
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the ECM <M/T> or the PCM <A/T> (terminal No. 104). The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM <M/T> or the PCM <A/T>.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM <M/T> or the PCM <A/T> 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)

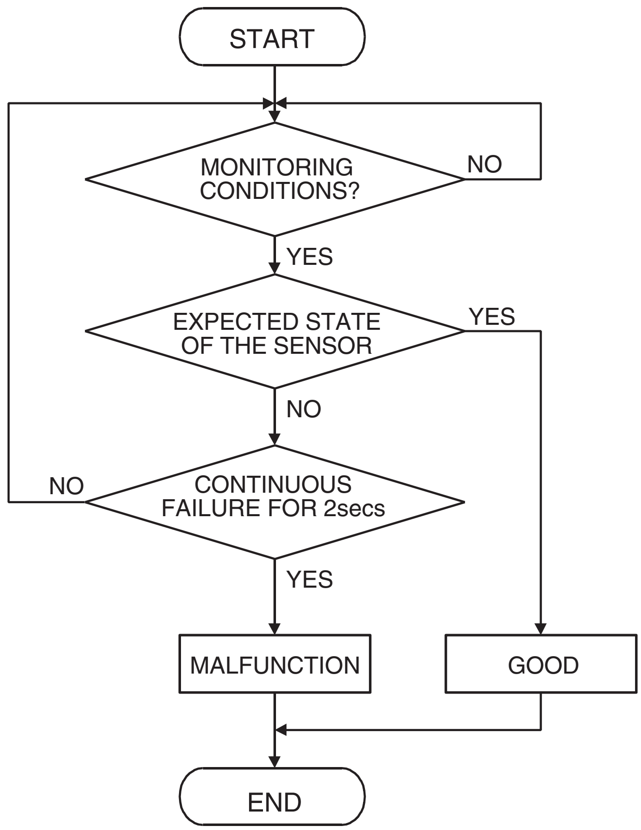
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem - Alignment>

Logic Flow Chart



AK302393

DTC SET CONDITIONS

Check Condition

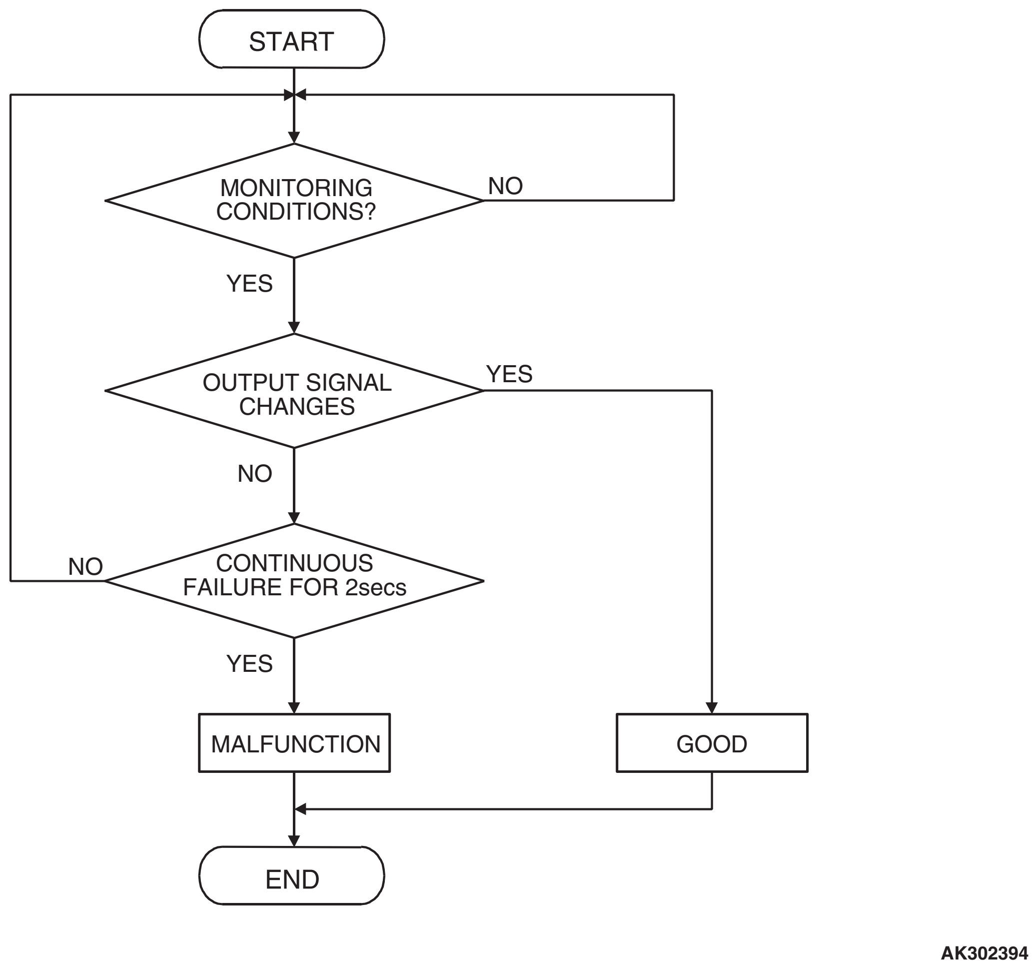
- Engine speed is higher than 50 r/min.

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.

DTC SET CONDITIONS <Range/Performance problem - Circuit continuity>

Logic Flow Chart



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.

OBD-II DRIVE CYCLE PATTERN

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

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

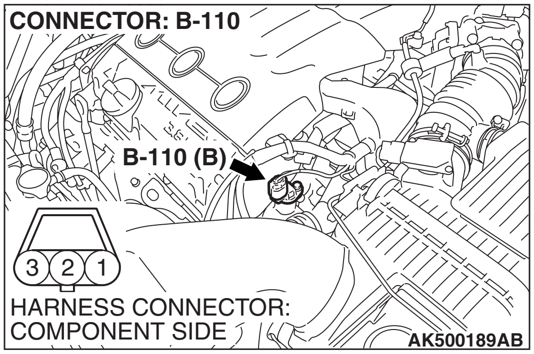
- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

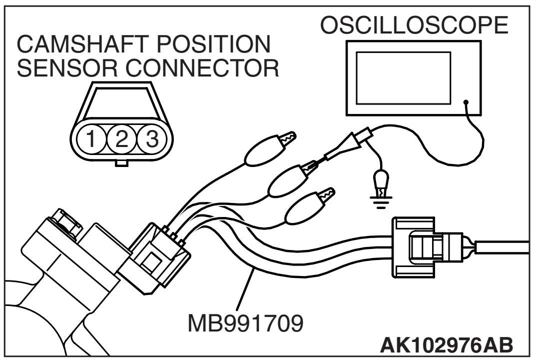
Required Special Tools:

- MB991709: Test Harness Set
- MB991923: Power Plant ECU Check Harness

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



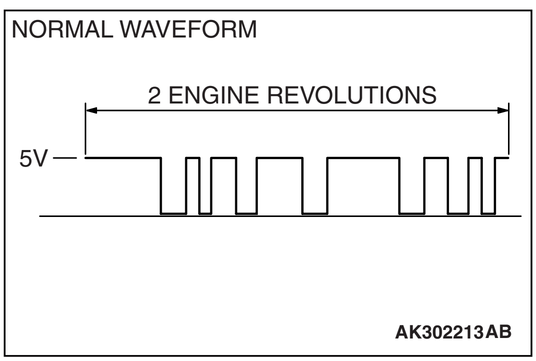
(1) Disconnect the camshaft position sensor connector B-110, and connect test harness special tool (MB991709) between the separated connectors (All terminals should be connected).



(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal No. 2.

NOTE: When measuring with the ECM <M/T> or the PCM <A/T> side connector, disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors. then connector the oscilloscope probe to the check harness connector terminal No. 104.

(3) Start the engine and run at idle.



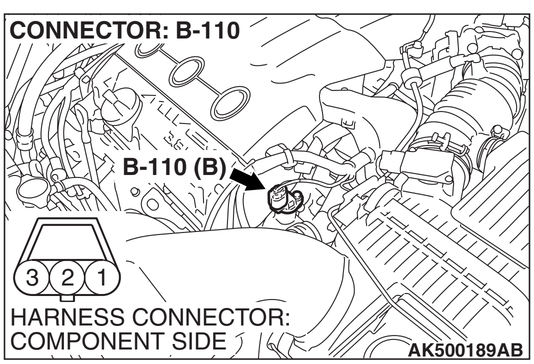
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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

STEP 2. Check harness connector B-110 at camshaft 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 20.

STEP 3. Check the trouble symptoms.

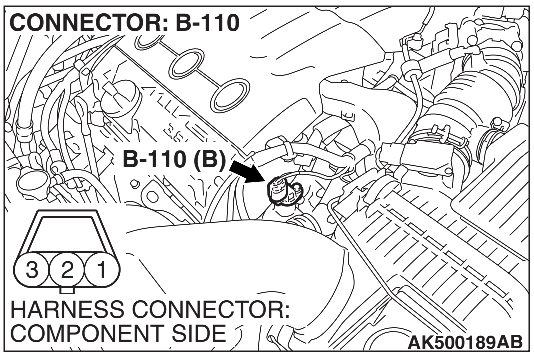
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13B-6.

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

Q: Is DTC P0340 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

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

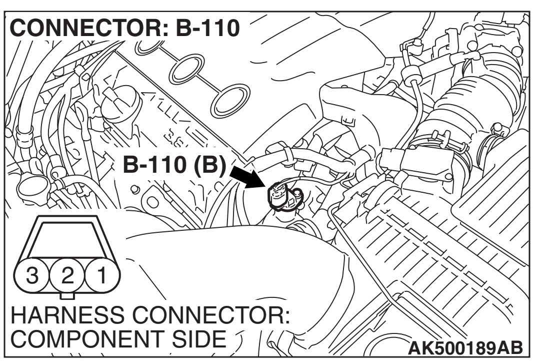


STEP 4. Check harness connector B-110 at camshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

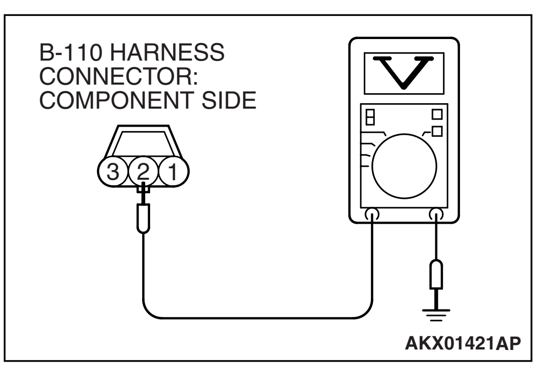
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 5. Measure the sensor supply voltage at camshaft position sensor connector B-110.

(1) Disconnect the connector B-110 and measure at the harness side.

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



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

- Voltage should be between 4.9 and 5.1 volts.

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

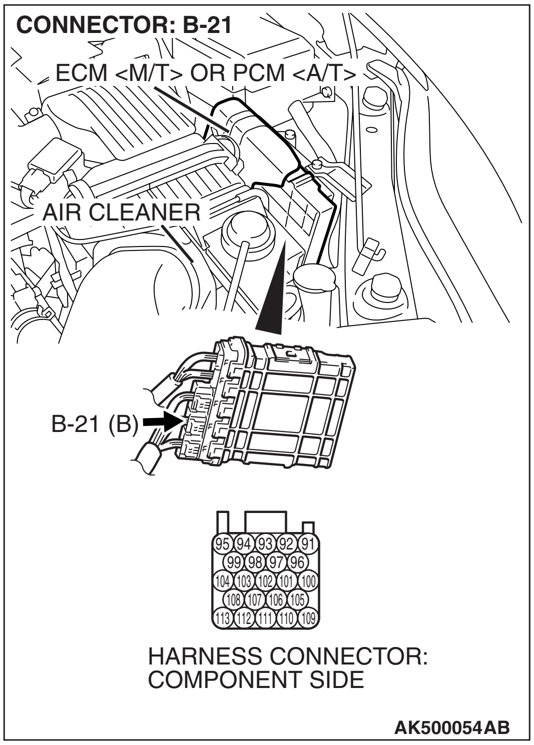
Q: Is the measured voltage between 4.9 and 5.1 volts?

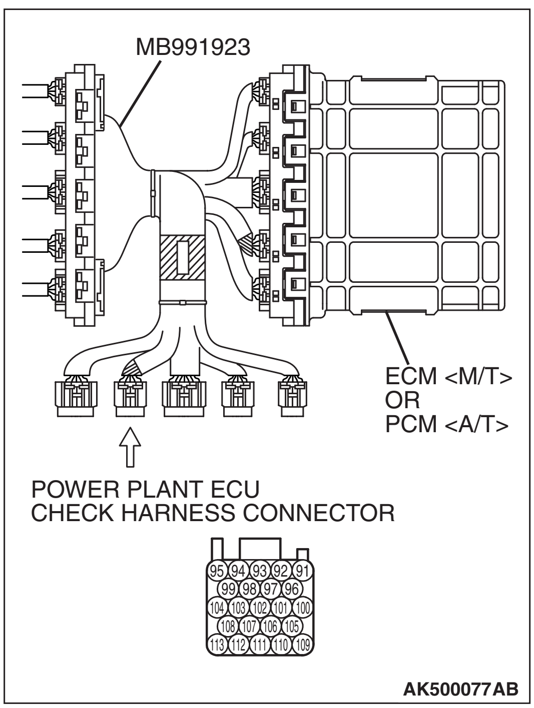
YES : Go to Step 10.

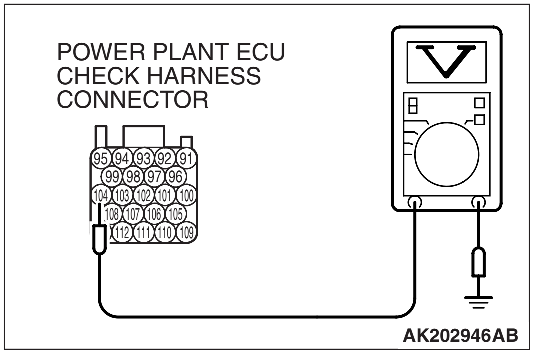
NO : Go to Step 6.

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

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the camshaft position sensor connector B-110.
(3) Turn the ignition switch to the "ON" position.







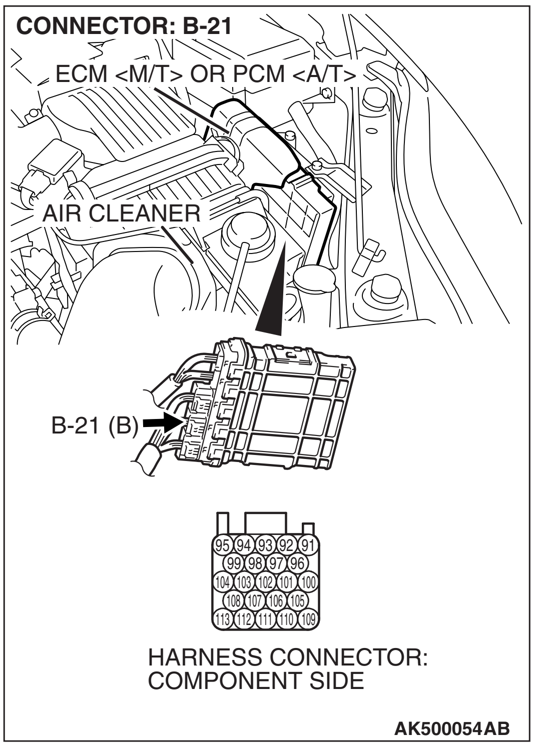
(4) Measure the voltage between terminal No. 104 and ground.
- Voltage should be between 4.9 and 5.1 volts.

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

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

YES : Go to Step 7.

NO : Go to Step 8.

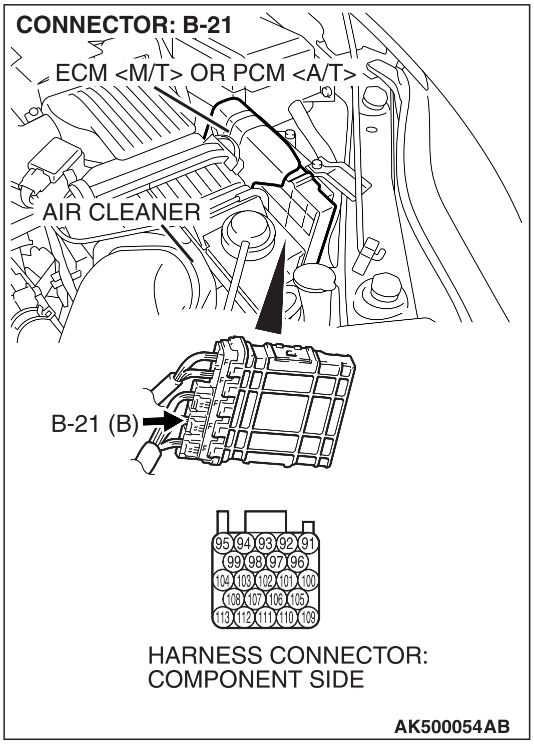


STEP 7. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-110 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 104) because of open circuit. Then go to Step 20.

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

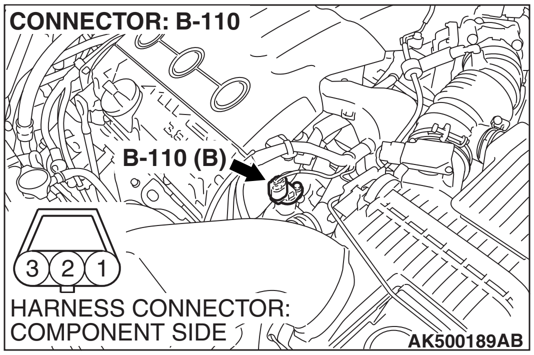


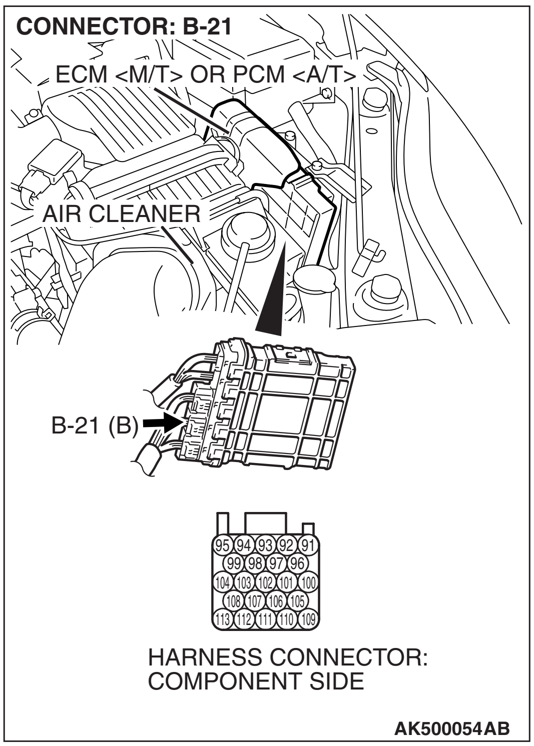
STEP 8. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

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





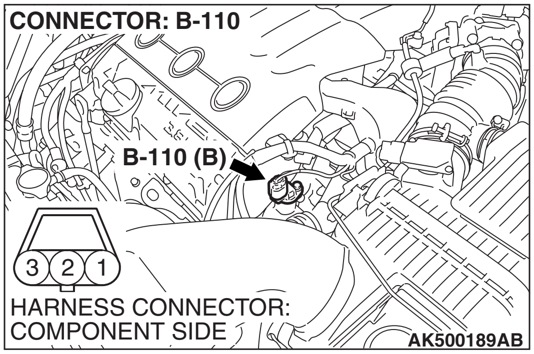
STEP 9. Check for short circuit to ground between camshaft position sensor connector B-110 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 104).

Q: Is the harness wire in good condition?

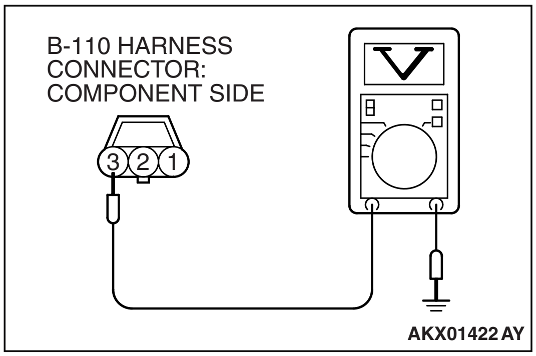
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 10. Measure the power supply voltage at camshaft position sensor connector B-110.



(1) Disconnect the connector B-110 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



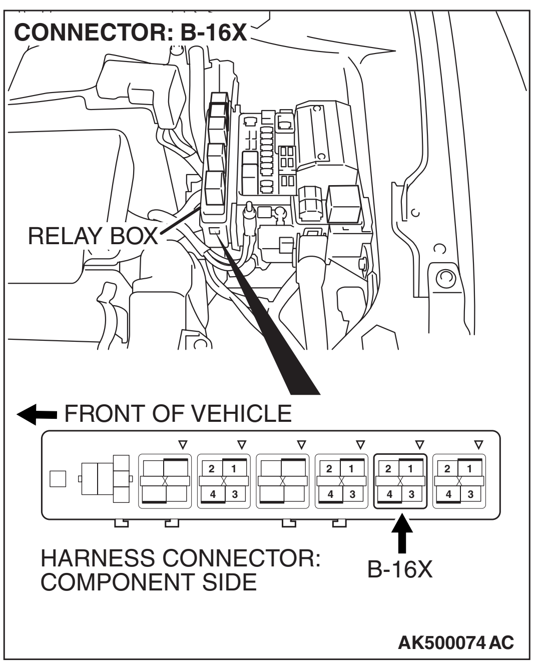
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

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

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

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

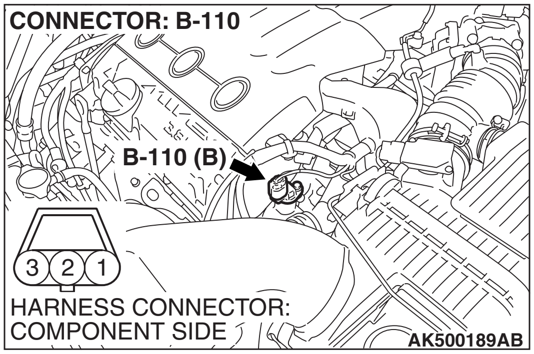
STEP 11. Check harness connector B-16X at MFI relay for damage.



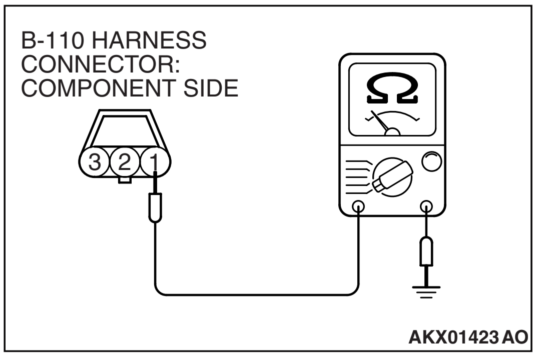
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and camshaft position sensor connector B-110 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check the continuity at camshaft position sensor connector B-110.



(1) Disconnect the connector B-110 and measure at the harness side.

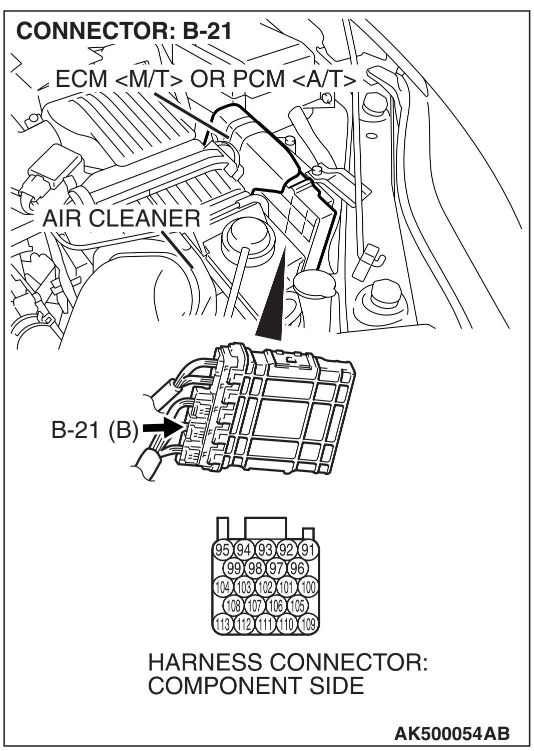


(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

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

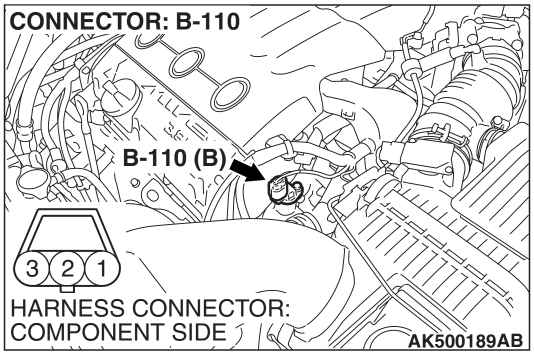
STEP 13. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

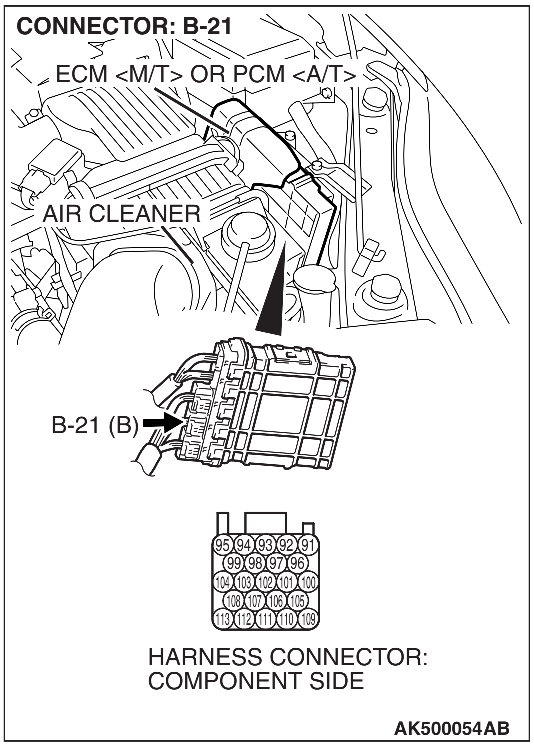


Q: Is the harness connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-110 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 113).

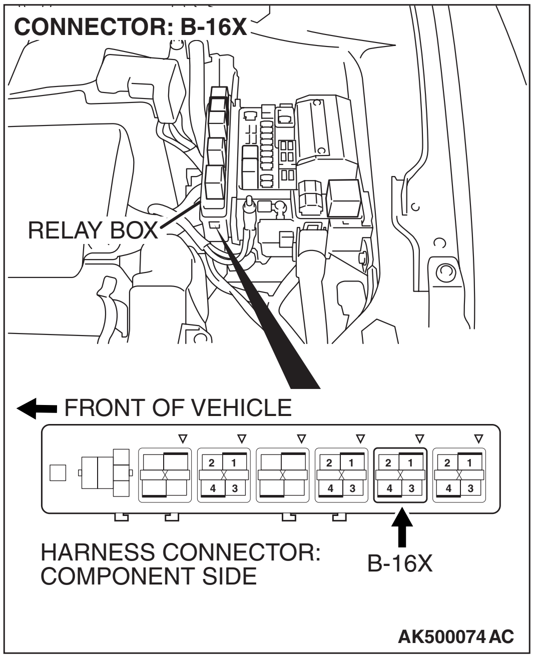




Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

NO : Repair it. Then go to Step 20.

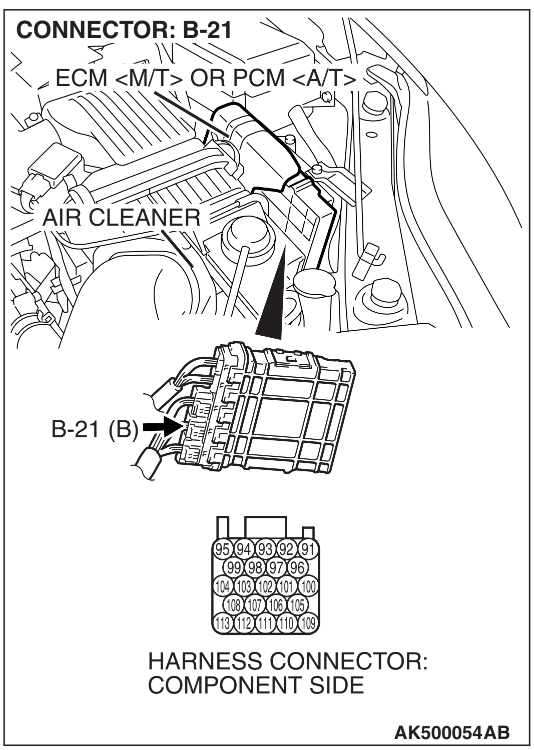


STEP 15. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.

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

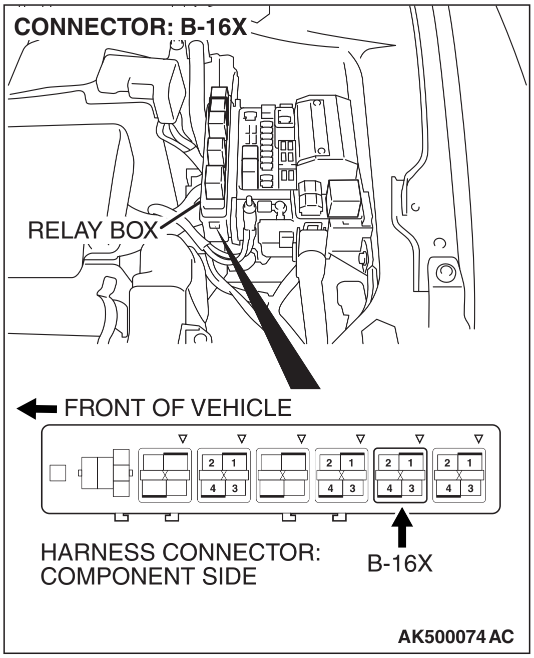


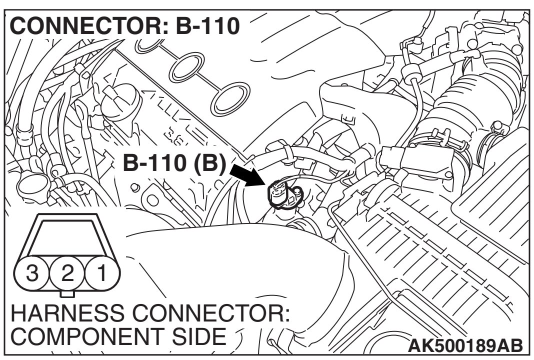
STEP 16. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

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



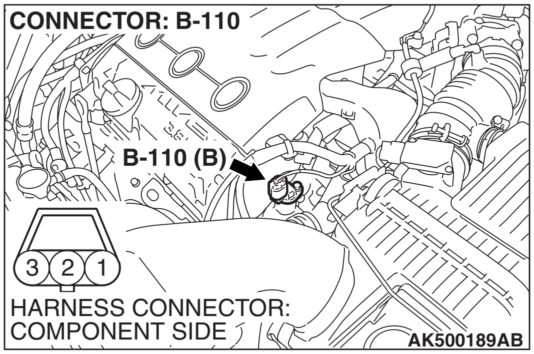


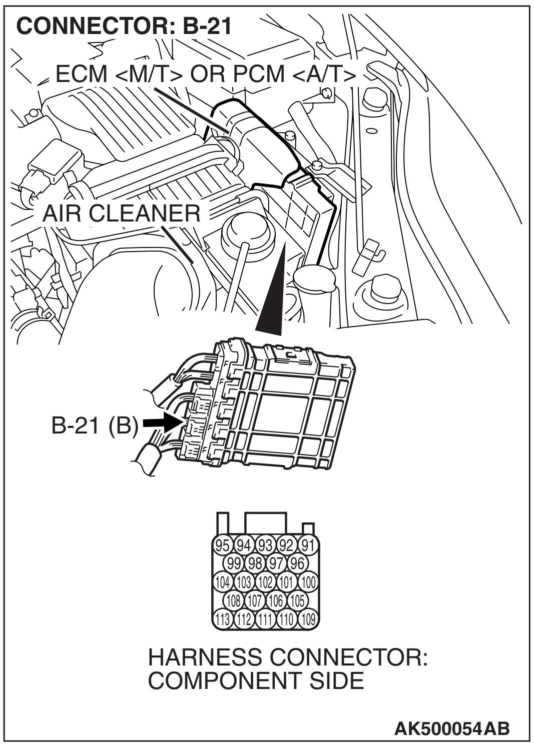
STEP 17. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and camshaft position sensor connector B-110 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.





STEP 18. Check for harness damage between camshaft position sensor connector B-110 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 104).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.

STEP 19. Check the camshaft position sensing cylinder.

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

YES : Replace the camshaft position sensor. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.
(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 ECM <M/T> or the PCM <A/T> checks how the EGR gas flow signal changes.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

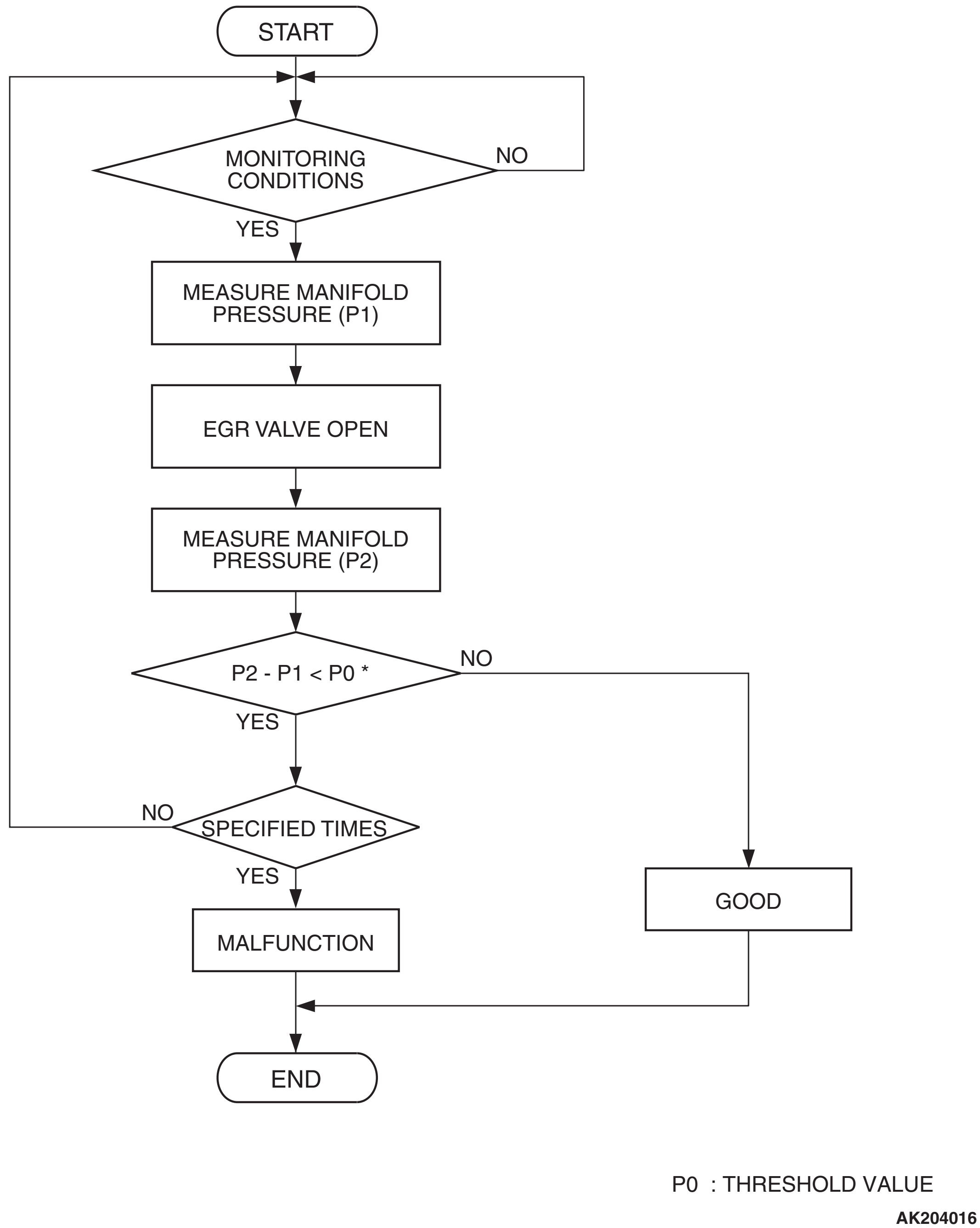
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- At least 10 seconds have passed since the last monitor was complete. <M/T>
- At least 20 seconds have passed since the last monitor was complete. <A/T>
- Engine coolant temperature is higher than 76° C (169° F).
- Engine speed is at between 1,000 and 1,700 r/min. <A/T>
- Engine speed is at between 1,000 and 2,000 r/min. <M/T>
- 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. <A/T>
- Vehicle speed is 1.5 km/h (1 mph) or more. <M/T>

- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- The throttle valve is closed.
- Volumetric efficiency is lower than 22 percent.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 3 cycles of 1.8 seconds each during the drive cycle.

Judgement Criteria

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.0 kPa (0.59 in.Hg). <A/T>
- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 3.0 kPa (0.88 in.Hg). <M/T>

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13B-6.

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

- Contaminated EGR valve and EGR passage.
- EGR valve (stopper motor) failed.
- Open or shorted EGR valve (stopper motor) circuit, or connector damage.
- Manifold absolute pressure sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

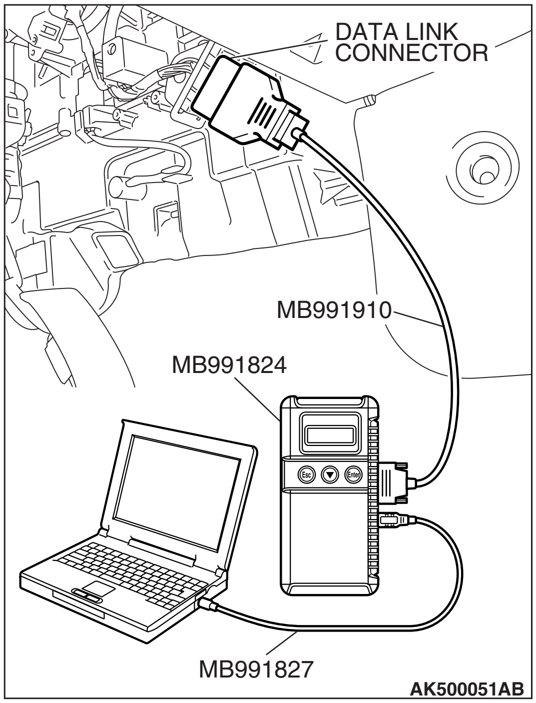
- MB991958: Scan Tool (MUT-III Sub Assembly)
    - MB991824: V.C.I.
    - MB991827: USB Cable
    - MB991910: Main Harness A

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System –Exhaust Gas Recirculation (EGR) System –General Information P.17-104.

Q: Are there any abnormalities?

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



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

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- Should be between 16 – 36 kPa (4.7 – 10.6 in.Hg) at engine idling.

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

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Sensor Circuit Range/Performance Problem P.13B-159, DTC P0107 –Manifold Absolute Pressure Sensor Circuit Low Input P.13B-174, DTC P0108 – Manifold Absolute Pressure Sensor Circuit High Input P.13B-186.

STEP 3. Test the OBD-II drive cycle.

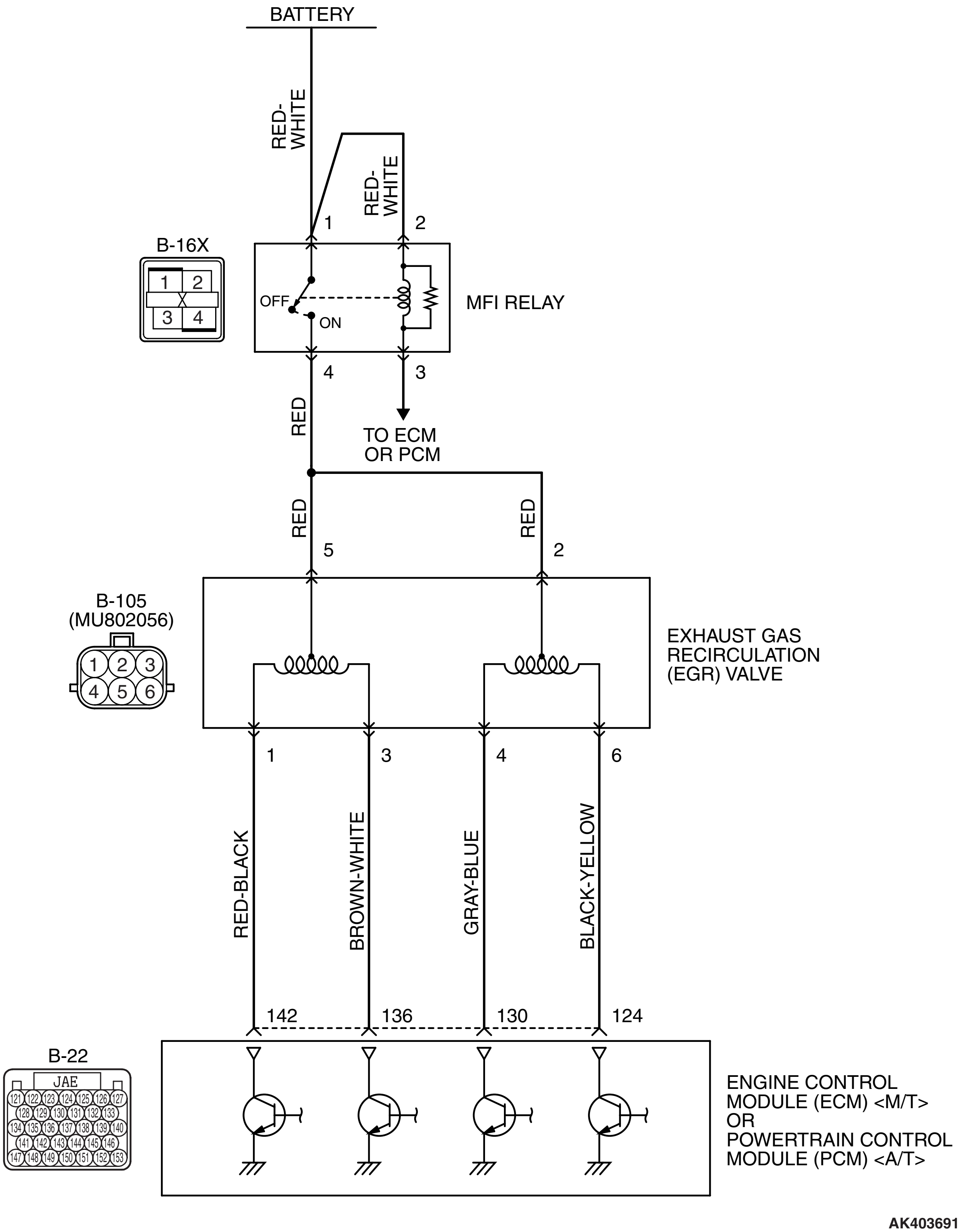
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

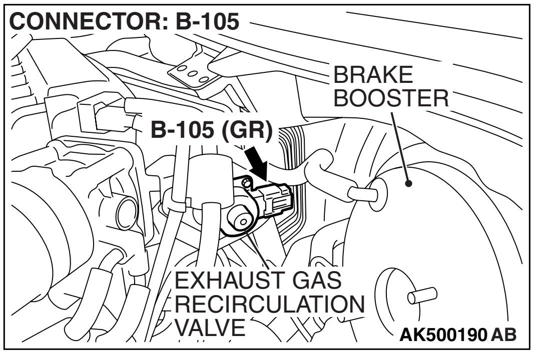
Q: Is DTC P0401 set?

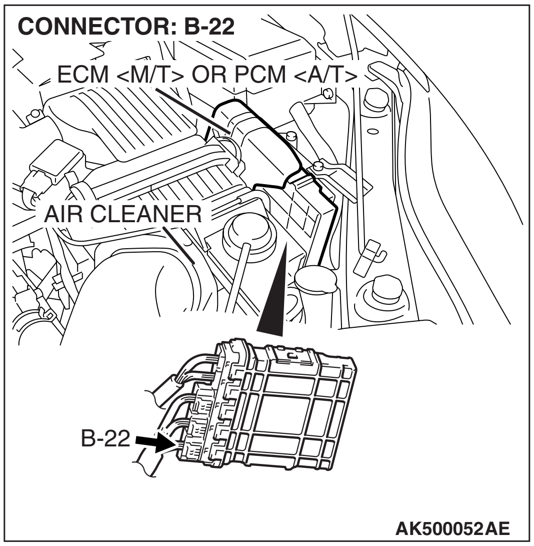
YES : Retry the troubleshooting.
NO : The inspection is complete.

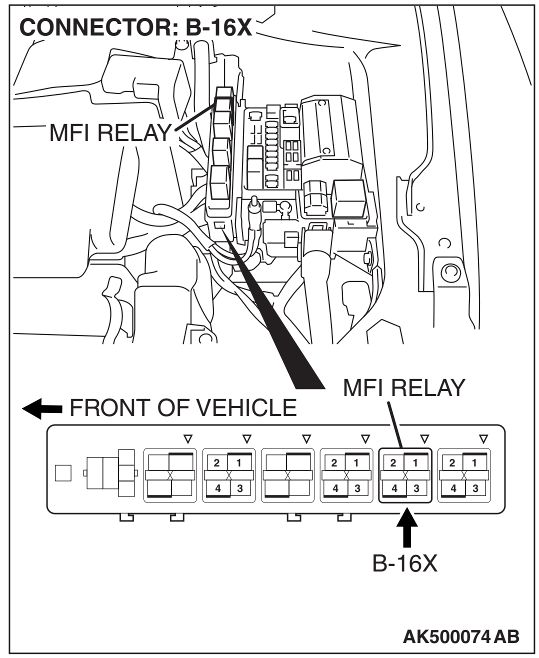
DTC P0403: Exhaust Gas Reculation Control Circuit

EGR Valve Circuit









CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> (terminals No. 124, No. 130, No. 136, No. 142) drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or the PCM <A/T> and providing ground to the idle air control motor (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR valve (stepper motor) drive circuit, ECM <M/T> or PCM <A/T> 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)

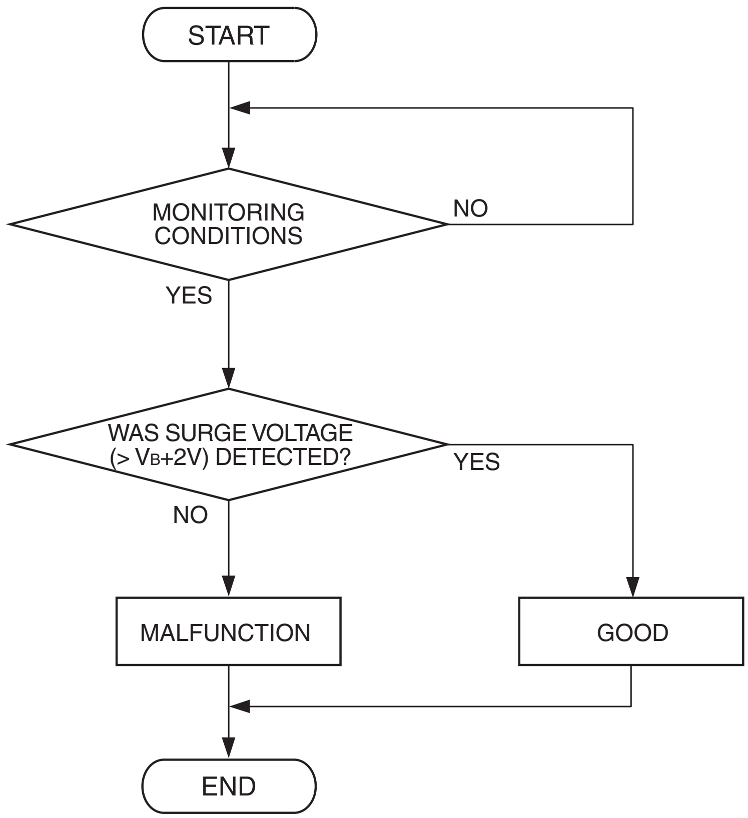
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK204017

Check Conditions

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

Judgement Criterion

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

Check 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 22 P.13B-6.

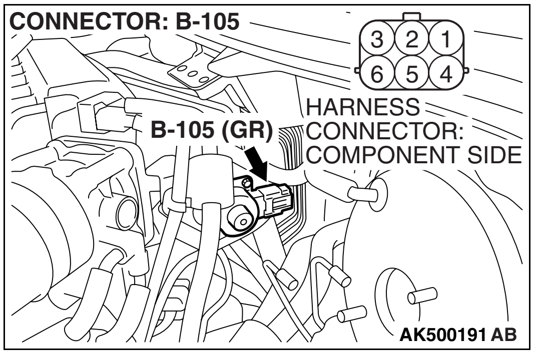
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, harness damage or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

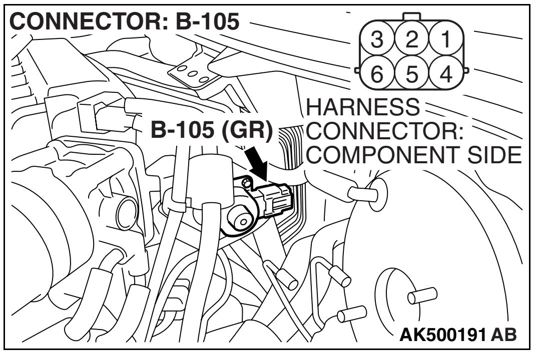


STEP 1. Check harness connector B-105 at EGR valve for damage.

Q: Is the harness connector in good condition?

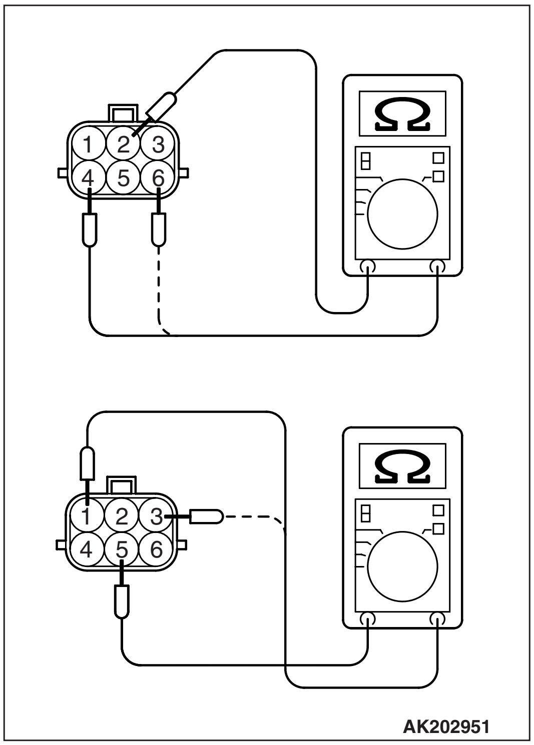
YES : Go to Step 2.

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



STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-105.



(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 4 or terminal No. 6.

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

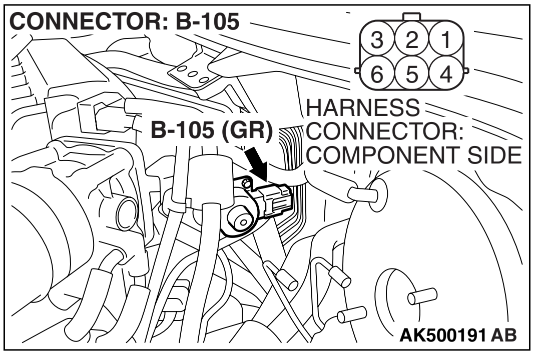
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 1 or terminal No. 3.

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

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

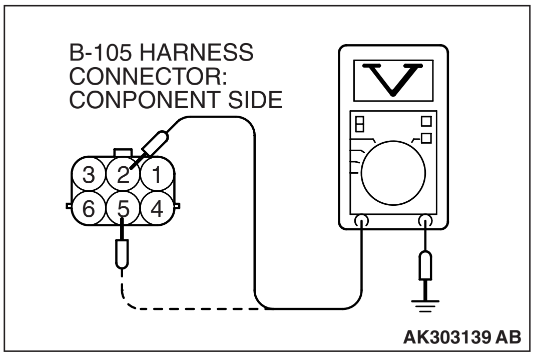
YES : Go to Step 3.

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-105.

(1) Disconnect the connector B-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

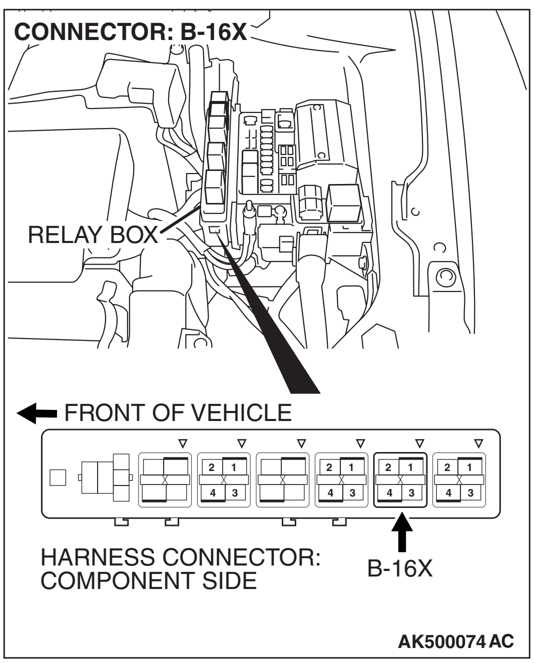


(3) Measure the voltage between terminal No. 2, No. 5 and ground.
  - Voltage should be battery positive voltage.

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

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

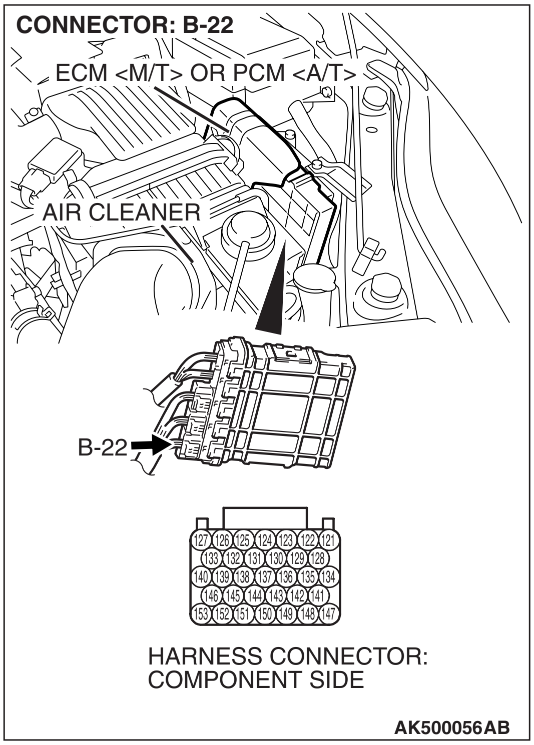
YES : Go to Step 5.
NO : Go to Step 4.

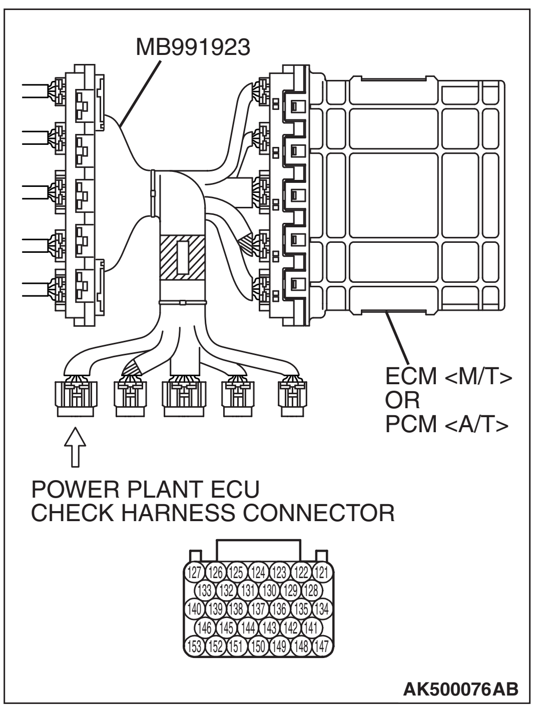


STEP 4. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

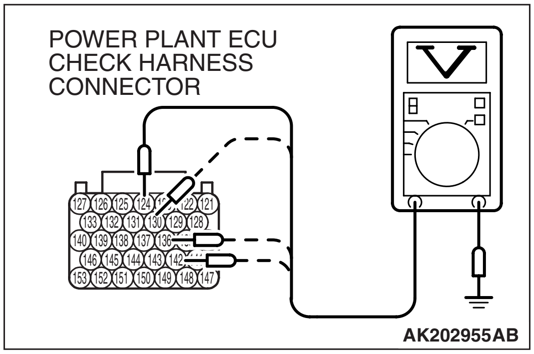
YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 5. Measure the power supply voltage at ECM <M/T> or PCM <A/T> connector B-22 by using power plant ECU check harness special tool MB991923.

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

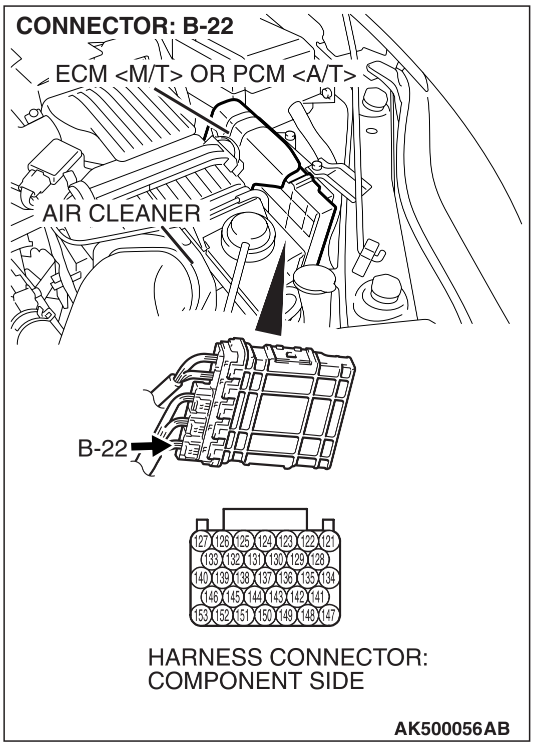


(2) Measure the voltage between terminal (No. 124, No. 130, No. 136, No. 142) and ground.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

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

Q: Is the voltage normal?

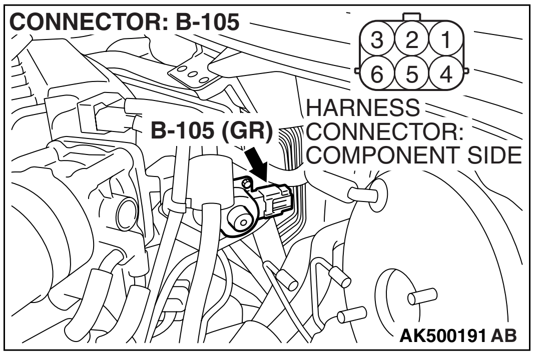
YES : Go to Step 8.
NO : Go to Step 6.

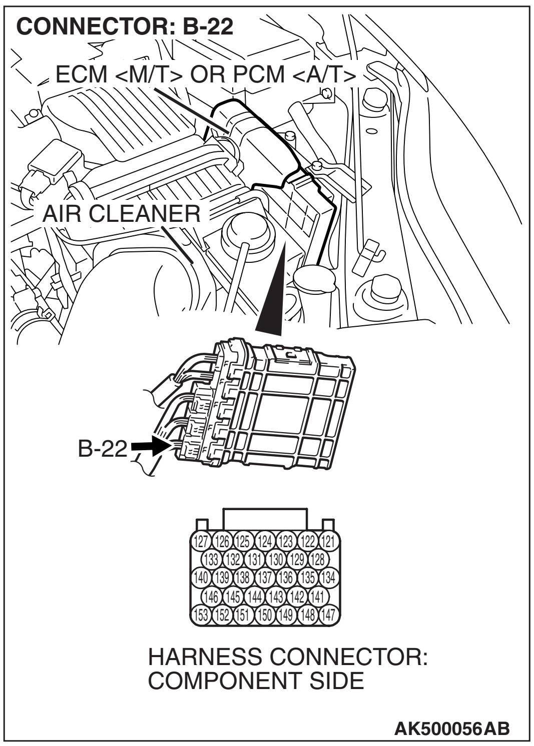


STEP 6. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

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





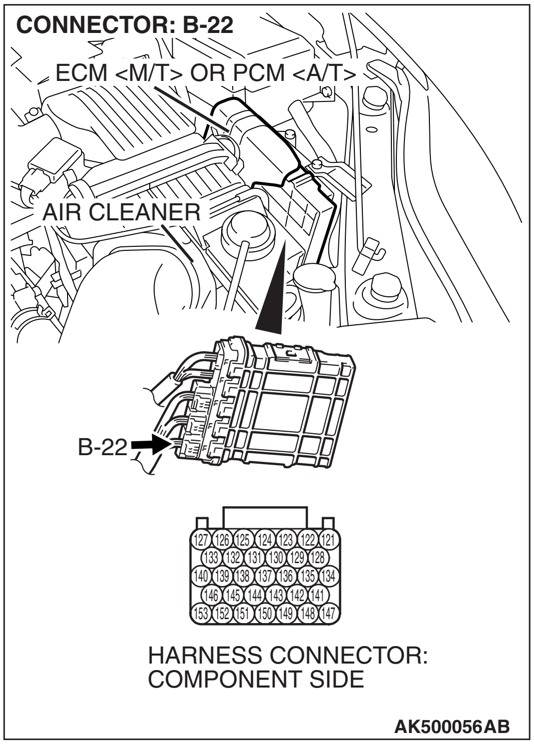
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-105 and ECM <M/T> or PCM <A/T> connector B-22.

a. EGR valve connector B-105 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 8. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

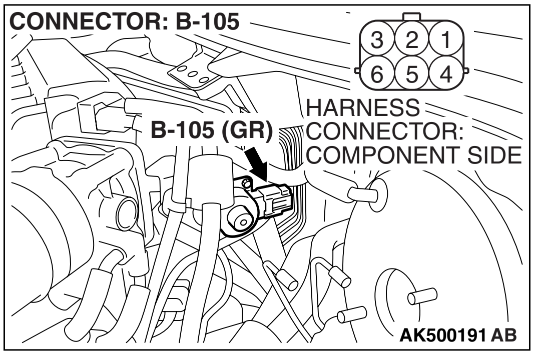
Q: Is the harness connector in good condition?

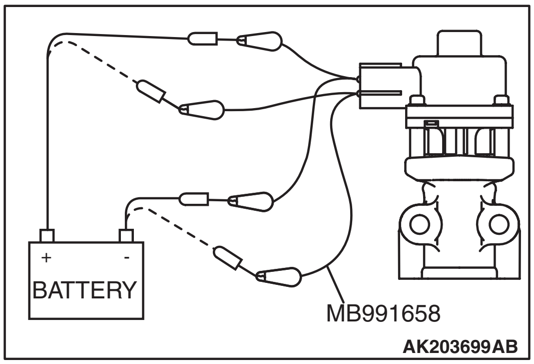
YES : Go to Step 9.

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

STEP 9. Check the EGR valve operation using special tool MB991658.

(1) Remove the EGR valve.





(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 5 of the EGR valve connector to the positive battery terminal.
(4) Check to ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

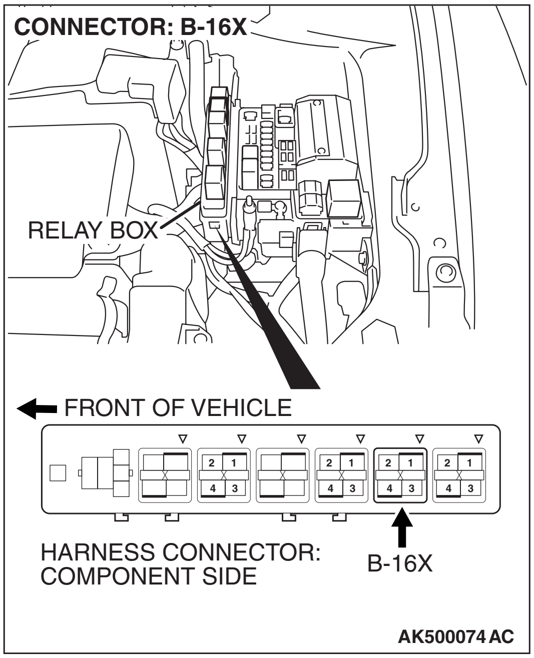
(5) Then, use jumper wires to connect the terminal No. 2 of the EGR valve connector to the positive battery terminal.
(6) Check to ensure that the motor operates when terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

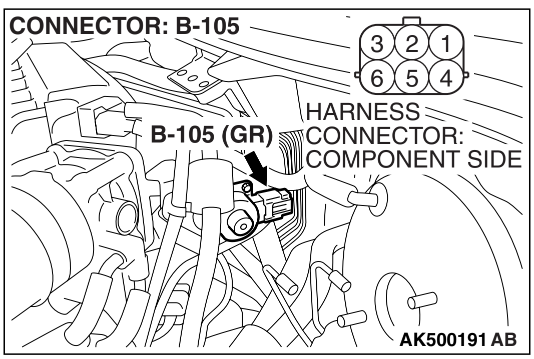
(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque: 24 $\pm$3 N· m [17 $\pm$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.

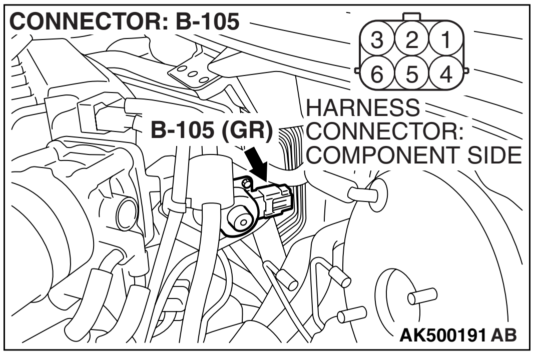


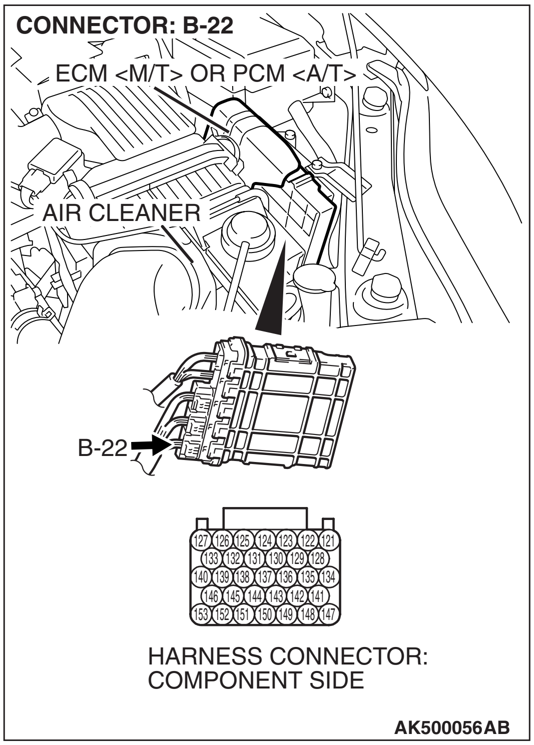


STEP 10. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5).

Q: Is the harness wire in good condition?

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





STEP 11. Check for harness damage between EGR valve connector B-105 and PCM connector B-22.

a. EGR valve connector B-105 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 142).
b. EGR valve connector B-105 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 136).
c. EGR valve connector B-105 (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 130).
d. EGR valve connector B-105 (terminal No. 6) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 124).

Q: Is the harness wire in good condition?

YES : Replace the ECM or 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 22 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0403 set?

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

DTC P0421: Warm Up Catalyst Efficiency Below Threshold (bank 1)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or the PCM <A/T> 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)

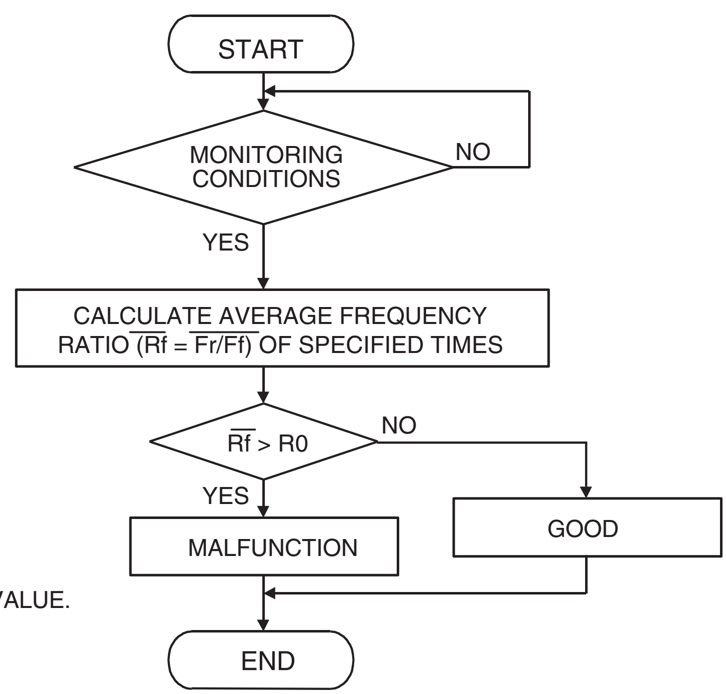
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



R0: AVERAGE THRESHOLD VALUE.

AK303028

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 10 and 35 g/sec. <A/T>
- Mass airflow is between 9 and 37 g/sec. <M/T>
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 3 cycles of 12 seconds each during the drive cycle. <A/T>
- The ECM monitors for this condition for 4 cycles of 12 seconds each during the drive cycle. <M/T>
- Short-term fuel trim is higher than –30 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criteria

- When the monitoring for 12 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more. <A/T>
- When the monitoring for 12 seconds is carried out 7 times, the frequency ratio of rear and front is 0.7 or more. <M/T>

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13B-6.

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.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Replace the right bank side catalytic converter.

(1) Replace the right bank side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0421 set?

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

NO : The inspection is complete.

DTC P0431: Warm Up Catalyst Efficiency Below Threshold (bank 2)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or the PCM <A/T> 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)

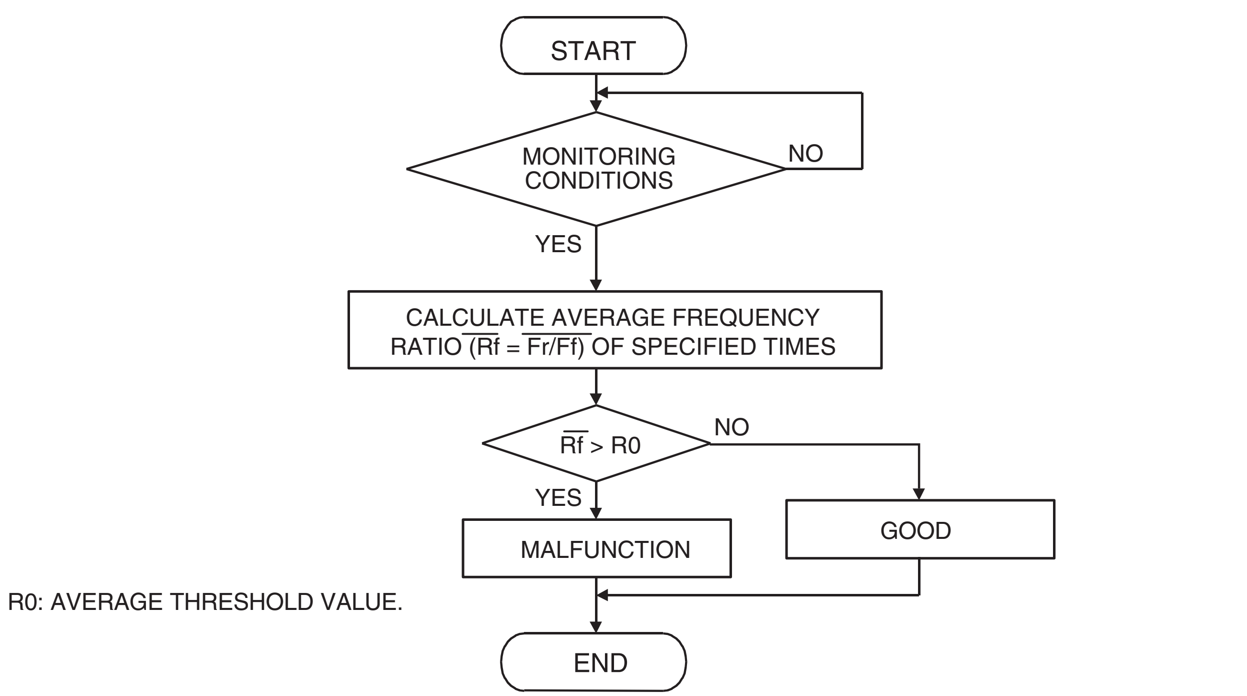
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 10 and 35 g/sec. <A/T>
- Mass airflow is between 9 and 37 g/sec. <M/T>
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The PCM monitors for this condition for 3 cycles of 12 seconds each during the drive cycle. <A/T>
- The ECM monitors for this condition for 4 cycles of 12 seconds each during the drive cycle. <M/T>
- Short-term fuel trim is higher than –30 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criteria

- When the monitoring for 12 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more. <A/T>
- When the monitoring for 12 seconds is carried out 7 times, the frequency ratio of rear and front is 0.7 or more. <M/T>

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 4 P.13B-6.

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.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Replace the left bank side catalytic converter.

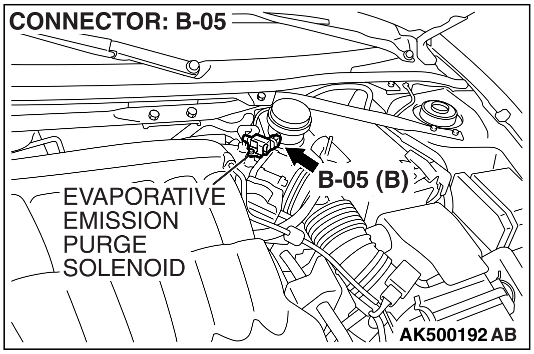
(1) Replace the left bank side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 4 P.13B-6.
(3) Check the diagnostic trouble code (DTC).

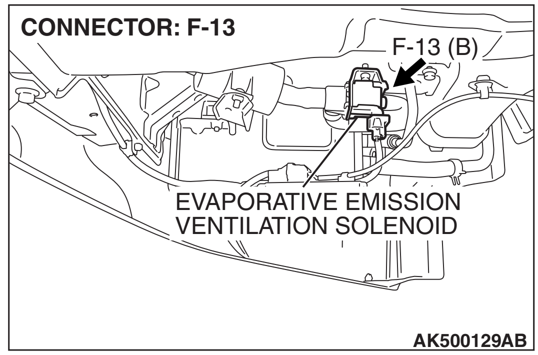
Q: Is DTC P0171 set?

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

NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow





TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> detects a stuck open condition of evaporative emission purge solenoid valve and a stuck closed condition of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid valve is judged after 20 seconds from end of monitoring leak of evaporative emission system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank pressure decreases largely during purge-cut.

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)

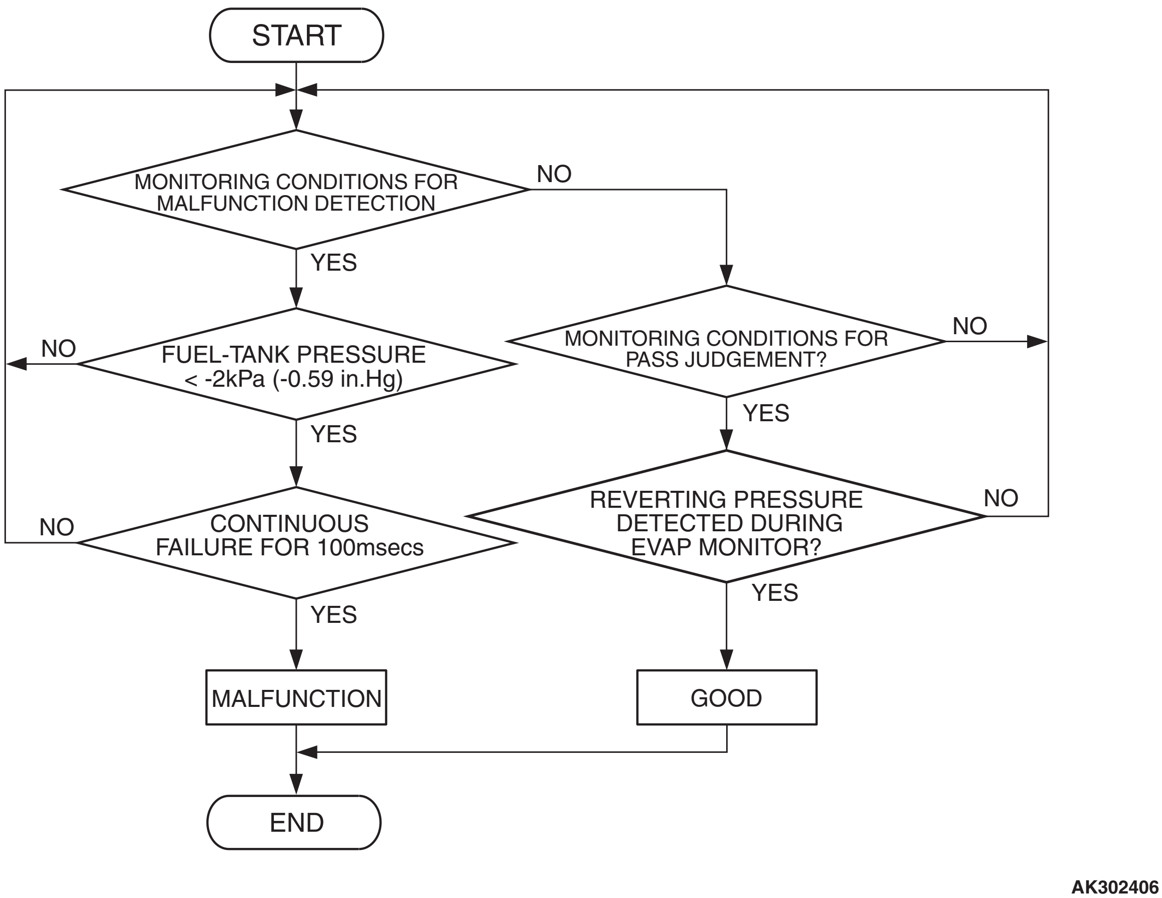
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Engine is running.
- 20 seconds have elapsed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgement Criterion
- The pressure in the fuel tank is –2 kPa (–0.59 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

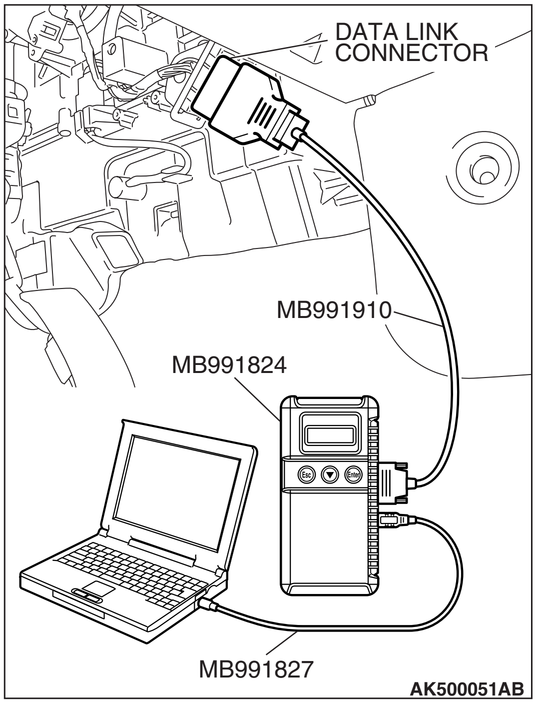
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13B-6.

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

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor circuit related part(s) failed.

DIAGNOSIS

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



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

⚠ CAUTION

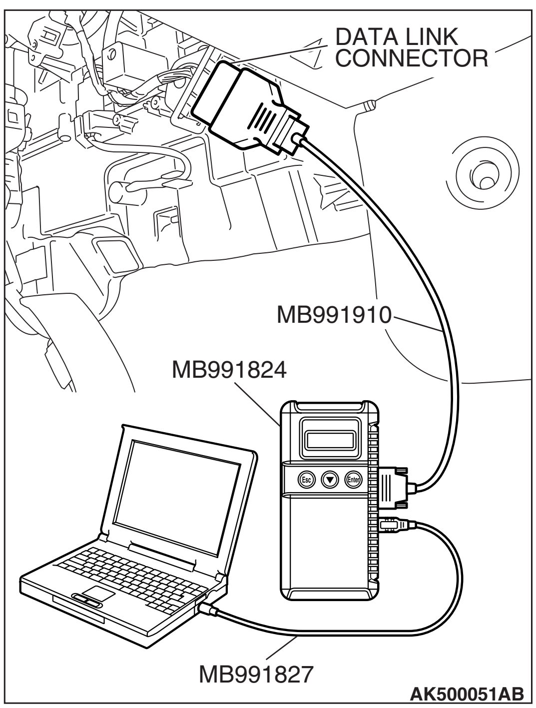
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

Q: Is DTC P0451 set?

YES : Refer to DTC P0451 –Evaporative Emission Control System Pressure Sensor Range/Performance P.13B-718.

NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

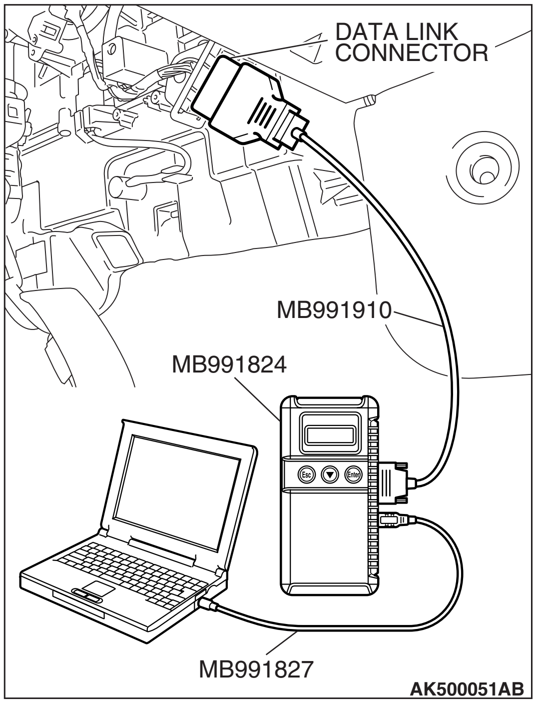
(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be 1,200 and 3,800 millivolts.

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

Q: Is the fuel tank pressure between 1,200 and 3,800 millivolts?

YES : Go to Step 3.

NO : Refer to DTC P0451 –Evaporative Emission Control System Pressure Sensor Range/Performance P.13B-718.



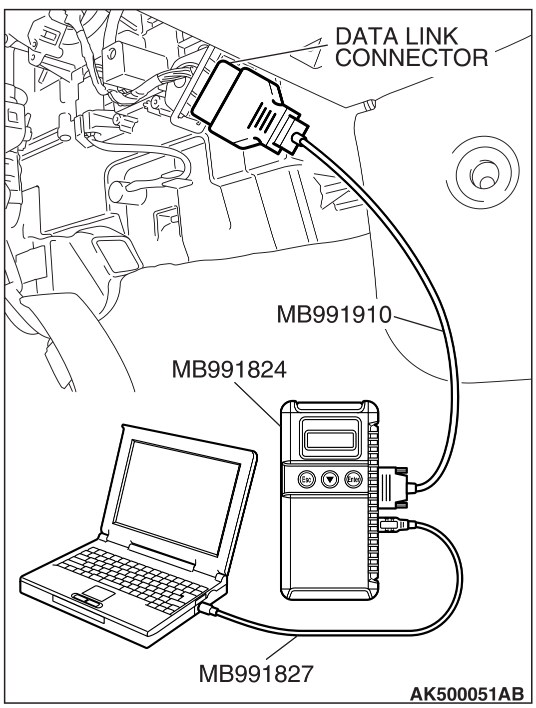
STEP 3. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.



STEP 4. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Repair or replace the vent hose and air filter. Then go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 5.

STEP 5 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.13B-6.

(2) Read the diagnostic trouble code.

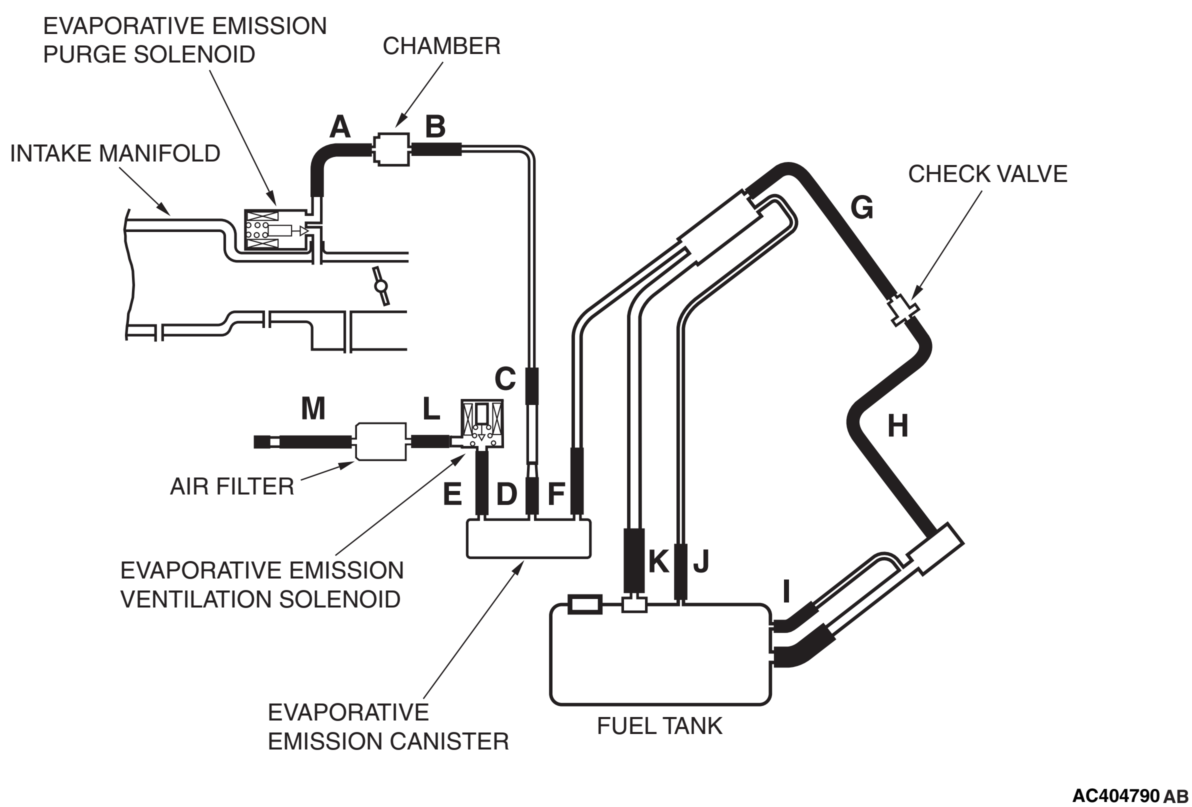
Q: Is DTC P0441 set?

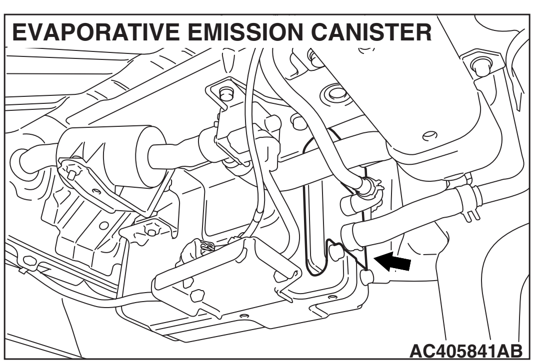
YES : Retry the troubleshooting.

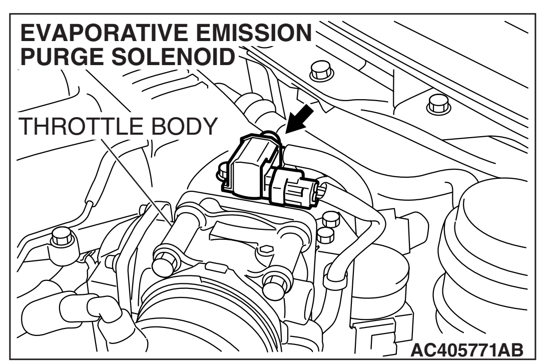
NO : The inspection is complete.

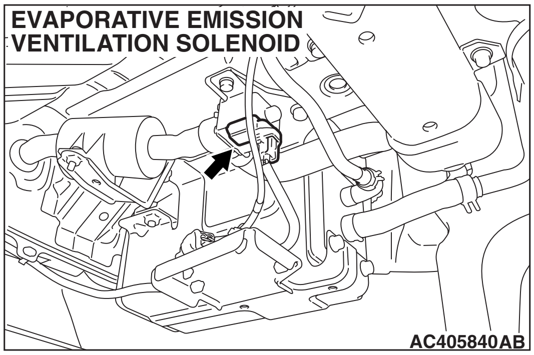
DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

System Diagram









TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> monitors the Evaporative Emission (EVAP) System pressure.
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DESCRIPTIONS OF MONITOR METHODS

- Measure reverting pressure after depressurizing by intake manifold negative pressure and detect malfunction if reverting pressure rises largely.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

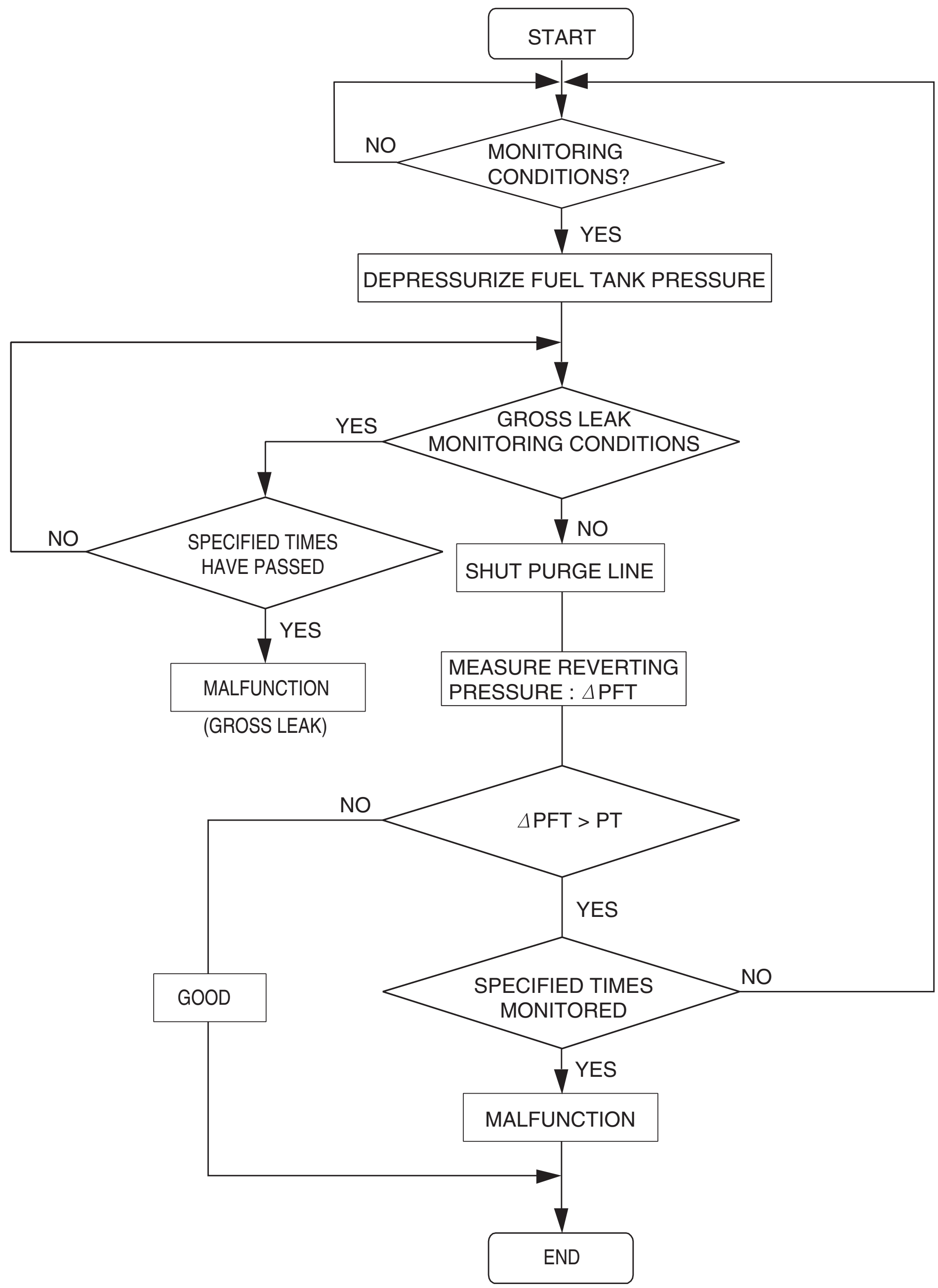
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

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

LOGIC FLOW CHARTS (Monitor Sequence)

0.04in, 0.02in GROSS LEAK MONITOR



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DTC SET CONDITIONS

Remaining fuel amount is 15 – 40 percent of capacity (fuel level sensor output signal voltage is 1.4 – 2.4 volts).

Check Conditions A: At Start up

- Intake air temperature is 36° C (97° F) or less when the engine is started.
- The engine coolant temperature is 36 ° C (97 ° F) or less when the engine is started.

Check Conditions B: For Test to Run

- The fuel temperature is less than 36 ° C (97 ° F), and less than 13 minutes have elapsed since the engine was started.
- Engine coolant temperature is greater than 60° C (140° F).
- Power steering pressure switch: "OFF"
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.
- Vehicle speed is greater than or equal to 20 km/h (12.4 mph).

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10° C (14° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- The pressure fluctuation is less than 647 Pa (0.094 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 75 – 125 seconds.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 977 Pa (0.142 psi) in 20 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (75– 125 seconds) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent of capacity (fuel level sensor output voltage is 2.4 – 3.7 volts).

Check Conditions A: At Start up

- Intake air temperature is less than 36 ° C (97 ° F) when the engine is started.
- The engine coolant temperature is less than 36 ° C (97 ° F) when the engine is started.

Check Conditions B: For Test to Run

- The fuel temperature is less than 36 ° C (97 ° F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10 ° C (14° F).
- Engine coolant temperature is greater than 20 ° C (68 ° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 2 kPa (0.29 psi) in 128 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (10– 14 minutes) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13B-6.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

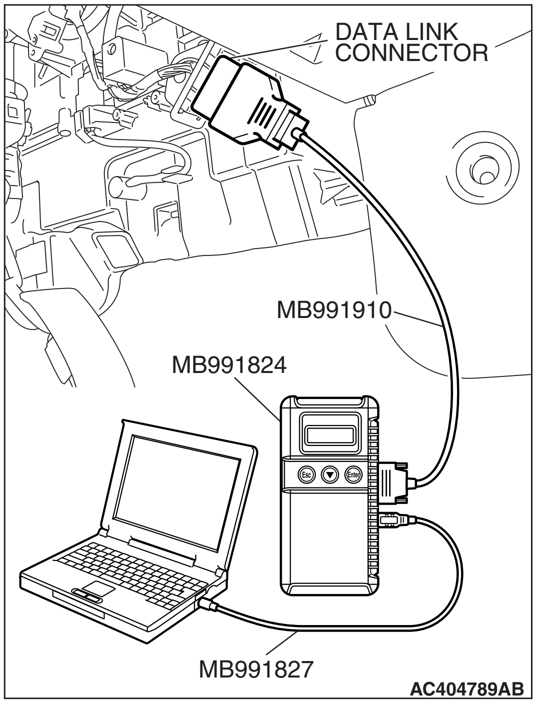
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is leaking.
- Fuel tank, purge line or vapor line seal is leaking.
- Evaporative emission ventilation solenoid does not seal.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.



⚠ 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.**
- **During this test, the ECM <M/T> or PCM <A/T> will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

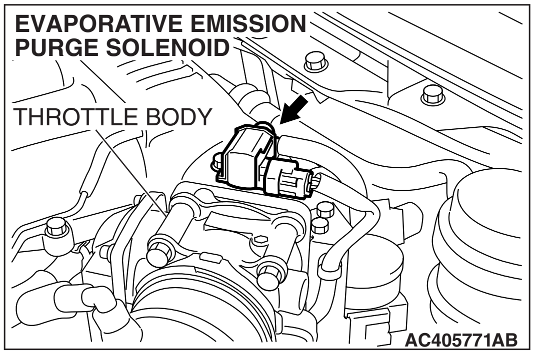
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13B-43. If no other DTC's have been set, go to Step 2.

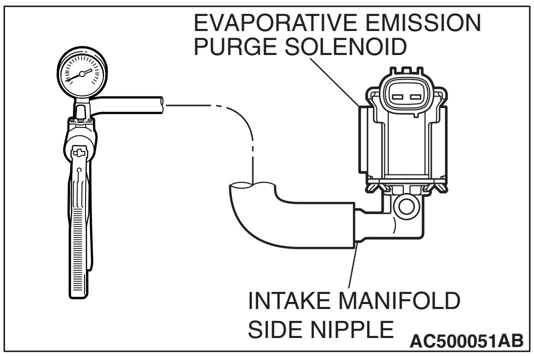
NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Remove the evaporative emission purge solenoid from the intake manifold (Refer to GROUP 15, Intake Manifold P.15-14).



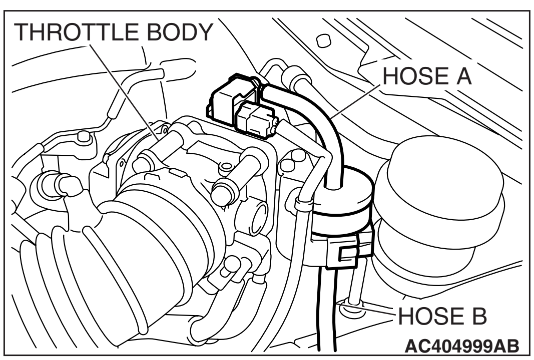
(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Install the evaporative emission purge solenoid to the intake manifold (Refer to GROUP 15, Intake Manifold P.15-14).

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 15.

STEP 3. Check for leaks in evaporative emission hoses A and B.

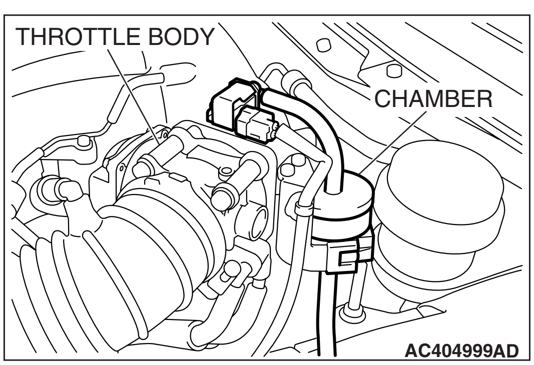
Use a hand vacuum pump to test each hose from hose A to hose B.



Q: Do the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Then go to Step 15.

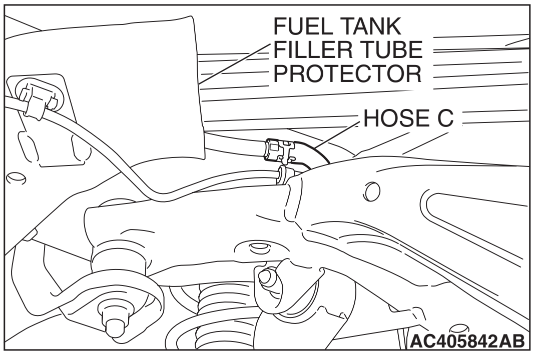
STEP 4. Check for leaks in the chamber.

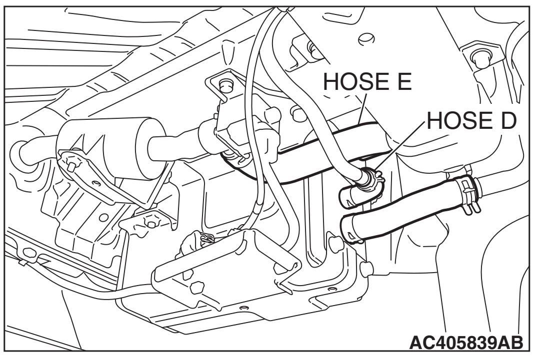


(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 15.





STEP 5. Check for leaks in evaporative emission hoses C through E.

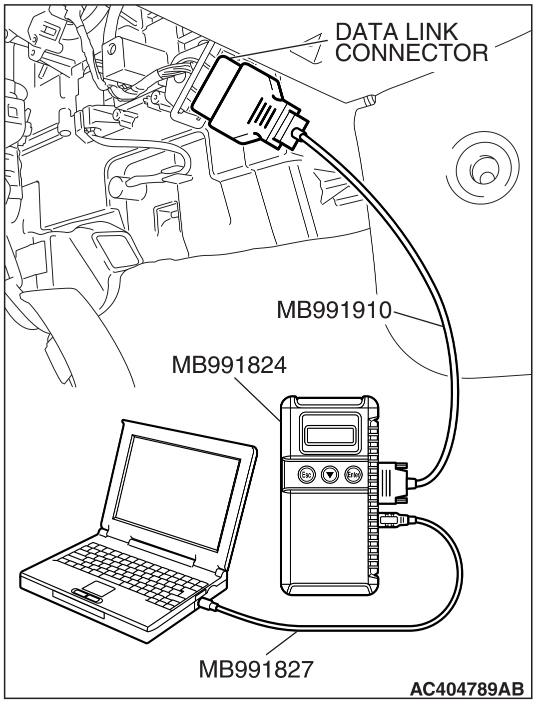
Use a hand vacuum pump to test each hose from hose C to hose E.

Q: Do the hoses hold vacuum?

YES : Go to Step 6.

NO : Replace any damaged hose. Then go to Step 15.

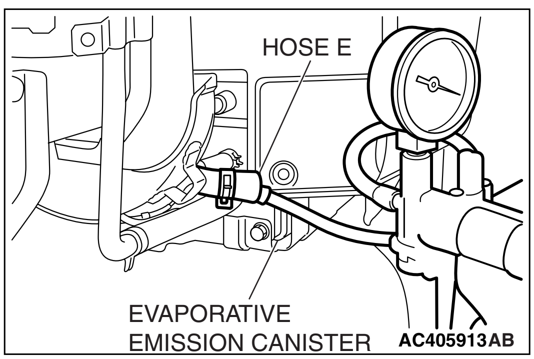
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.



⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Remove the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).



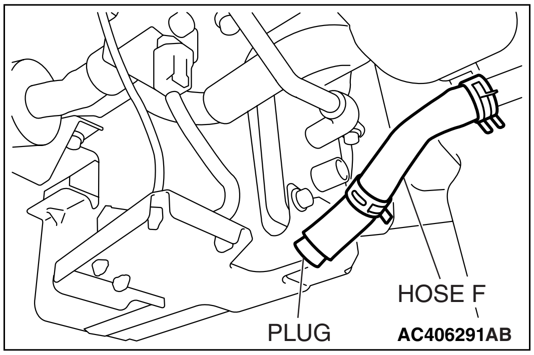
(3) Disconnect the hose E and evaporative emission canister connection, and connect the hand vacuum pump to the hose E.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.
(7) Disconnect the hand vacuum pump, and connect hose E to the evaporative emission canister.
(8) Reinstall the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).

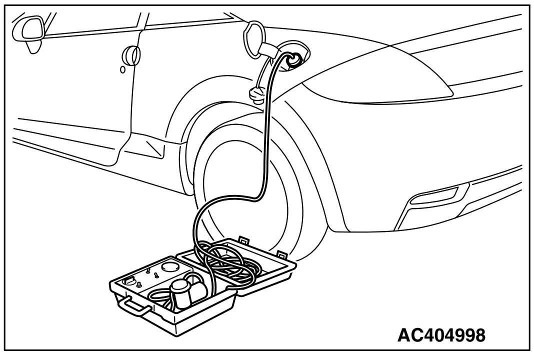
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 7.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-110). Then go to Step 15.

STEP 7. Pressure test the evaporative emission system lines from hoses F to K.



(1) Disconnect hose F from the evaporative emission canister, and plug hose F securely.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(3) Remove the fuel cap.



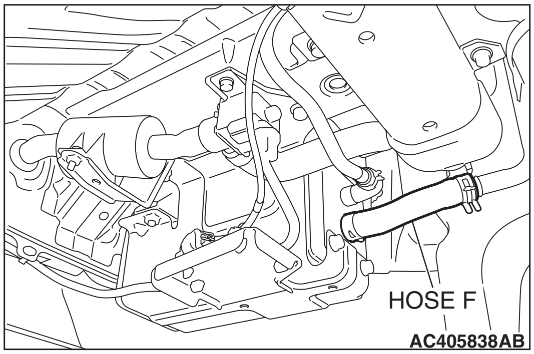
(4) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(5) Pressure test the system to determine whether any leaks are present.

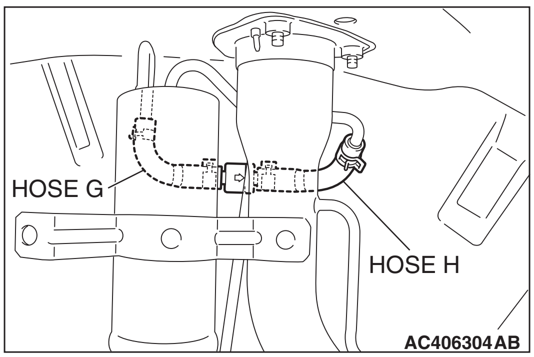
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(6) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 13.
NO : Go to Step 8.





STEP 8. Check for leaks in evaporative emission hoses F through H.

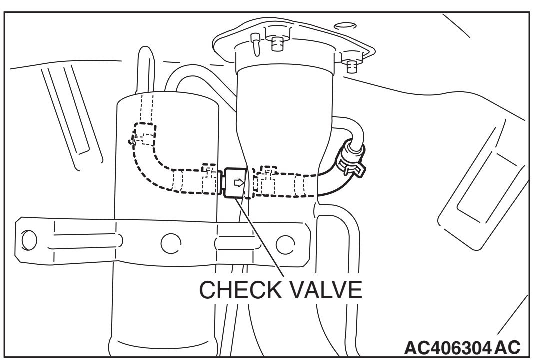
(1) Remove the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9).

(2) Use a hand vacuum pump to test each hose from hose F to hose H.

Q: Do the hoses hold vacuum?

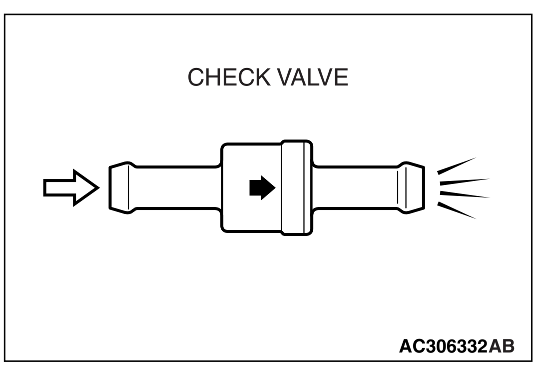
YES : Go to Step 9.

NO : Replace any damaged hose. Then go to Step 15.



STEP 9. Test check valve.

(1) Check valve is a one-way check valve.



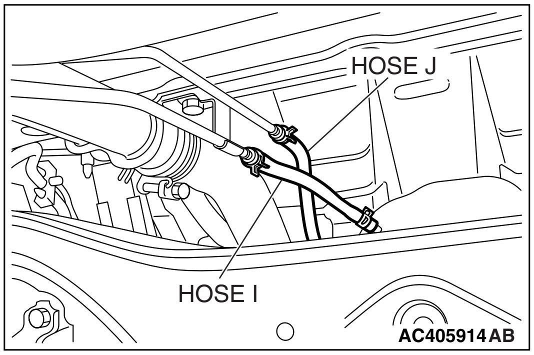
(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

STEP 10. Check for leaks in evaporative emission hoses I and J.

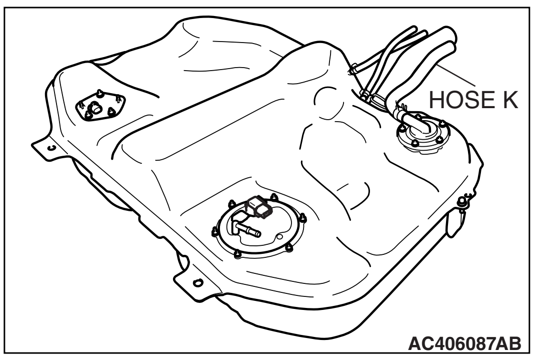


Use a hand vacuum pump to test each hose I and J.

Q: Do the hoses hold vacuum?

YES : Go to Step 11.
NO : Replace any damaged hose. Then go to Step 15.

STEP 11. Check for leaks in evaporative emission hose K.

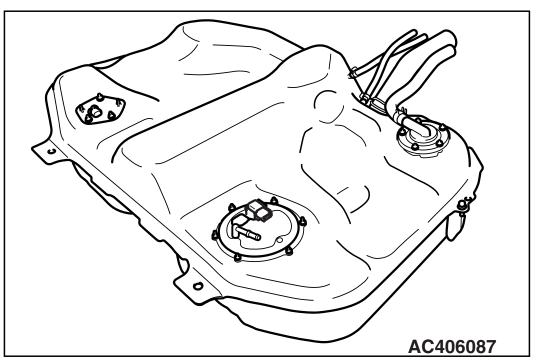


(1) Remove the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9).
(2) Use the hand vacuum pump to check the hose K.

Q: Does the hose hold vacuum?

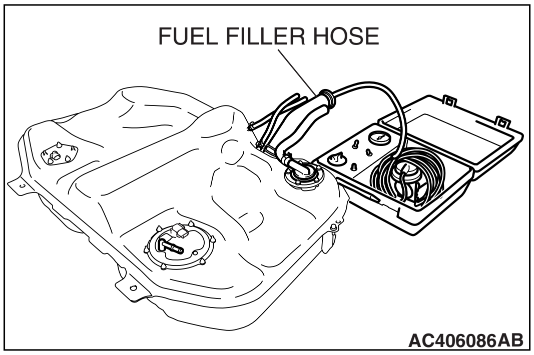
YES : Go to Step 12.
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

STEP 12. Check for leaks in the fuel tank.

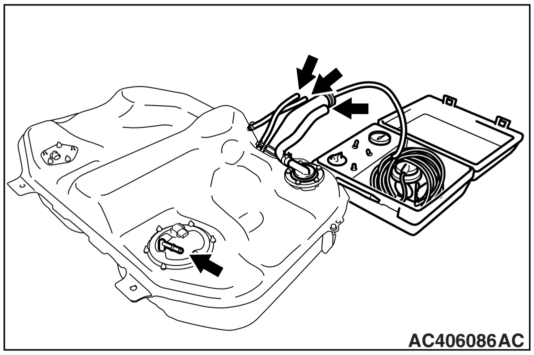


(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.



(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.



(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.

(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

Q: Are any leaks found?

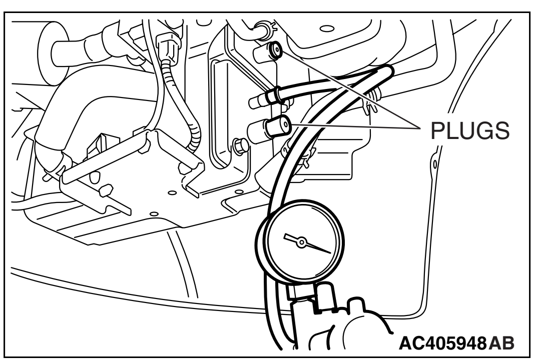
YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor (sub) or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 15.

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 14.

STEP 13. Check the evaporative emission canister for vacuum leaks.

(1) Remove the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110).



(2) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.

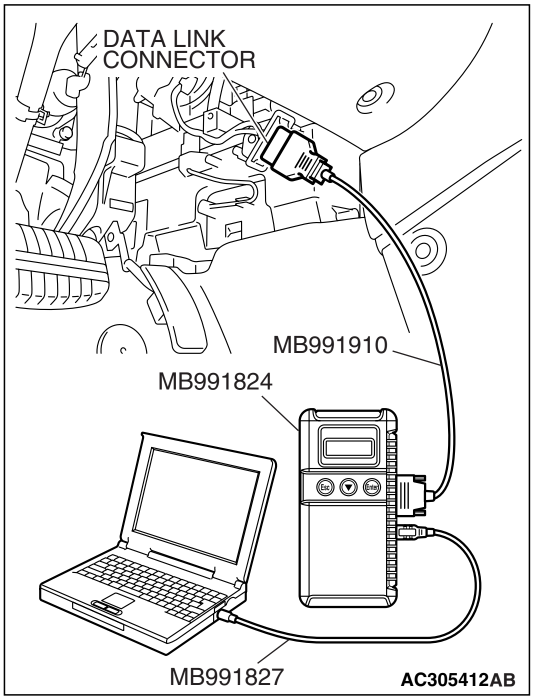
(3) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.

(4) Disconnect the hand vacuum pump and remove the plugs, and then install the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110).

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 14.

NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110). Then go to Step 15.



STEP 14. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ 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.**
- **During this test, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During the test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES."
(10)Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the ECM <M/T> or PCM <A/T>. When the ECM <M/T> or PCM <A/T> is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 15.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 15.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14.

STEP 15. Perform the OBD-II drive cycle.

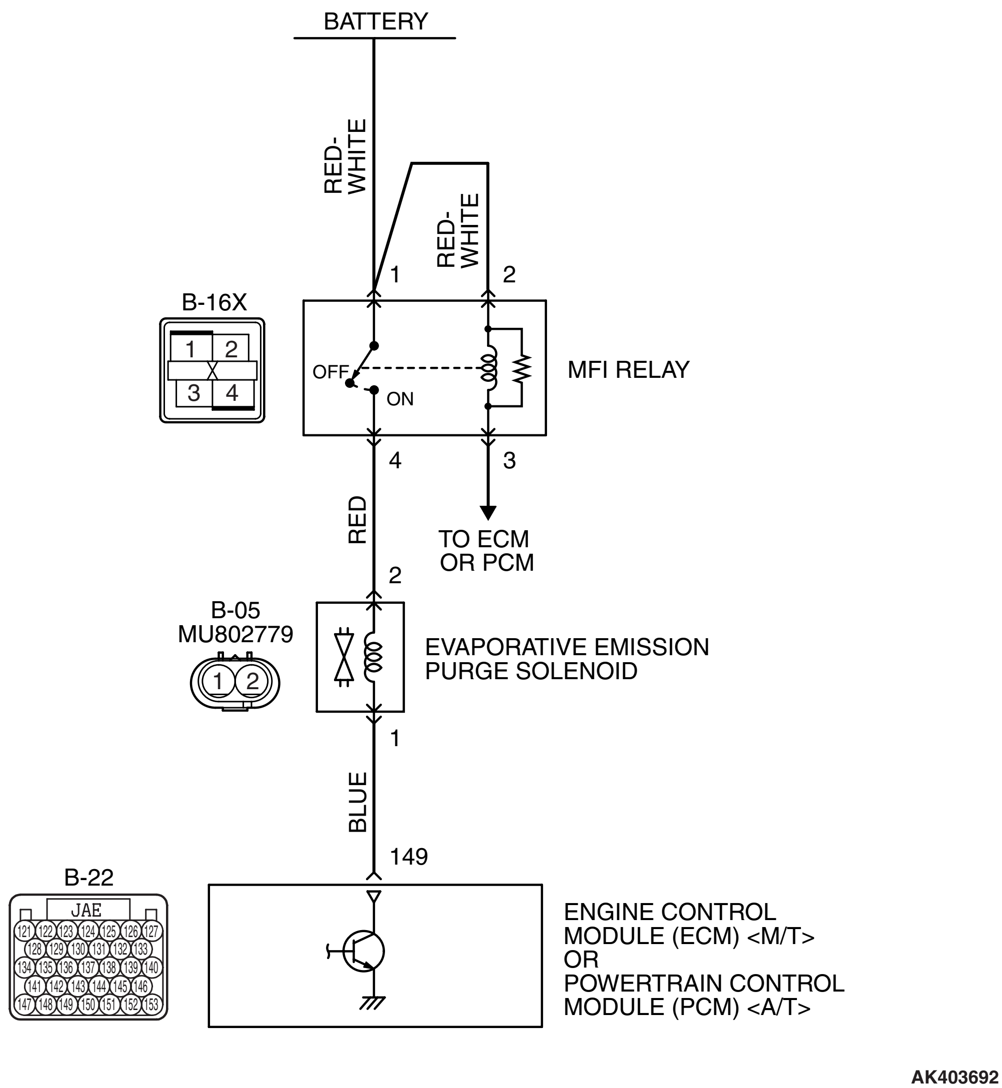
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13B-6).
(2) Read the DTC.

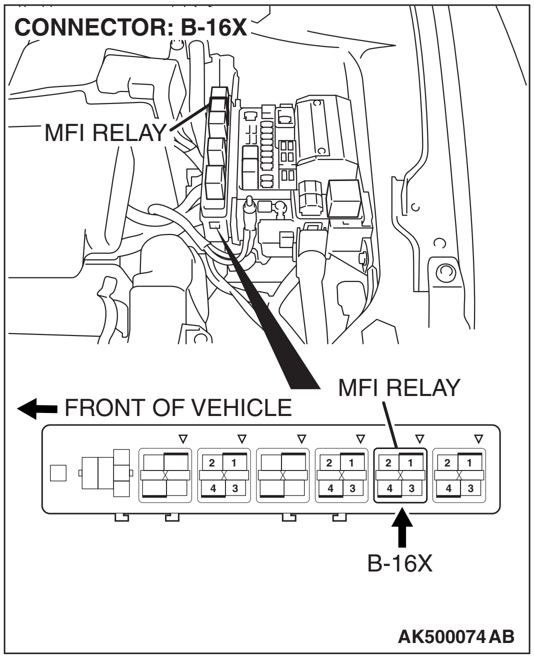
Q: Is DTC P0442 set?

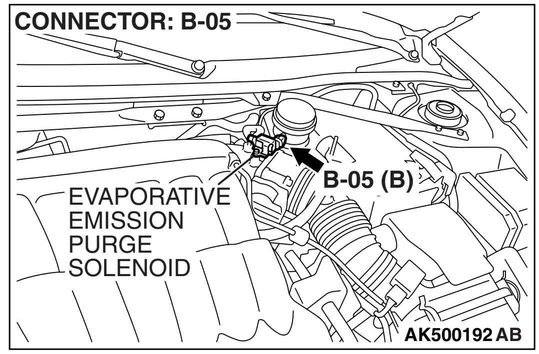
YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

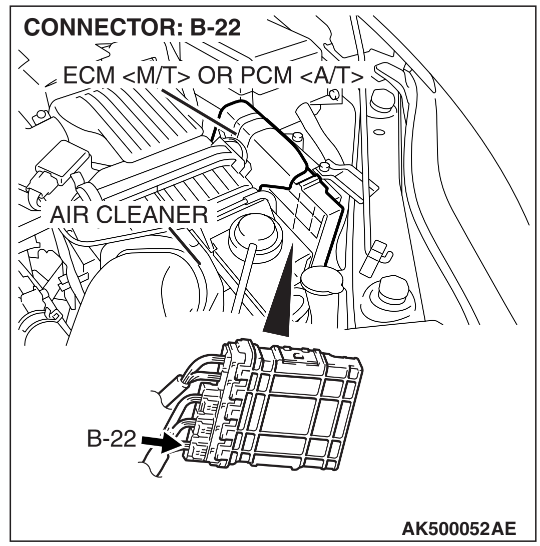
DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

Evaporative Emission Purge Solenoid Circuit









CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls ground evaporative emission purge solenoid by turning the power transistor in the ECM <M/T> or the PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the ECM <M/T> or the PCM <A/T> measures the surge voltage of the evaporative emission purge solenoid coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid is operated from 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)

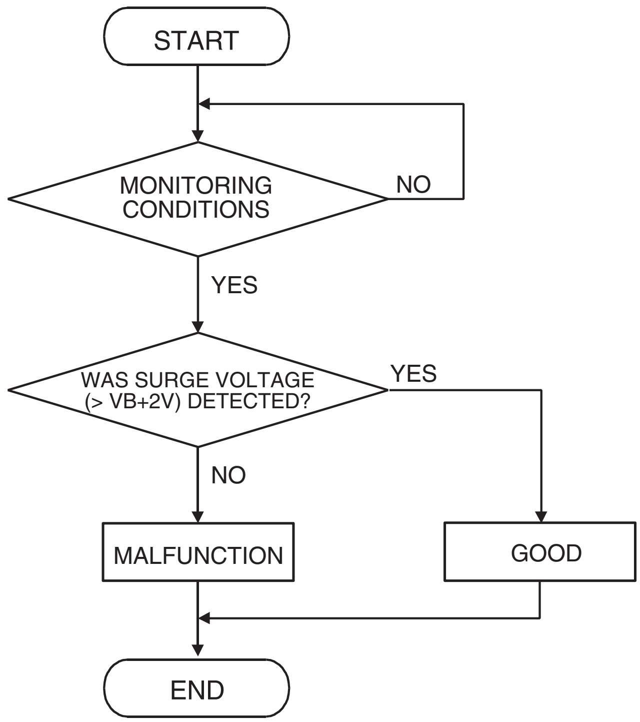
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or the PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- Evaporative emission ventilation solenoid is off.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned off.

OBD-II DRIVE CYCLE PATTERN

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

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

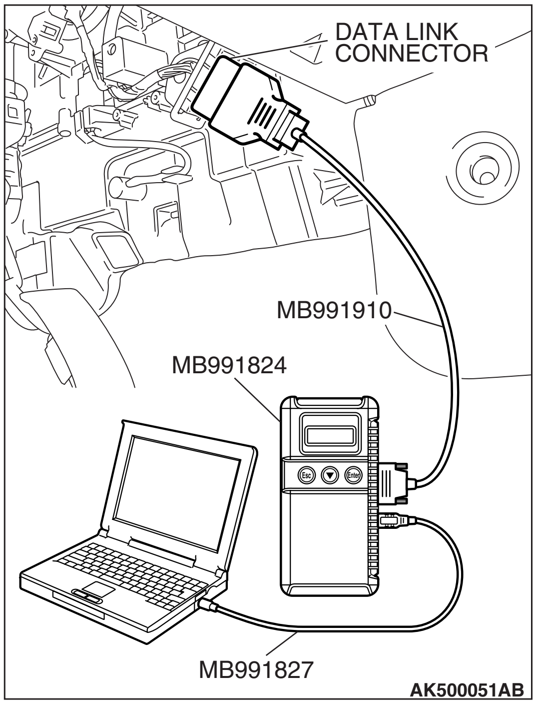
- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.



⚠ 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 actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

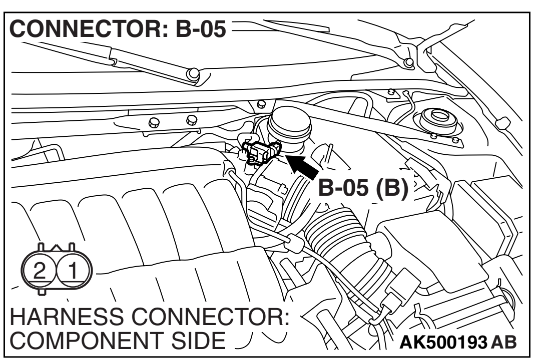
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

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

NO : Go to Step 2.

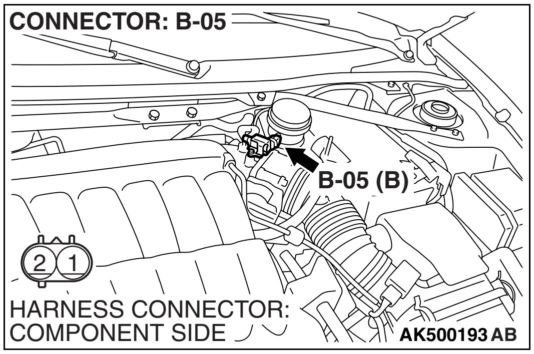
STEP 2 Check harness connector B-05 at the evaporative emission purge solenoid for damage.



Q: Is the harness connector in good condition?

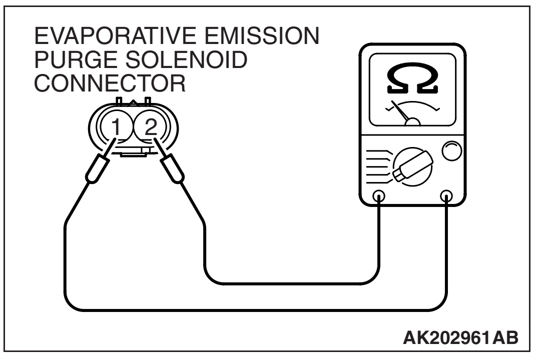
YES : Go to Step 3.

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



STEP 3 Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-05.

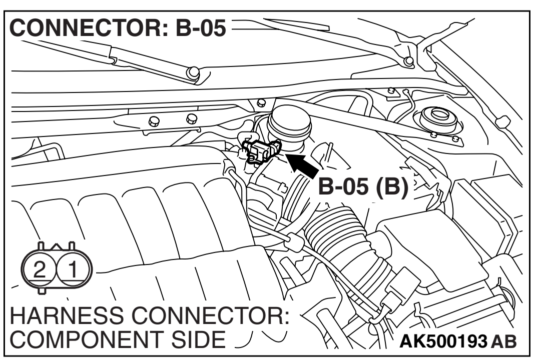


(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

Standard value: 30 – 34 ohms [at 20° C (68° F)]

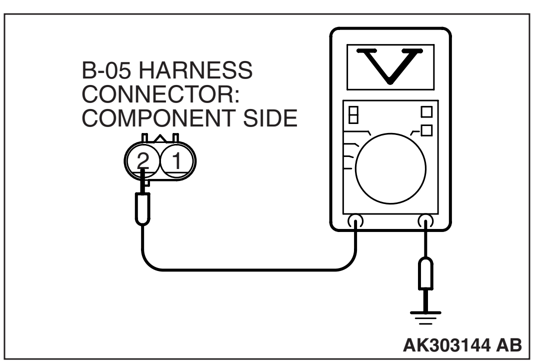
Q: Is the measured resistance between 30 and 34 ohms [at 20° C (68° F)]?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 12.



STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-05.

(1) Disconnect the connector B-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.

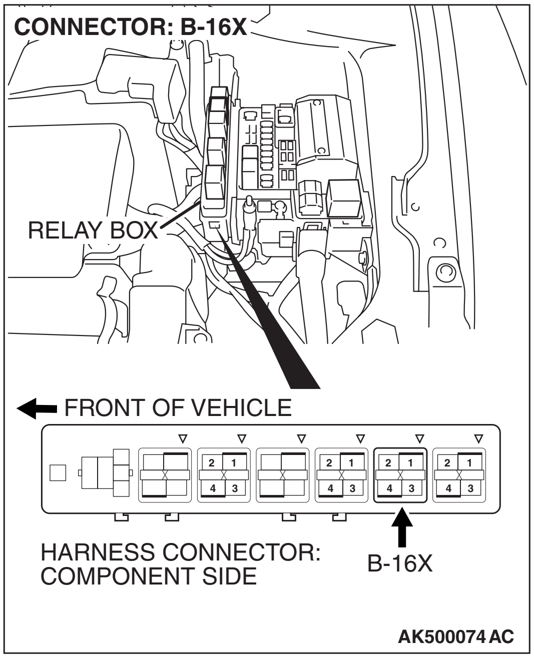


(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

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

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

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

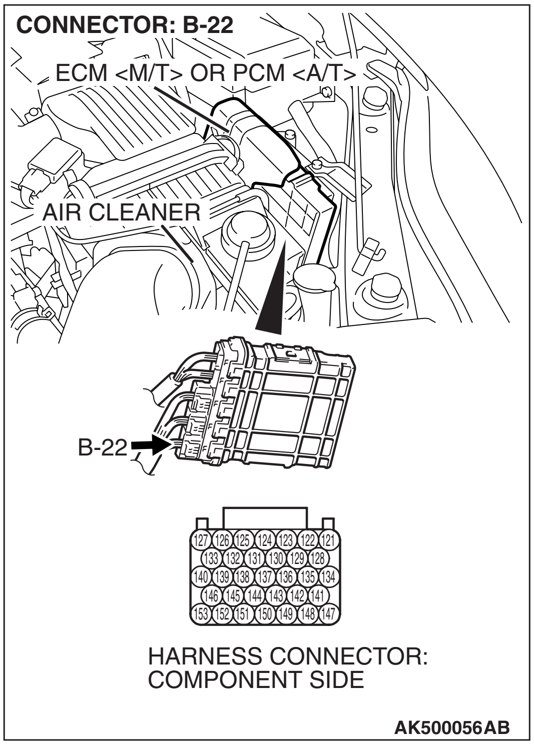


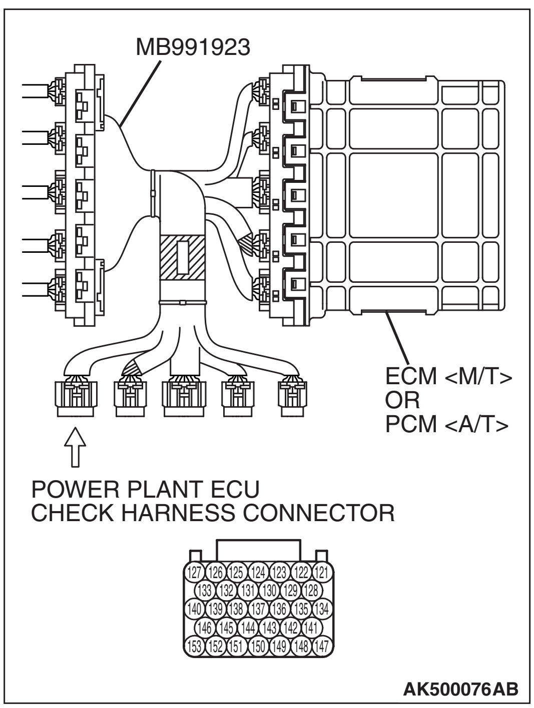
STEP 5. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and evaporative emission purge solenoid connector B-05 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

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

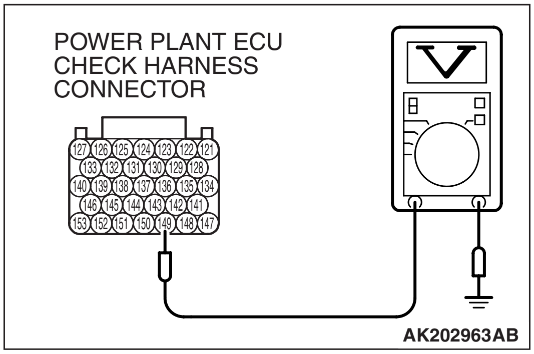




STEP 6. Measure the power supply voltage at ECM <M/T> or PCM <A/T> connector B-22 by using power plant ECU check harness special tool MB991923.

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

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



(3) Measure the voltage between terminal No. 149 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 9.

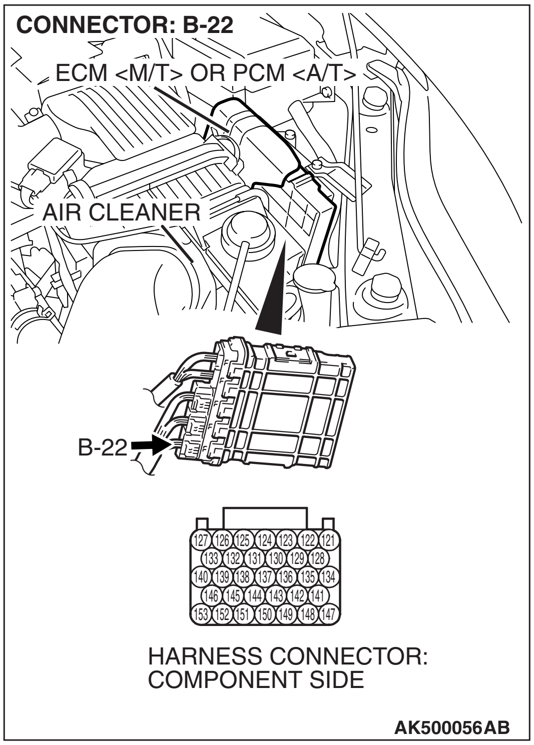
NO : Go to Step 7.

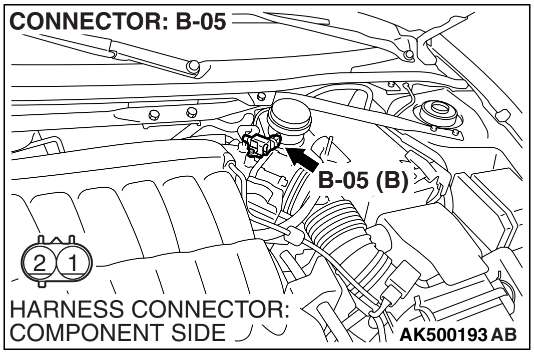
STEP 7. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

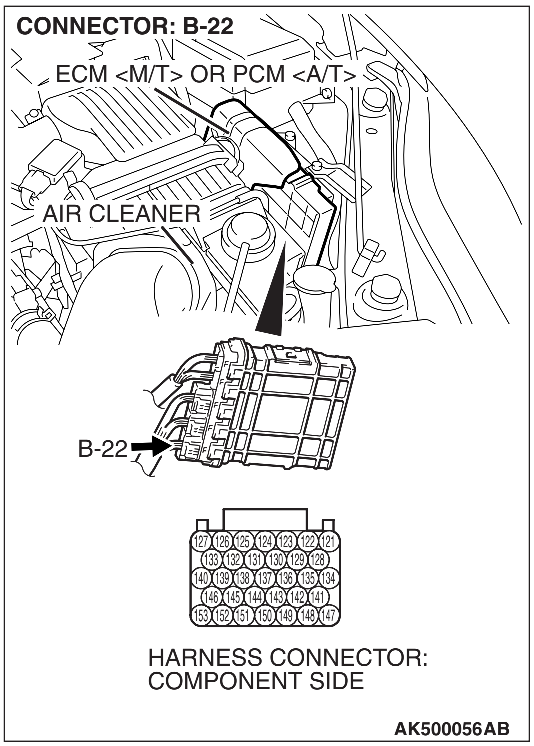
Q: Is the harness connector in good condition?

YES : Go to Step 8.

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





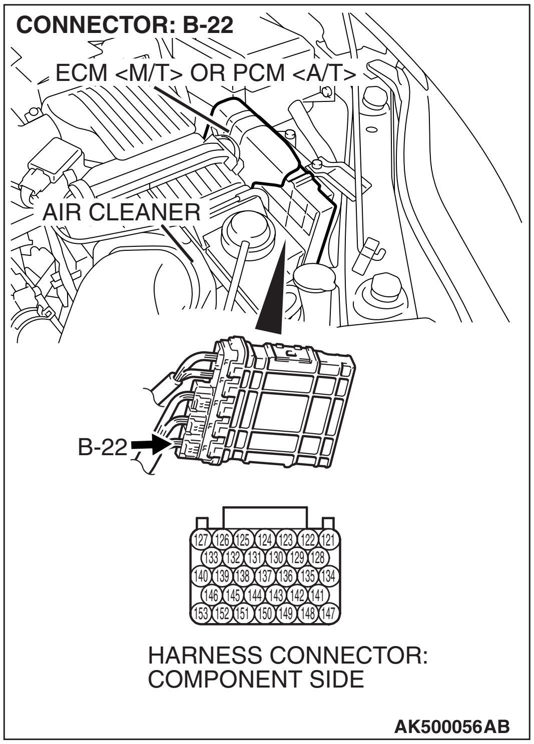


STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-05 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 149).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.

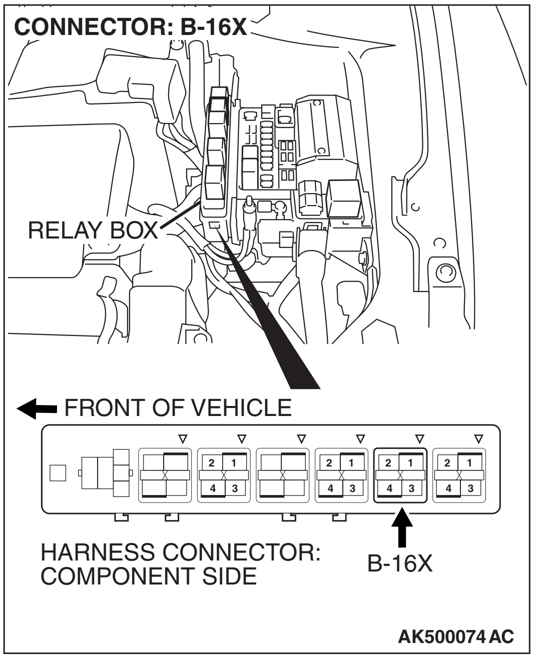


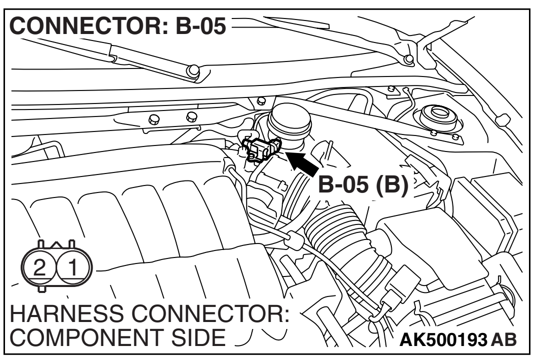
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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

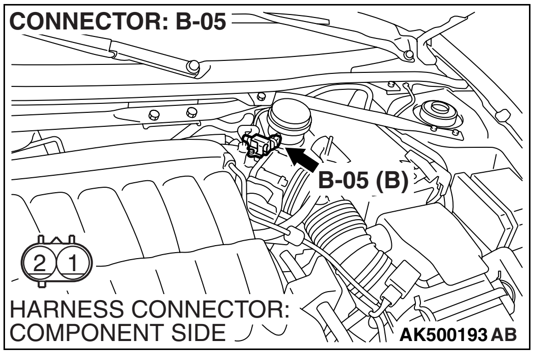


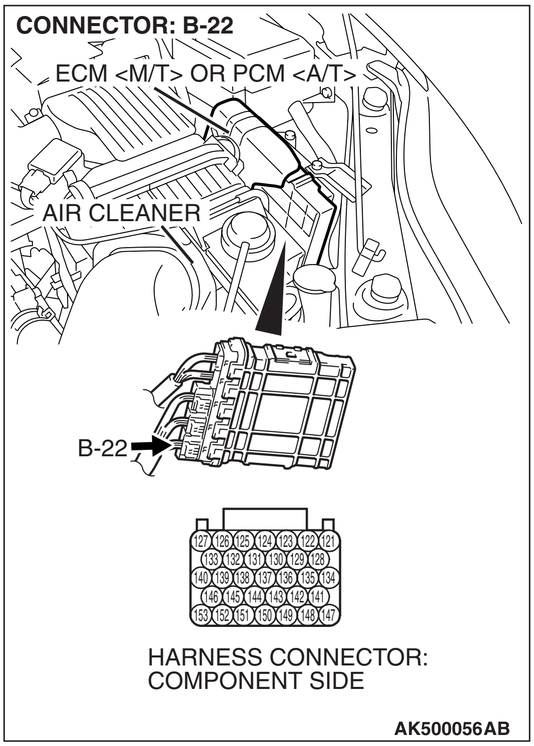


STEP 10. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and evaporative emission purge solenoid connector B-05 (terminal No. 2).

Q: Is the harness wire in good condition?

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





STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-05 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 149).

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

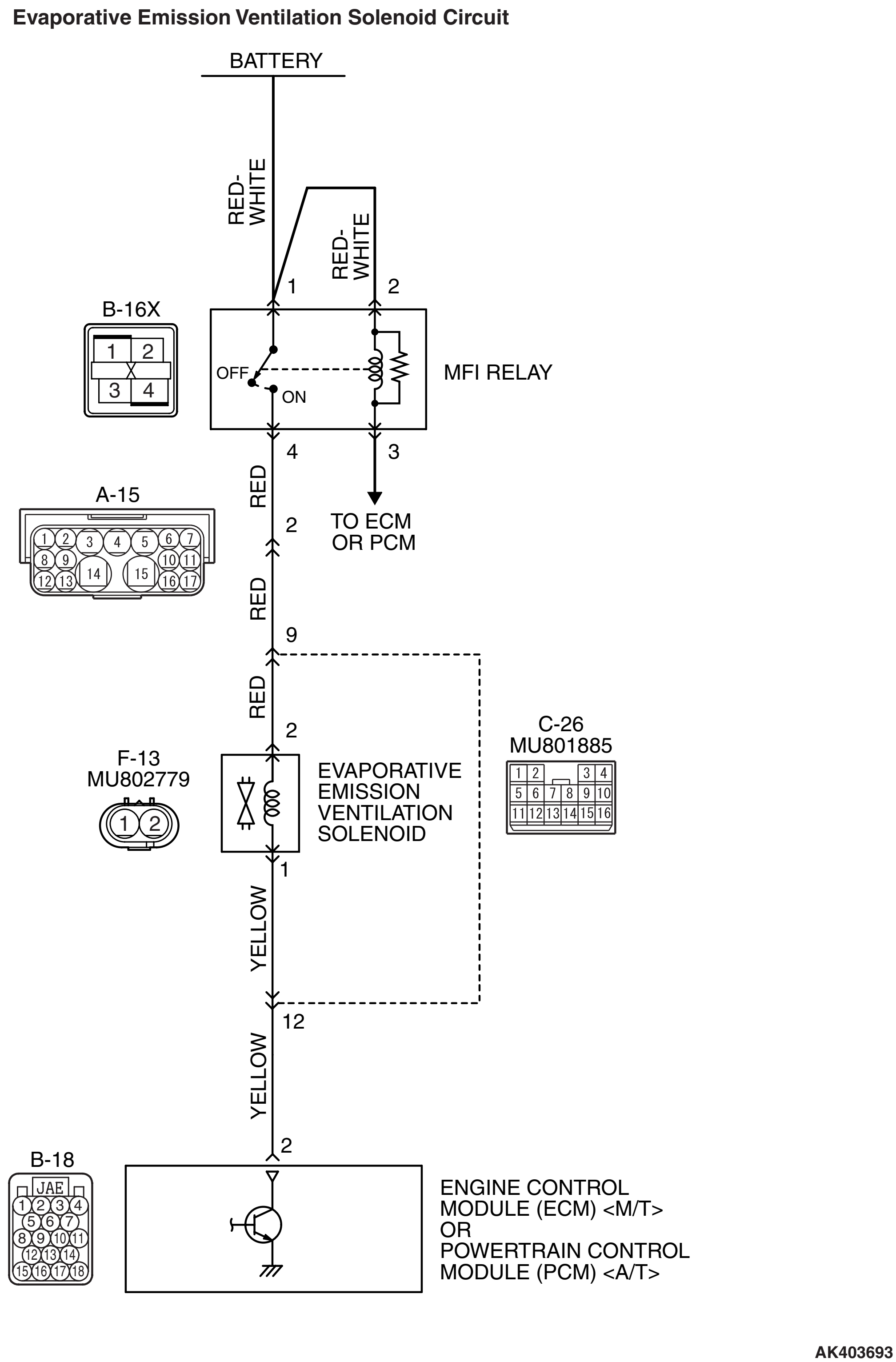
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13B-6.
(2) Check the diagnostic trouble code (DTC).

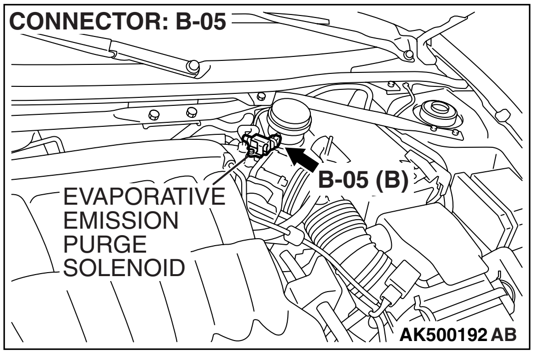
Q: Is DTC P0443 set?

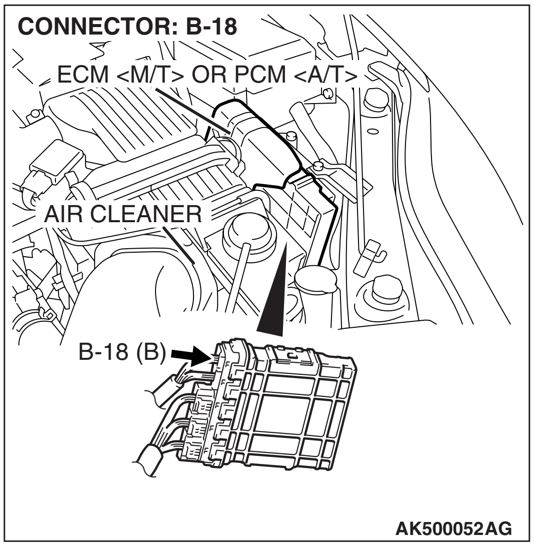
YES : Retry the troubleshooting.

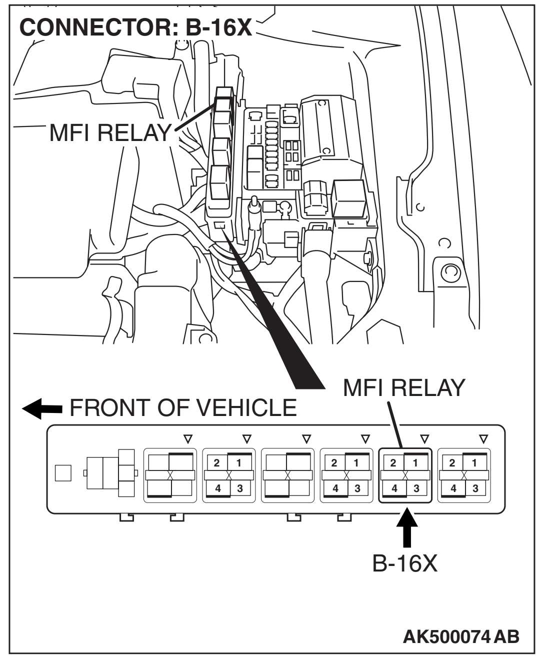
NO : The inspection is complete.

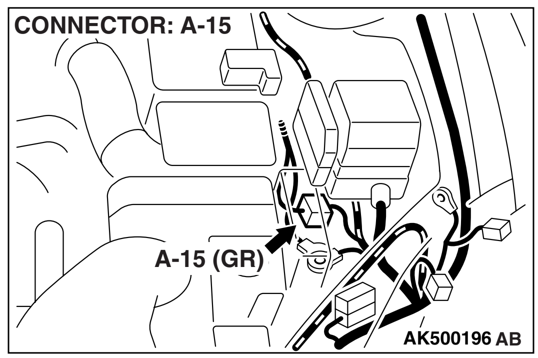
DTC P0446: Evaporative Emission Control System Vent Control Circuit

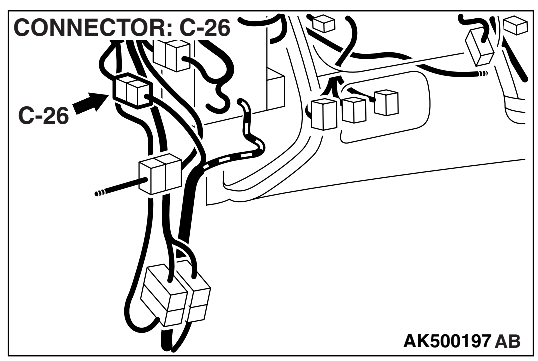












CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or the PCM <A/T> controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM <M/T> or the PCM <A/T> ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM <M/T> or the PCM <A/T> drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM <M/T> or the PCM <A/T> will check if the solenoid coil produces a surge voltage (battery positive voltage + 2 volts).

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid 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)

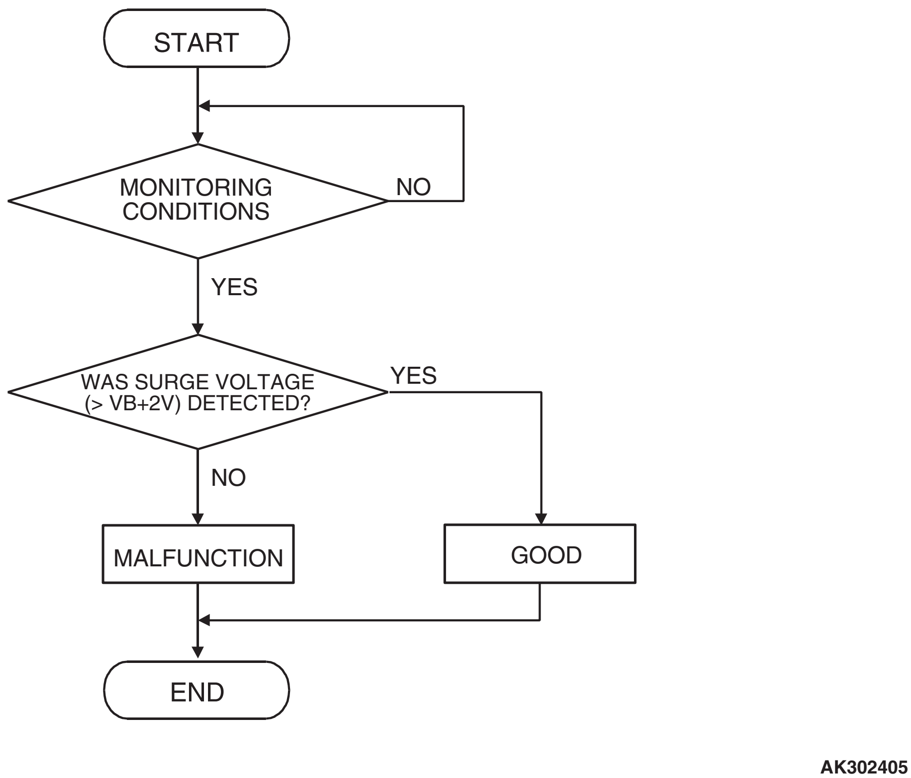
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or the PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission ventilation solenoid is turned OFF.

OBD-II DRIVE CYCLE PATTERN

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

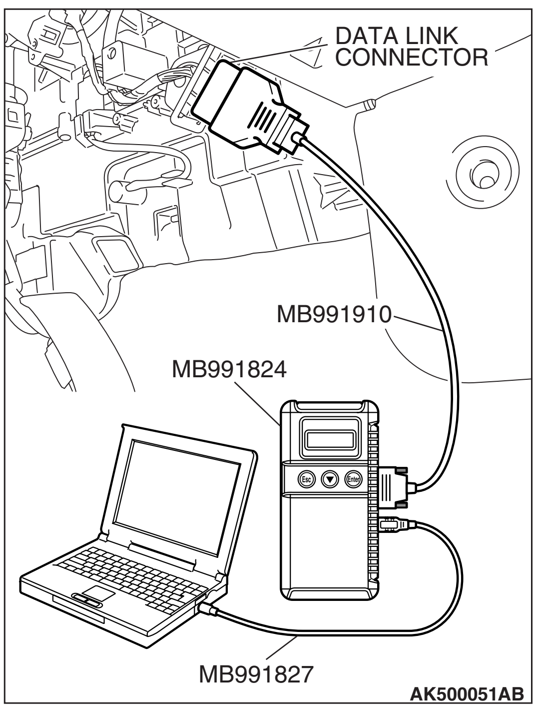
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, harness damage, or connector damage.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

⚠ 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.

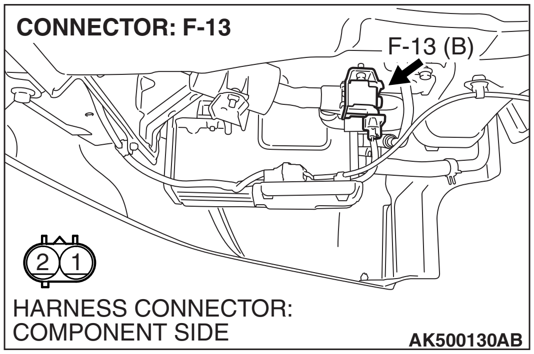
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

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

Q: Is the solenoid operating properly?

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

NO : Go to Step 2.

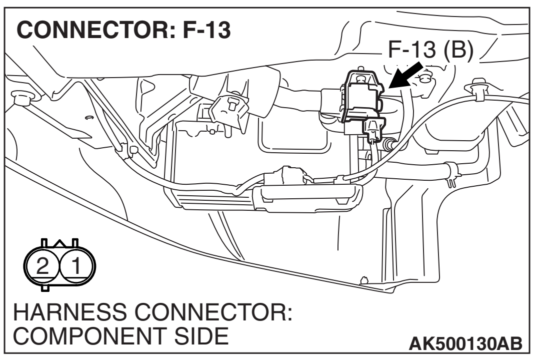


STEP 2. Check harness connector F-13 at the evaporative emission ventilation solenoid for damage.

Q: Is the harness connector in good condition?

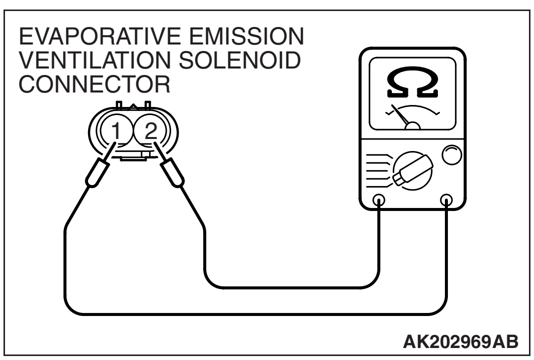
YES : Go to Step 3.

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



STEP 3. Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector F-13.



(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

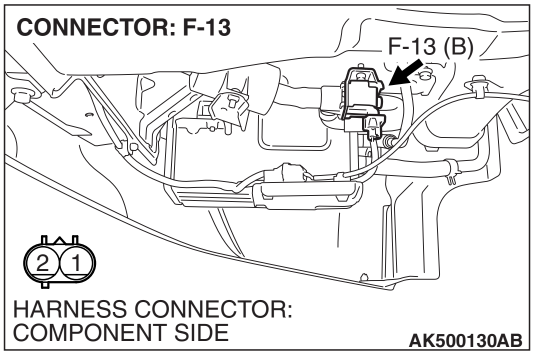
Standard value: 17 – 21 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 17 and 21 ohms [at 20° C (68° F)]?

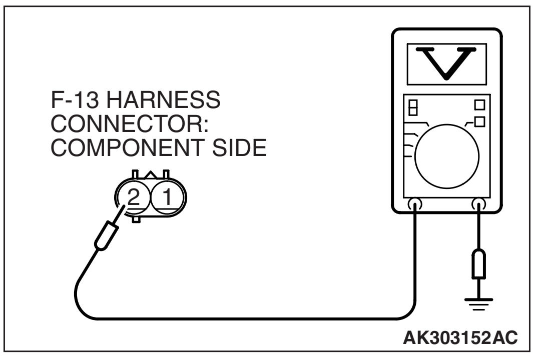
YES : Go to Step 4.

NO : Replace it. Then go to Step 12.

STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-13.



(1) Disconnect the connector F-13 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



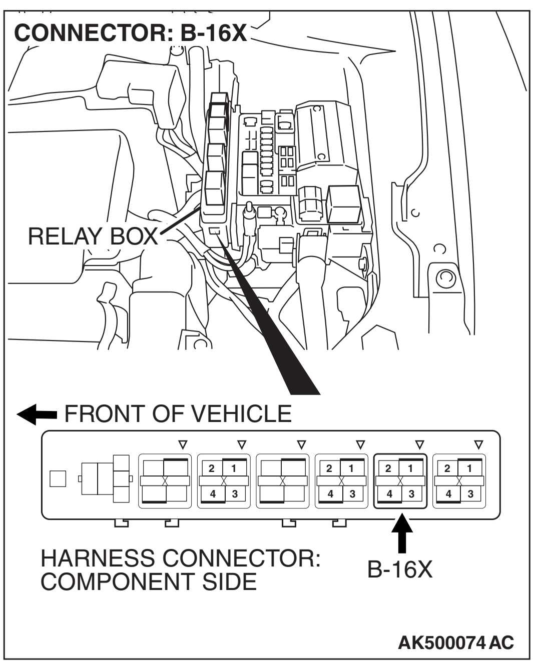
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

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

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

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

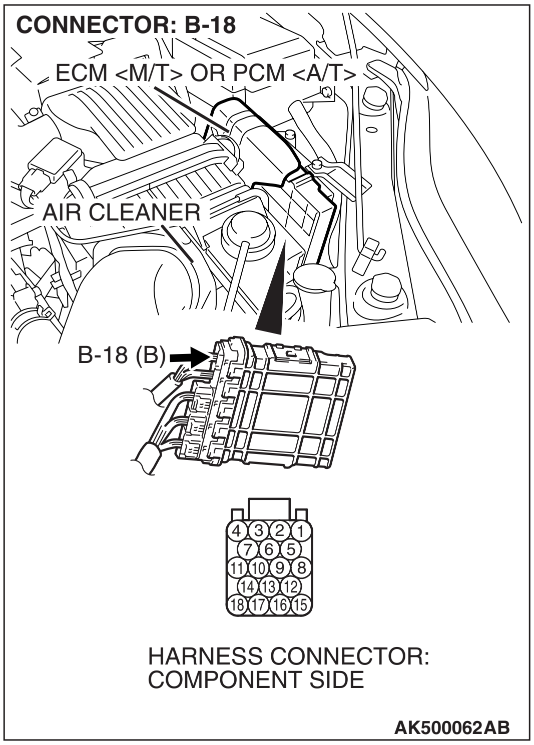
STEP 5. Check harness connector B-16X at MFI relay for damage.

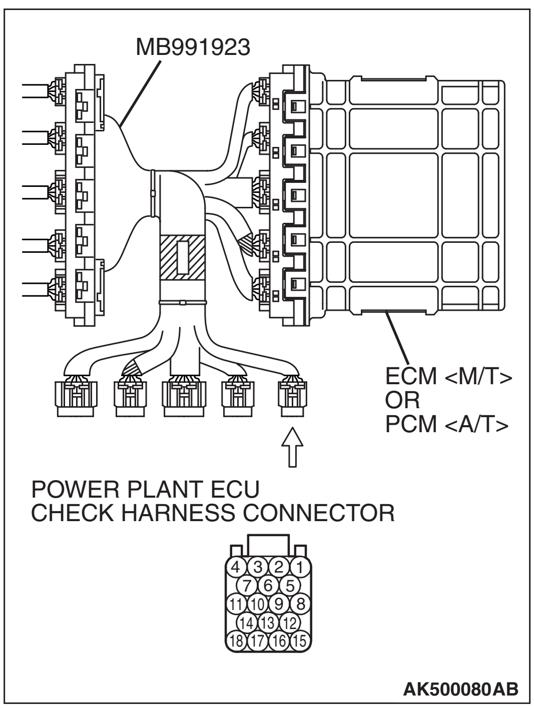


Q: Is the harness connector in good condition?

YES : Check connectors A-15 and C-26 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector B-16X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

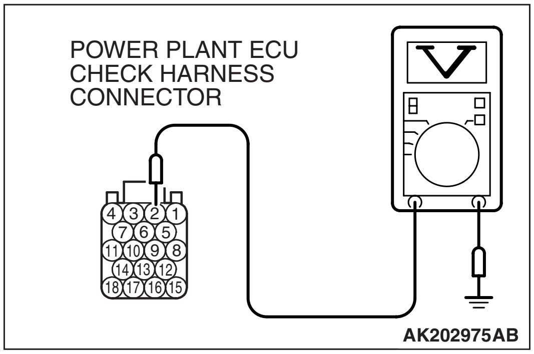
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 6. Measure the power supply voltage at ECM <M/T> or PCM <A/T> connector B-18 by using power plant ECU check harness special tool MB991923.

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



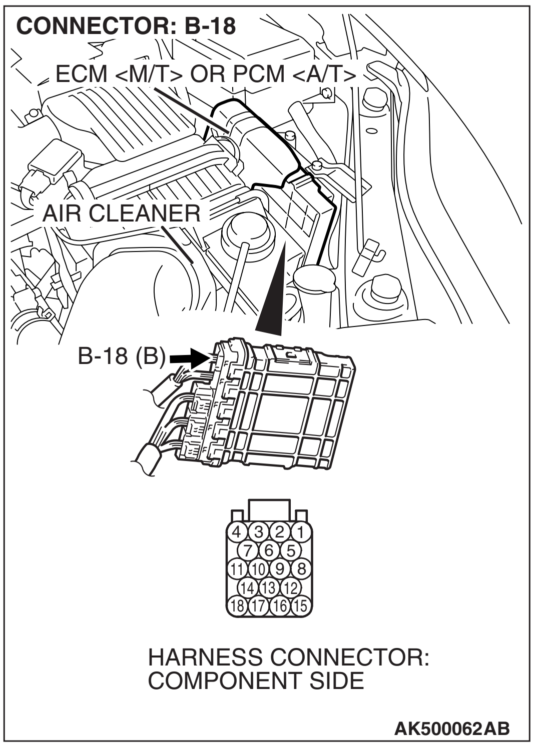
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 9.

NO : Go to Step 7.



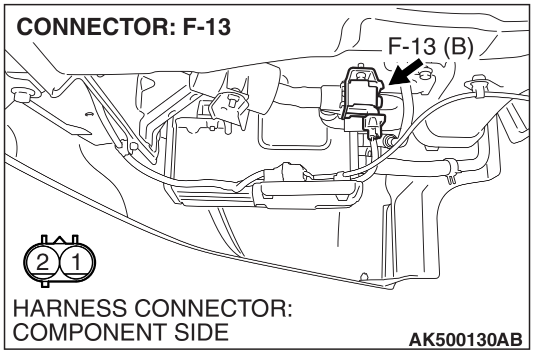
STEP 7. Check harness connector B-18 at ECM <M/T> or PCM <A/T> for damage.

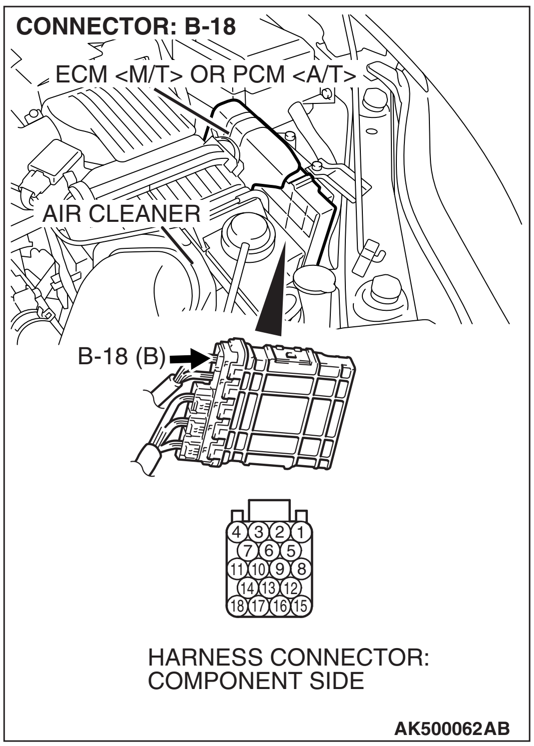
Q: Is the harness connector in good condition?

YES : Go to Step 8.

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

STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector F-13 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-18 (terminal No. 2).



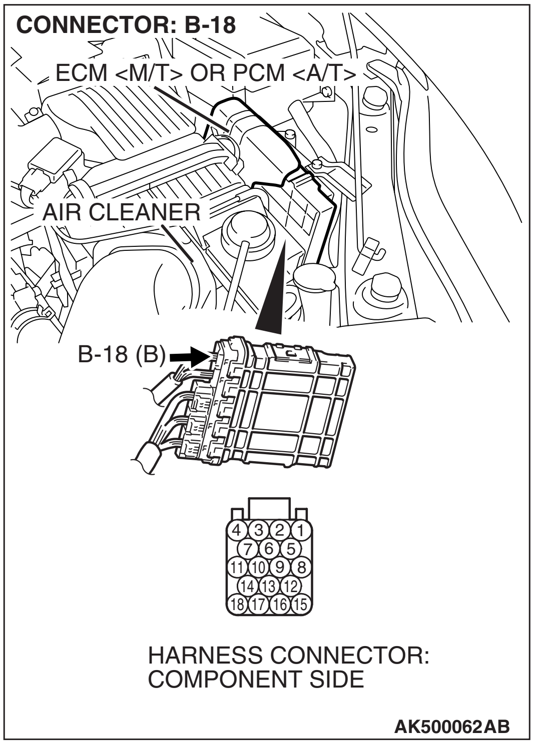


NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 12.

NO : Repair it. Then go to Step 12.



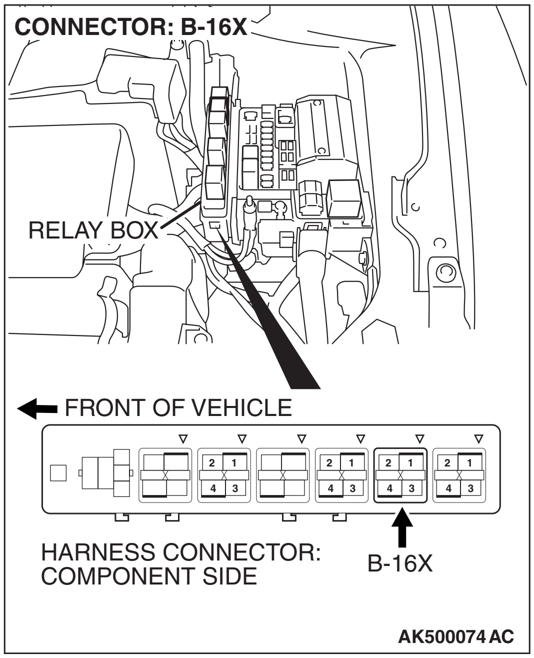
STEP 9. Check harness connector B-18 at ECM <M/T> or PCM <A/T> for damage.

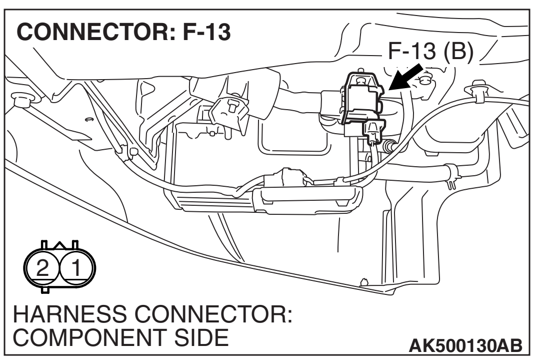
Q: Is the harness connector in good condition?

YES : Go to Step 10.

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

STEP 10. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2).





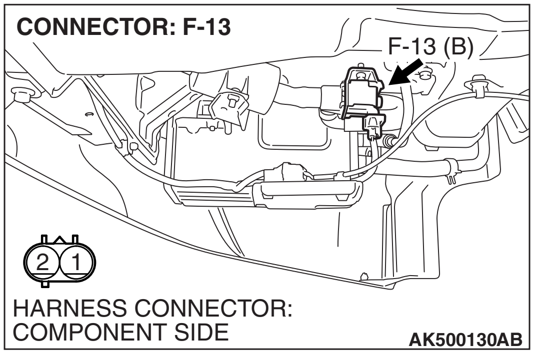
NOTE: Check harness after checking intermediate connectors A-15 and C-26. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

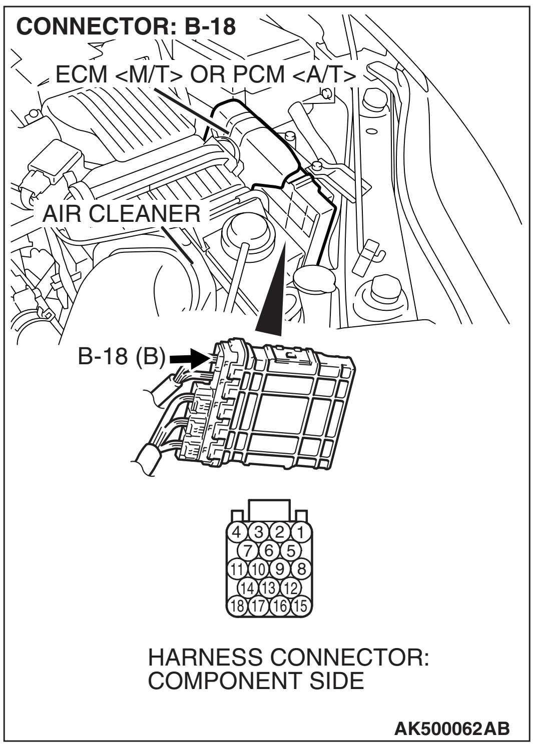
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector F-13 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-18 (terminal No. 2).





NOTE: Check harness after checking intermediate connector C-25. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 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 22 P.13B-6.

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

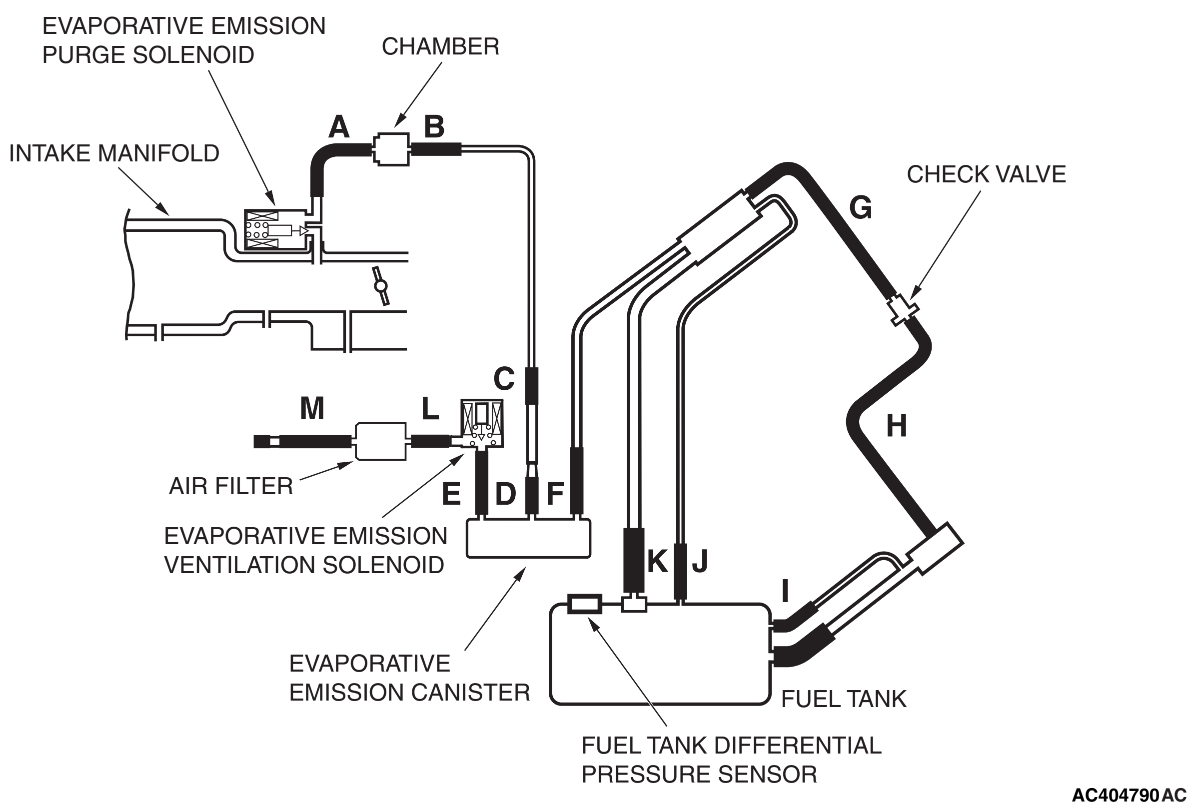
Q: Is DTC P0446 set?

YES : Retry the troubleshooting.

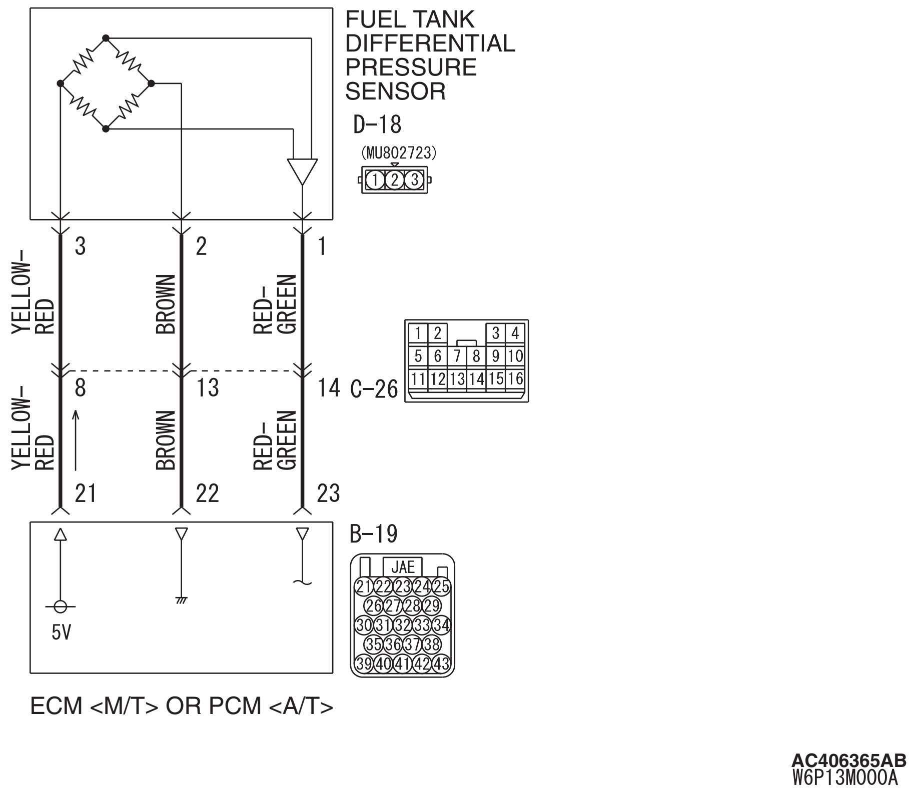
NO : The inspection is complete.

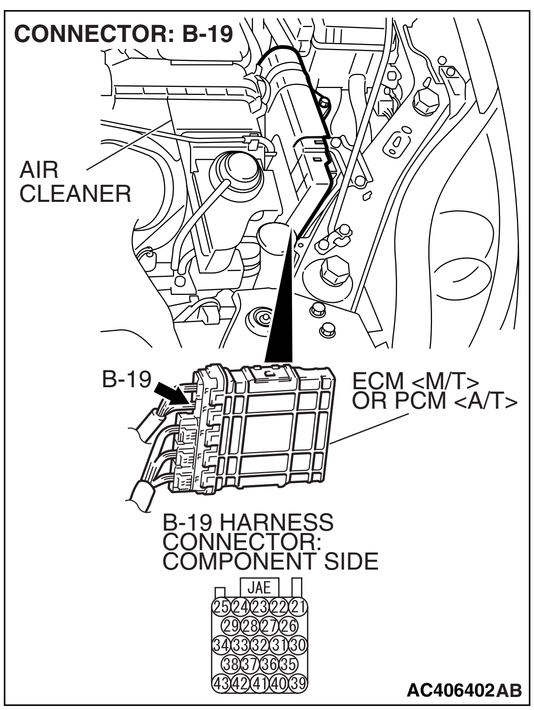
DTC P0450: Evaporative Emission System Pressure Sensor malfunction

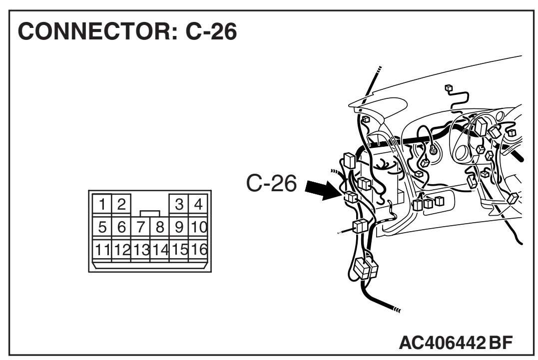
System Diagram

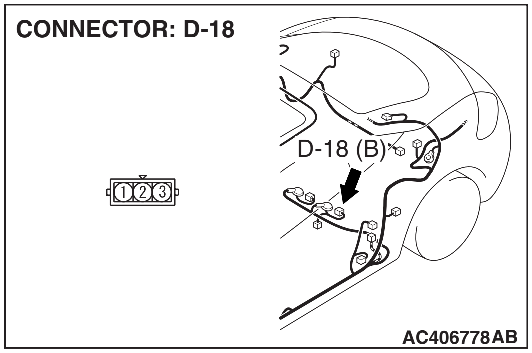


Fuel Tank Differential Pressure Sensor Circuit









CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> (terminal 21) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM <M/T> or PCM <A/T> (terminal 22).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM <M/T> or PCM <A/T> (terminal 23) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- The ECM <M/T> or PCM <A/T> determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

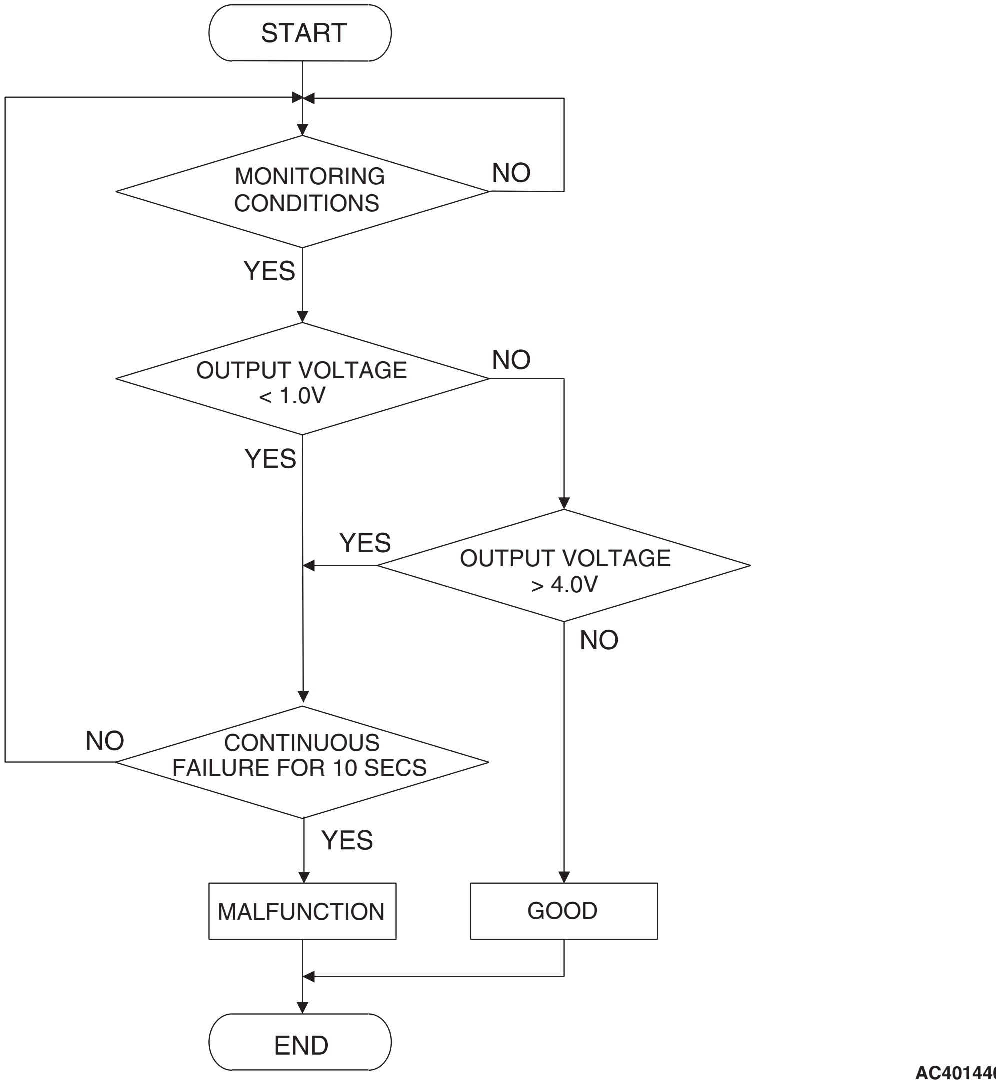
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

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

LOGIC FLOW CHARTS (Monitor Sequence)

RATIONALITY - HIGH/LOW



DTC SET CONDITIONS

Check Conditions

- Intake air temperature is greater than 5° C (41° F).
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 70 percent.

Judgement Criteria

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains 1.0 volt or less for ten seconds.

Check Conditions

- Intake air temperature is between 5° C (41° F) and 45° C (113° F) or greater.
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 70 percent.

Judgement Criteria

- When the evaporative emission purge solenoid valve is fully operational (100 percent ratio), the fuel differential pressure sensor output voltage remains at 4.0 volts or greater for ten seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13B-6.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

OVERVIEW OF TROUBLESHOOTING

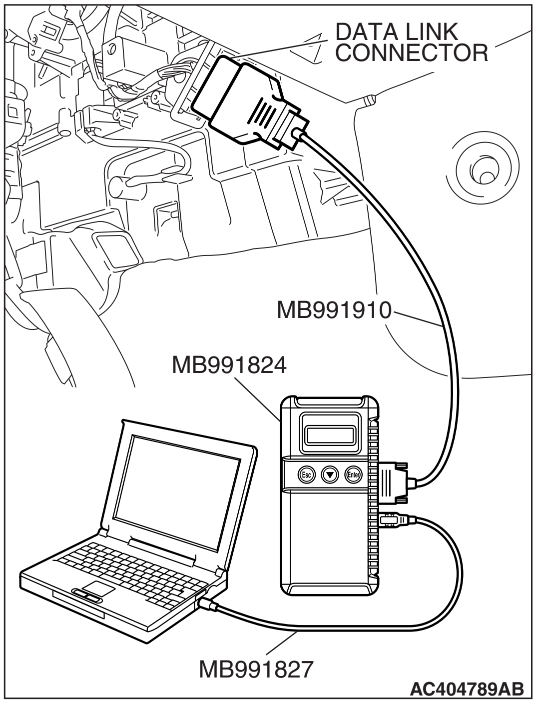
- DTC P0450 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

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

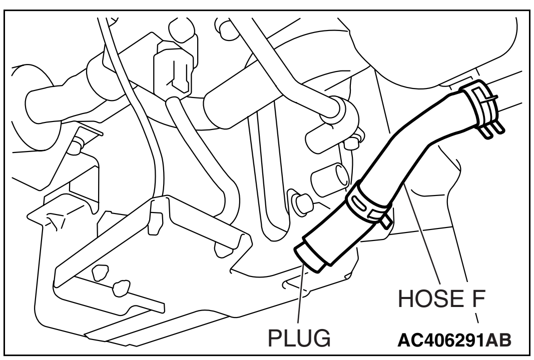
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



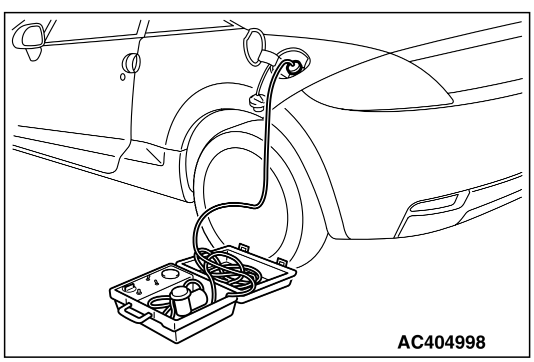
⚠ CAUTION

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) Disconnect hose F from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2050 to 2950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

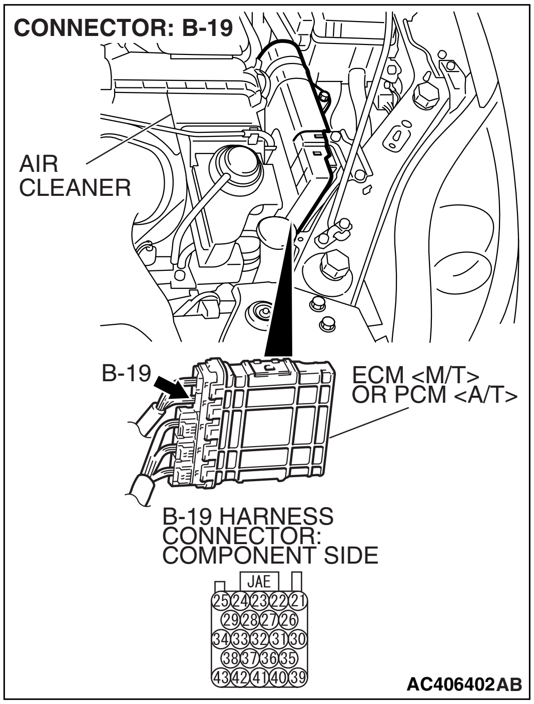
Q: Is the fuel tank pressure between 2050 and 2950 mV?

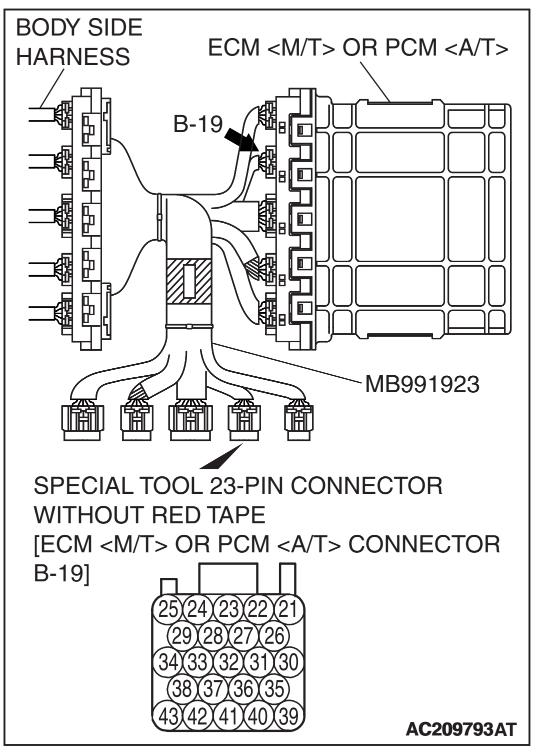
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

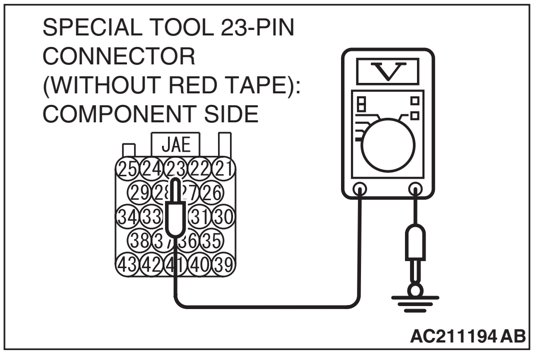
STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.





(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

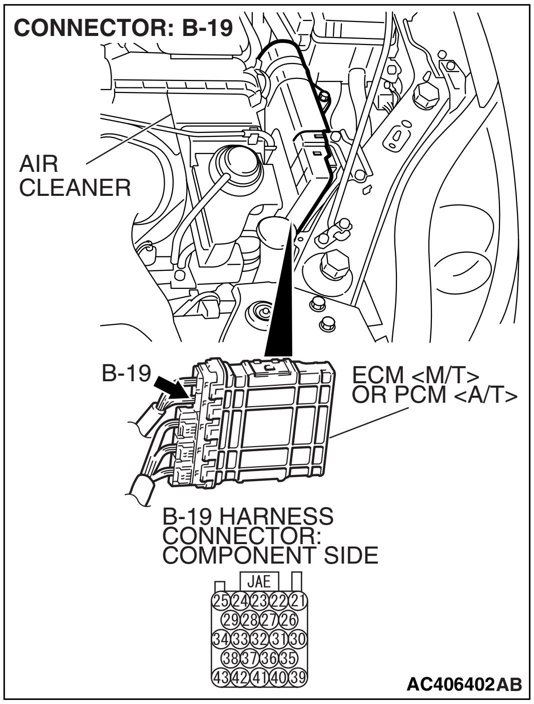
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

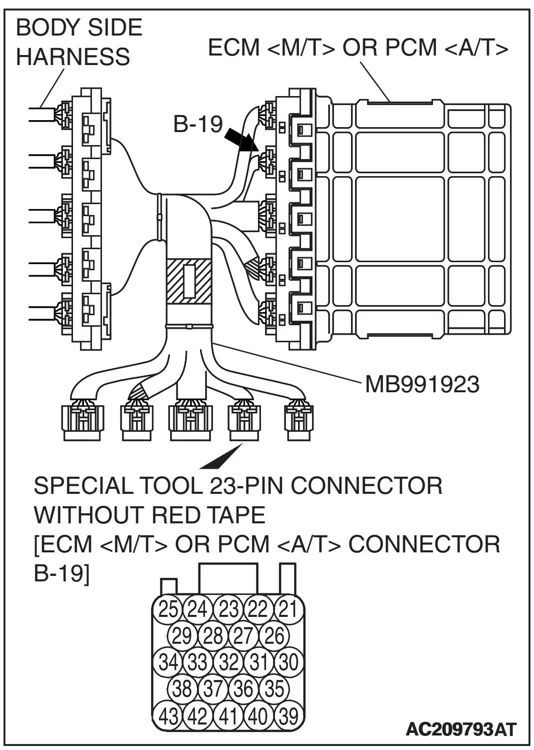
STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

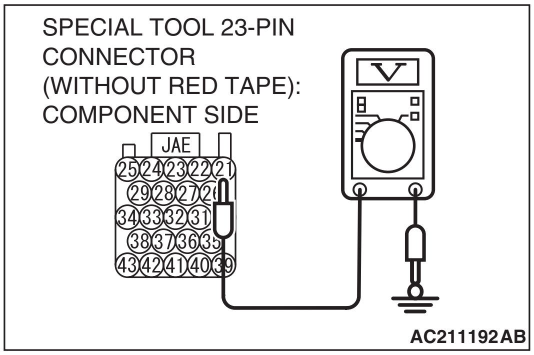
(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.



(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.

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





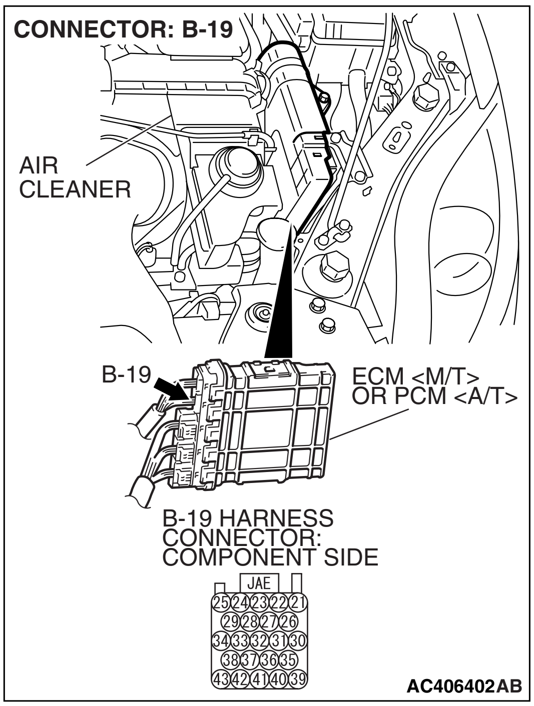
(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(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 5.
NO : Go to Step 4.

STEP 4. Check ECM <M/T> or PCM <A/T> connector B-19 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

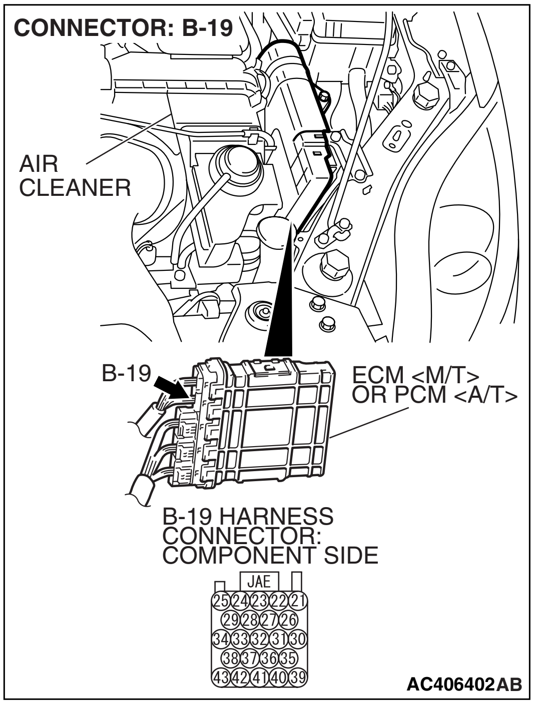


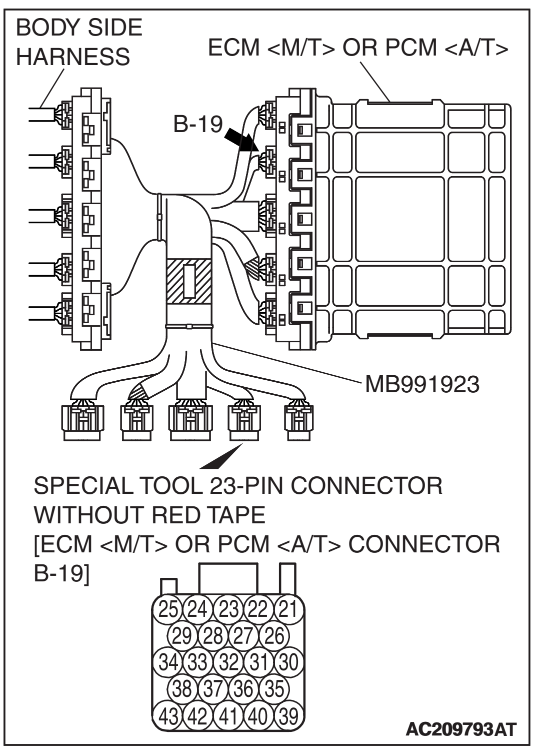
Q: Are the connector and terminals in good condition?

YES : Go to Step 16.
NO : Repair or replace the faulty components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

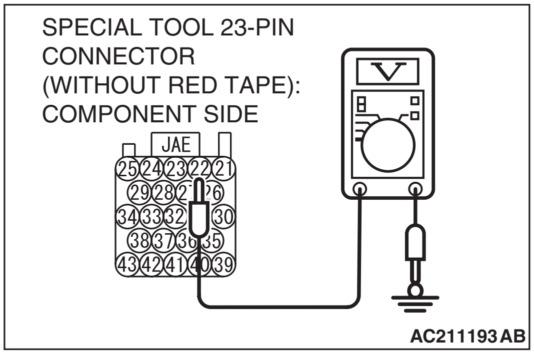
STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.





(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

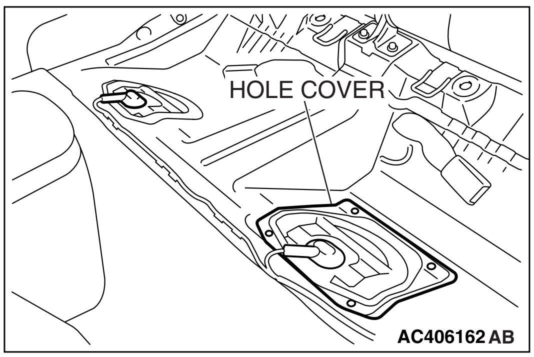
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

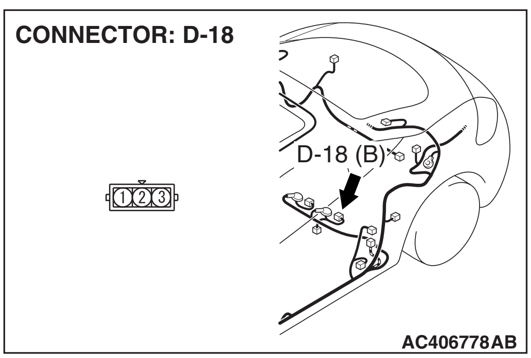
YES : Go to Step 6.
NO : Go to Step 9.

STEP 6. Measure the signal voltage at intermediate connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).
(2) Remove the hole cover.

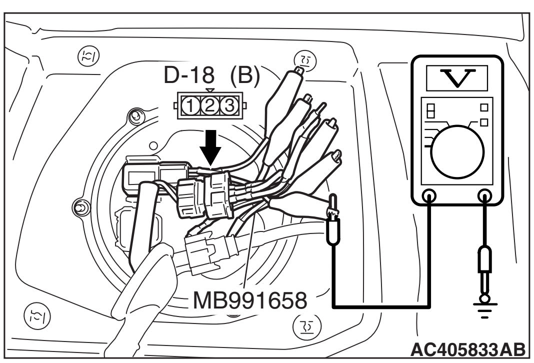


(3) Disconnect fuel tank differential pressure sensor connector D-18.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-18 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

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



Q: Is the measured voltage between 2.0 and 3.0 volts?

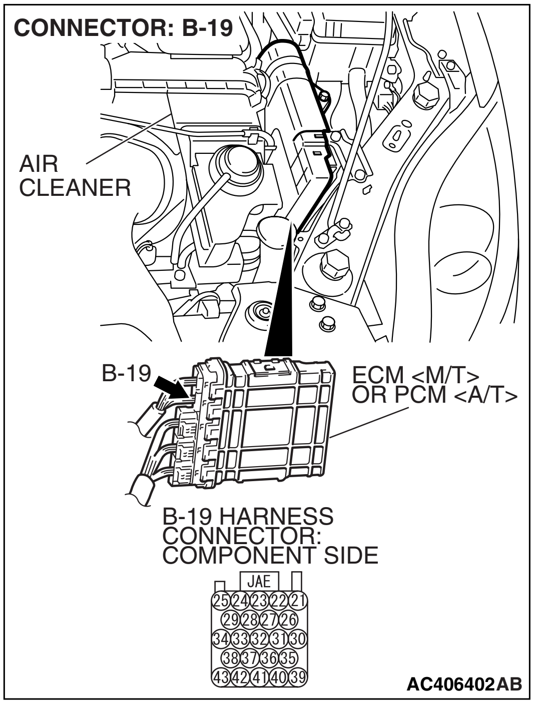
YES : Go to Step 7.
NO : Go to Step 15.

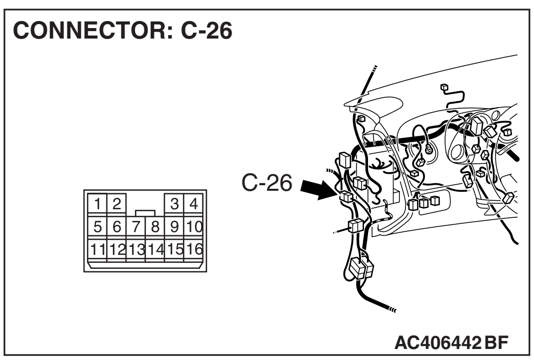
STEP 7. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

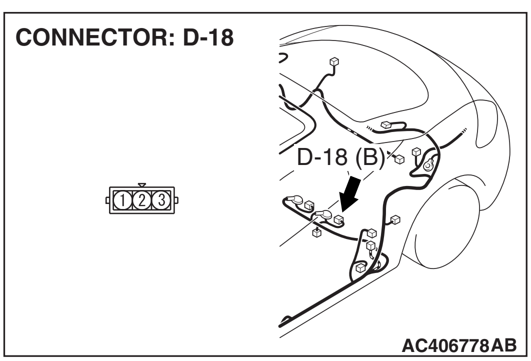
Q: Are the connectors and terminals in good condition?

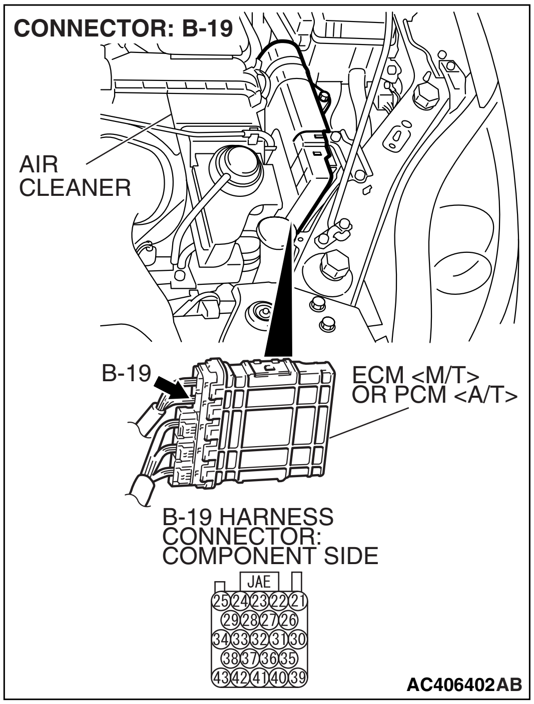
YES : Go to Step 8.

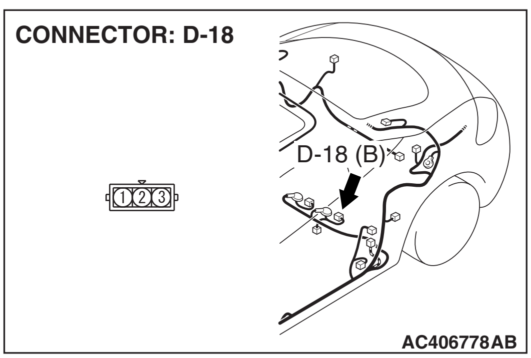
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 8. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 23 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

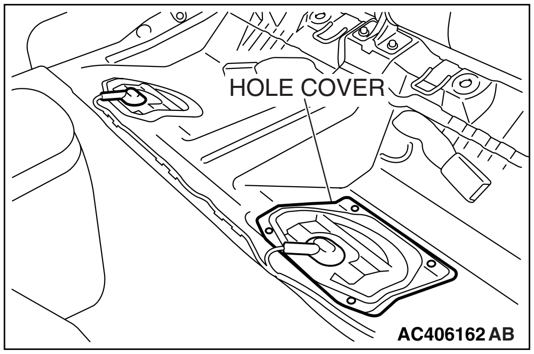
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wire. Then go to Step 17.

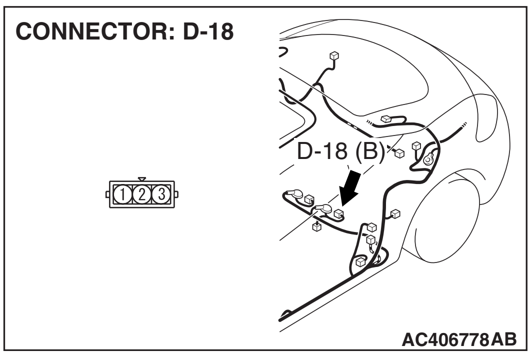
STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).

(2) Remove the hole cover.



(3) Disconnect fuel tank differential pressure sensor connector D-18.

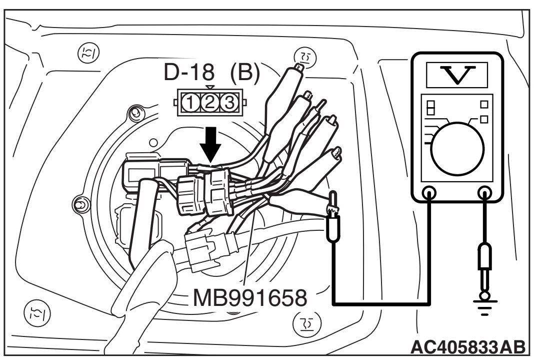


(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.

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

(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

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



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

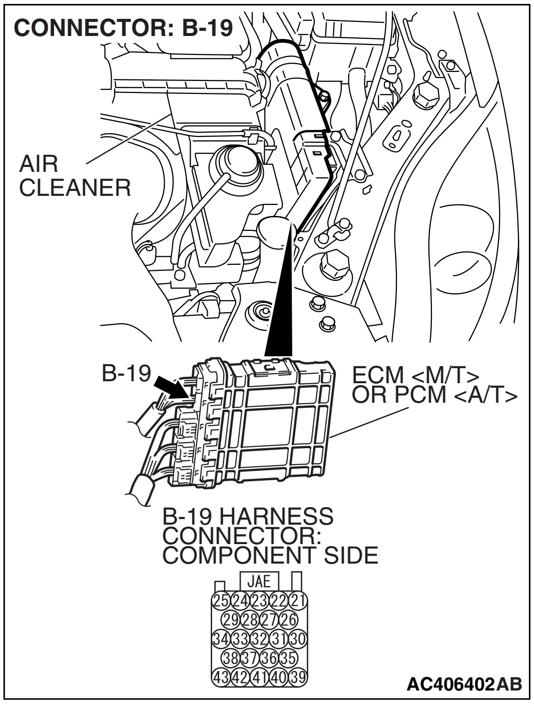
YES : Go to Step 12.
NO : Go to Step 10.

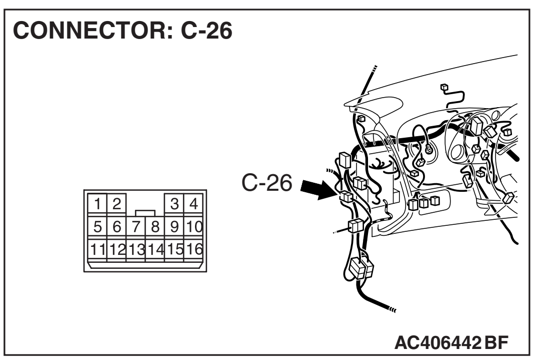
STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

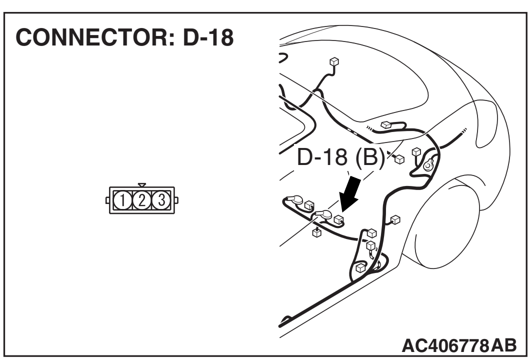
Q: Are the connectors and terminals in good condition?

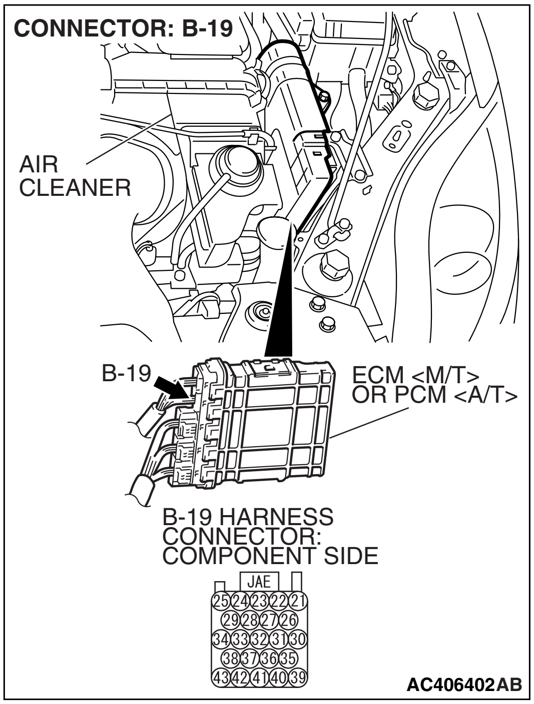
YES : Go to Step 11.

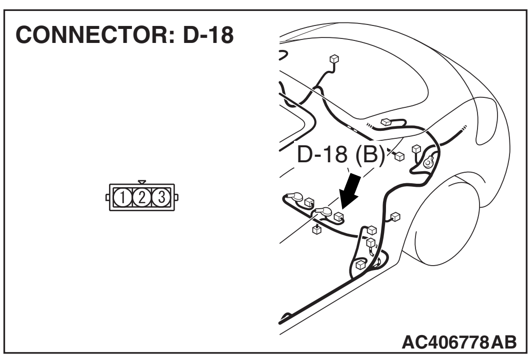
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











STEP 11. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 21 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

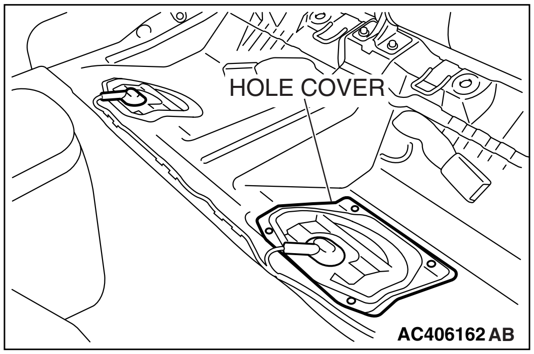
Q: Are the harness wires in good condition?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

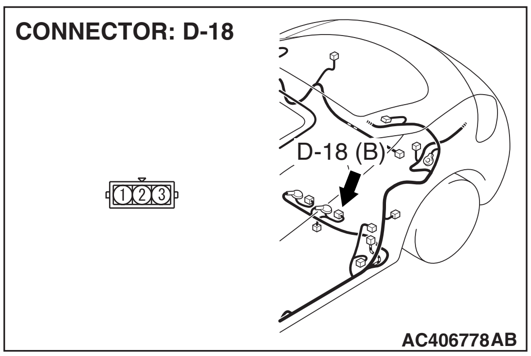
NO : Repair the damaged harness wires. Then go to Step 17.

STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).
(2) Remove the hole cover.

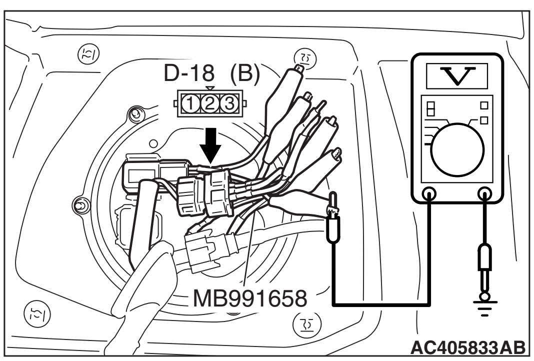


(3) Disconnect fuel tank differential pressure sensor connector D-18.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Measure the voltage between terminal 2 and ground.
- The voltage should measure 0.5 volt or less.

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



Q: Is the measured voltage 0.5 volt or less?

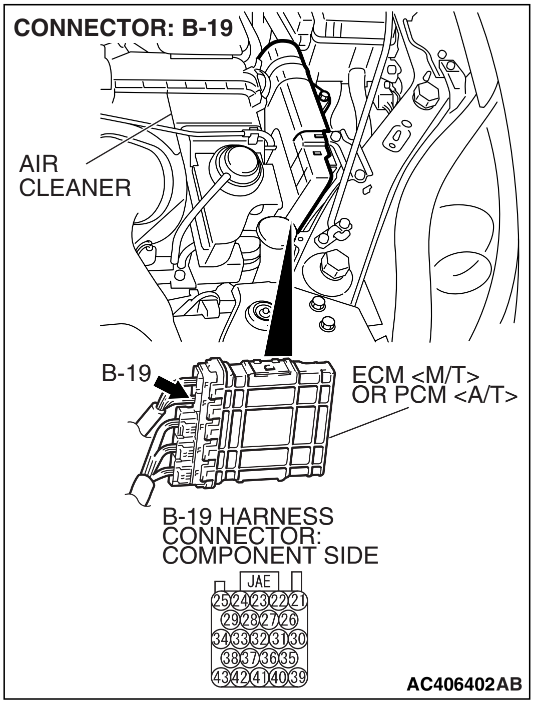
YES : Go to Step 13.
NO : Go to Step 17.

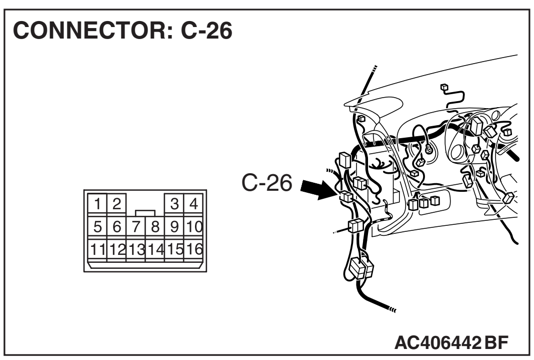
STEP 13. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

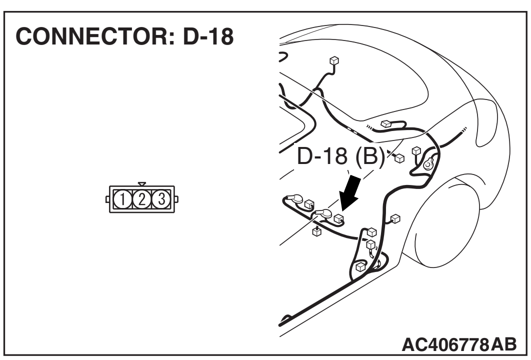
Q: Are the connectors and terminals in good condition?

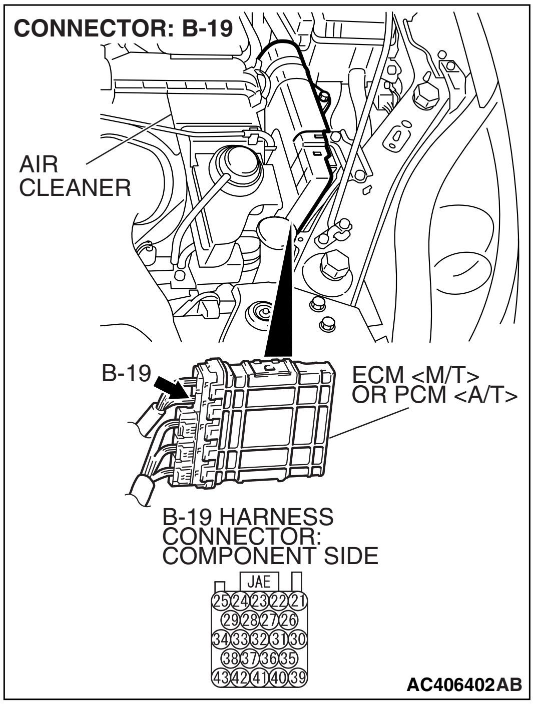
YES : Go to Step 14.

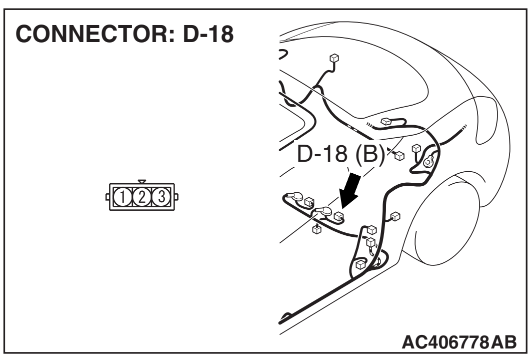
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.









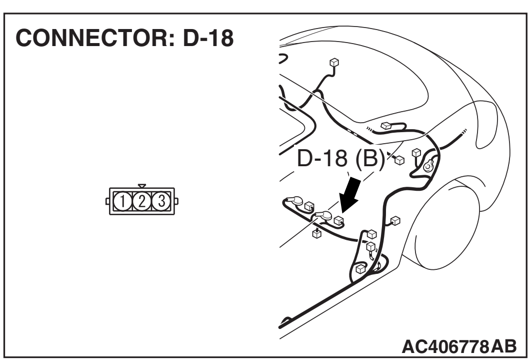


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Are the harness wires in good condition?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.



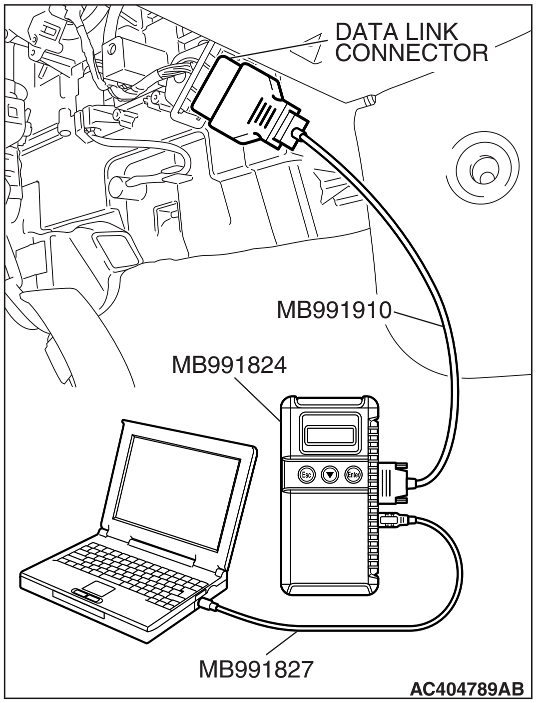
STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the connectors and terminals in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

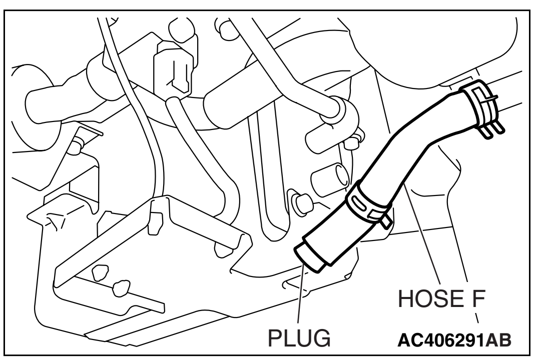
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



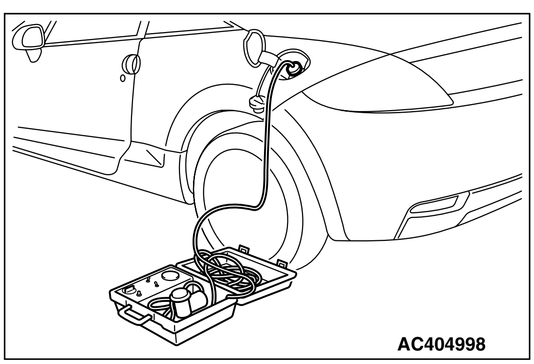
⚠ CAUTION

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) Disconnect hose F from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2050 to 2950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

Q: Is the fuel tank pressure between 2050 and 2950 mV?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Replace the ECM <M/T> or PCM <A/T>. When the ECM <M/T> or PCM <A/T> is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 17.

STEP 17. Perform 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.13B-6).

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

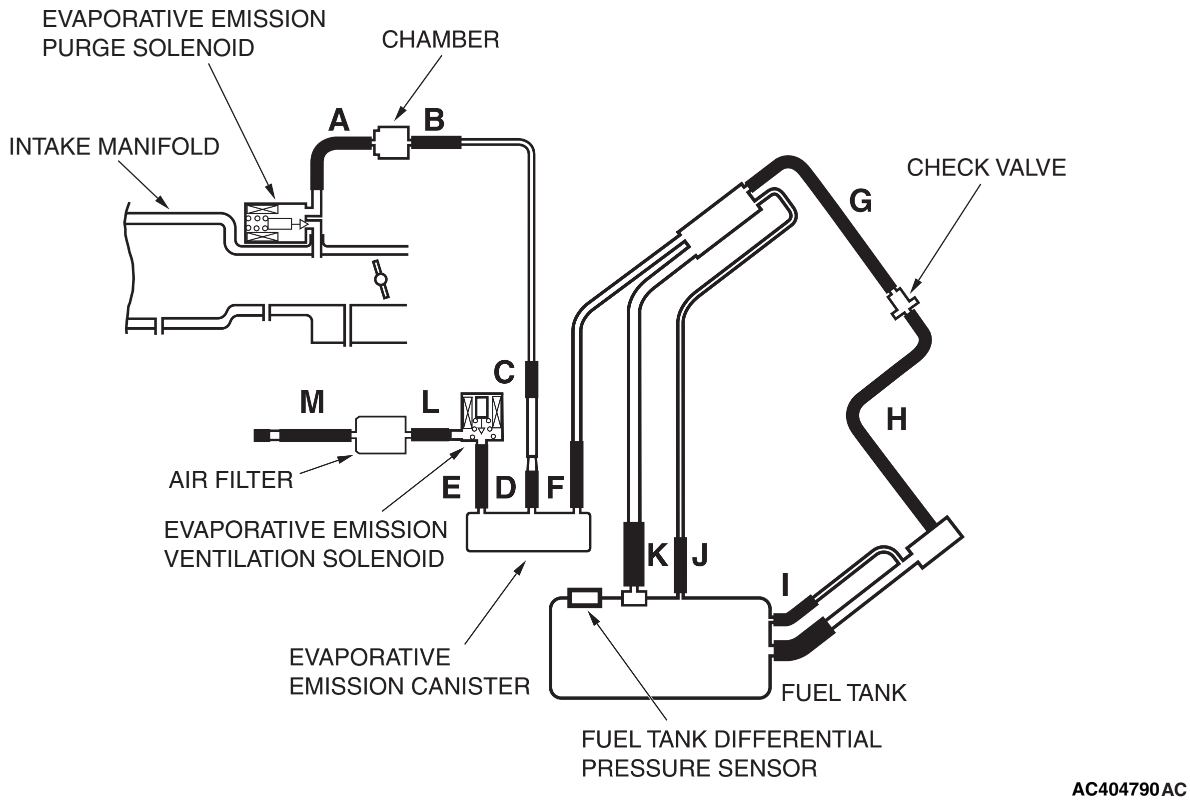
Q: Is DTC P0450 set?

YES : Repeat the troubleshooting from Step 2.

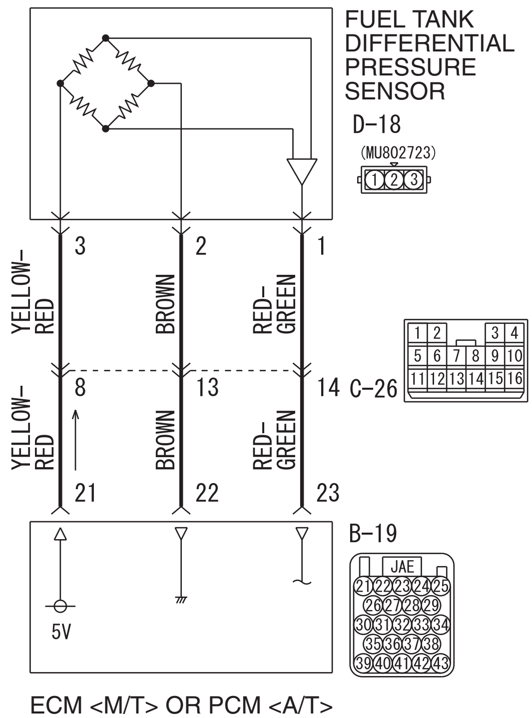
NO : The procedure is complete.

DTC P0451: Evaporative Emission System Pressure Sensor Range/Performance

System Diagram



Fuel Tank Differential Pressure Sensor Circuit



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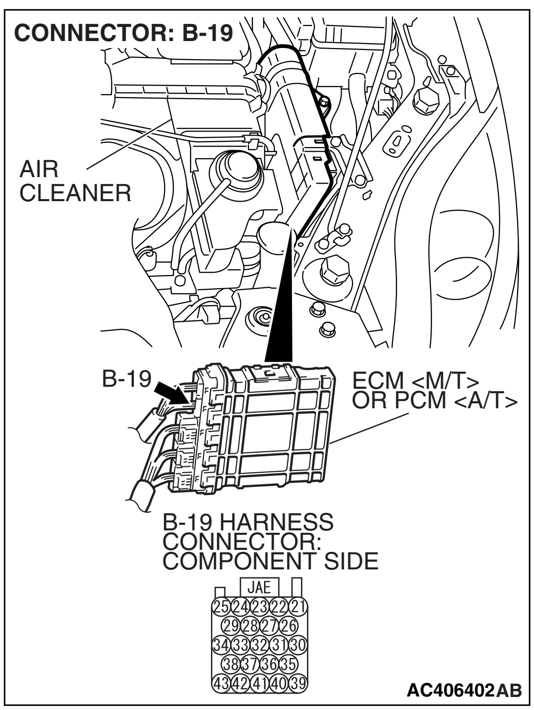
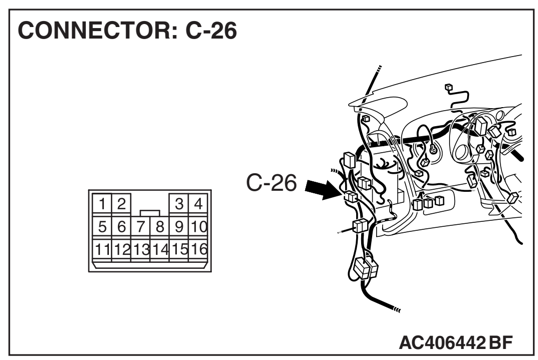
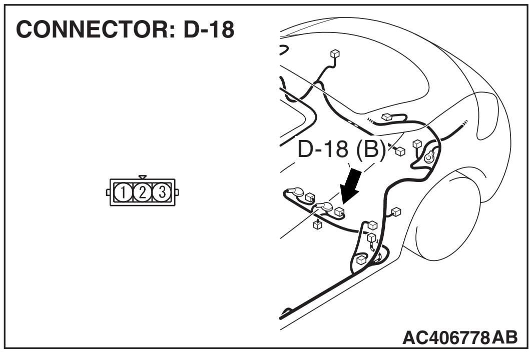
W6P13M000A







CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> (terminal 21) supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM <M/T> or PCM <A/T> (terminal 22).
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM <M/T> or PCM <A/T> (terminal 23) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor signal voltage.
- The ECM <M/T> or PCM <A/T> determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Detect malfunction if change of fuel tank differential pressure sensor output voltage during idling stays large during specified go/stop operations.

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)

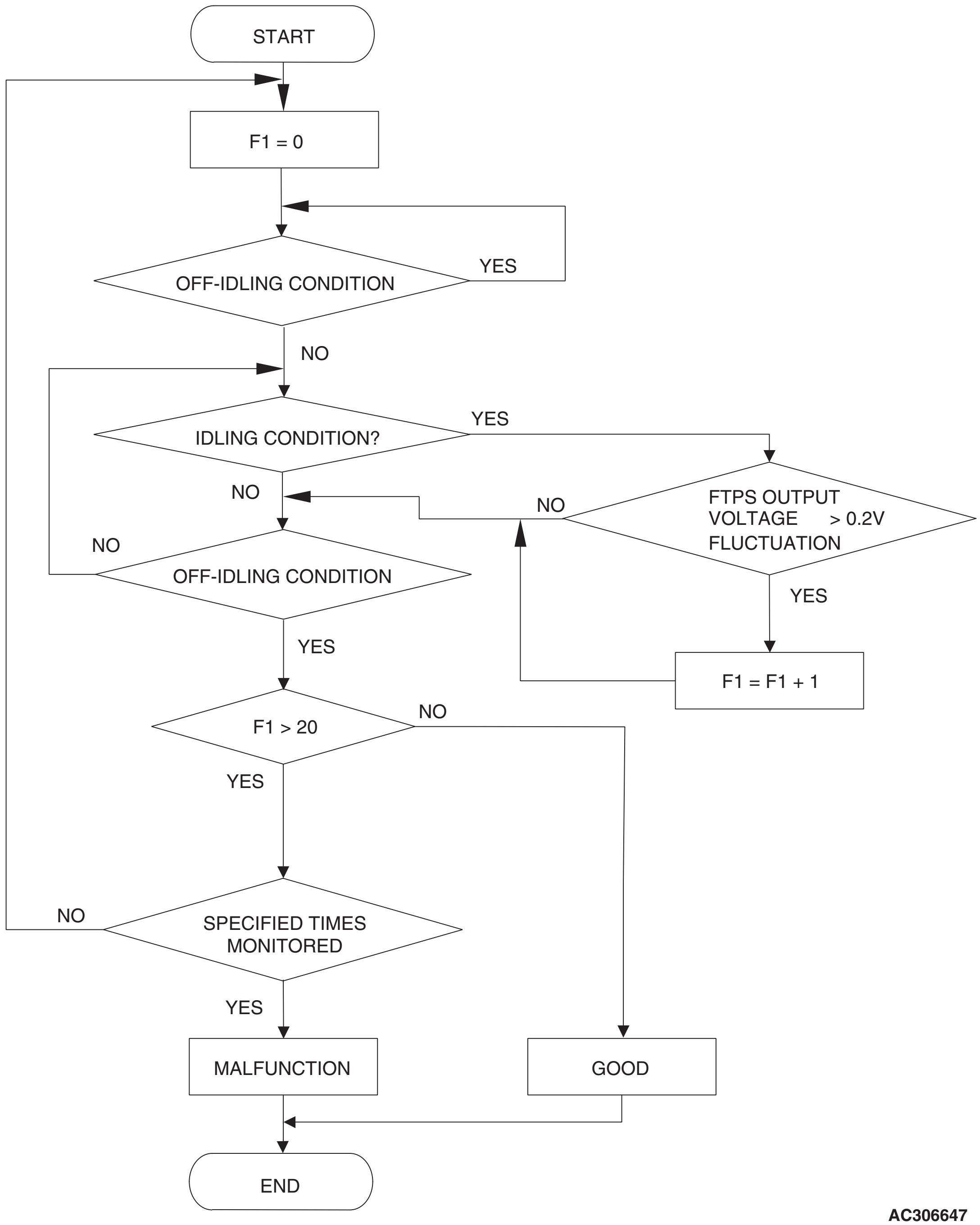
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

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

LOGIC FLOW CHARTS (Monitor Sequence)

RATIONALITY - NOISE



DTC SET CONDITIONS

Check Conditions

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement Criteria

- If the voltage signal from the fuel tank differential pressure sensor changes by 0.2 volt or more, DTC P0451 will set. The code may also set if a sudden pressure fluctuation occurs twenty times while the engine is idling, and then four consecutive times during normal driving.

  NOTE: If the number of sudden pressure fluctuations does not reach twenty during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to zero.

  NOTE: The conditions for deviating from idling operation are as follows:

  - *Vehicle speed is 50 km/h (31 mph) or greater.*

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

OVERVIEW OF TROUBLESHOOTING

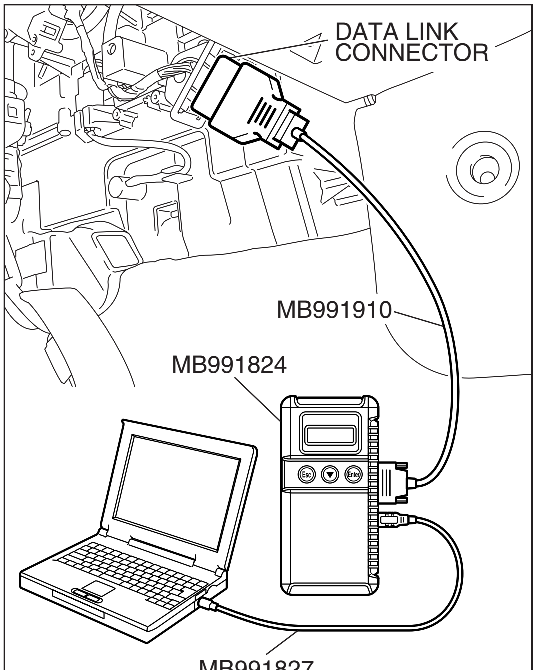
- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



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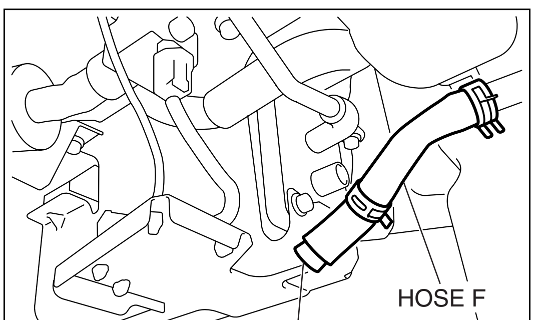
⚠ CAUTION

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.



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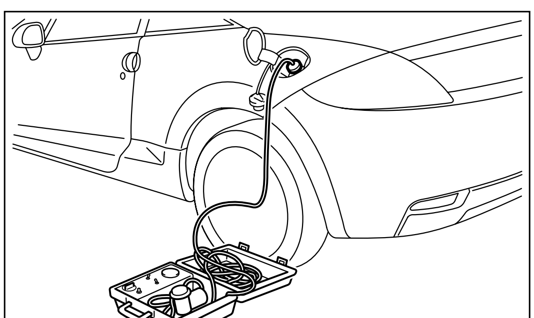
(2) Disconnect hose F from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2050 to 2950 mV.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(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

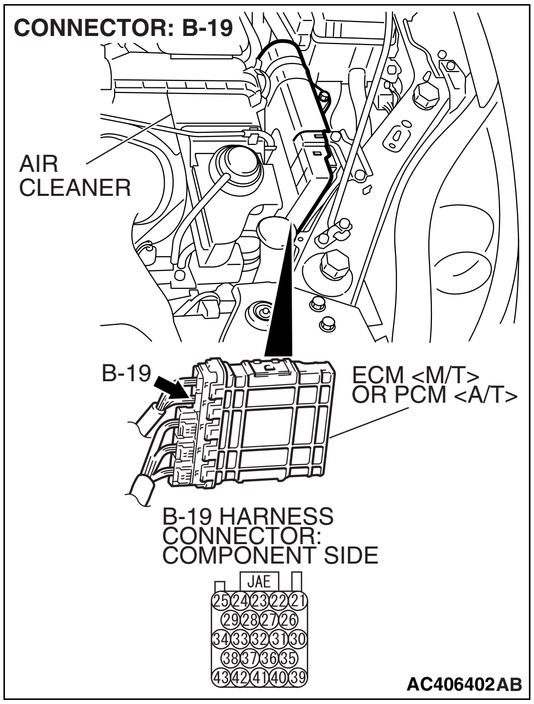
Q: Is the fuel tank pressure between 2050 and 2950 mV?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

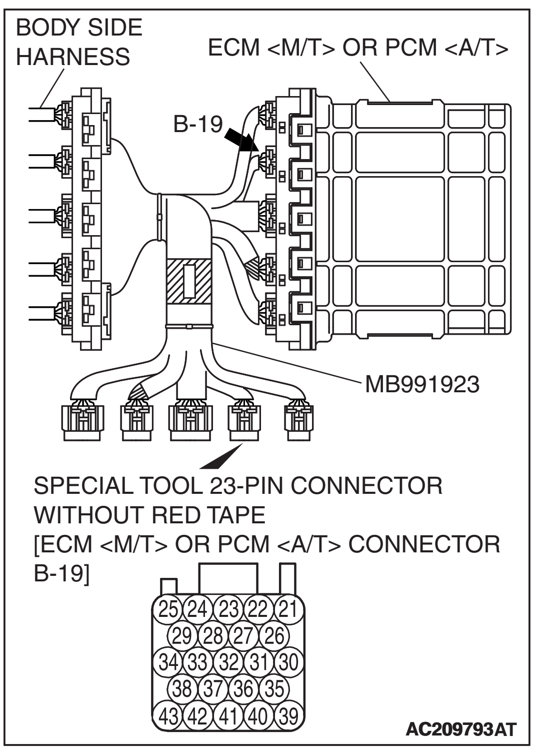
NO : Go to Step 2.

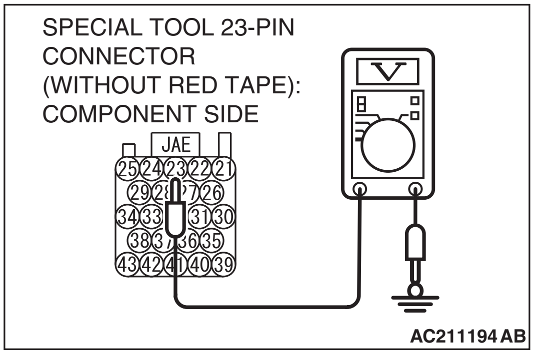
STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.



(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.





(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

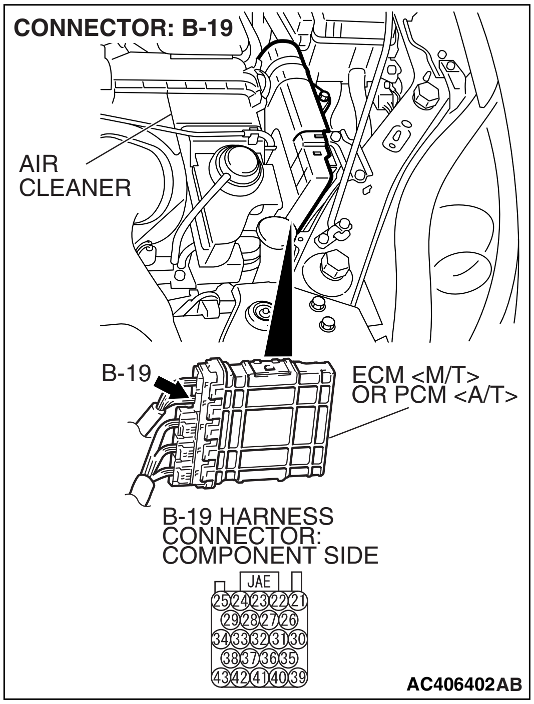
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

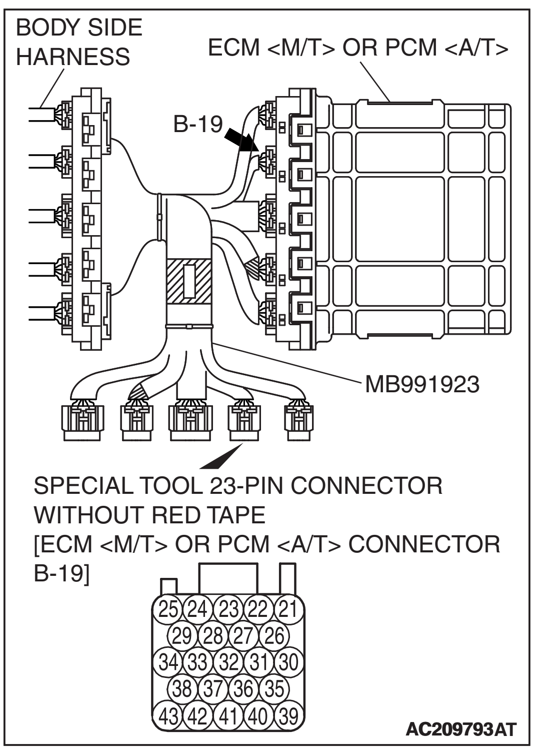
STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

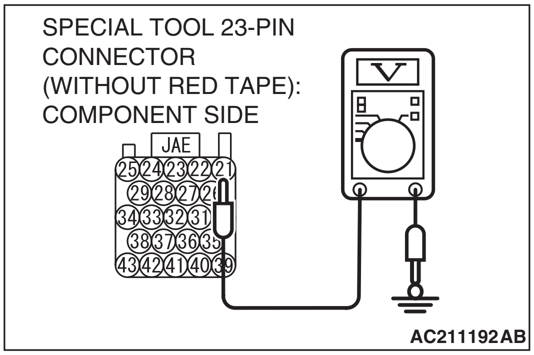
(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.



(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.

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



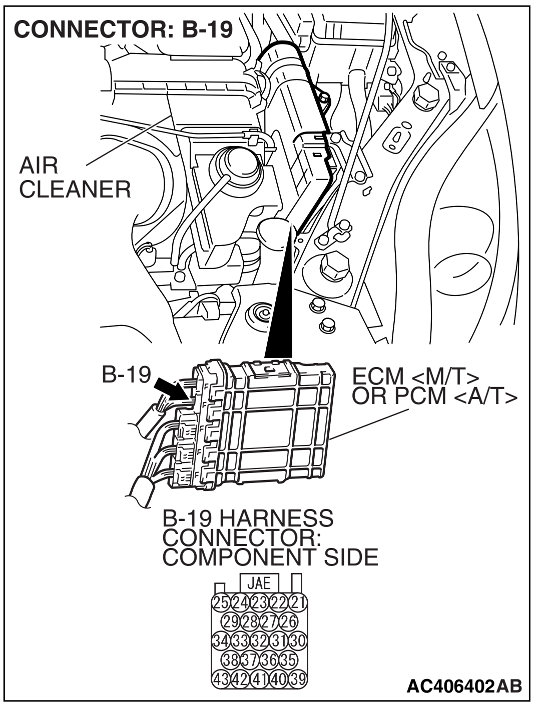


(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(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 5.
NO : Go to Step 4.



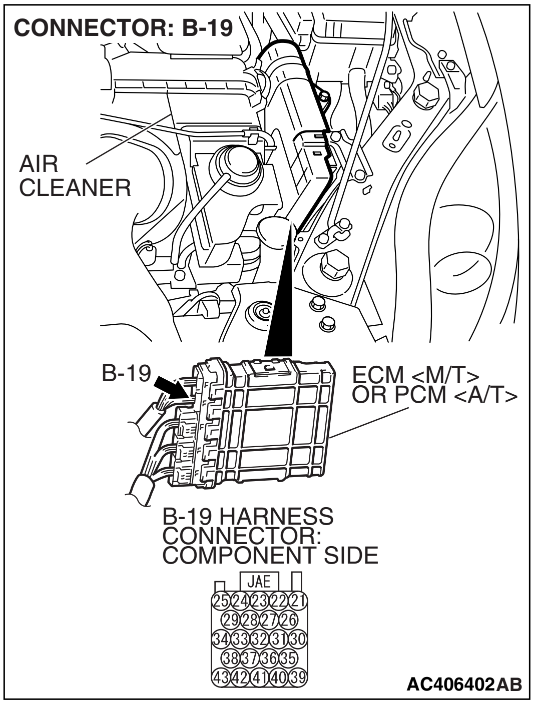
STEP 4. Check ECM <M/T> or PCM <A/T> connector B-19 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

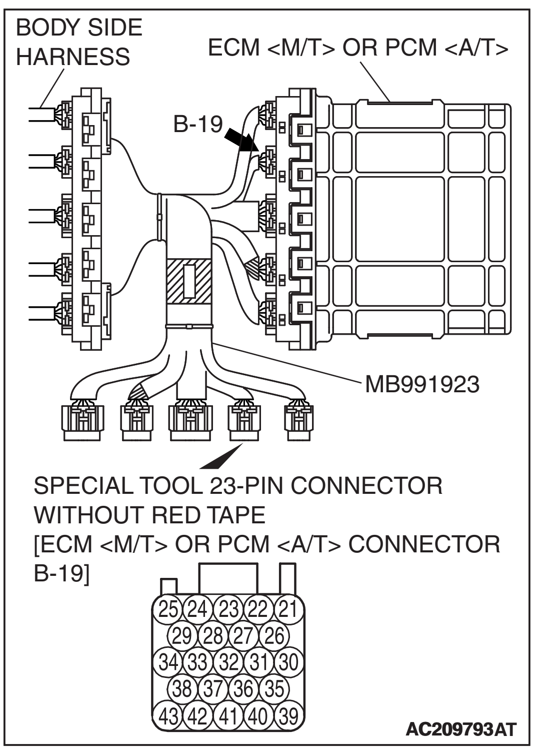
Q: Are the connector and terminals in good condition?

YES : Go to Step 16.
NO : Repair or replace the faulty components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

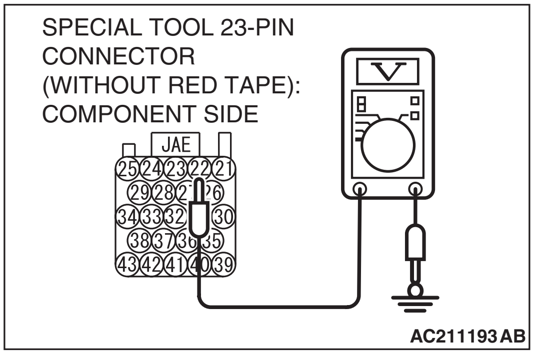
STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the ECM <M/T> or PCM <A/T>.





(2) Connect special tool MB991923 (check harness) between the ECM <M/T> or PCM <A/T> and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.



(5) Measure the voltage between terminal 22 and ground.
- The voltage should measure 0.5 volt or less.

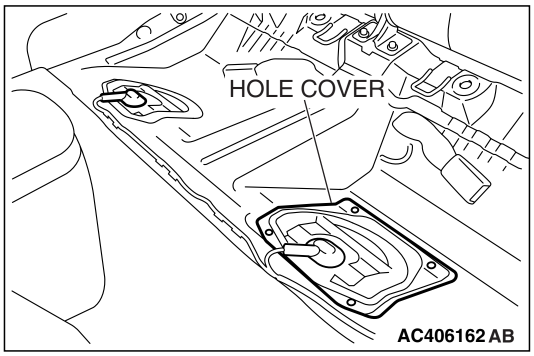
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

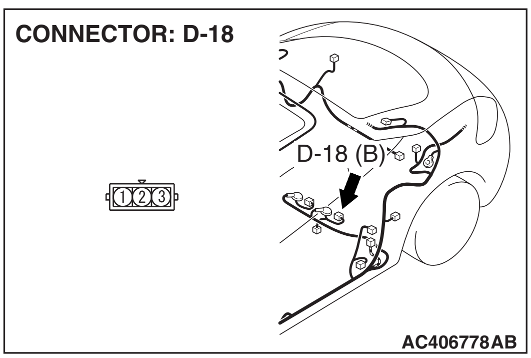
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

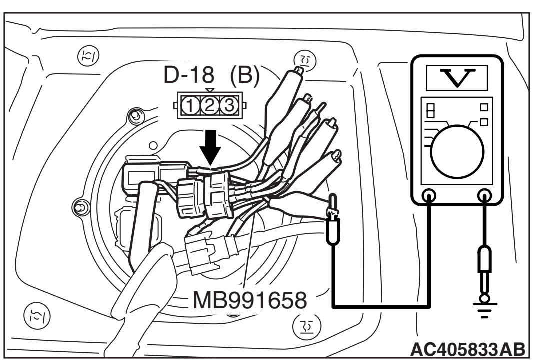
STEP 6. Measure the signal voltage at intermediate connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).
(2) Remove the hole cover.





(3) Disconnect fuel tank differential pressure sensor connector D-18.

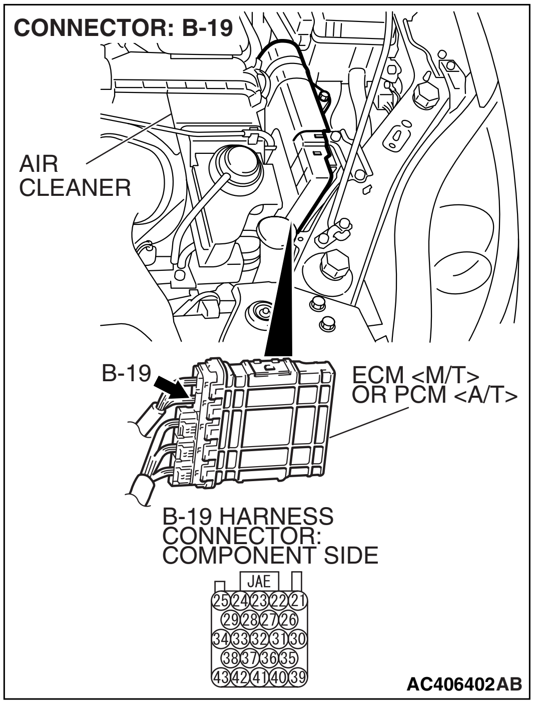


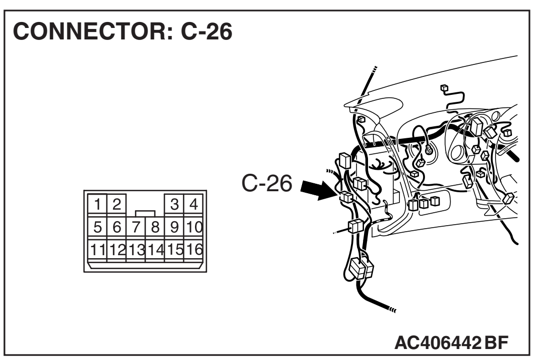
(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-18 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

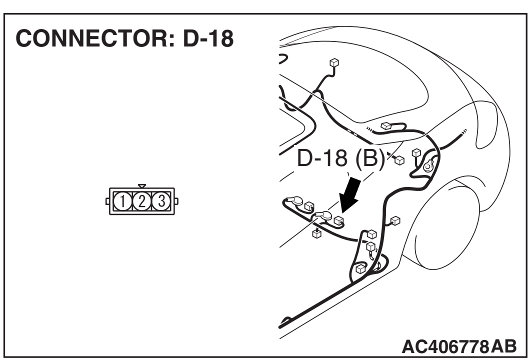
(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 7.
NO : Go to Step 15.





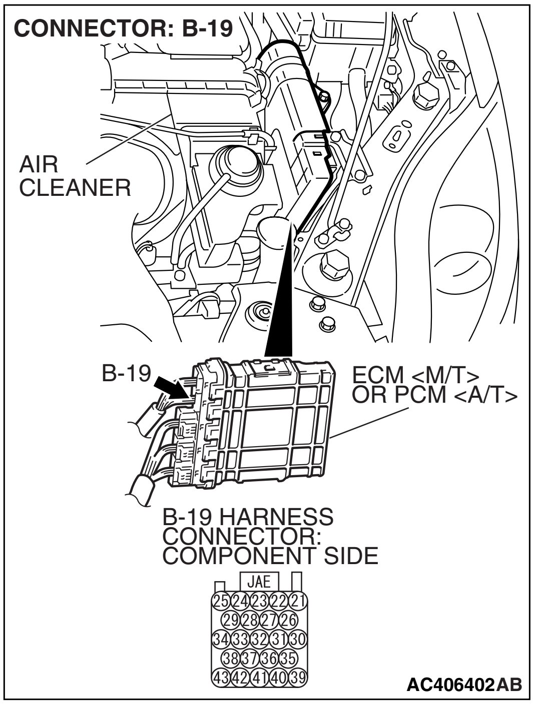


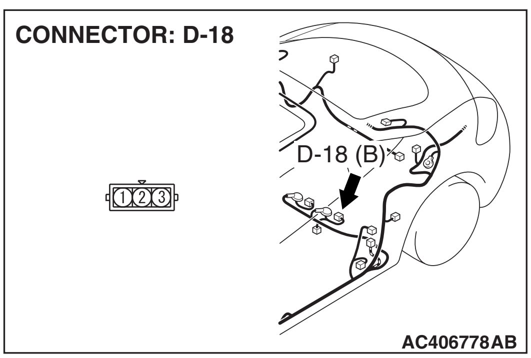
STEP 7. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 8.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.





STEP 8. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 23 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

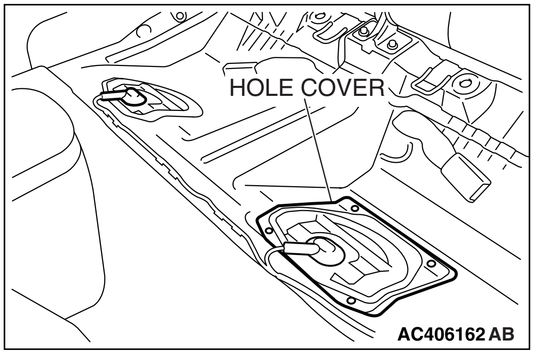
Q: Is the harness wire in good condition?

YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

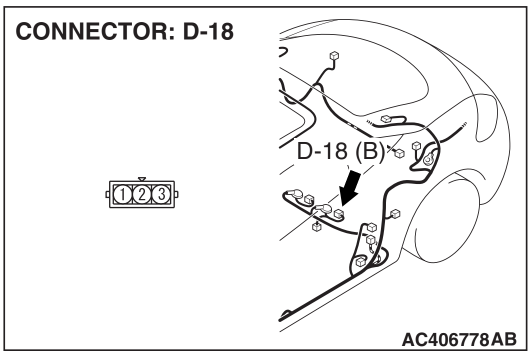
NO : Repair the damaged harness wire. Then go to Step 17.

STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).
(2) Remove the hole cover.

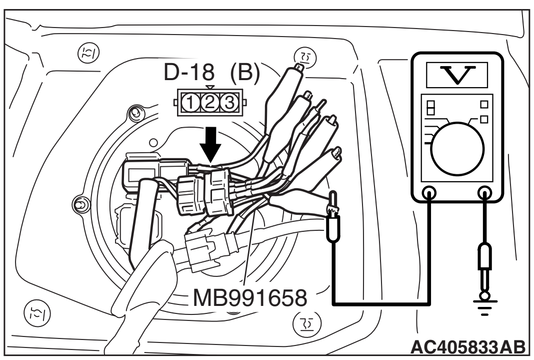


(3) Disconnect fuel tank differential pressure sensor connector D-18.



(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

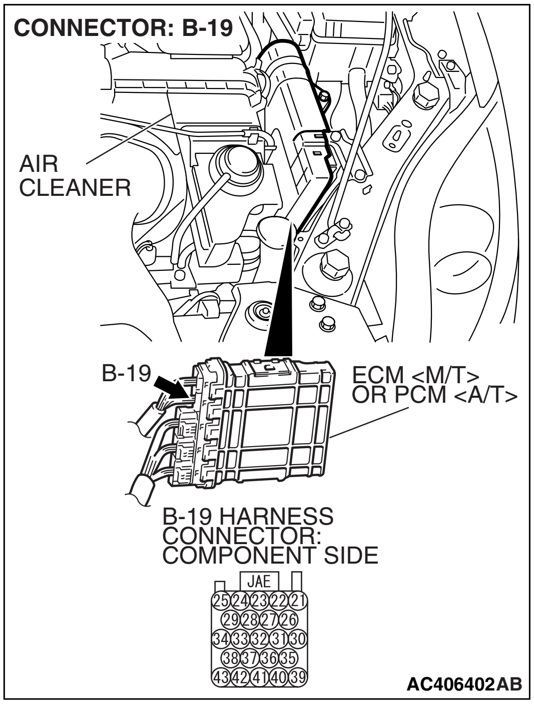
(7) Turn the ignition switch to the "LOCK" (OFF) position.

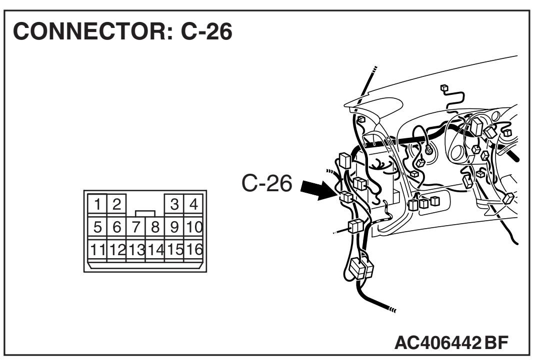


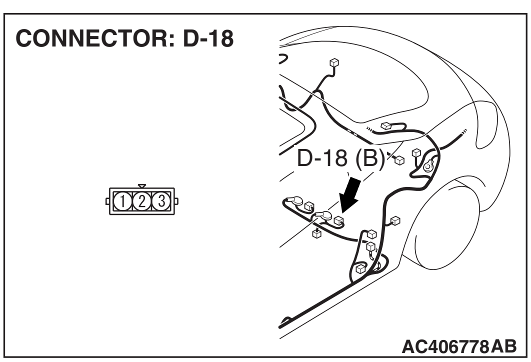
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



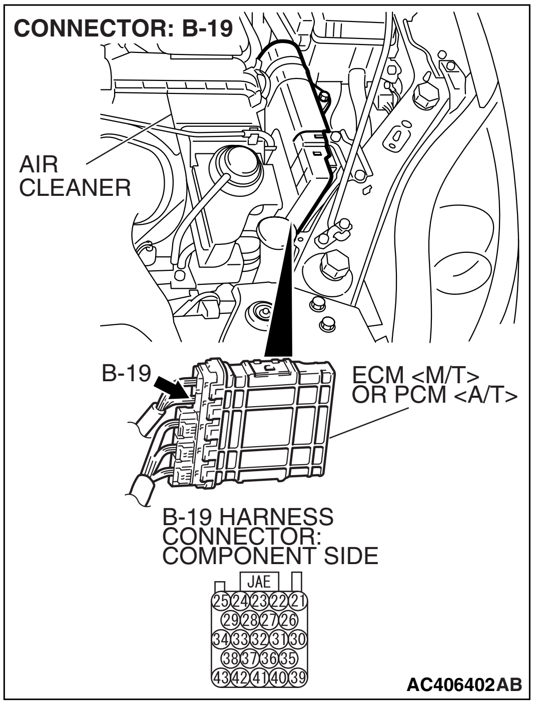


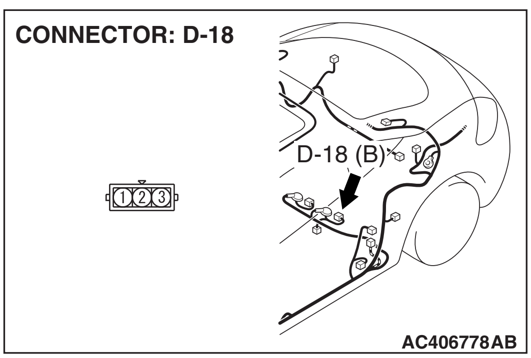


Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.





STEP 11. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 21 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

Q: Are the harness wires in good condition?

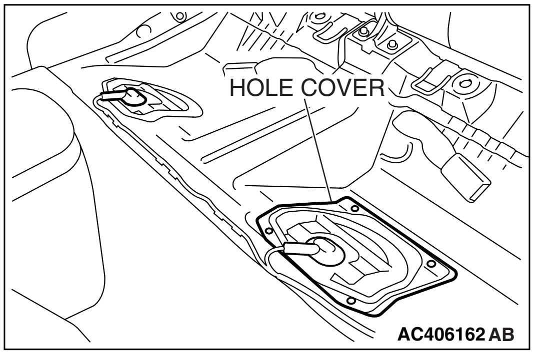
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

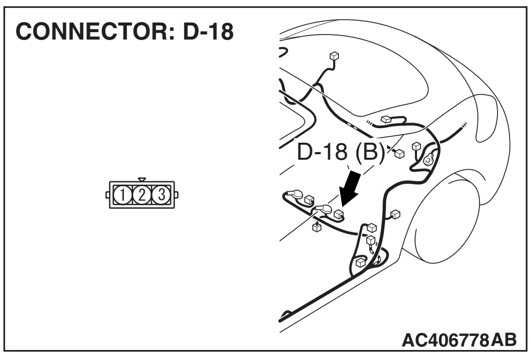
STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).

(2) Remove the hole cover.



(3) Disconnect fuel tank differential pressure sensor connector D-18.



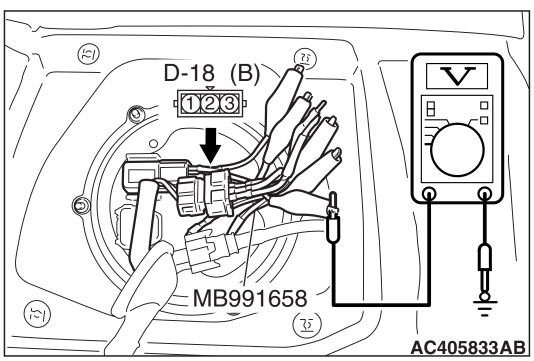
(4) Use special tool MB991658 to connect terminals 1,2 and 3 of the fuel tank differential pressure sensor connector D-18.

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

(6) Measure the voltage between terminal 2 and ground.

- The voltage should measure 0.5 volt or less.

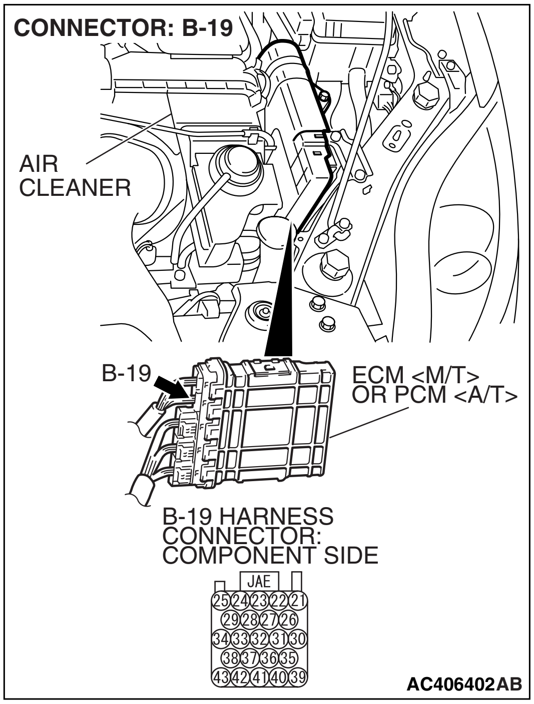
(7) Turn the ignition switch to the "LOCK" (OFF) position.

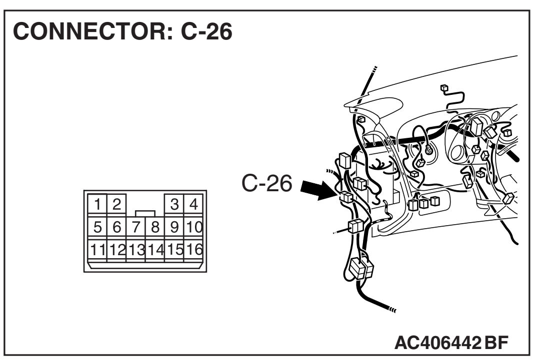


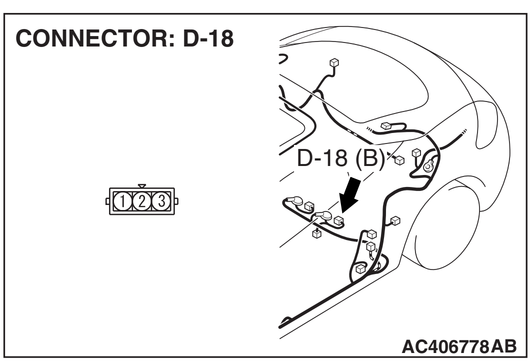
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 13.

NO : Go to Step 17.





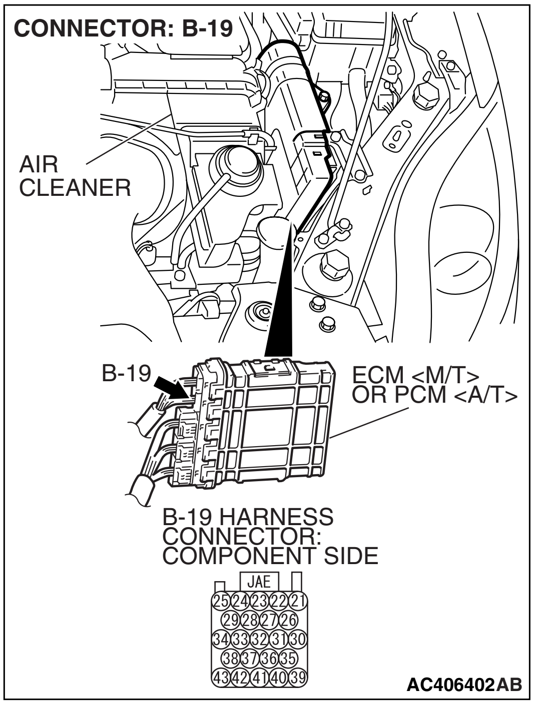


STEP 13. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 14.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

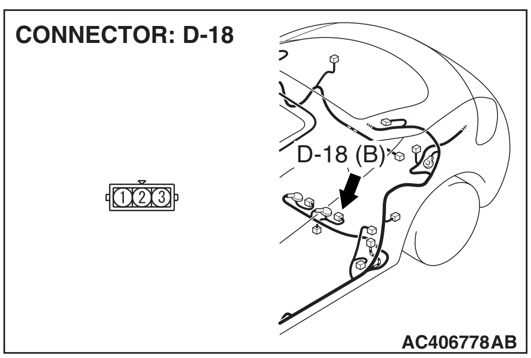


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Are the harness wires in good condition?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

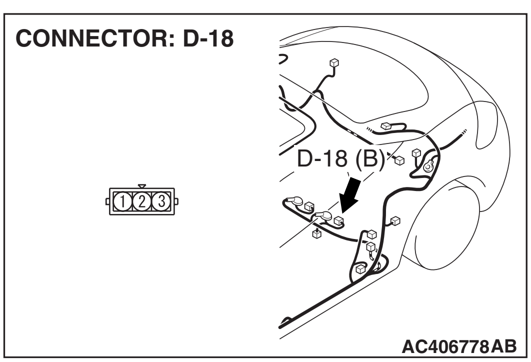


STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

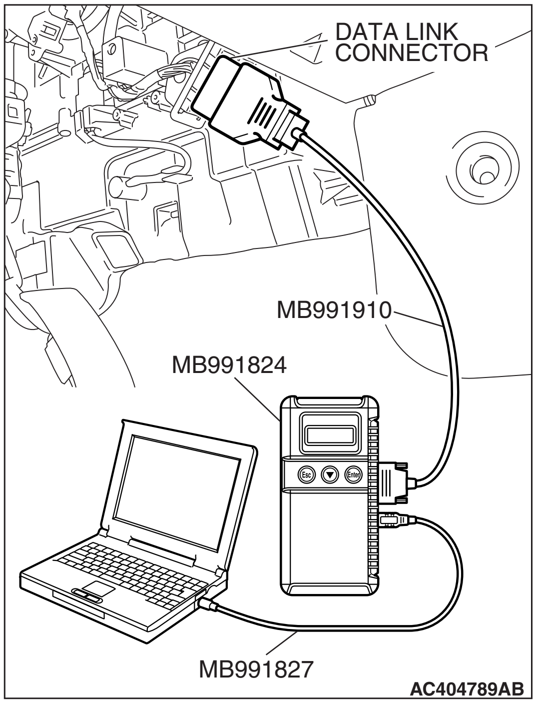
Q: Is the connectors and terminals in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 17.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



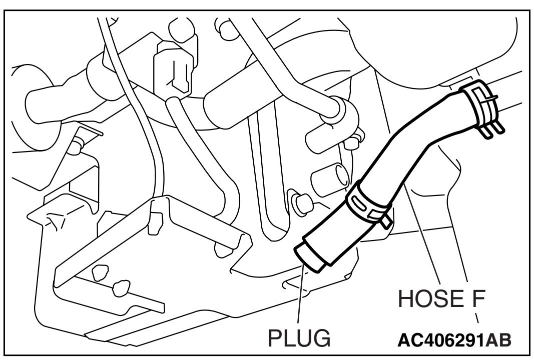
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



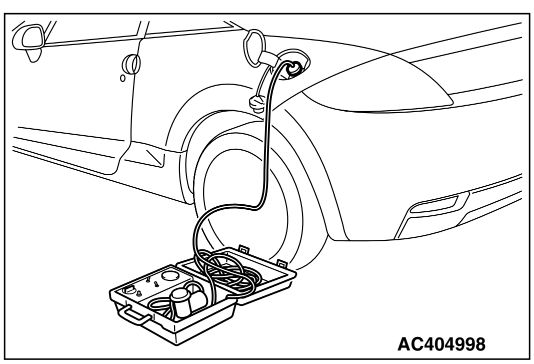
⚠ CAUTION

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) Disconnect hose F from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 2050 to 2950 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

Q: Is the fuel tank pressure between 2050 and 2950 mV?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Replace the ECM <M/T> or PCM <A/T>. When the ECM <M/T> or PCM <A/T> is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 17.

STEP 17. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13B-6).
(2) Read the diagnostic trouble code (DTC).

Q: Is DTC P0451 set?

YES : Repeat the troubleshooting from Step 2.

NO : The procedure is complete.

NEXT>>