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)

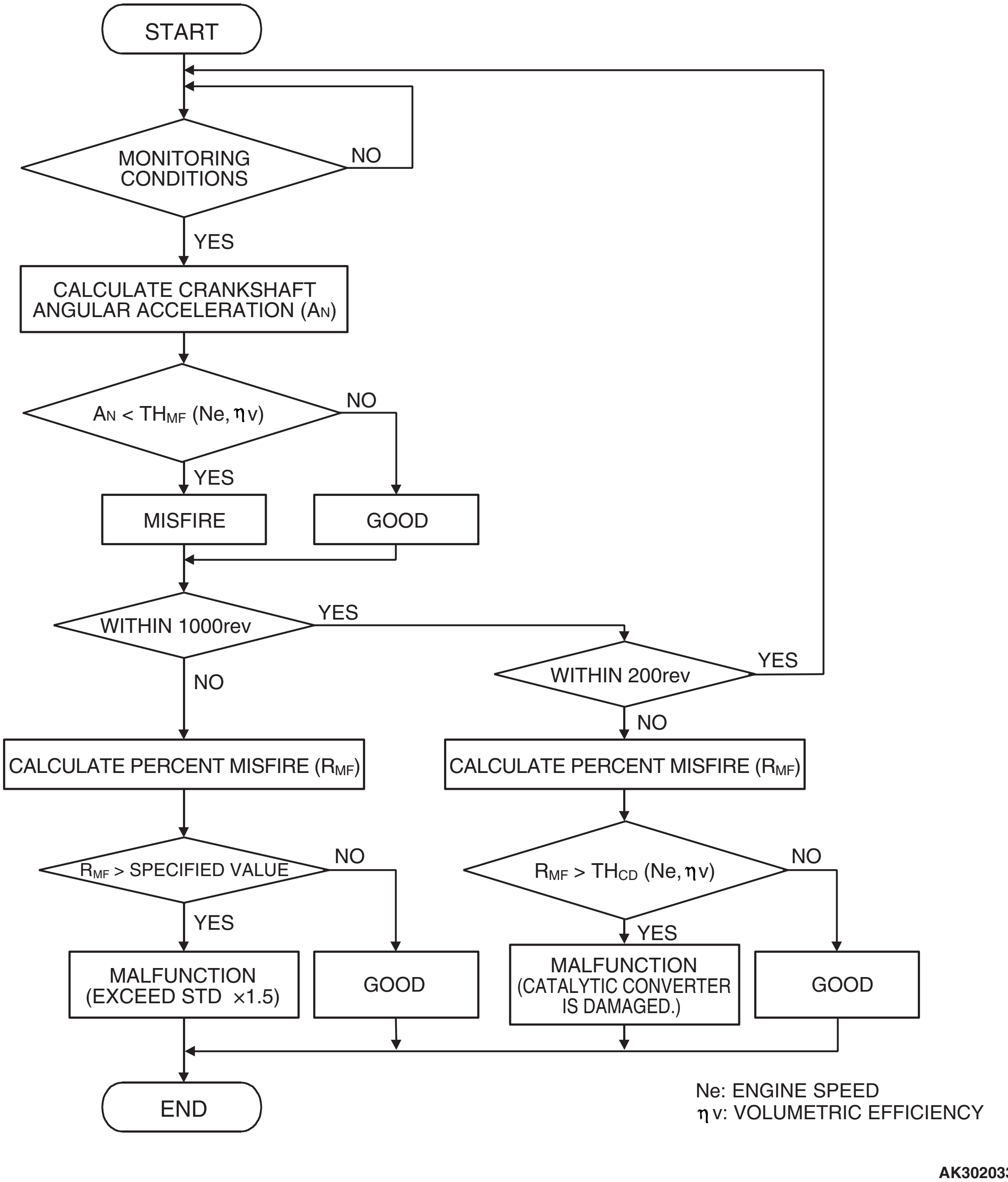
- Not applicable

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 500 and 6,500 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is 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 – 0.6 V/10 ms to +0.6 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 14 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <M/T>

or

- Misfire has occurred in 11 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <A/T>

OBD-II DRIVE CYCLE PATTERN

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

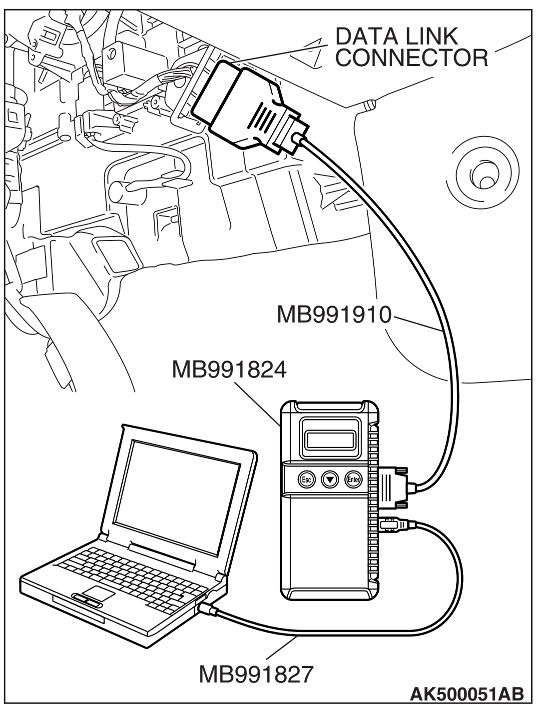
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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

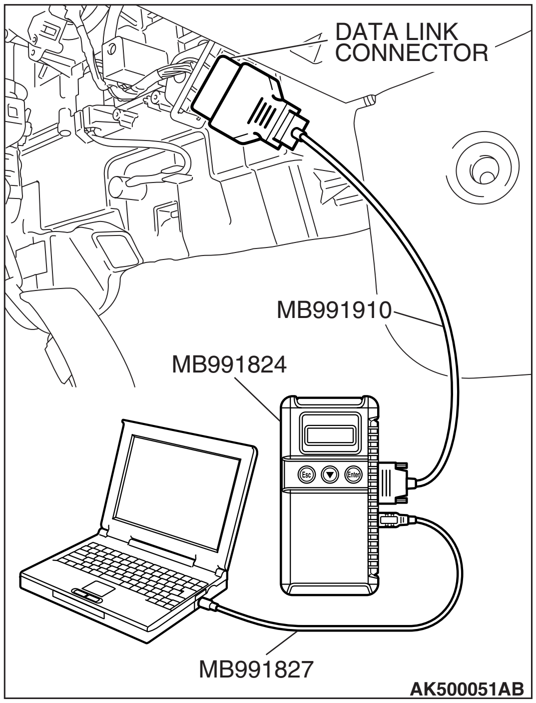
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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.

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 –Crankshaft Position Sensor Circuit P.13A-559.



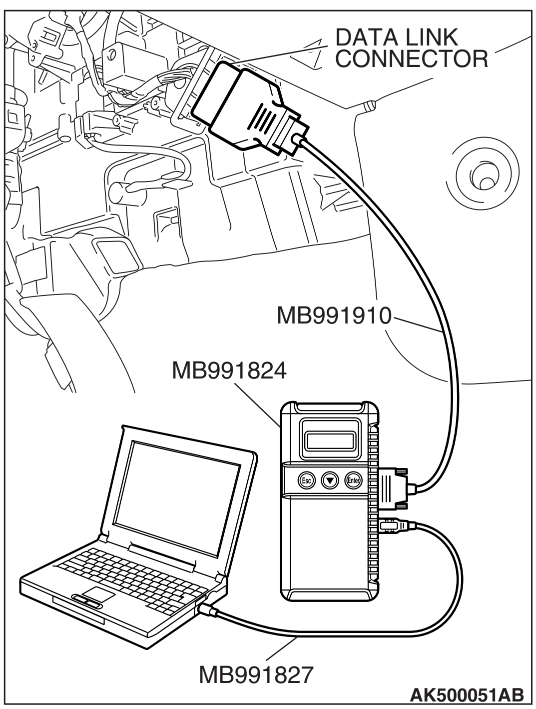
STEP 2. Using scan tool MB991958, check data list item 26: Cylinder 1, 4 Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 26, Cylinder 1, 4 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.

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

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to DTC P0171 –System too Lean (cylinder 1, 4) P.13A-412, DTC P0172 –System too Rich (cylinder 1, 4) P.13A-420.



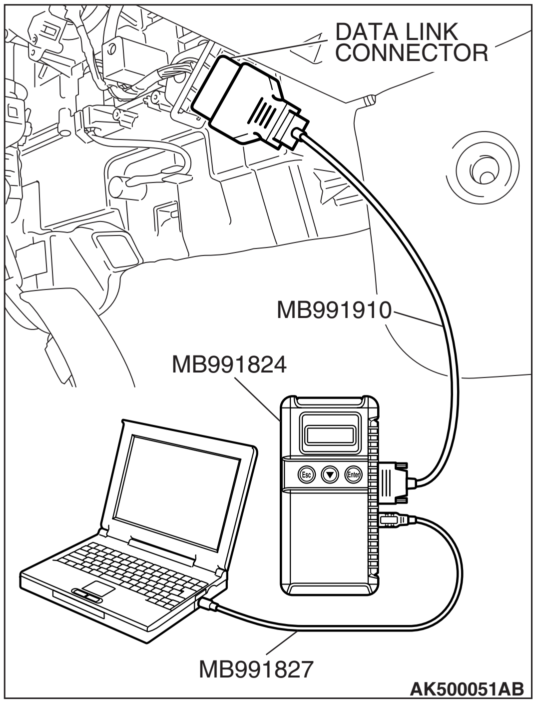
STEP 3. Using scan tool MB991958, check data list item 27: Cylinder 2, 3 Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 27, Cylinder 2, 3 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.

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

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to DTC P0174 –System too Lean (cylinder 2, 3) P.13A-425, DTC P0175 –System too Rich (cylinder 2, 3) P.13A-433.



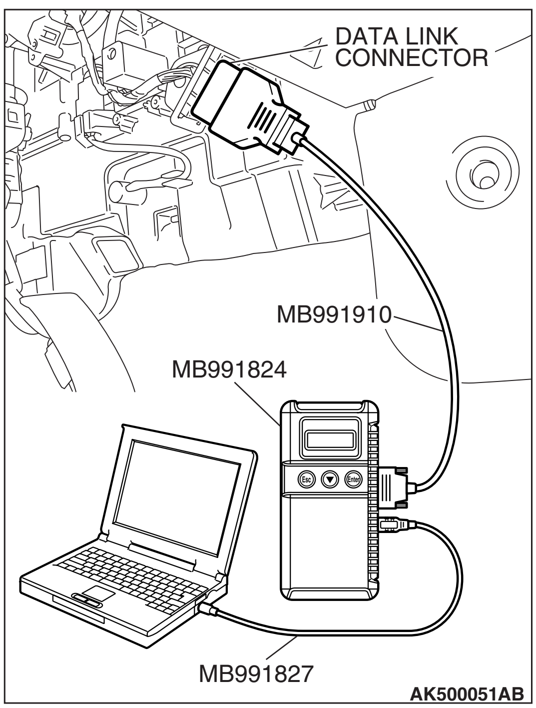
STEP 4. Using scan tool MB991958, check data list item 28: Cylinder 1, 4 Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28, Cylinder 1, 4 Short-Term Fuel Trim.
- The fuel trim should be between –25 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 5.
NO : Refer to DTC P0171 –System too Lean (cylinder 1, 4) P.13A-412, DTC P0172 –System too Rich (cylinder 1, 4) P.13A-420.



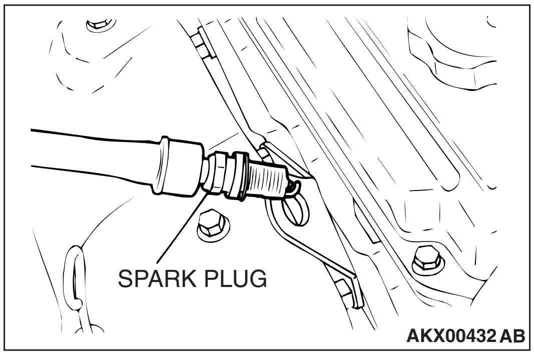
STEP 5. Using scan tool MB991958, check data list item 29: Cylinder 2, 3 Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 29, Cylinder 2, 3 Short-Term Fuel Trim.
- The fuel trim should be between –25 and +25 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 6.
NO : Refer to DTC P0174 –System too Lean (cylinder 2, 3) P.13A-425, DTC P0175 –System too Rich (cylinder 2, 3) P.13A-433.

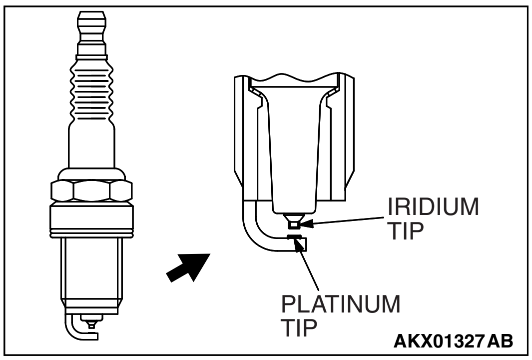


STEP 6. Check the each ignition coil spark.

(1) Remove the spark plug and connect to the ignition coil.
(2) 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 8.
NO : Go to Step 7.



STEP 7. 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.13A-1136.
NO : Replace the faulty spark plug. Then go to Step 10.

STEP 8. 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 10.
NO : Go to Step 9.

STEP 9. 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.13A-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 10.

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 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 15 P.13A-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)

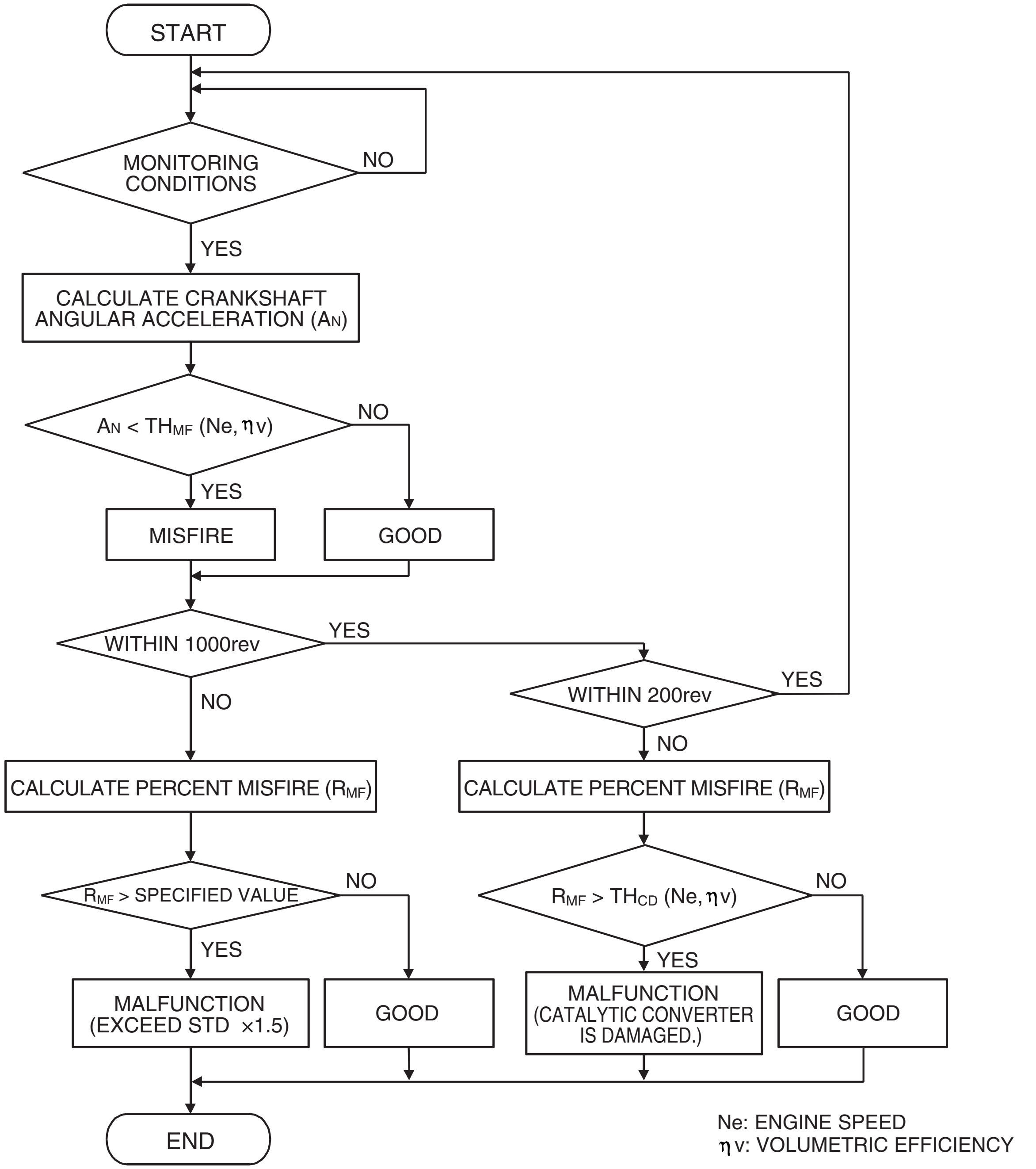
- Not applicable

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 500 and 6,500 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is 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 14 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <M/T>

or

- Misfire has occurred in 11 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <A/T>

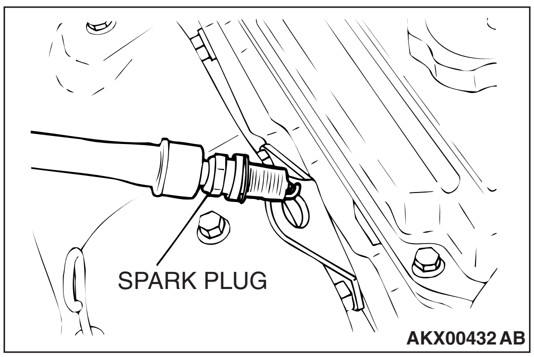
OBD-II DRIVE CYCLE PATTERN

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

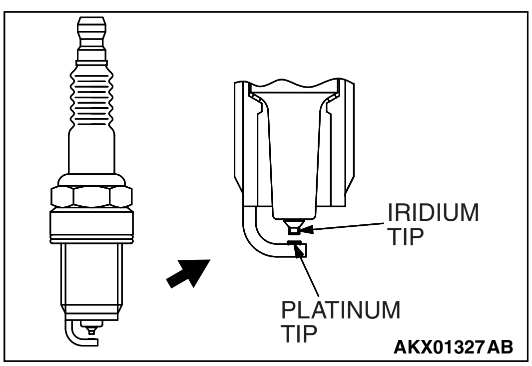


STEP 1. Check the No. 1 cylinder ignition coil spark.

(1) Remove the No. 1 cylinder ignition coil.
(2) Remove the No. 1 cylinder spark plug and connect to the No. 1 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. 1 cylinder spark plug.

⚠ 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.13A-1136.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service –Compression Pressure Check P.11A-14.

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.13A-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.13A-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)

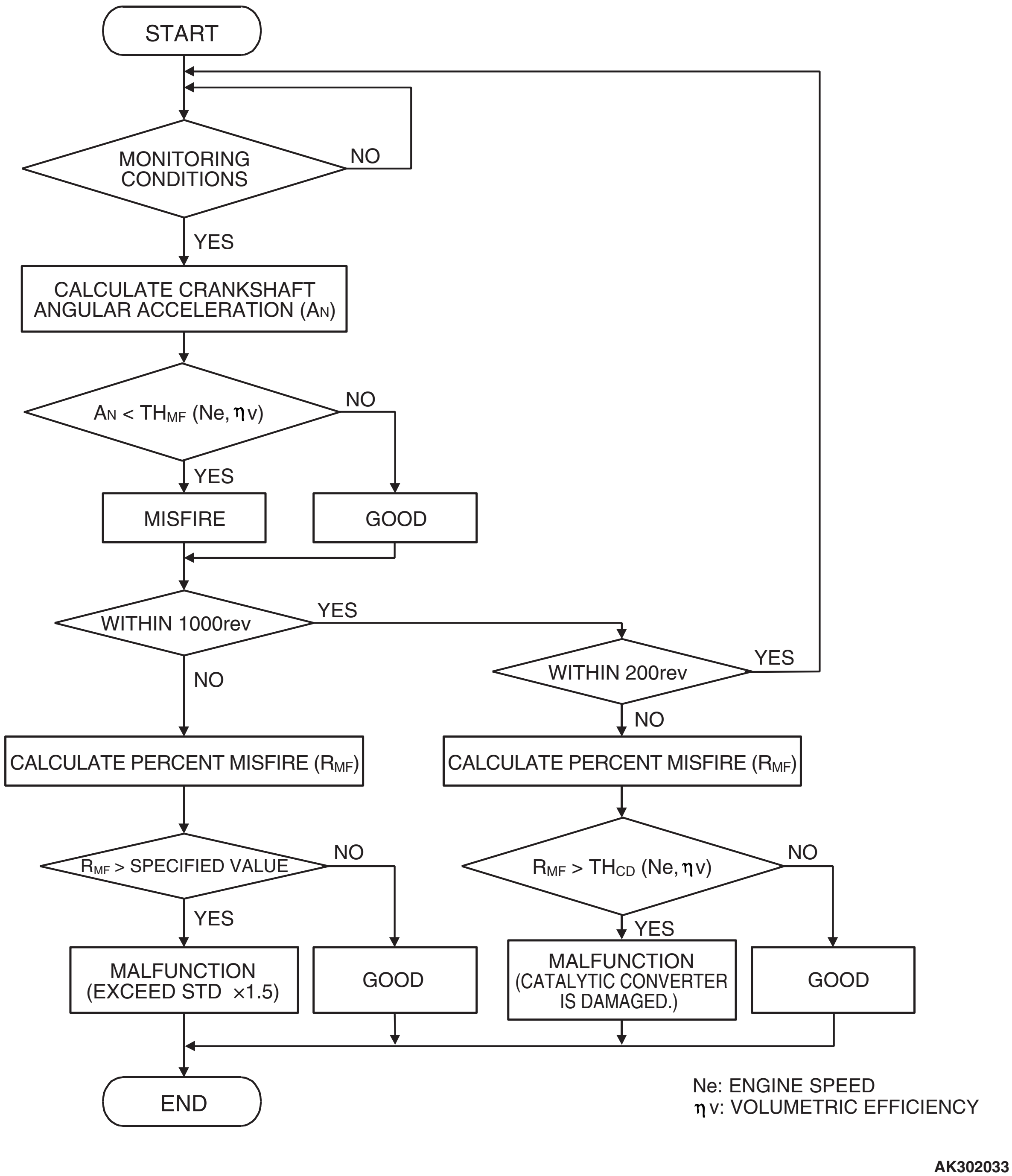
- Not applicable

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



Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is 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 14 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <M/T>

or

- Misfire has occurred in 11 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <A/T>

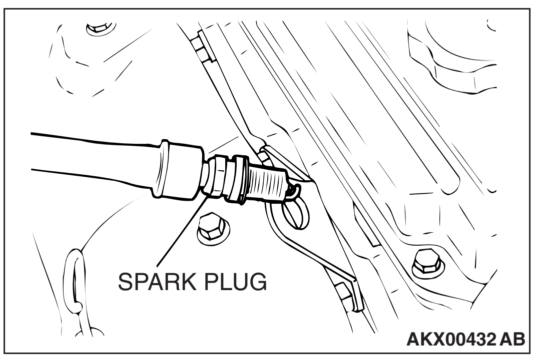
OBD-II DRIVE CYCLE PATTERN

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

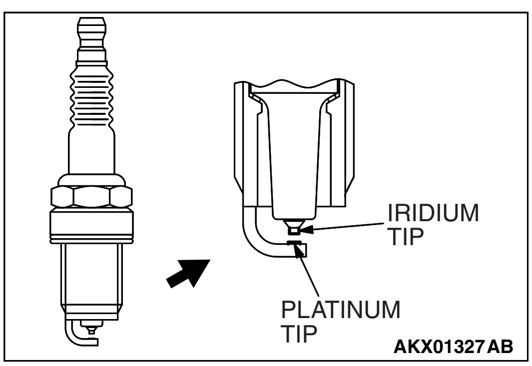


STEP 1. Check the No. 2 cylinder ignition coil spark.

(1) Remove the No. 2 cylinder ignition coil.
(2) Remove the No. 2 cylinder spark plug and connect to the No. 2 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. 2 cylinder spark plug.

⚠ 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.13A-1136.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service –Compression Pressure Check P.11A-14.

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.13A-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.13A-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)

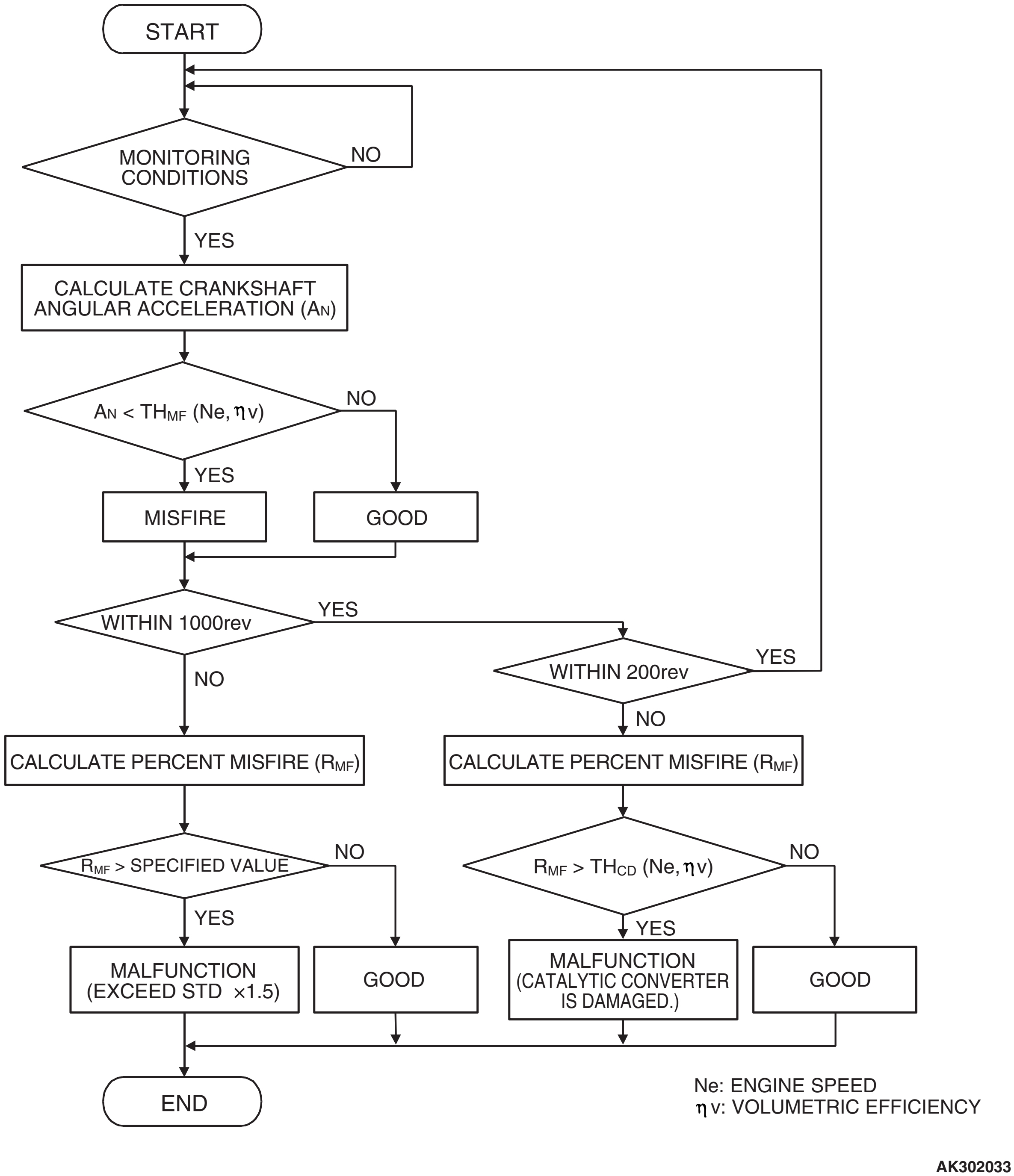
- Not applicable

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 500 and 6,500 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is 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 14 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <M/T>

or

- Misfire has occurred in 11 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <A/T>

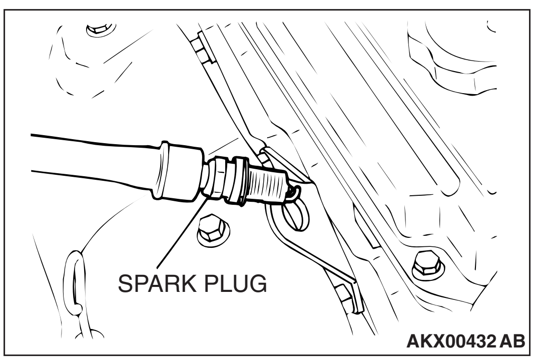
OBD-II DRIVE CYCLE PATTERN

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



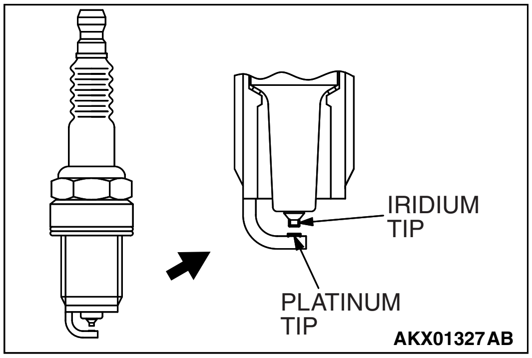
STEP 1. Check the No. 3 cylinder ignition coil spark.

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

⚠ 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.13A-1136.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service –Compression Pressure Check P.11A-14.

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.13A-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.13A-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)

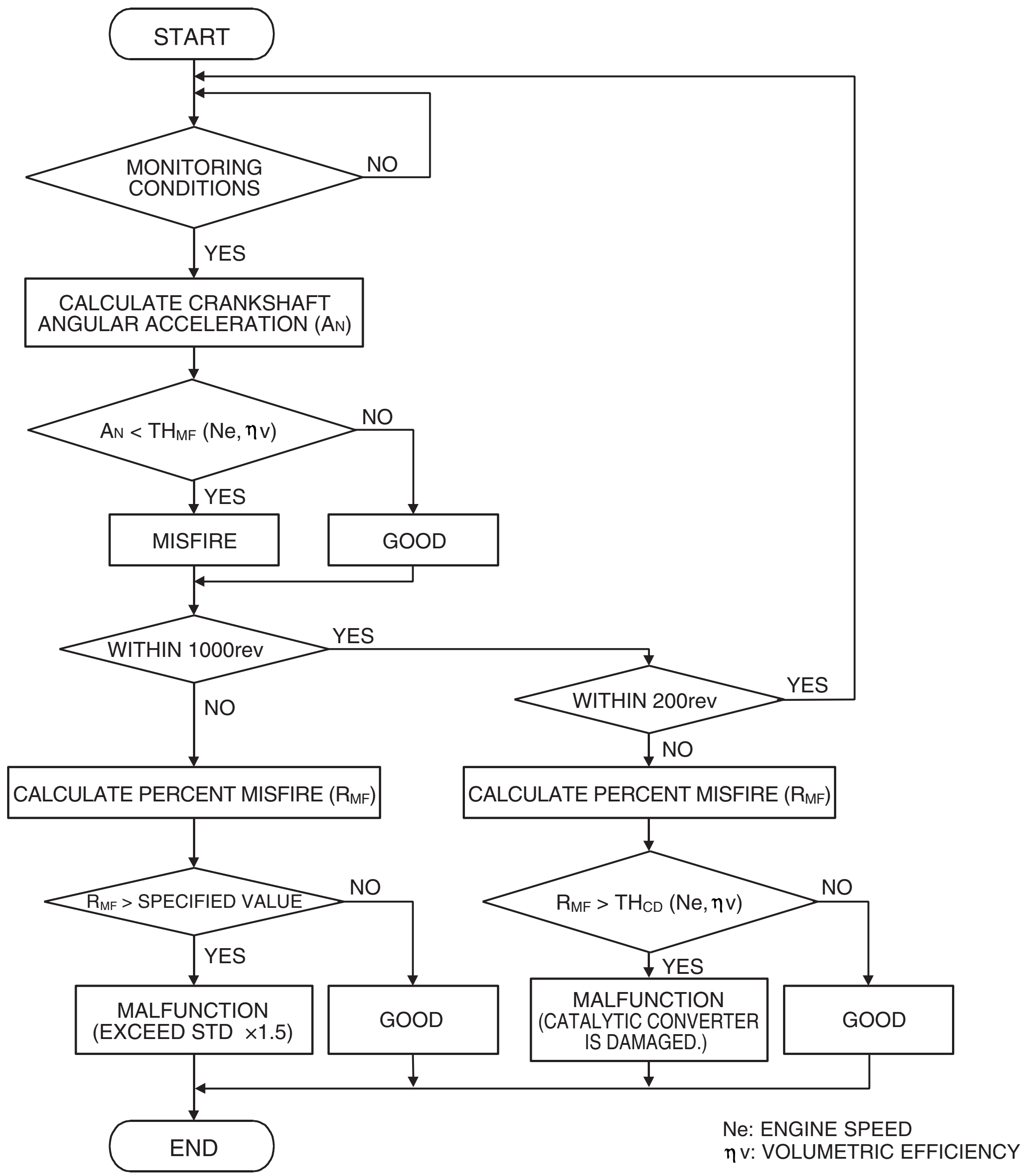
- Not applicable

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



AK302033

Check Conditions

- Engine speed is between 500 and 6,500 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is 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 14 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <M/T>

or

- Misfire has occurred in 11 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard). <A/T>

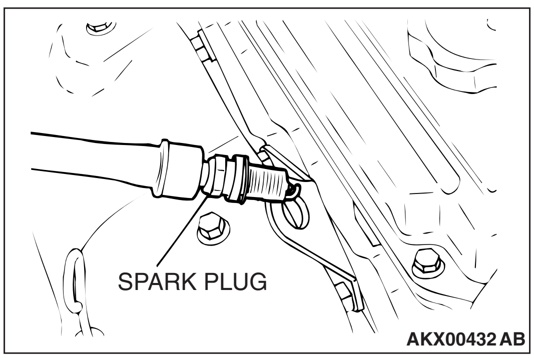
OBD-II DRIVE CYCLE PATTERN

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



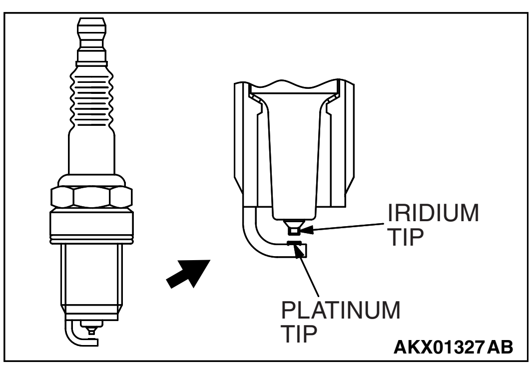
STEP 1. Check the No. 4 cylinder ignition coil spark.

(1) Remove the No. 4 cylinder ignition coil.
(2) Remove the No. 4 cylinder spark plug and connect to the No. 4 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. 4 cylinder spark plug.

⚠ 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.13A-1136.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-Vehicle Service –Compression Pressure Check P.11A-14.

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.13A-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.13A-6.
(2) Check the diagnostic trouble code (DTC).

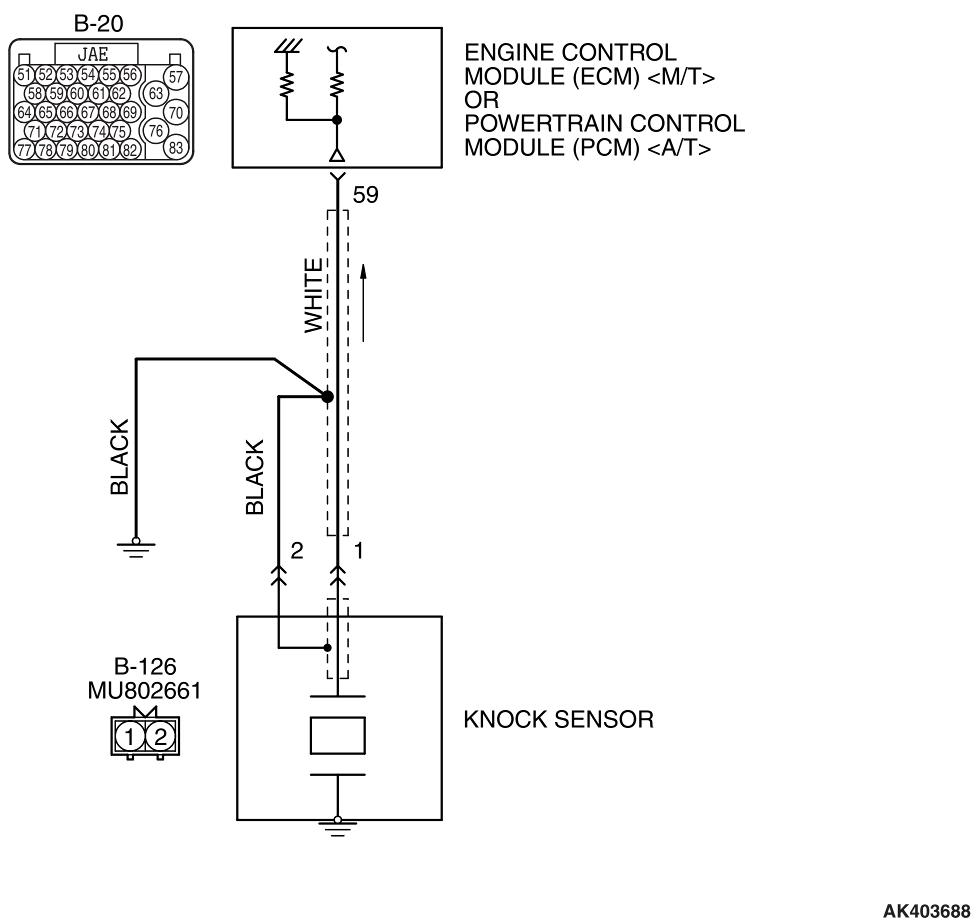
Q: Is DTC P0304 set?

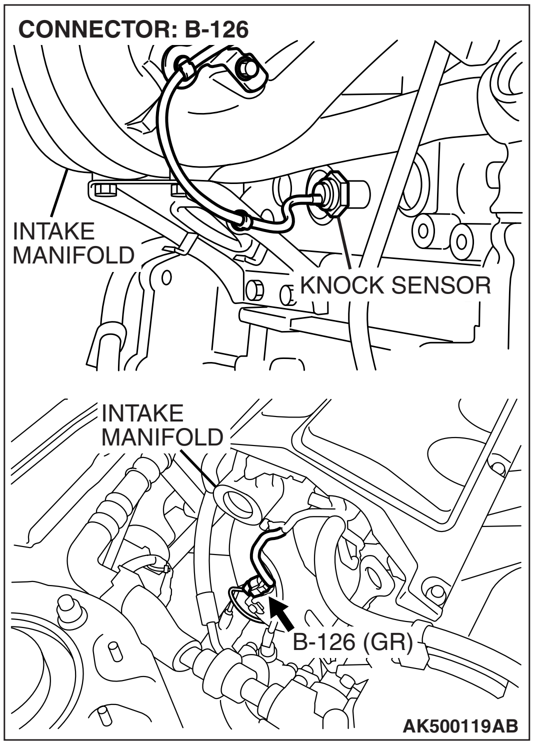
YES : Retry the troubleshooting.
NO : The inspection is complete.

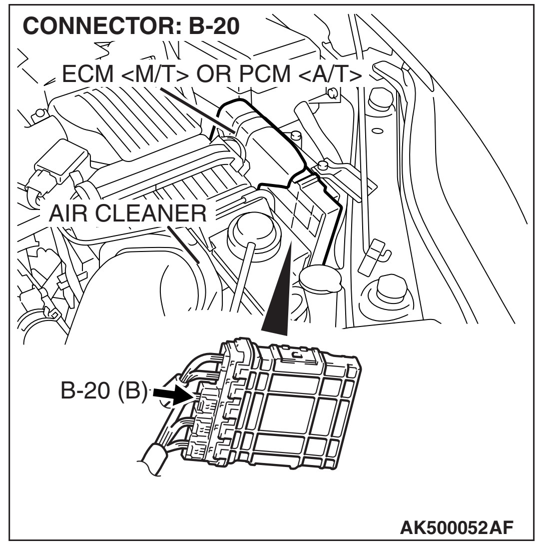
DTC P0325: Knock Sensor Circuit

⚠ 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







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 starting sequence was completed.
- Engine speed is higher than 2,500 r/min.
- Volumetric efficiency is 40% or more.

Judgement Criterion

- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

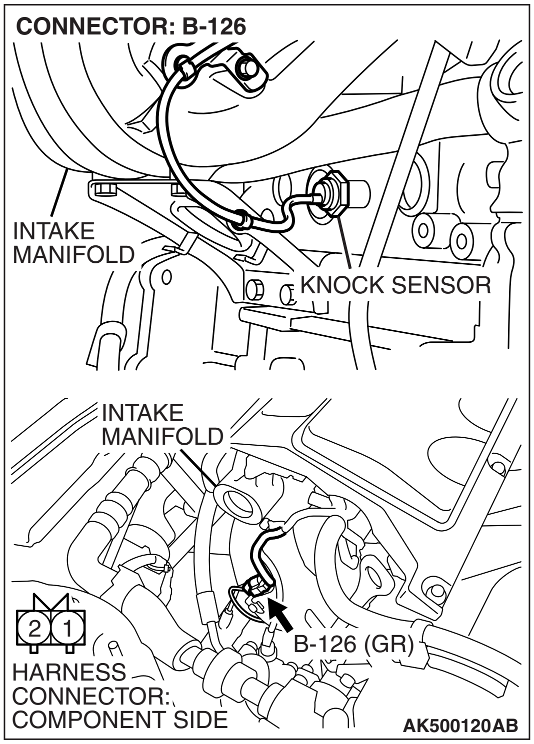
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit, 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

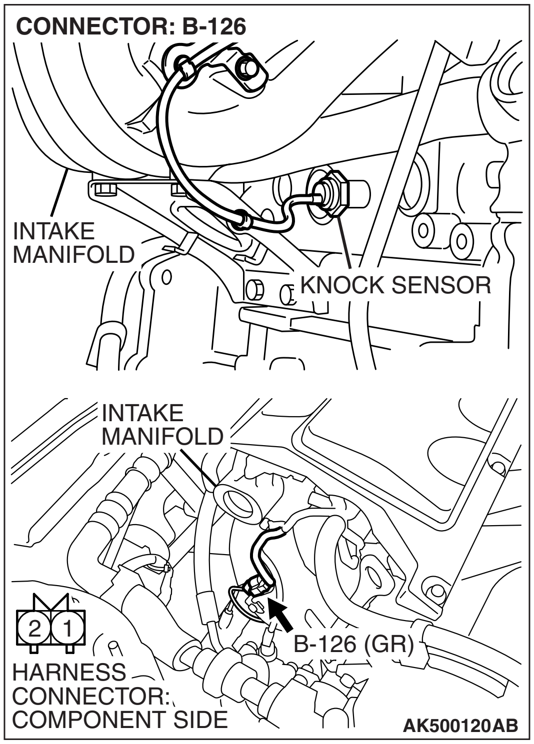


STEP 1. Check harness connector B-126 at the knock sensor for damage.

Q: Is the harness connector in good condition?

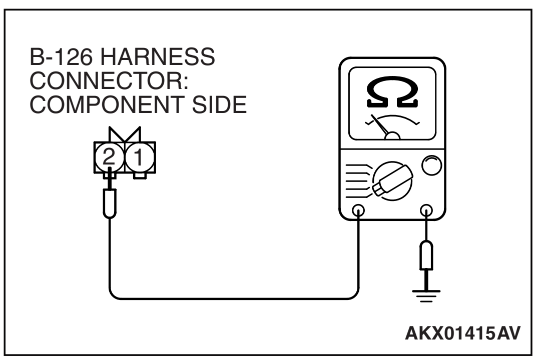
YES : Go to Step 2.

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.

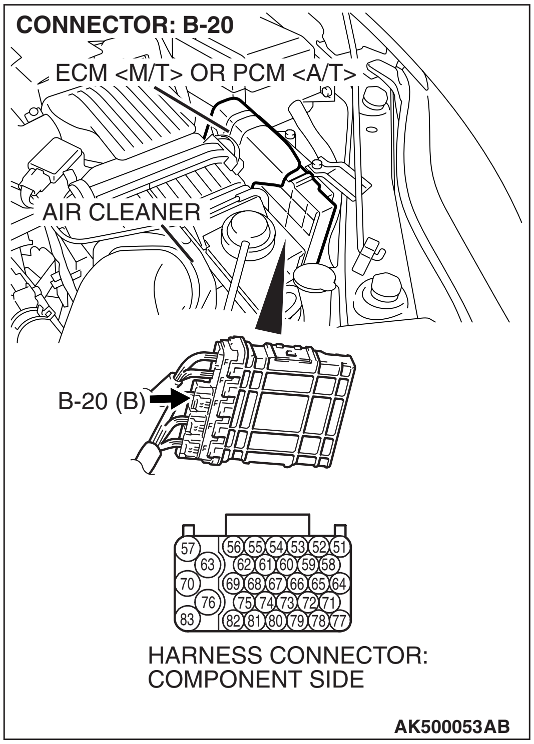


(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 3.

NO : Repair harness wire between knock sensor connector B-126 (terminal No. 2) and ground because of open circuit or harness damage. 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?

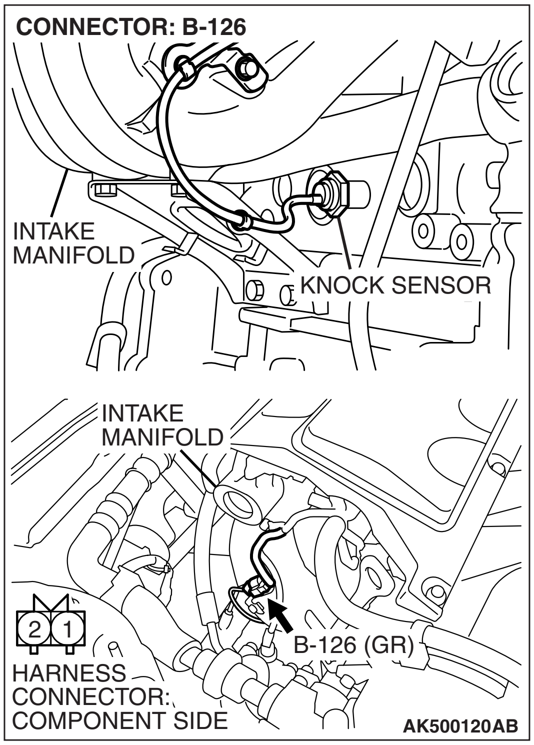
YES : Go to Step 4.

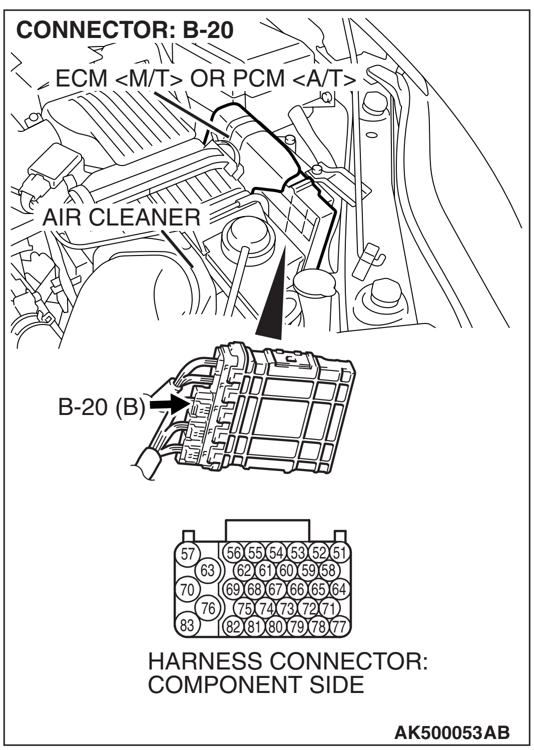
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

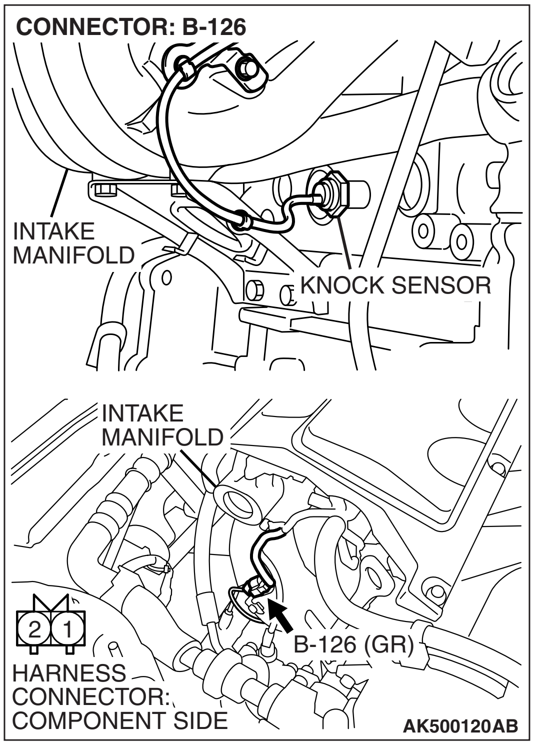
STEP 4. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-126 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 59).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

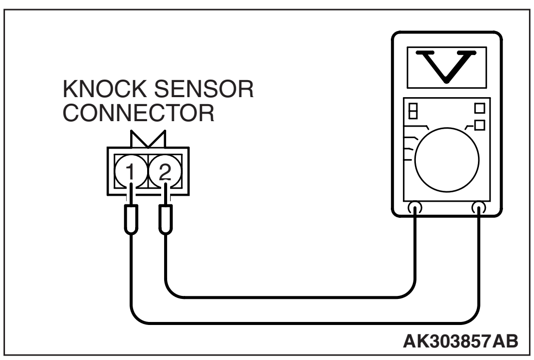






STEP 5. Check the knock sensor.

(1) Disconnect the knock sensor connector B-126.
(2) Start the engine and run at idle.



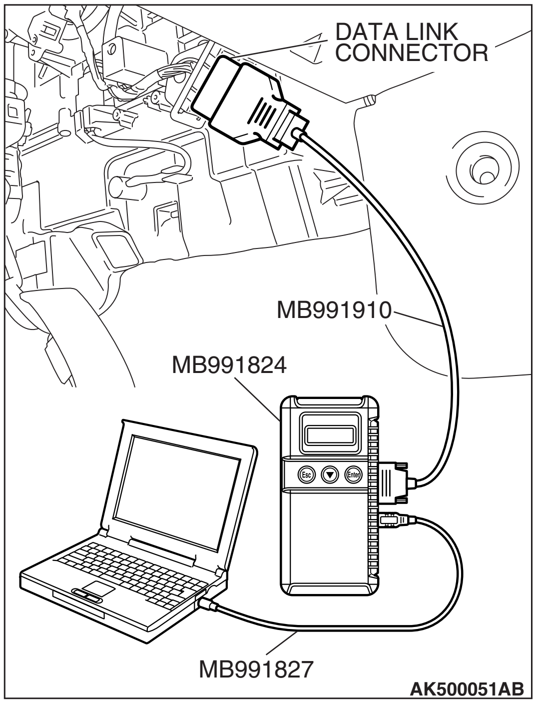
(3) Measure the voltage between knock sensor side connector terminal No. 1 (output) and No. 2 (ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

(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?

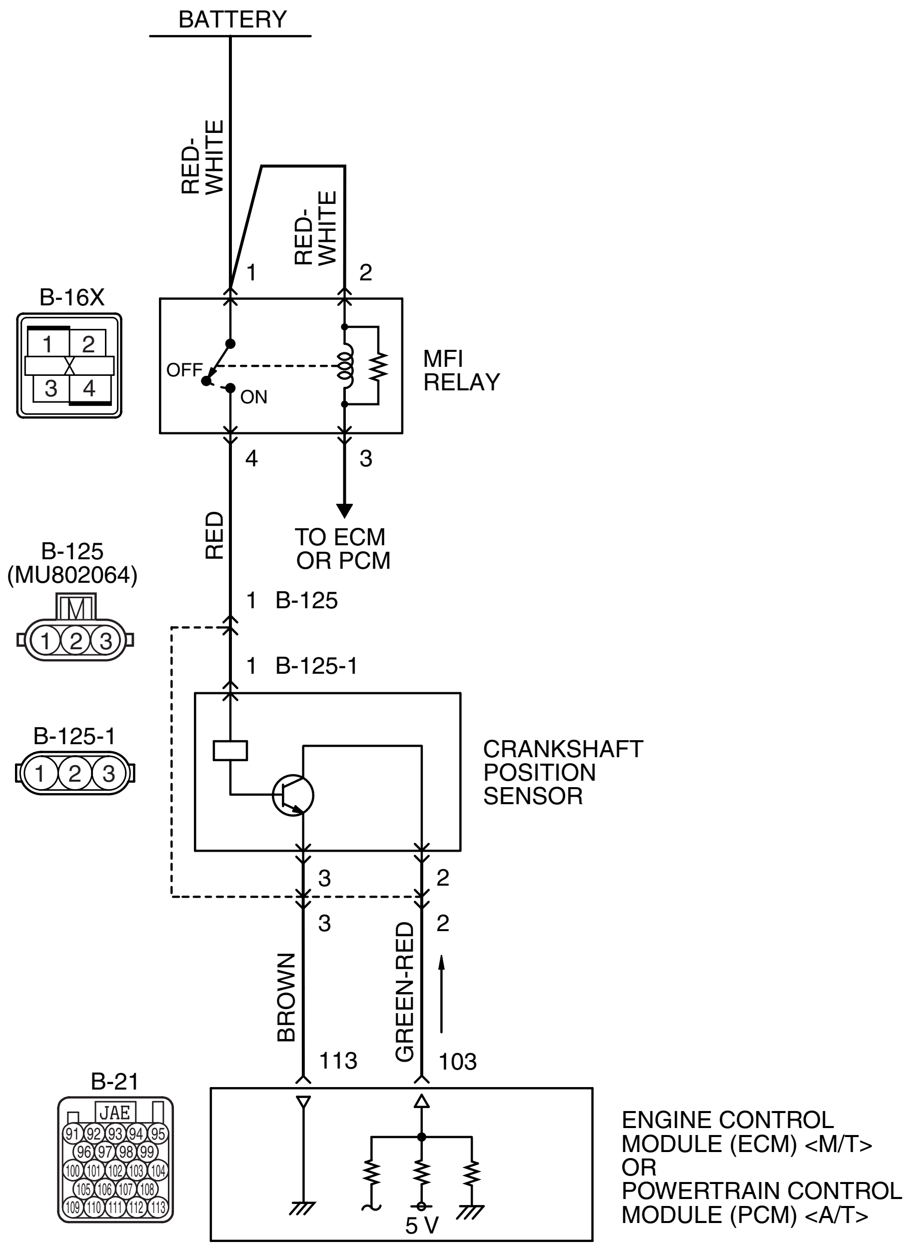
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit

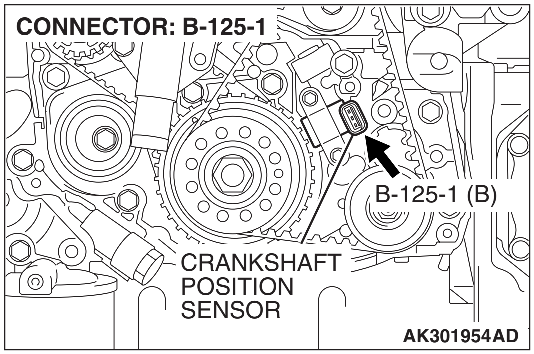
⚠ CAUTION

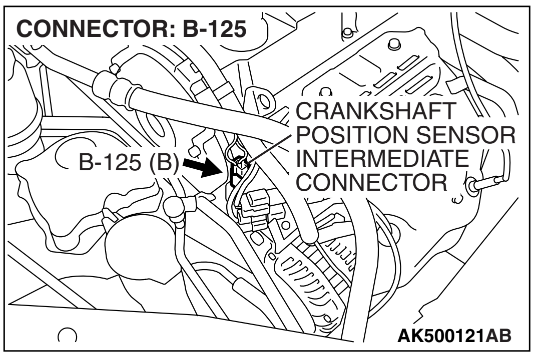
If DTC P0335 has been set, TCL related DTC U1120 is also set. After P0335 has been diagnosed, don't forget to erase DTC U1120.

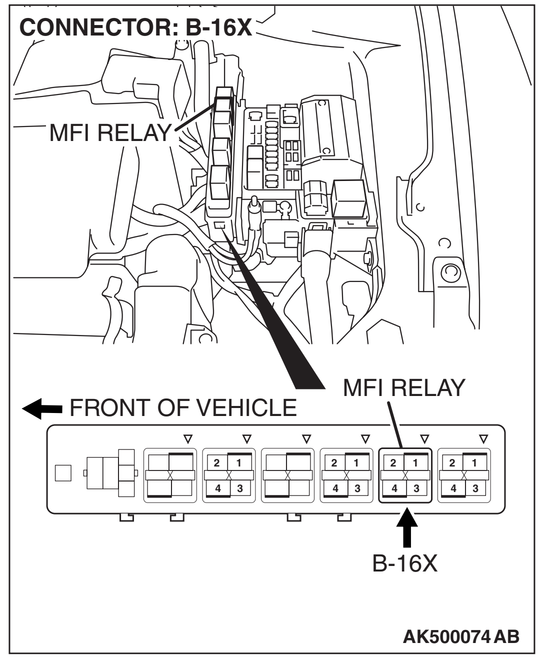
Crankshaft Position Sensor Circuit

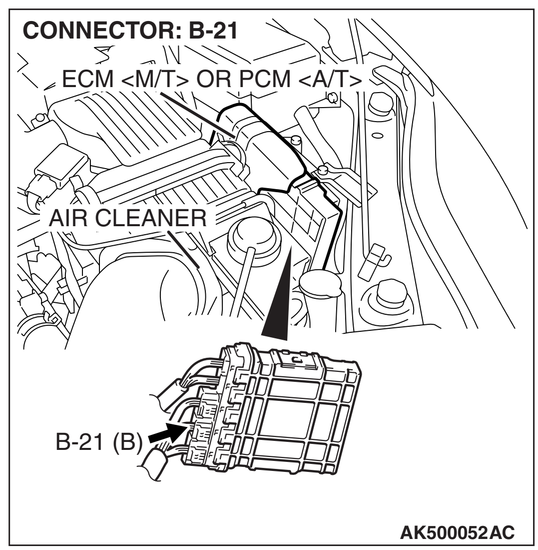


AK403689









CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 3 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)

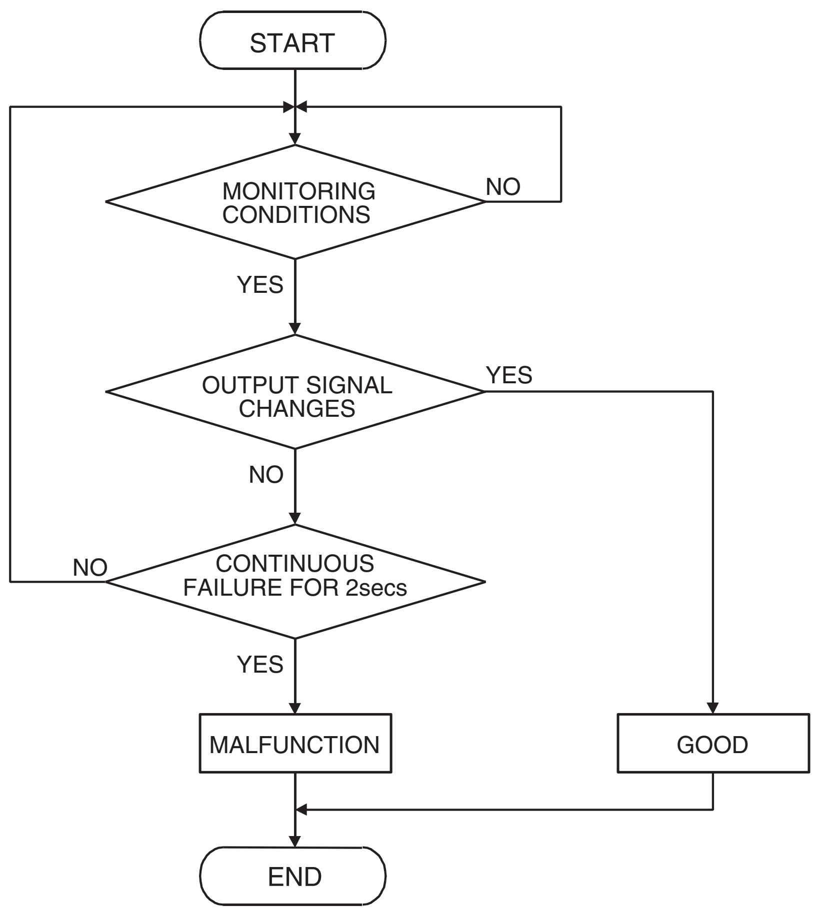
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK302034

Check Condition

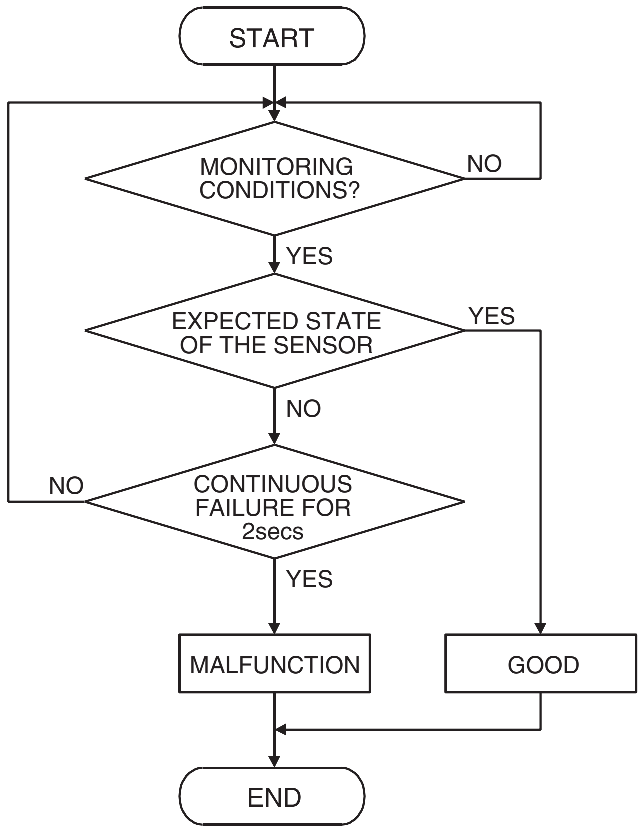
- Engine is being cranked.

Judgement Criterion

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

DTC SET CONDITIONS <Range/Performance problem –alignment>

Logic Flow Chart



AK302035

Check Condition, Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

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

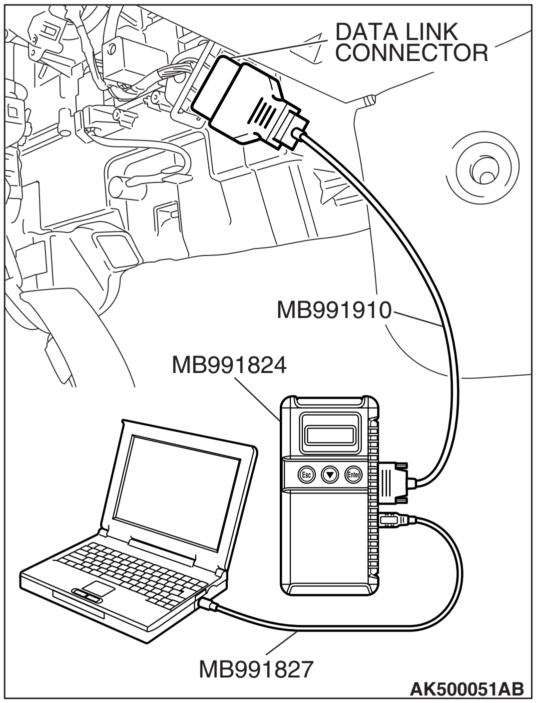
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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:

- 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 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.

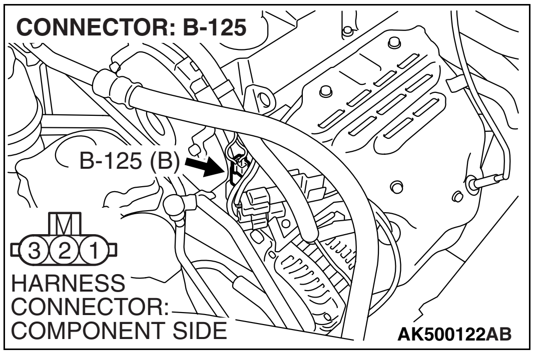
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

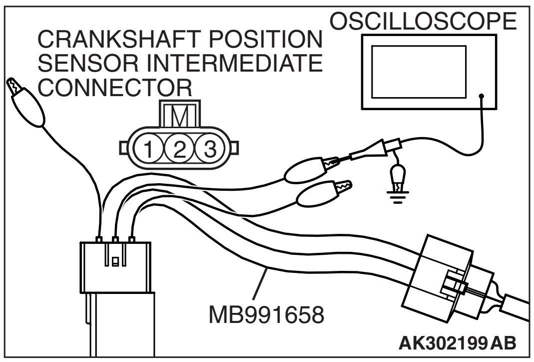
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

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



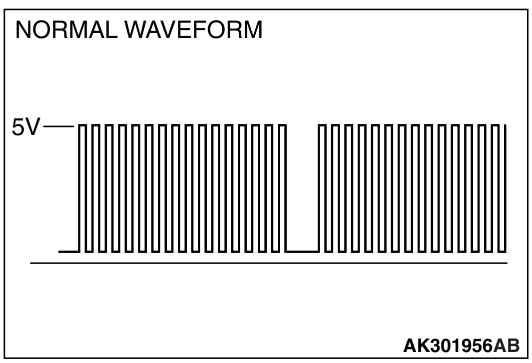
(1) Disconnect the crankshaft position sensor intermediate connector B-125 and connect the test harness special tool (MB991658) between the separated connectors.



(2) Connect the oscilloscope probe to terminal No. 2 of the crankshaft position sensor side connector.

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 the oscilloscope probe to the check harness connector terminal No. 103.

(3) Start the engine and run at idle.



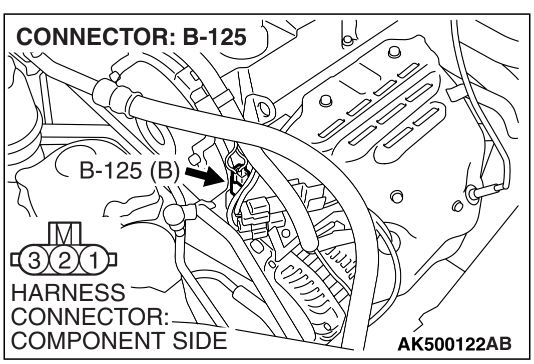
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

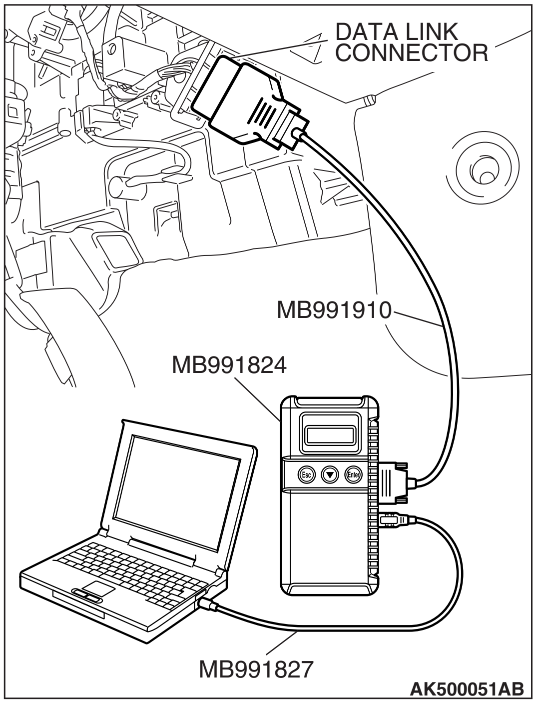
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-125 at the crankshaft position sensor intermediate connector 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 22.



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.

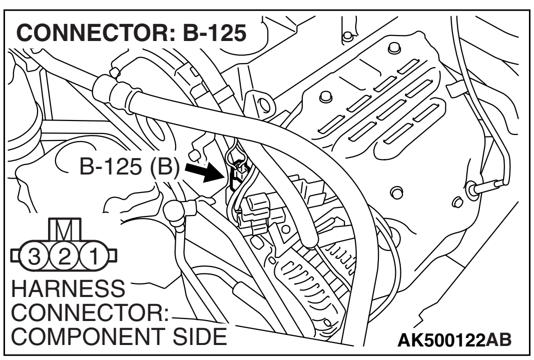
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(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 22.

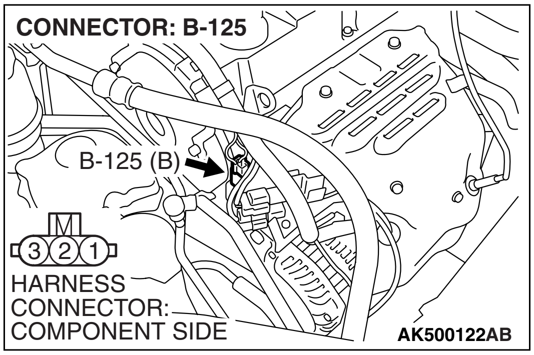


STEP 5. Check harness connector B-125 at the crankshaft position sensor intermediate connector for damage.

Q: Is the harness connector in good condition?

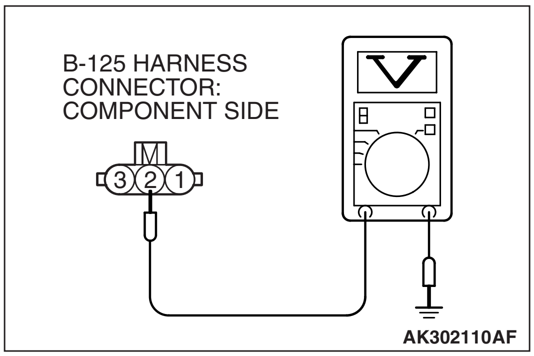
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



STEP 6. Measure the sensor supply voltage at crankshaft position sensor intermediate 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.

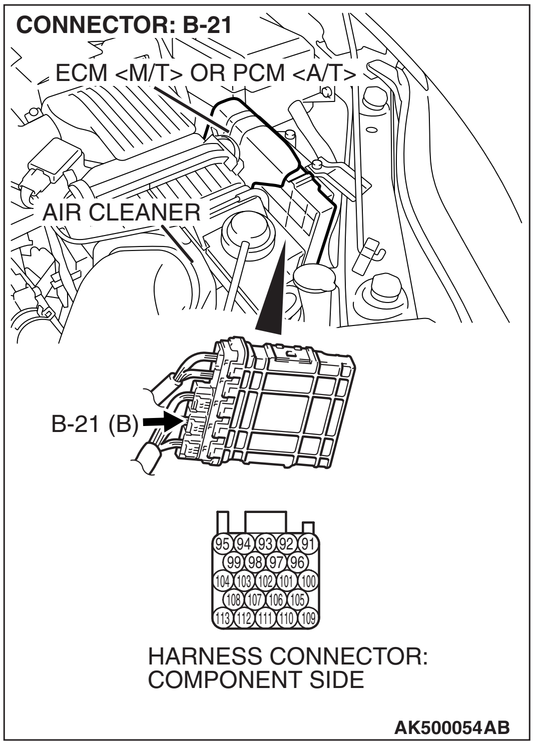
(4) Turn the ignition switch to the "LOCK" (OFF) position.

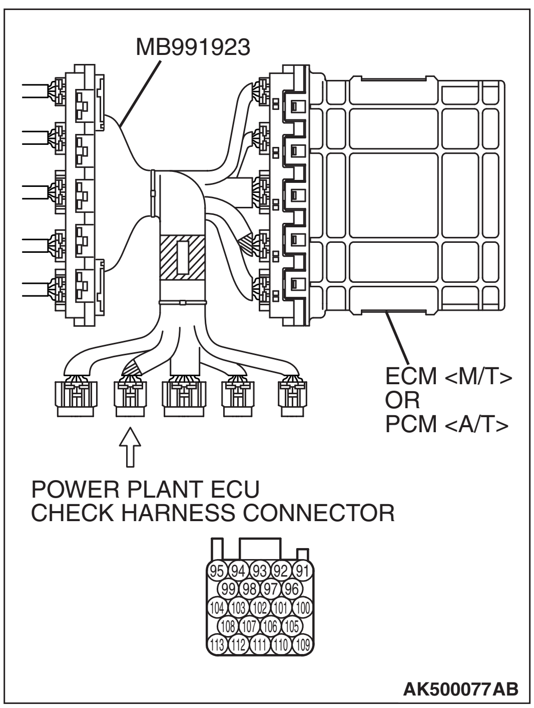
Q: Is the measured voltage between 4.9 and 5.1 volts?

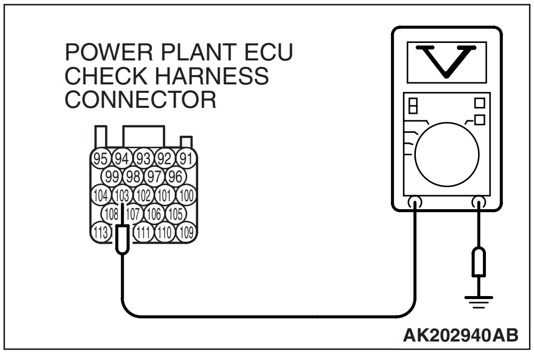
YES : Go to Step 11.
NO : Go to Step 7.

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 intermediate connector B-125.
(3) Turn the ignition switch to the "ON" position.







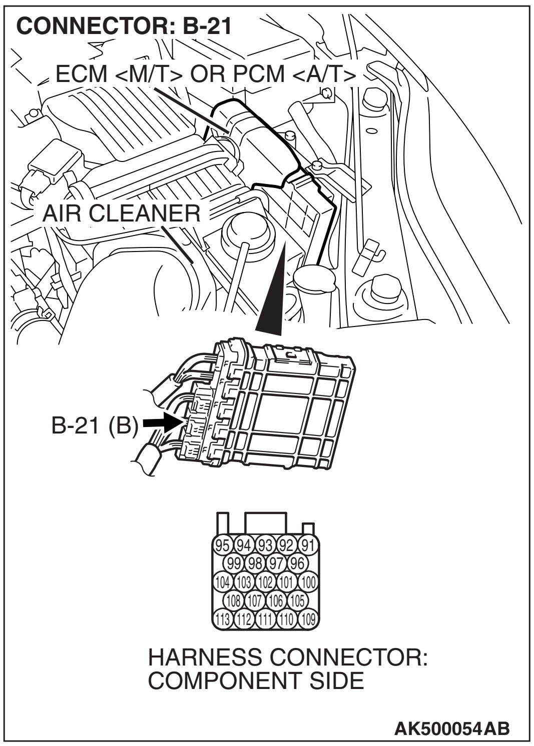
(4) Measure the voltage between terminal No. 103 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(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.

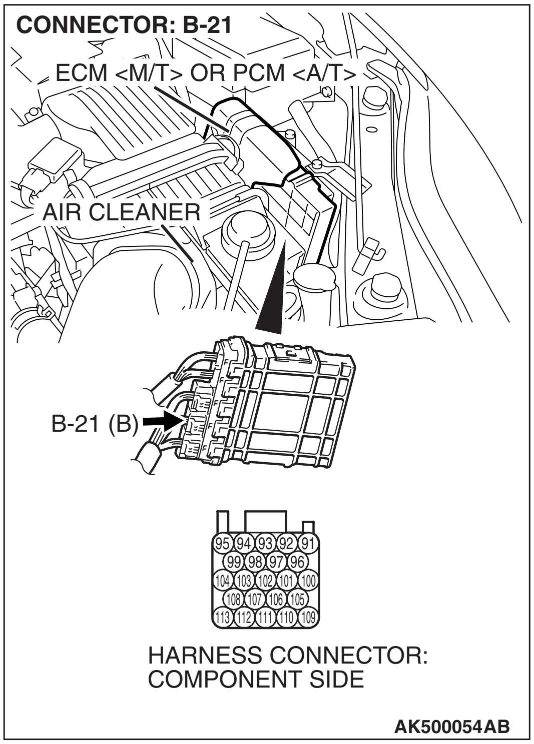
STEP 8. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.



Q: Is the harness connector in good condition?

YES : Repair harness wire between crankshaft position sensor intermediate 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 22.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

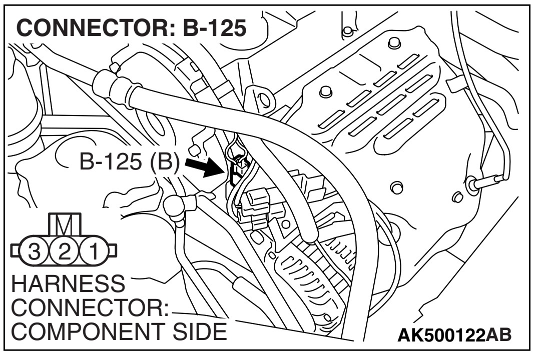


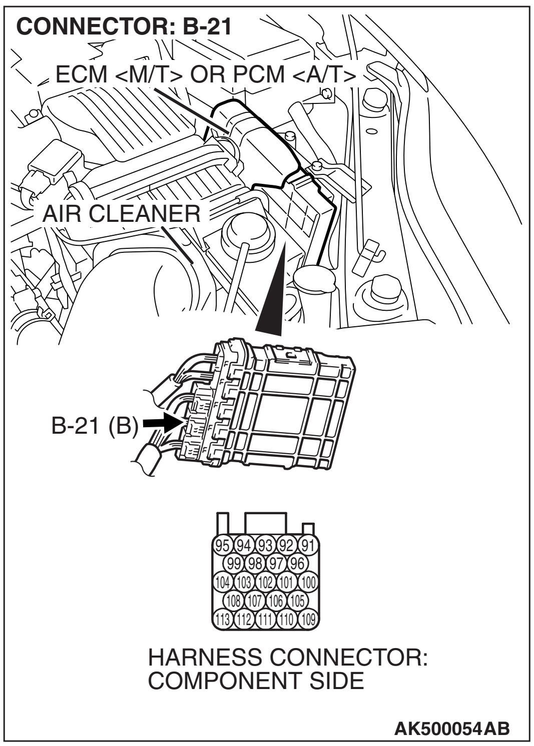
STEP 9. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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 22.





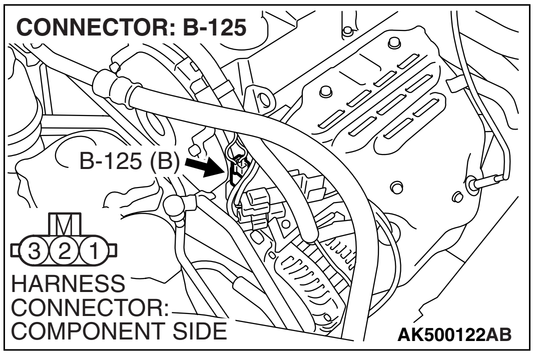
STEP 10. Check for short circuit to ground between crankshaft position sensor intermediate connector B-125 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 103).

Q: Is the harness wire in good condition?

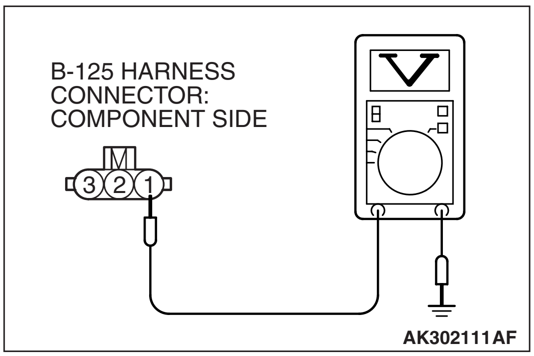
YES : Replace the ECM or the PCM.When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 22.

NO : Repair it. Then go to Step 22.

STEP 11. Measure the power supply voltage at crankshaft position sensor intermediate 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.



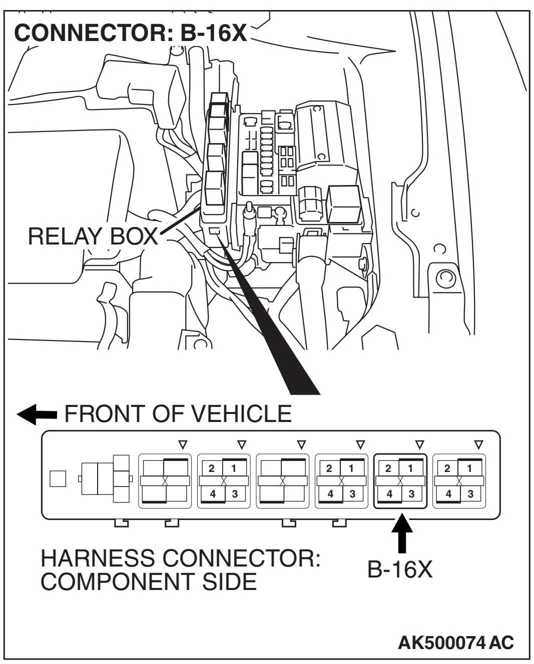
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 13.
NO : Go to Step 12.

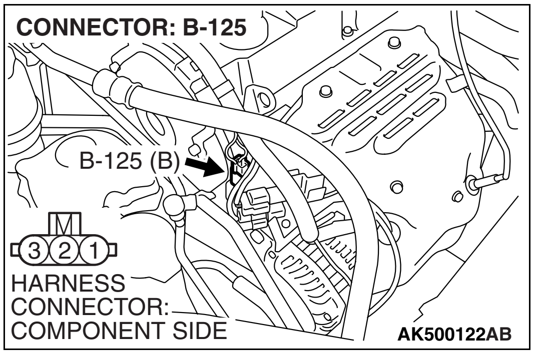
STEP 12. Check harness connector B-16X at MFI relay for damage.



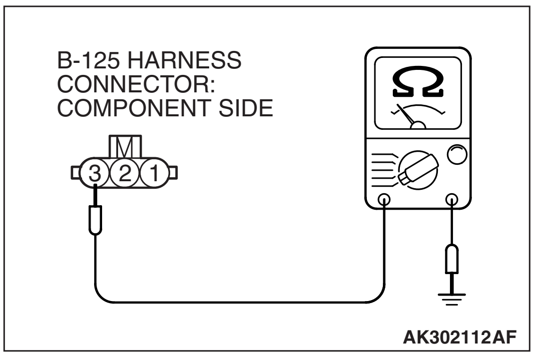
Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and crankshaft position sensor intermediate connector B-125 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 22.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

STEP 13. Check the continuity at crankshaft position sensor intermediate harness side connector B-125.



(1) Disconnect the connector B-125 and measure at the harness side.

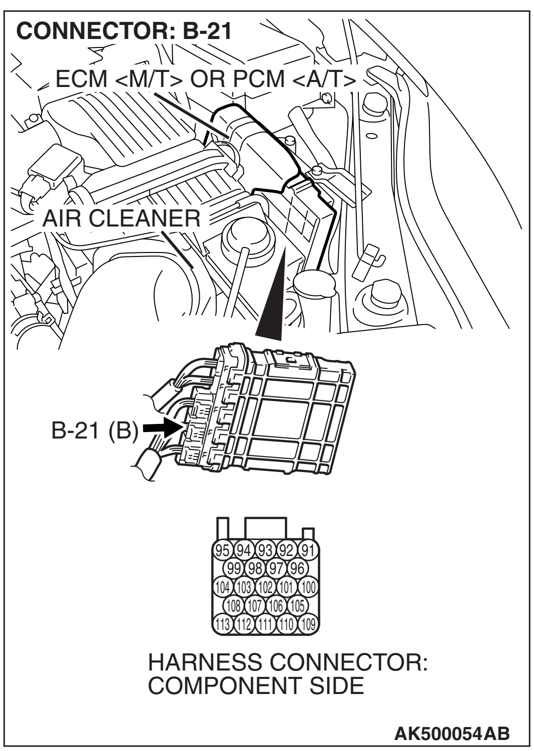


(2) Check for the continuity between terminal No. 3 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

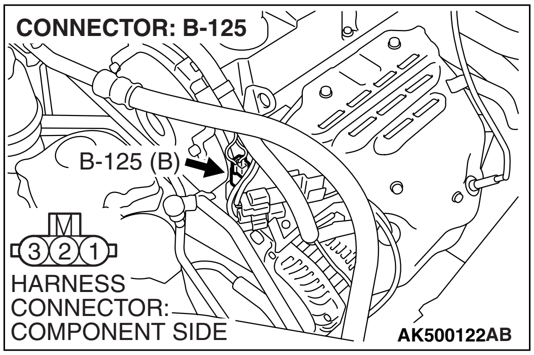
YES : Go to Step 16.
NO : Go to Step 14.

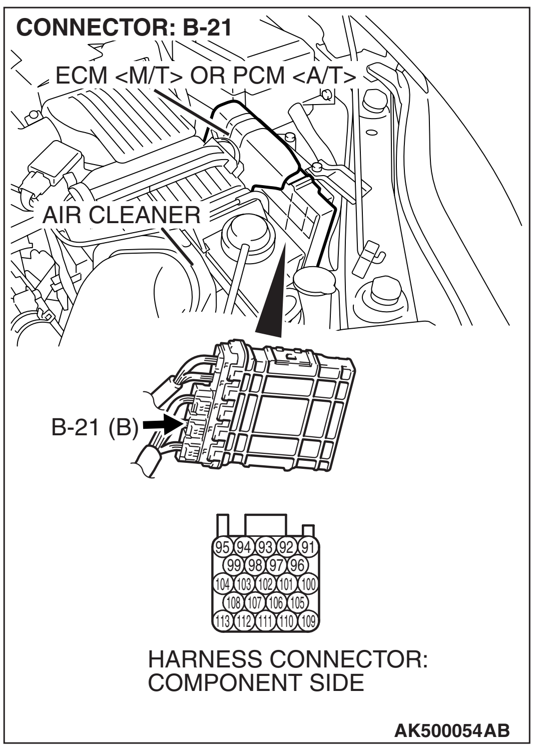
STEP 14. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.



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 22.



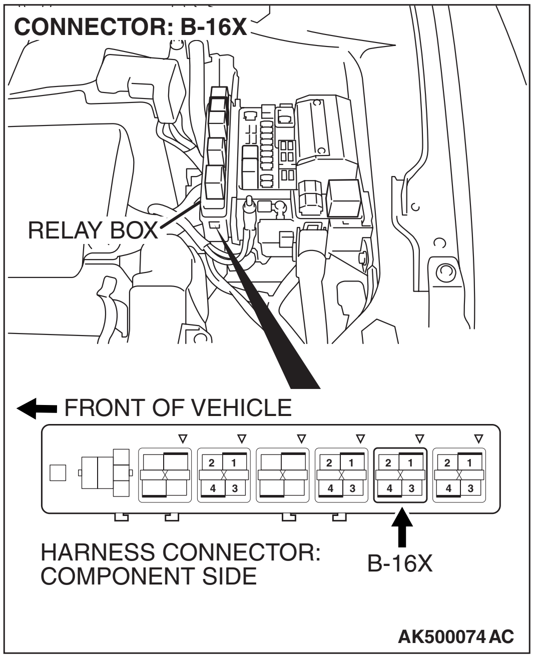


STEP 15. Check for open circuit and harness damage between crankshaft position sensor intermediate connector B-125 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 113).

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 22.

NO : Repair it. Then go to Step 22.

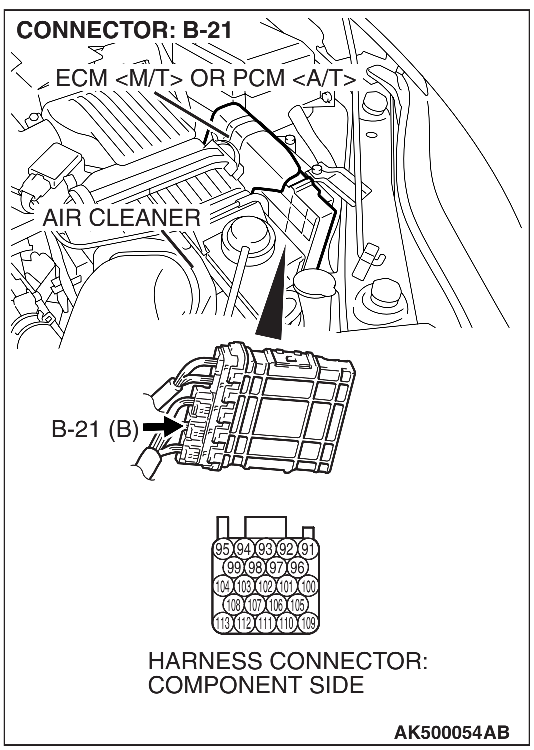


STEP 16. Check harness connector B-16X at the MFI relay for damage.

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 22.



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.

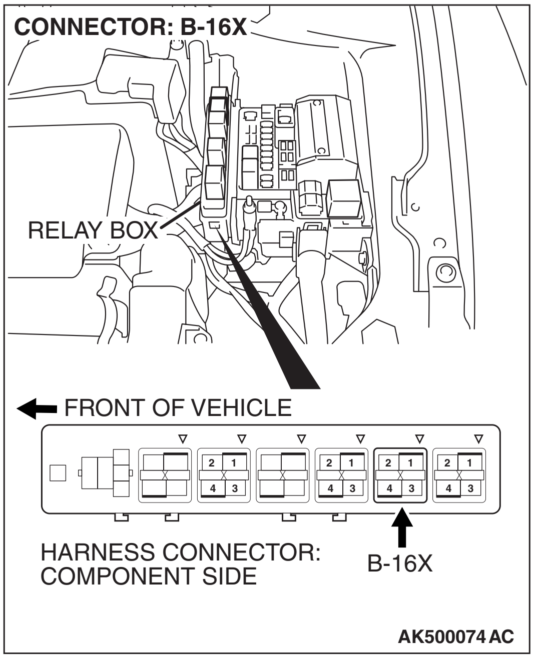
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

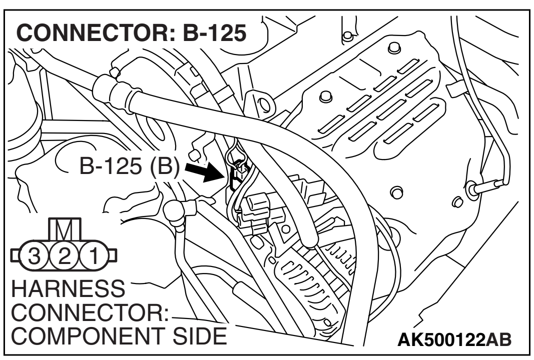
STEP 18. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and crankshaft position sensor intermediate connector B-125 (terminal No. 1).

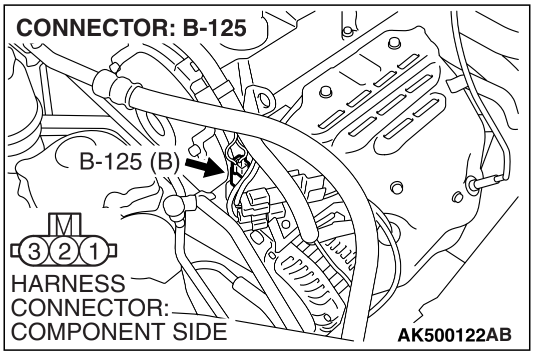
Q: Is the harness wire in good condition?

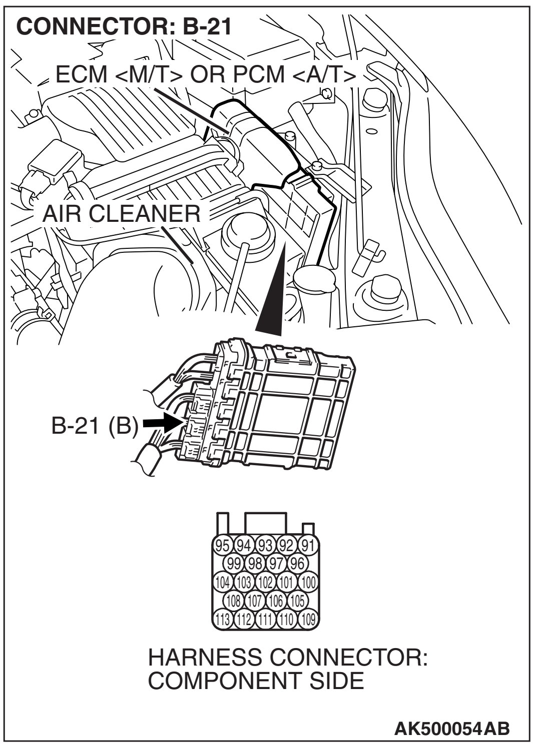
YES : Go to Step 19.

NO : Repair it. Then go to Step 22.







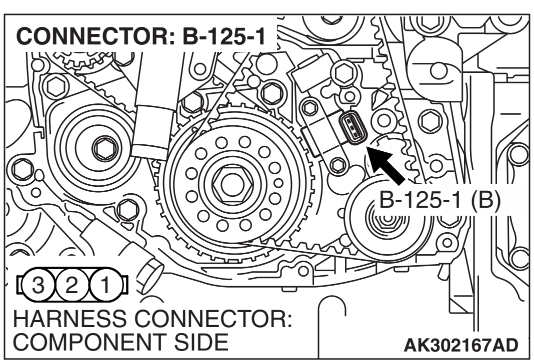


STEP 19. Check for harness damage between crankshaft position sensor intermediate connector B-125 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 103).

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 22.

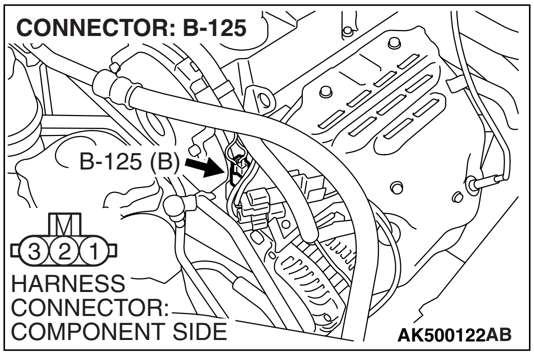


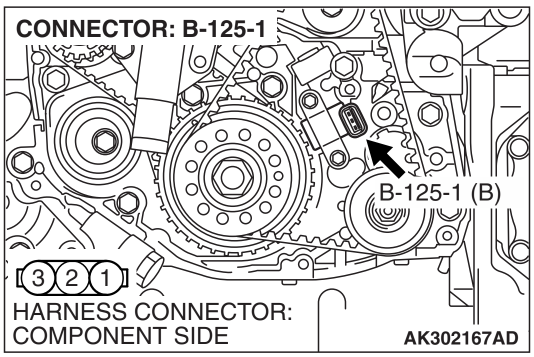
STEP 20. Check harness connector B-125-1 at crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 21. Check for open circuit and short circuit to ground and harness damage between crankshaft position sensor intermediate connector B-125 and crankshaft position sensor connector B-125-1.

Q: Is the harness wire in good condition?

YES : Replace the crankshaft position sensor. Then go to Step 22.

NO : Replace the timing belt cover (lower). Then go to Step 22.

STEP 22. 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.13A-6.

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

Q: Is DTC P0335 set?

YES : Retry the troubleshooting.

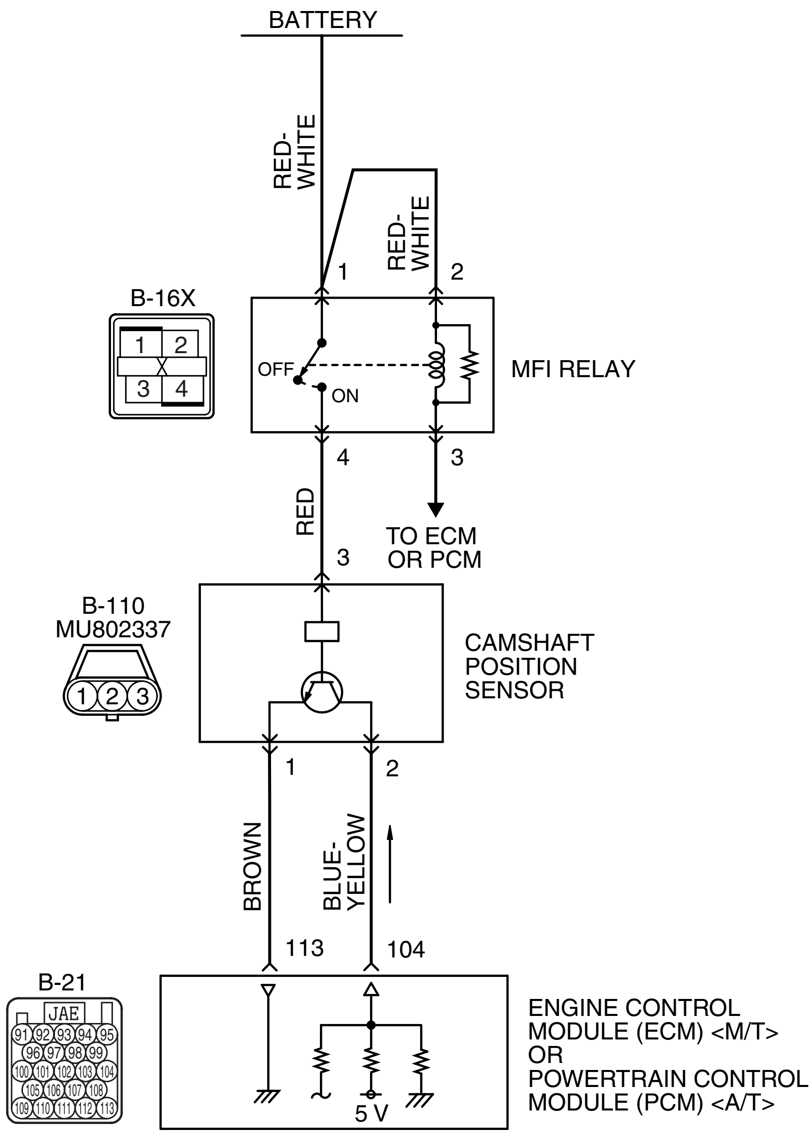
NO : The inspection is complete.

DTC P0340: Camshaft Position Sensor Circuit

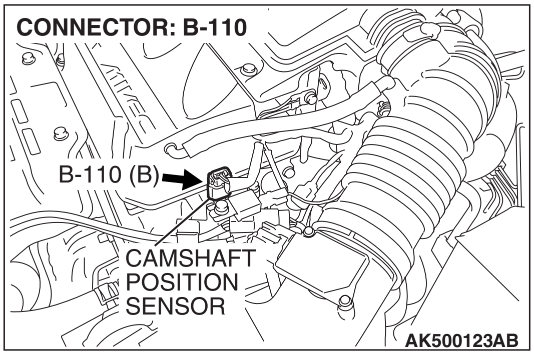
⚠ CAUTION

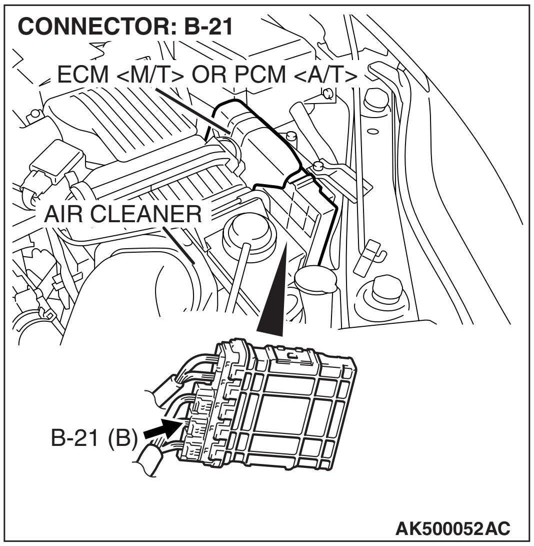
If DTC P0340 has been set, TCL related DTC U1120 is also set. After P0340 has been diagnosed, don't forget to erase DTC U1120.

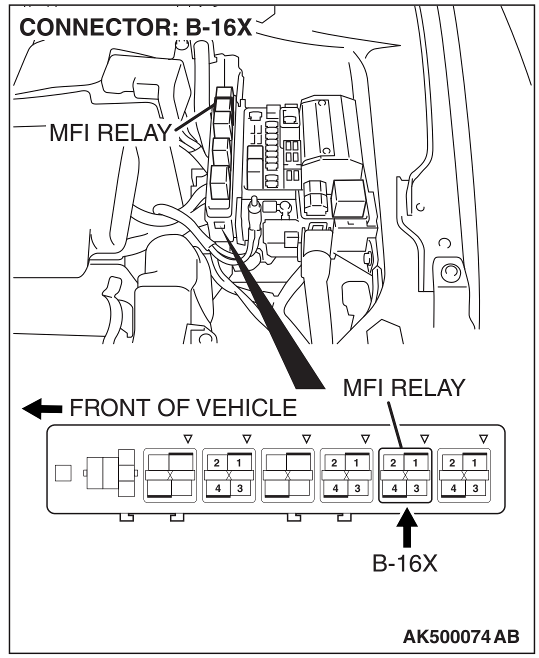
Camshaft Position Sensor Circuit



AK404196







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)

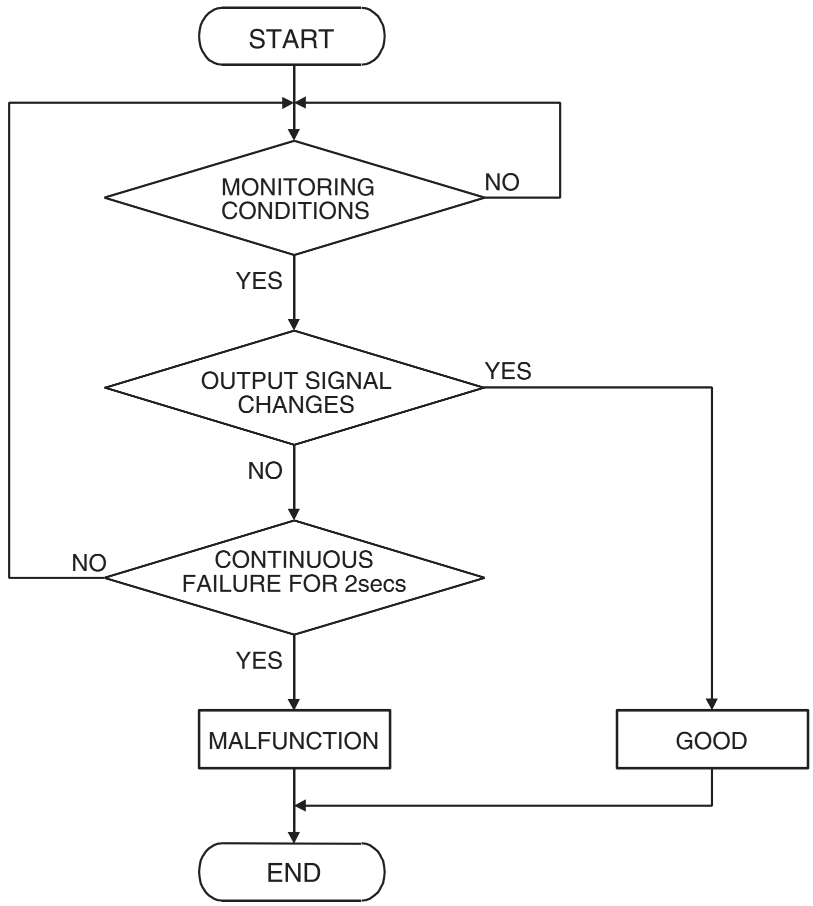
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK302034

Check Condition

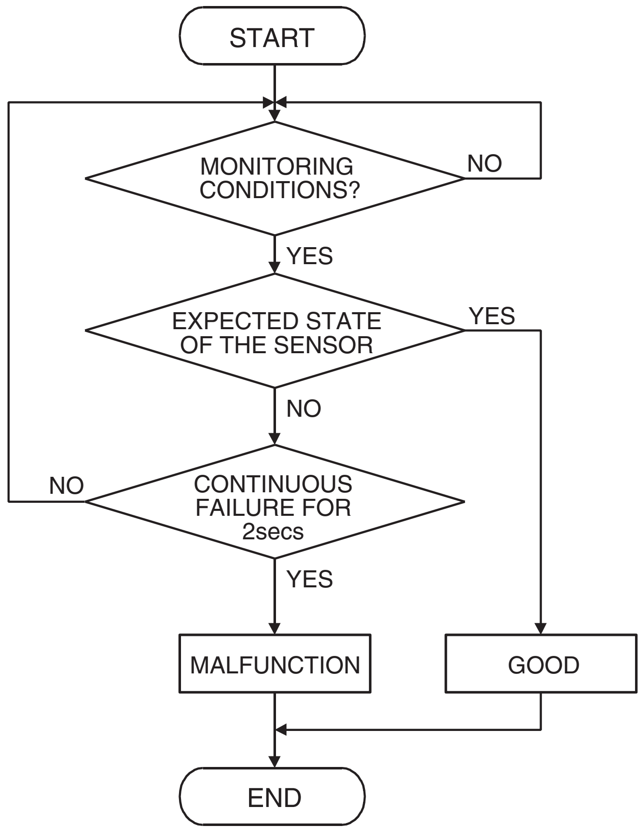
- Engine speed is higher than 50 r/min.

Judgement Criterion

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

DTC SET CONDITIONS <Range/Performance problem –alignment>

Logic Flow Chart



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.

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>

OBD-II DRIVE CYCLE PATTERN

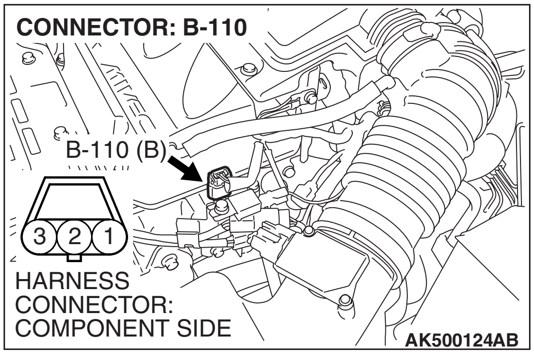
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-6.

DIAGNOSIS

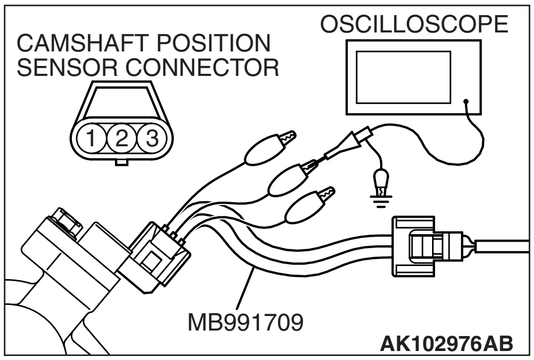
Required Special Tools:

- MB991709: Test Harness
- MB991923: Power Plant ECU Check Harness

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



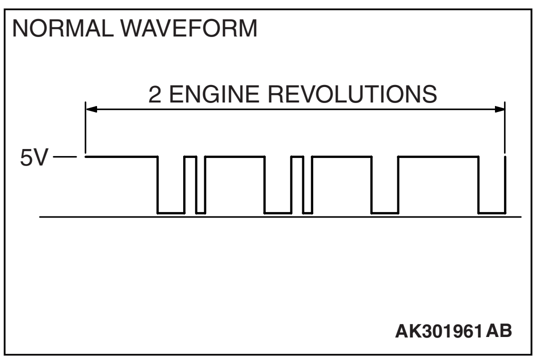
(1) Disconnect the camshaft position sensor connector B-110, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)



(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 connect the oscilloscope probe to the check harness connector terminal No. 104.

(3) Start the engine and run at idle.



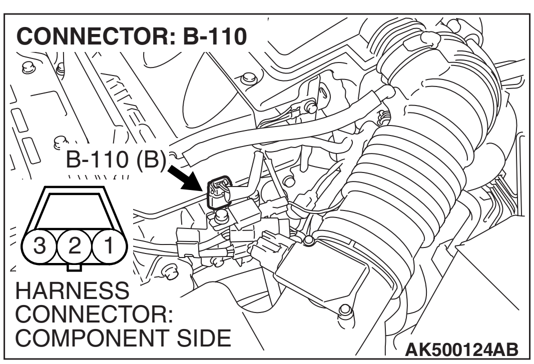
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

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

Q: Is the waveform normal?

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

STEP 2. Check harness connector B-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.

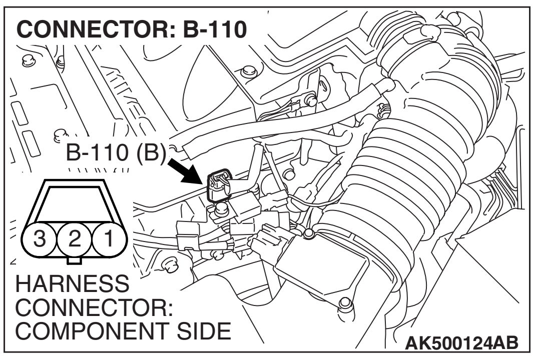
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-6.

(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.

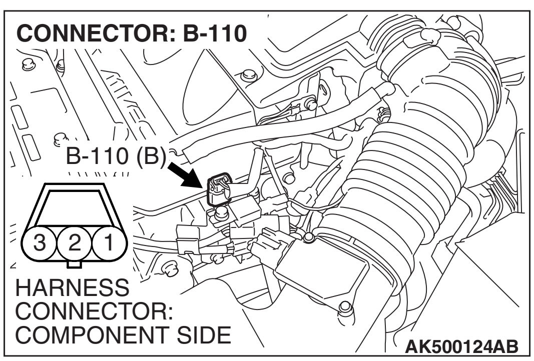


STEP 4. Check harness connector B-110 at camshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

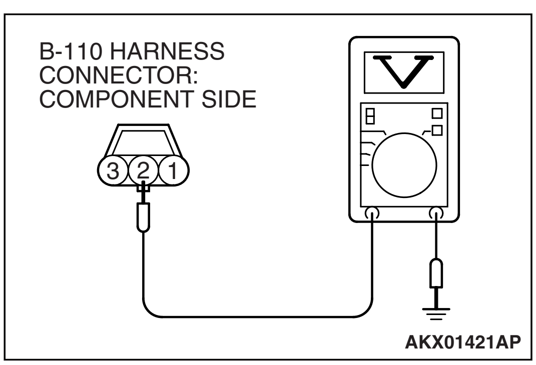
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



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.

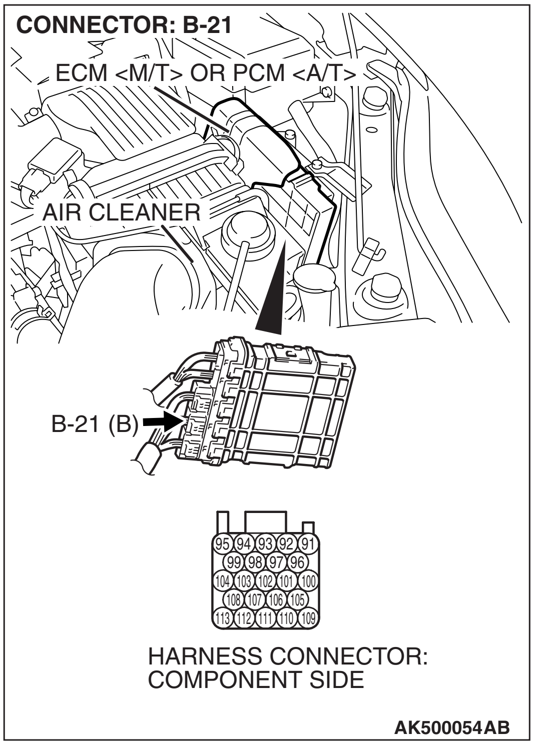
- Voltage should be between 4.9 and 5.1 volts.

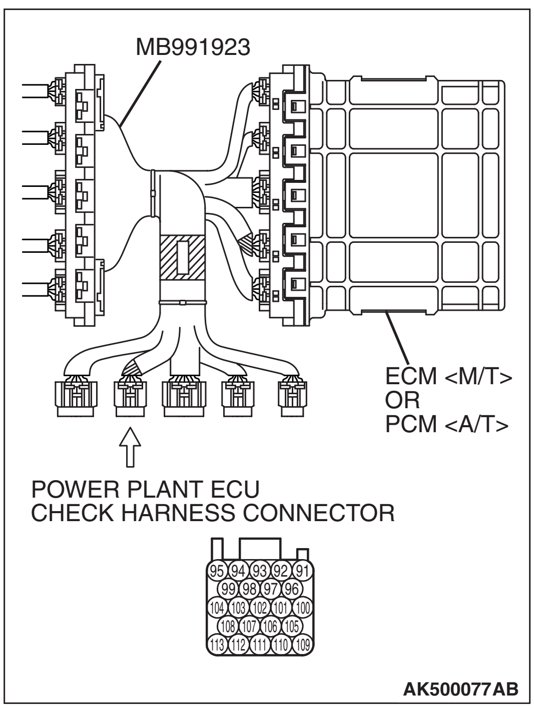
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 10.

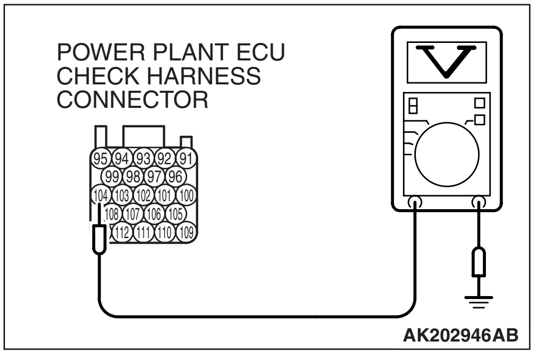
NO : Go to Step 6.





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 the 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.

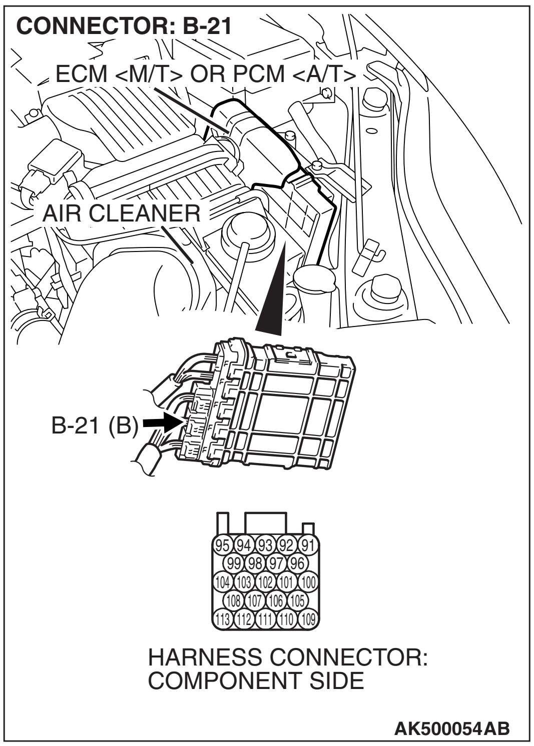
Q: Is the measured voltage between 4.9 and 5.1 volts?

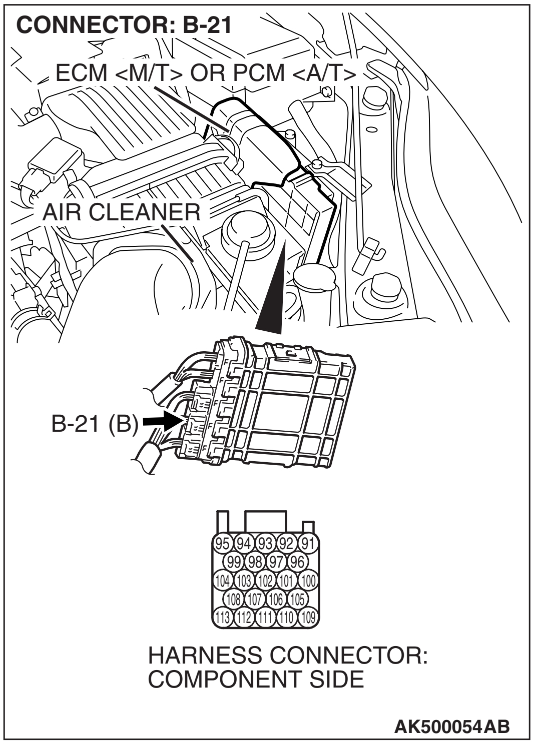
YES : Go to Step 7.
NO : Go to Step 8.

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.



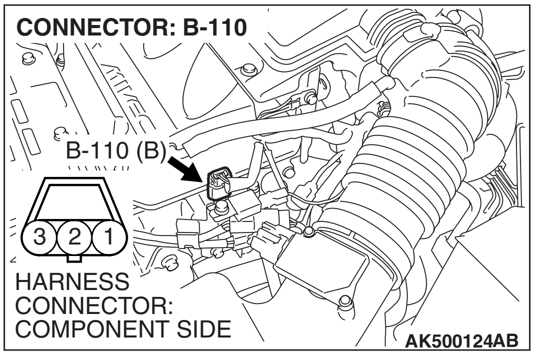


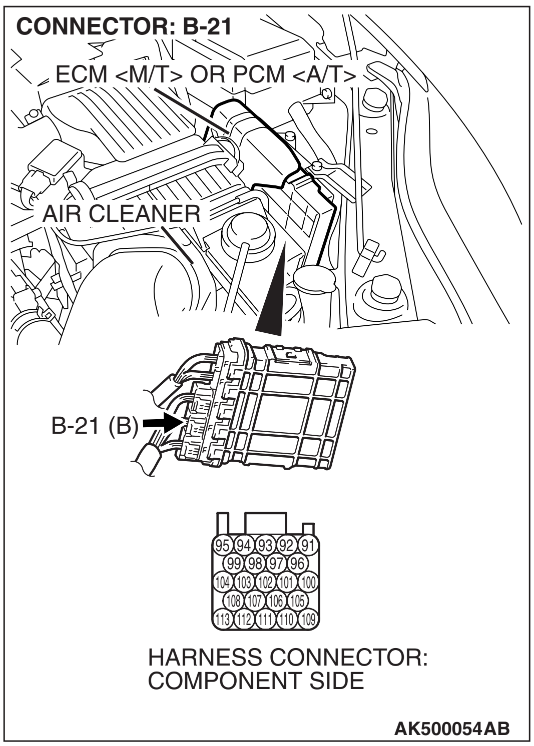
STEP 8. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.





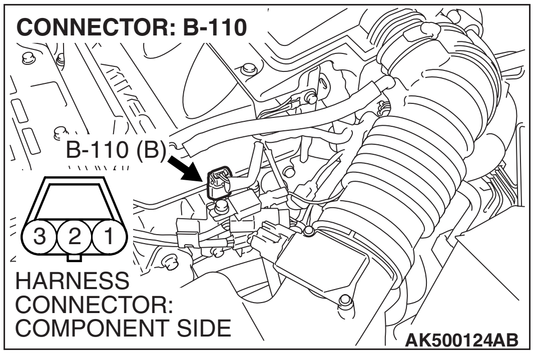
STEP 9. Check for short circuit to ground between camshaft position sensor connector B-110 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 104).

Q: Is the harness wire in good condition?

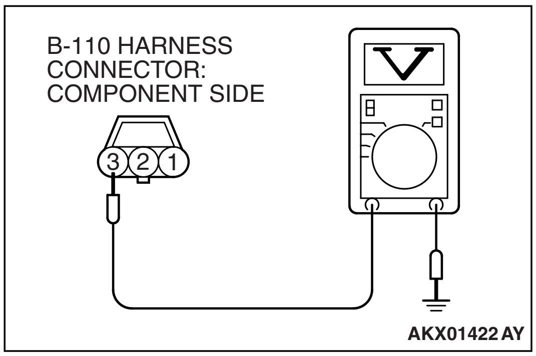
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 20.

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.



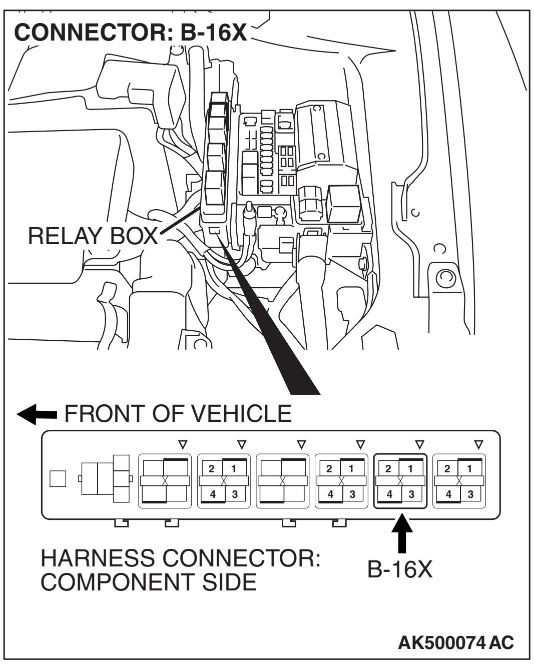
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be battery positive voltage.

(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.

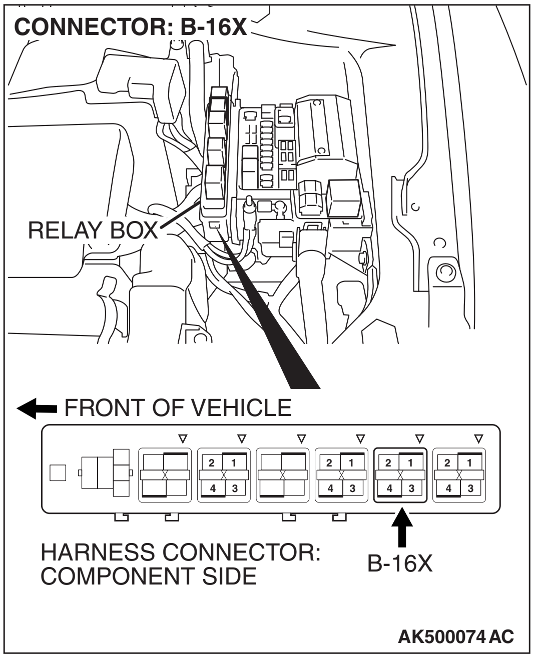


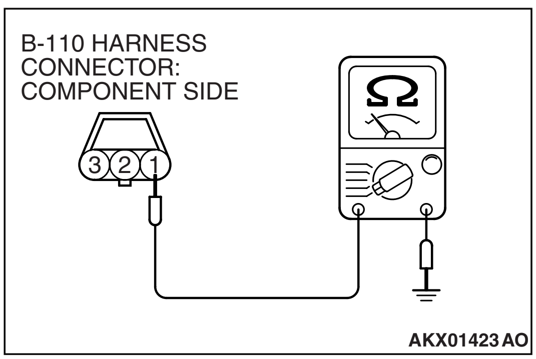
Q: Is the harness connector in good condition?

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.

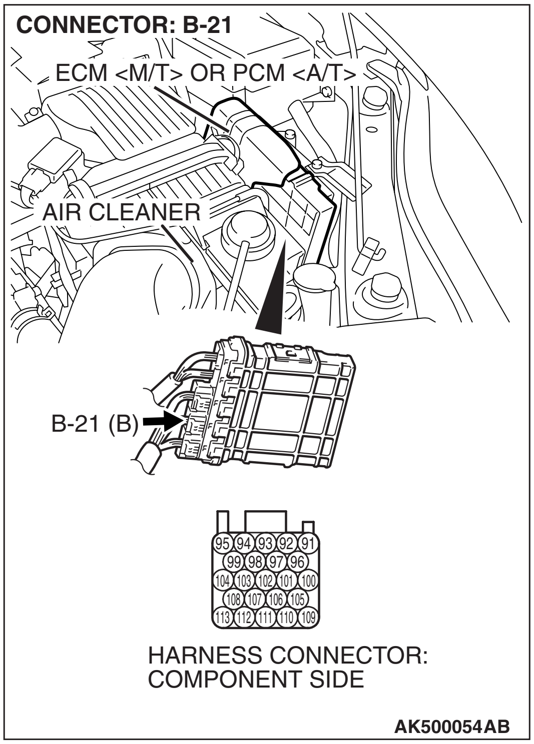




(2) Check for the continuity between terminal No. 1 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

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

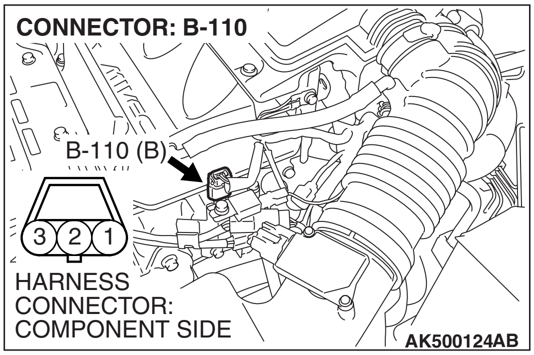


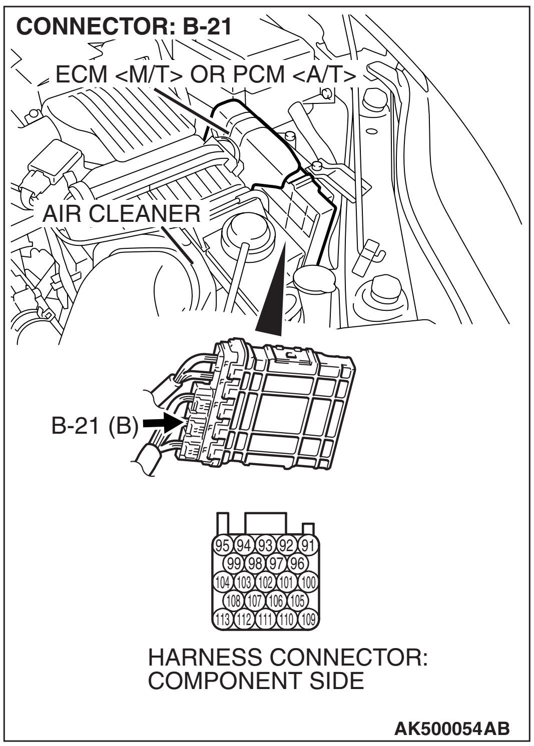
STEP 13. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.



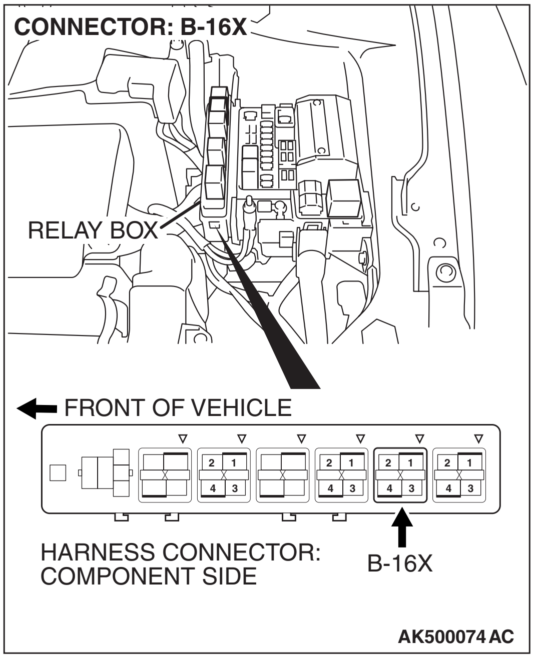


STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-110 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-21 (terminal No. 113).

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.

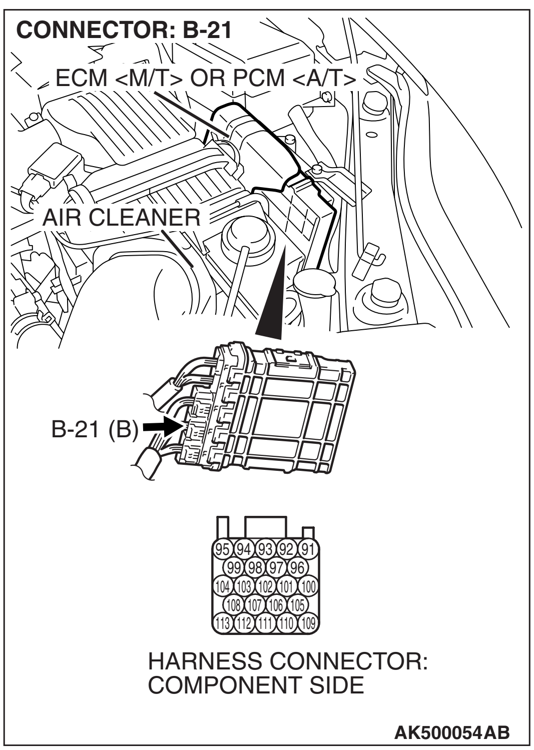


STEP 15. Check harness connector B-16X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.

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

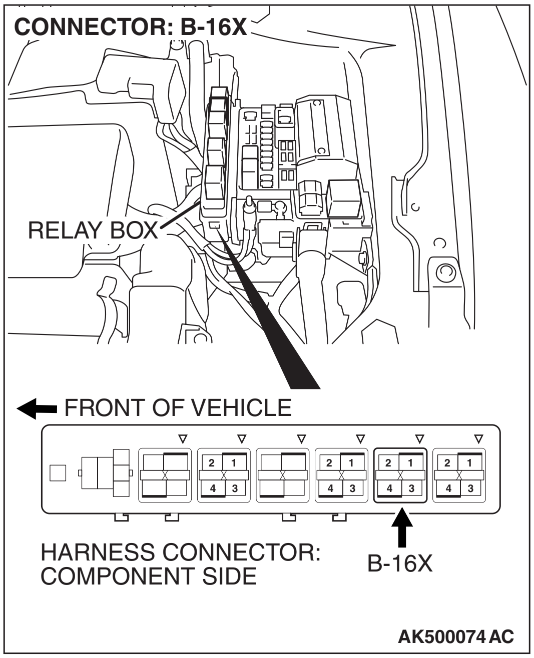


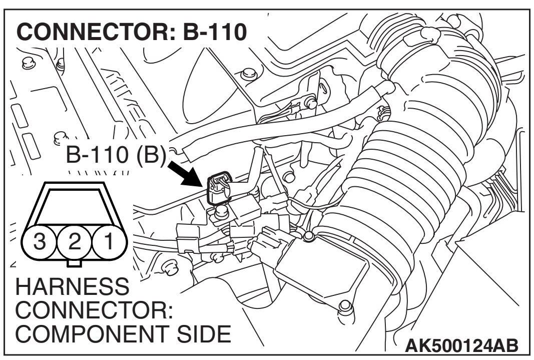
STEP 16. Check harness connector B-21 at ECM <M/T> or PCM <A/T> for damage.

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.



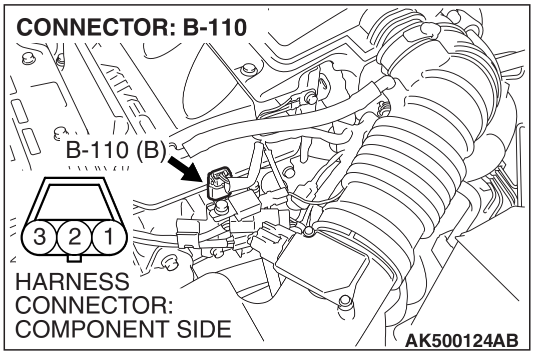


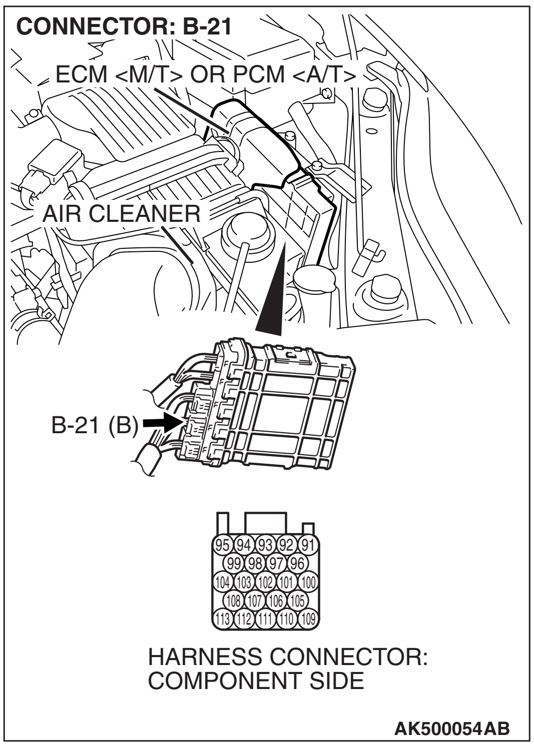
STEP 17. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and camshaft position sensor connector B-110 (terminal No. 3).

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.13A-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)

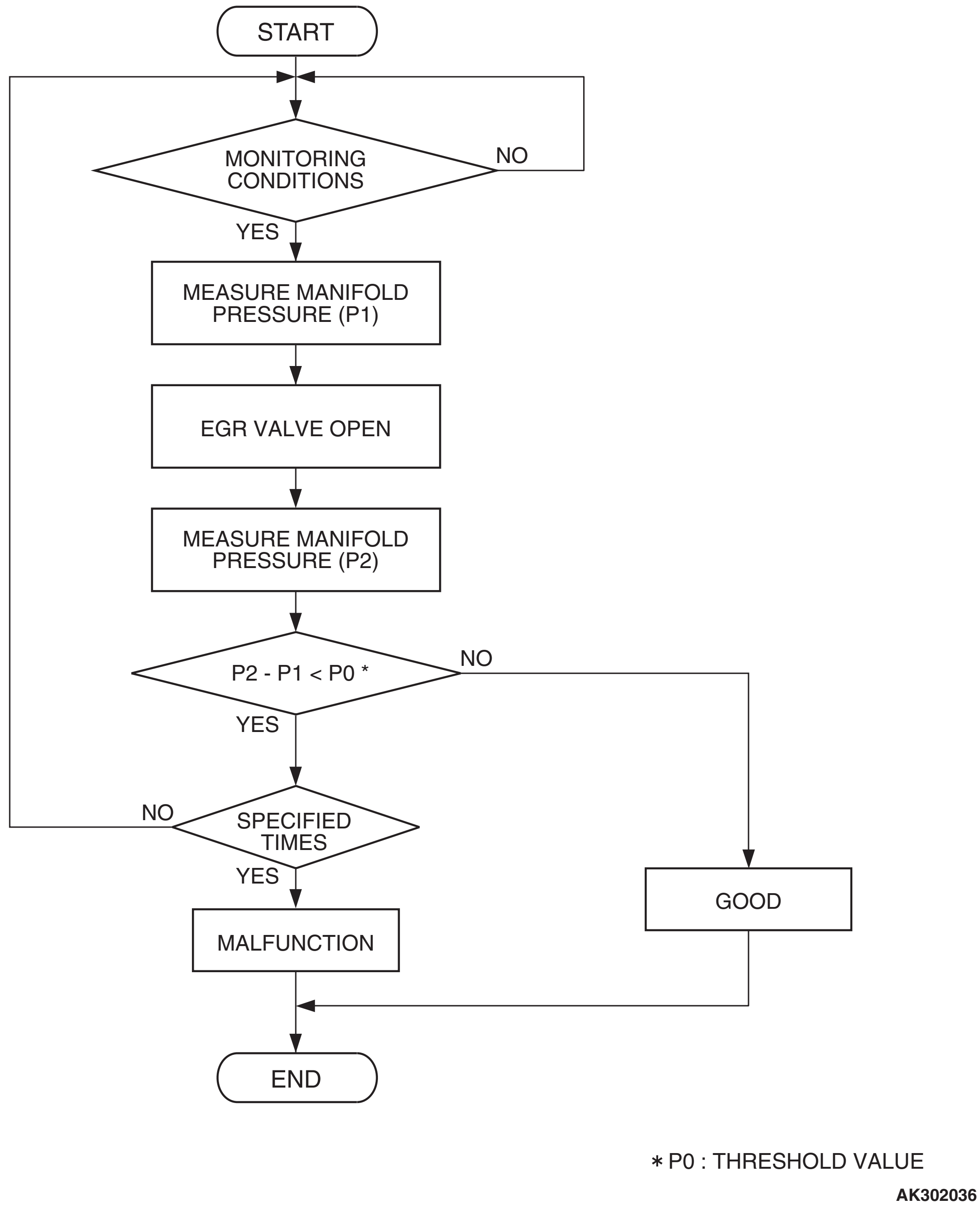
- EGR stepper motor monitor

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
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76° C (169° F).
- Engine speed is at between 1,100 and 1,750 r/min.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Vehicle speed is 20 km/h (32 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- Accelerator pedal is closed.
- Volumetric efficiency is lower than 23.8 percent.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 3 cycles of 2.0 seconds each during the drive cycle.

Judgement Criterion

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.0 kPa (0.59 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13A-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:

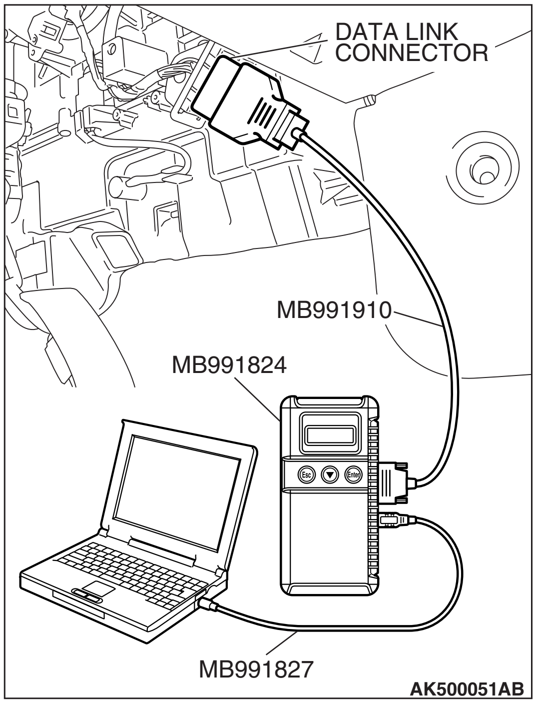
- MB991958: Scan Tool (MUT-III Sub Assembly)
    - MB991824: V.C.I.
    - MB991827: USB Cable
    - MB991910: Main Harness A

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.13A-158, DTC P0107 –Manifold Absolute Pressure Sensor Circuit Low Input P.13A-172, DTC P0108 –Manifold Absolute Pressure Sensor Circuit High Input P.13A-184.

STEP 3. Test the OBD-II drive cycle.

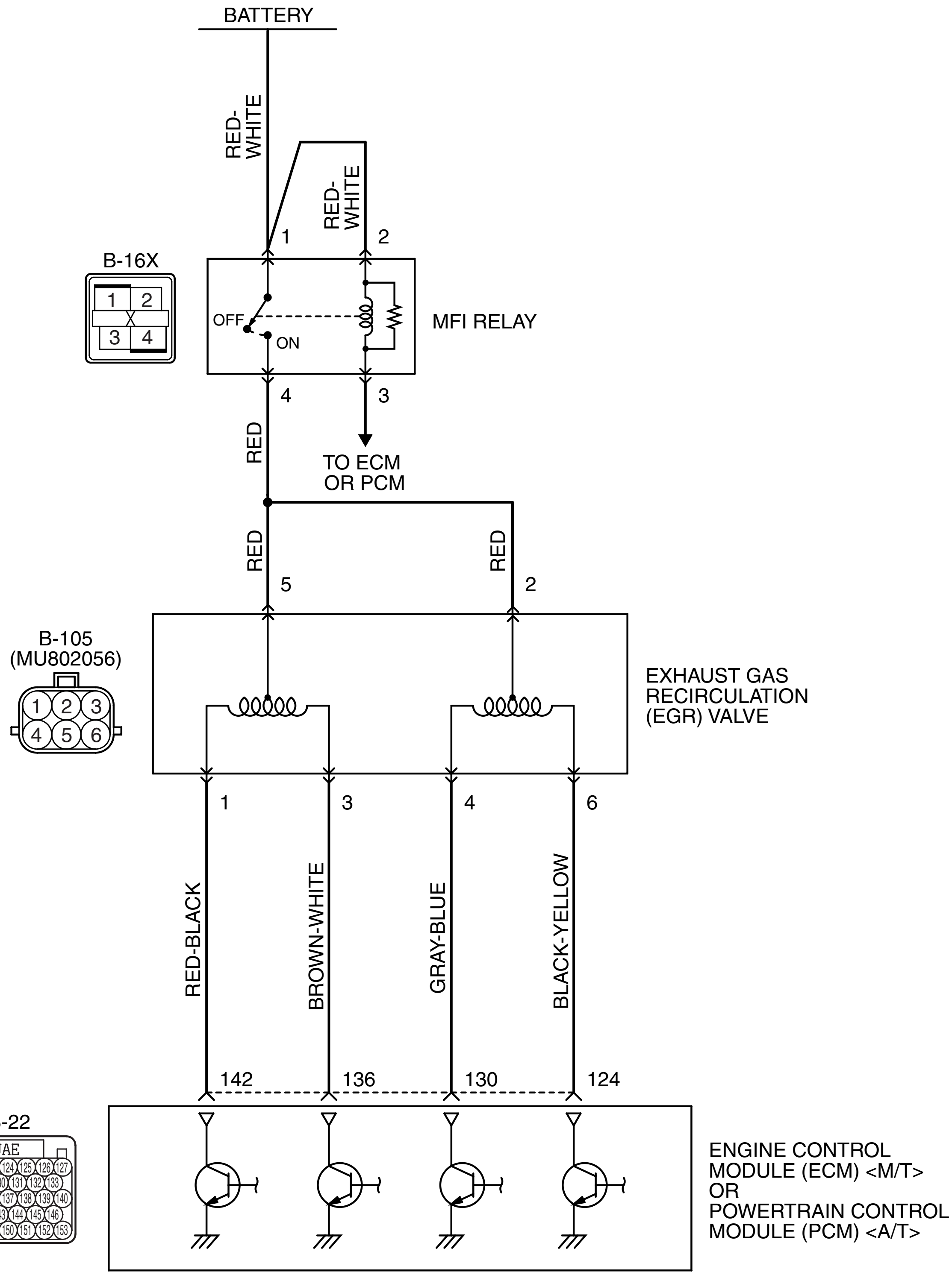
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 3 P.13A-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0401 set?

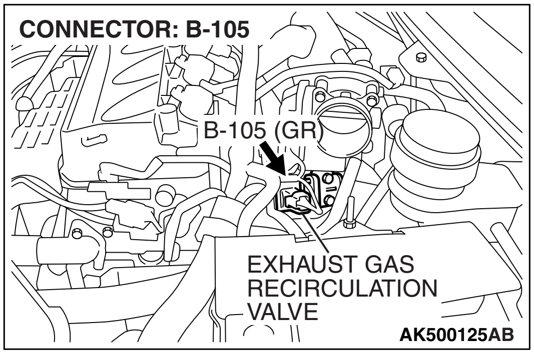
YES : Retry the troubleshooting.
NO : The inspection is complete.

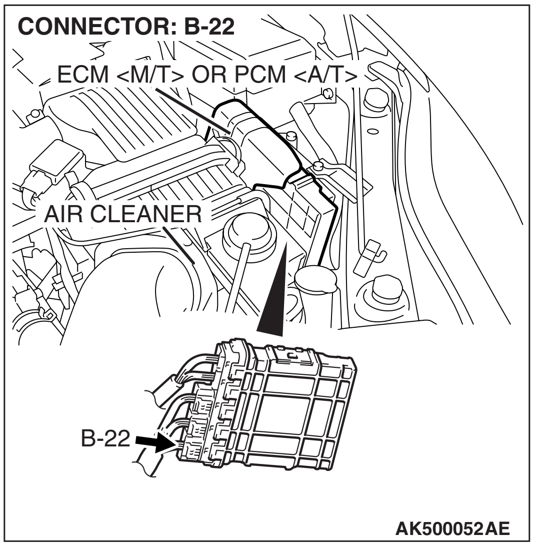
DTC P0403: Exhaust Gas Reculation Control Circuit

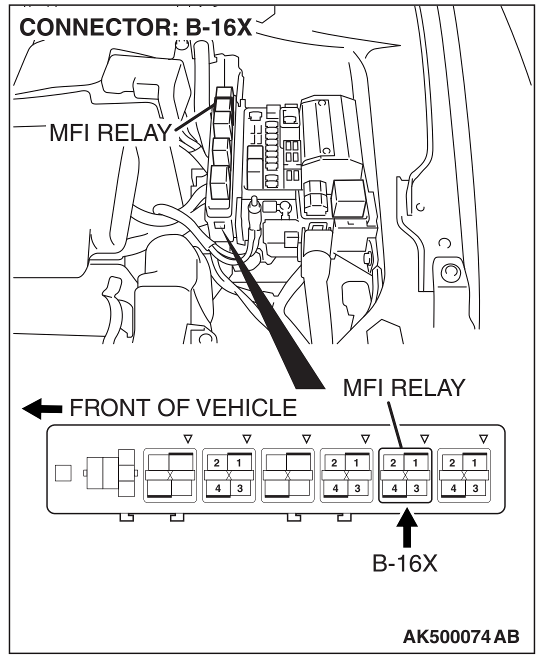
EGR Valve Circuit



AK403691







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)

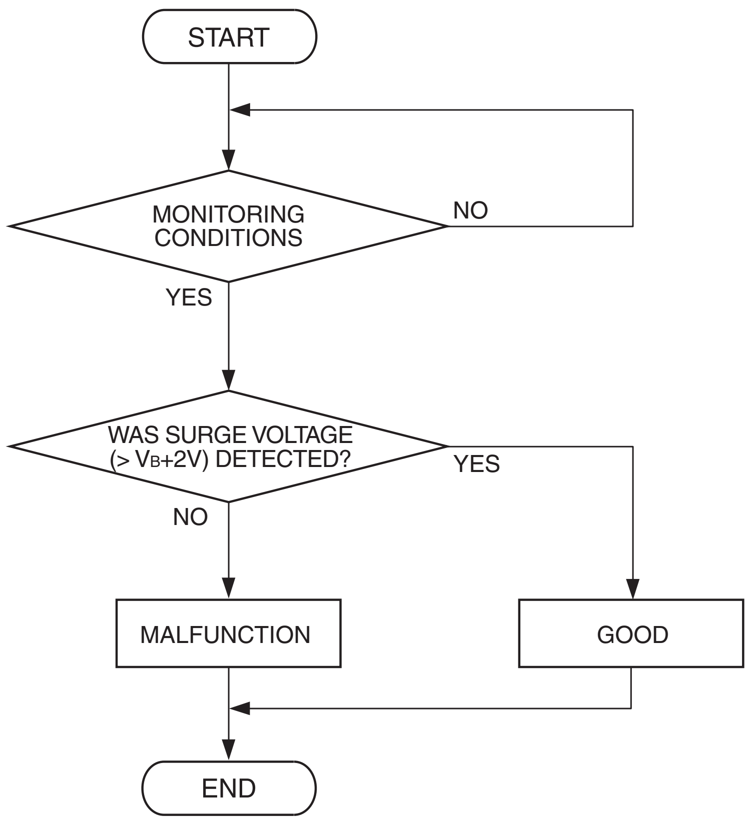
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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 being 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.13A-6.

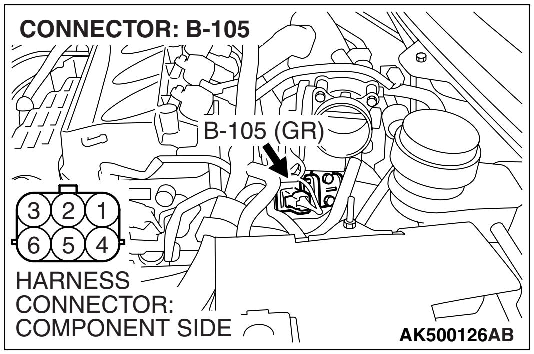
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.

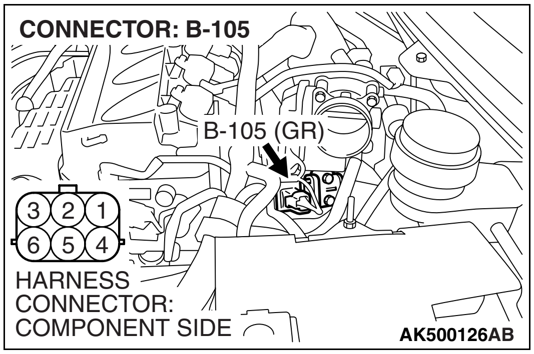
Q: Is the harness connector in good condition?

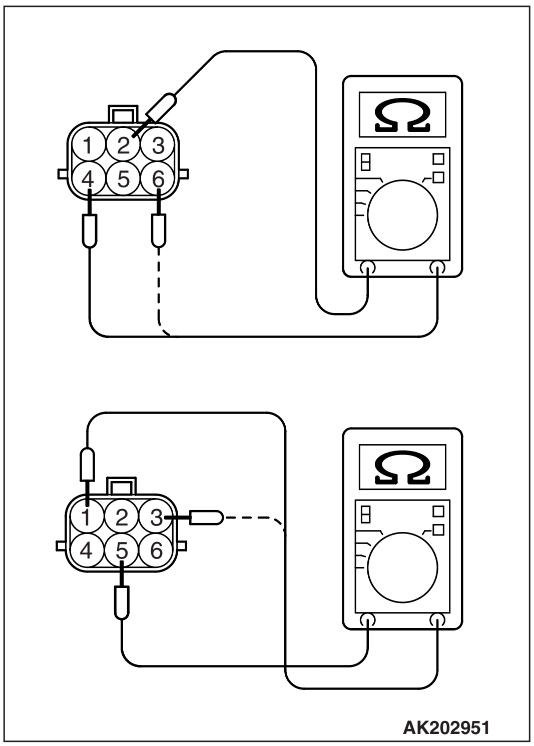
YES : Go to Step 2.

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.

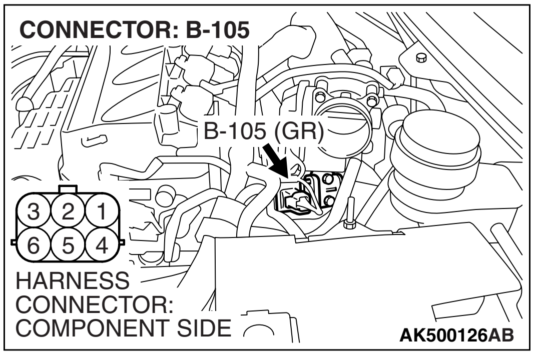
Standard value: 20 – 24 ohms [at 20° C (68° F)]

(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)]

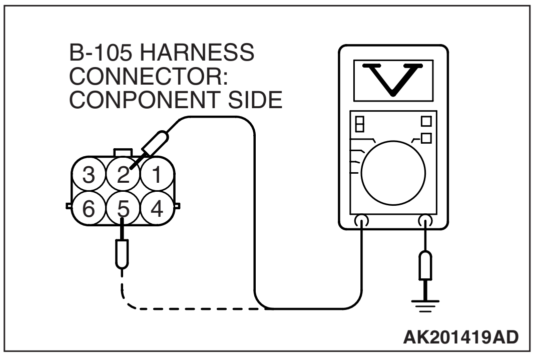
Q: Is the measured resistance between 20 and 24 ohms [at 20° C (68° F)]?

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 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.

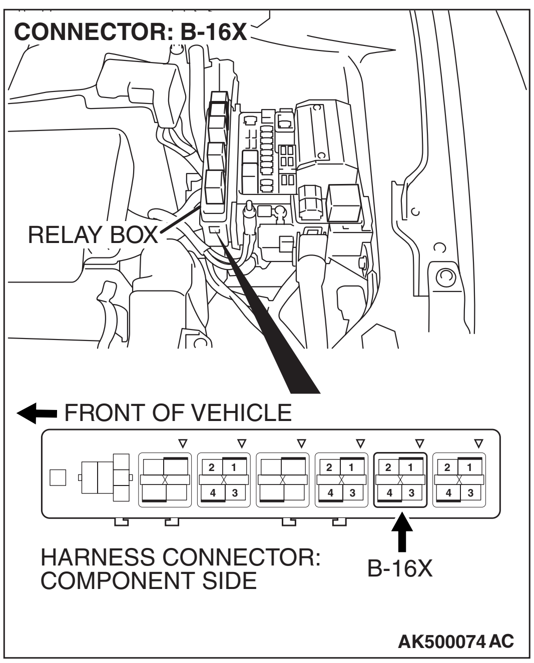


(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

(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.



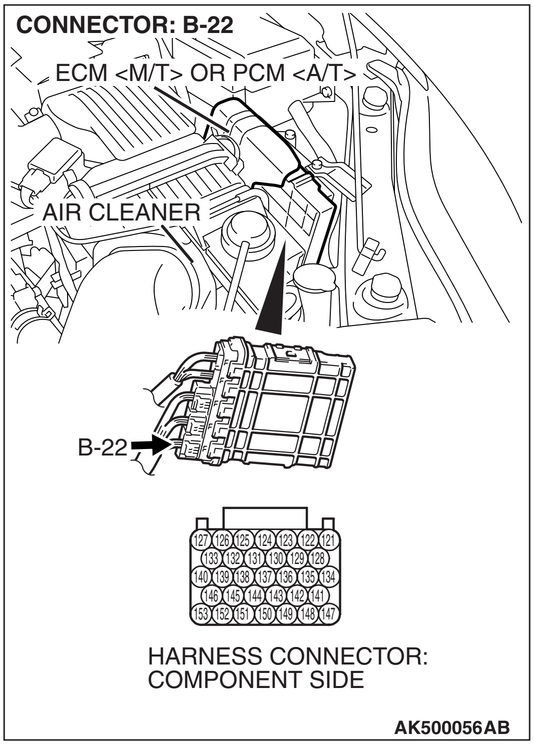
STEP 4. Check harness connector B-16X at MFI relay for damage.

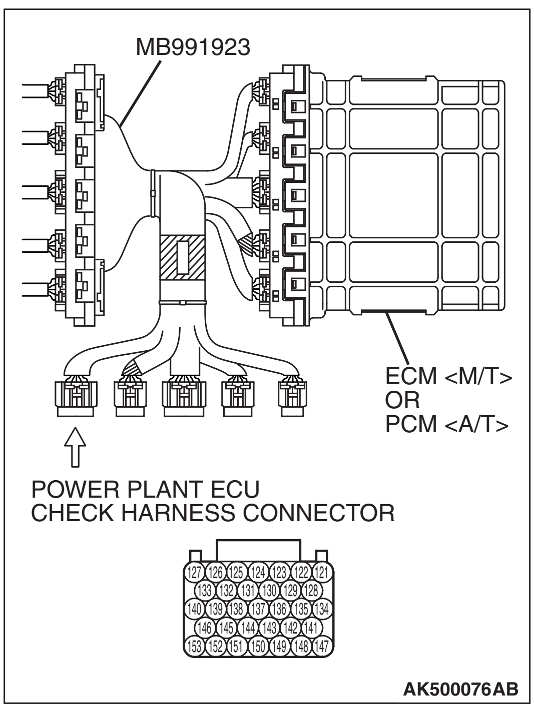
Q: Is the harness connector in good condition?

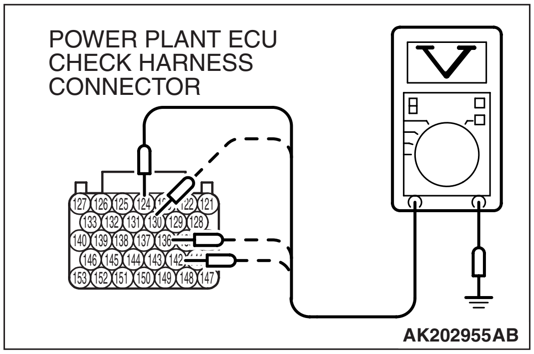
YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 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.





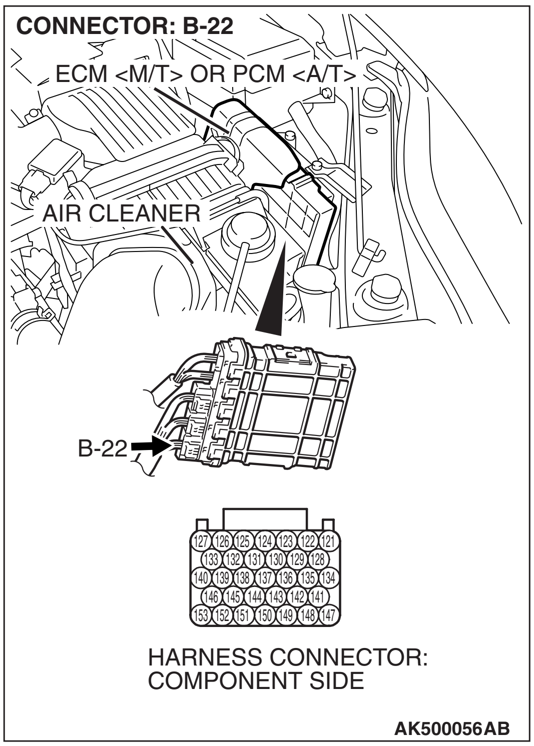


(2) Measure the voltage between terminal (No. 124, No. 130, No. 136, No. 142) and ground.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

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

Q: Is the voltage normal?

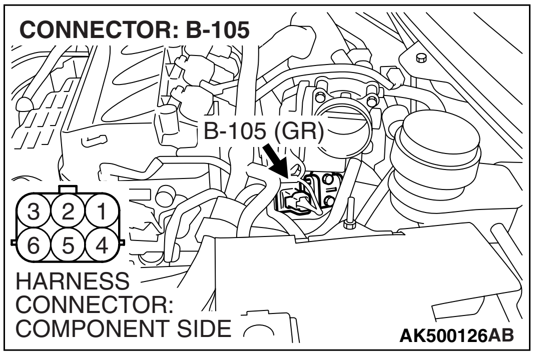
YES : Go to Step 8.
NO : Go to Step 6.

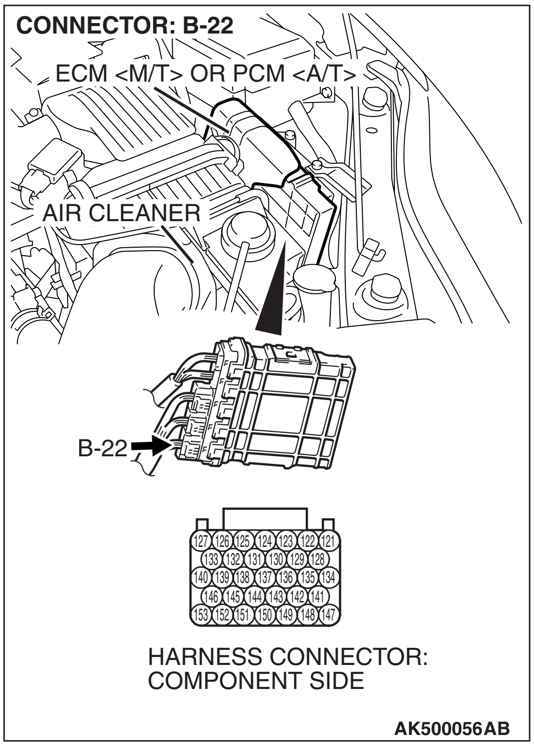


STEP 6. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

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.





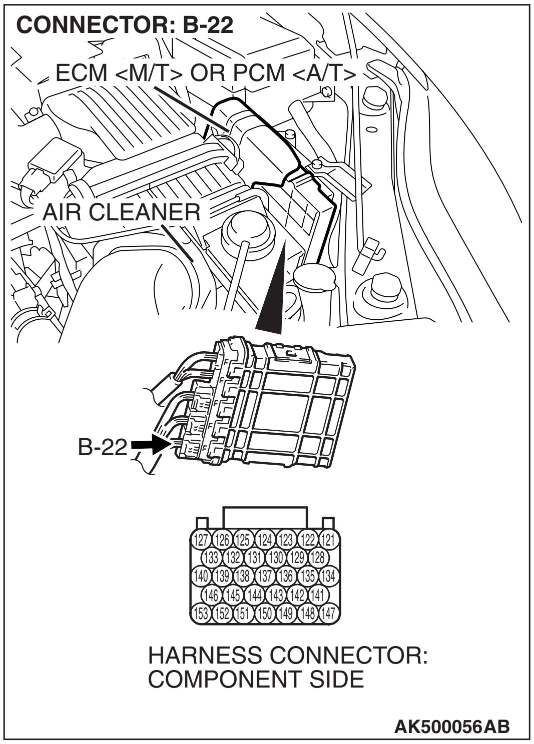
STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-105 and ECM <M/T> or PCM <A/T> connector B-22.

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.

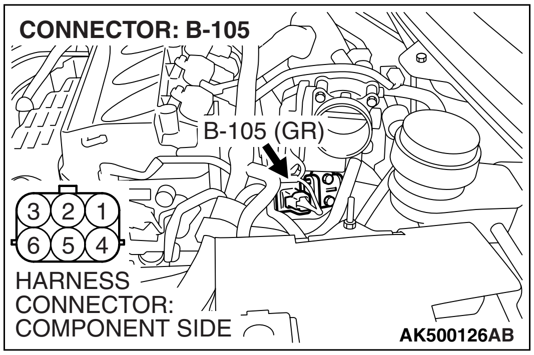
Q: Is the harness connector in good condition?

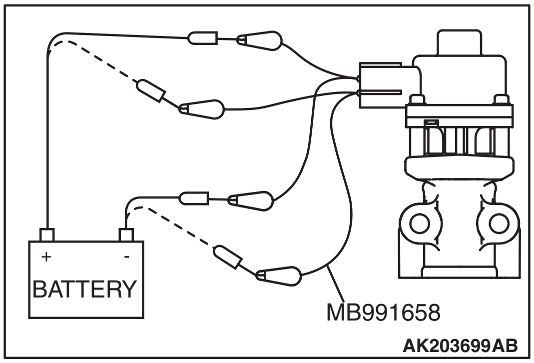
YES : Go to Step 9.

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.

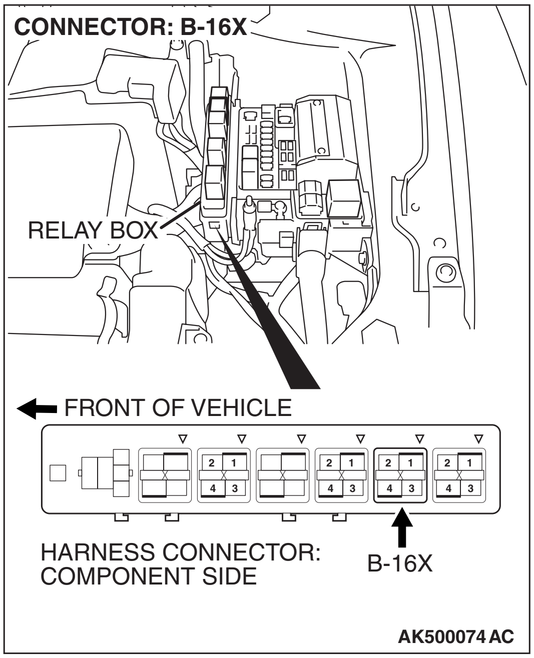
(6) Check to ensure that the motor operates when terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

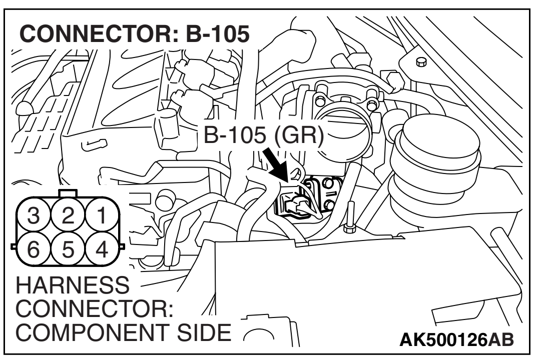
(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque: 24 ± 3 N· m [17 ± 3 ft· lb]

Q: Is the EGR valve operating properly?

YES : Go to Step 10.
NO : Replace the EGR valve. Then go to Step 12.



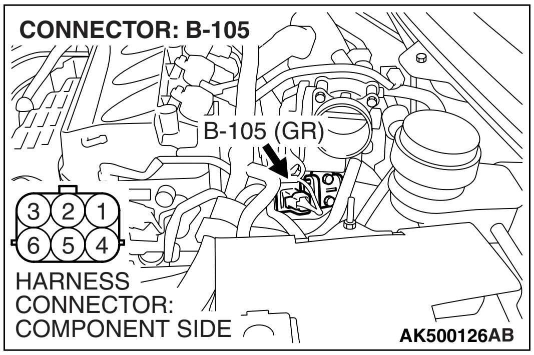


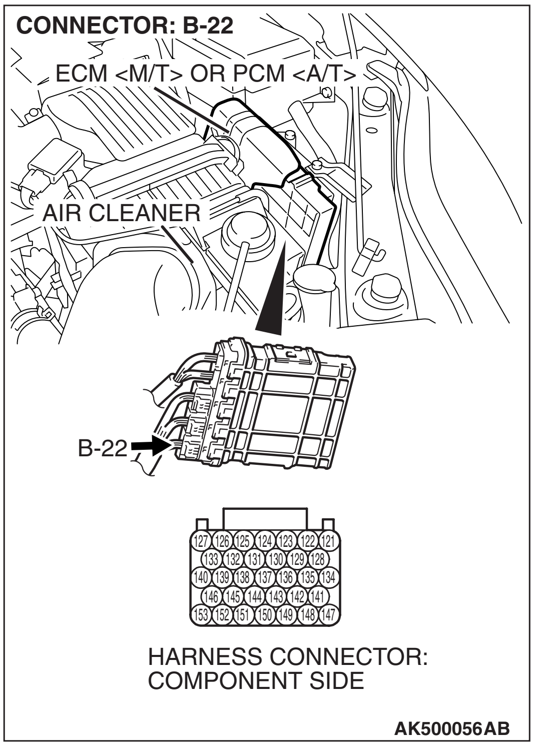
STEP 10. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and EGR valve connector B-105 (terminal No. 2, No. 5).

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 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 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.13A-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 (cylinder 1, 4)

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)

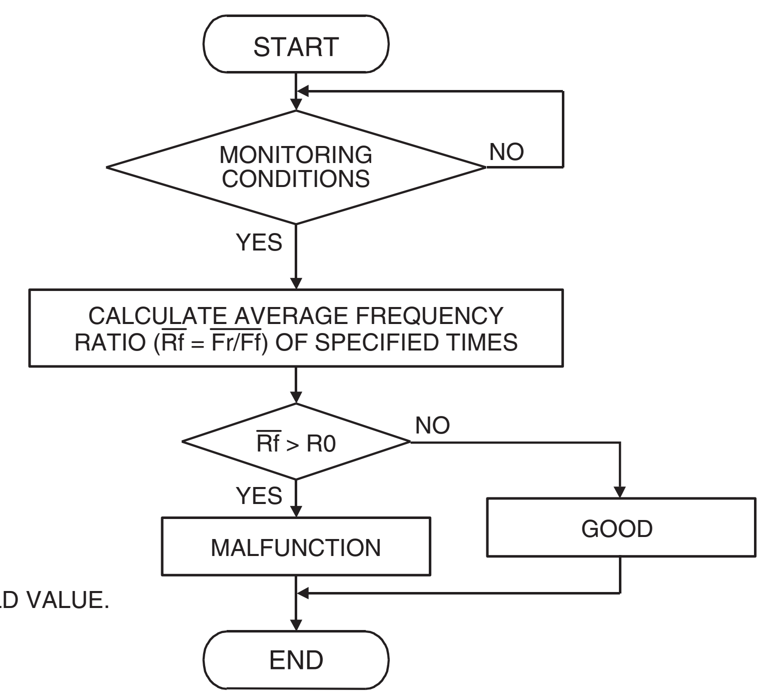
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

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.

AK302038

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is open.
- Mass airflow is between 14 and 45 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 5 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion

- The frequency ratio of cylinder 1, 4 heated oxygen sensor (rear) and cylinder 1, 4 heated oxygen sensor (front) is more than 0.7.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13A-6.

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

- Cylinder 1, 4 side catalytic converter deteriorated.
- Cylinder 1, 4 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 cylinder 1, 4 side catalytic converter.

(1) Replace the cylinder 1, 4 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.13A-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 (cylinder 2, 3)

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)

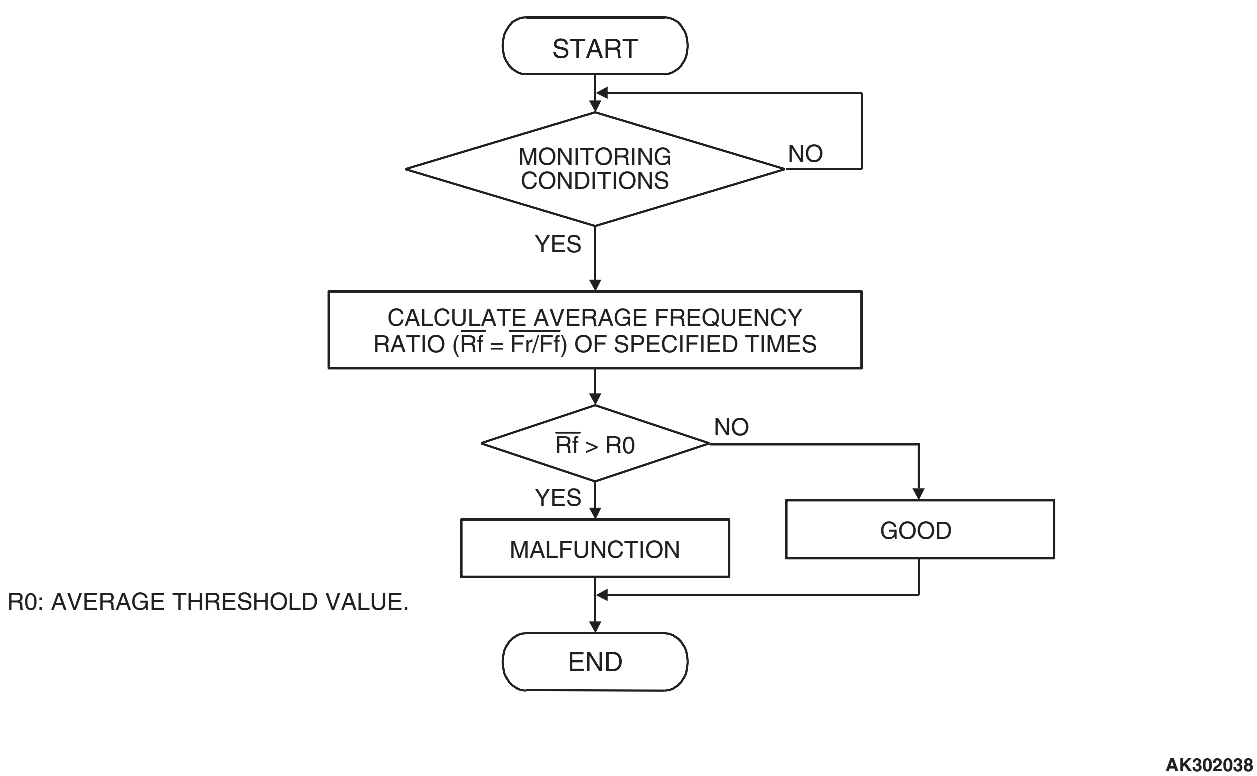
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

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 14 and 45 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The ECM <M/T> or the PCM <A/T> monitors for this condition for 5 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion

- The frequency ratio of left bank heated oxygen sensor (rear) and left bank heated oxygen sensor (front) is more than 0.7.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13A-6.

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

- Cylinder 2, 3 side catalytic converter deteriorated.
- Cylinder 2, 3 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

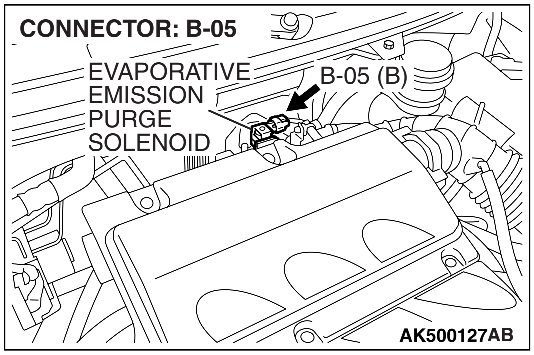
STEP 1. Replace the cylinder 2, 3 side catalytic converter.

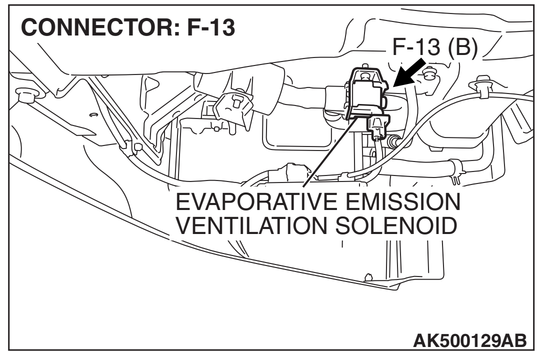
(1) Replace the cylinder 2, 3 side catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13A-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0431 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 and a stuck closed condition of evaporative emission ventilation solenoid by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid 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)

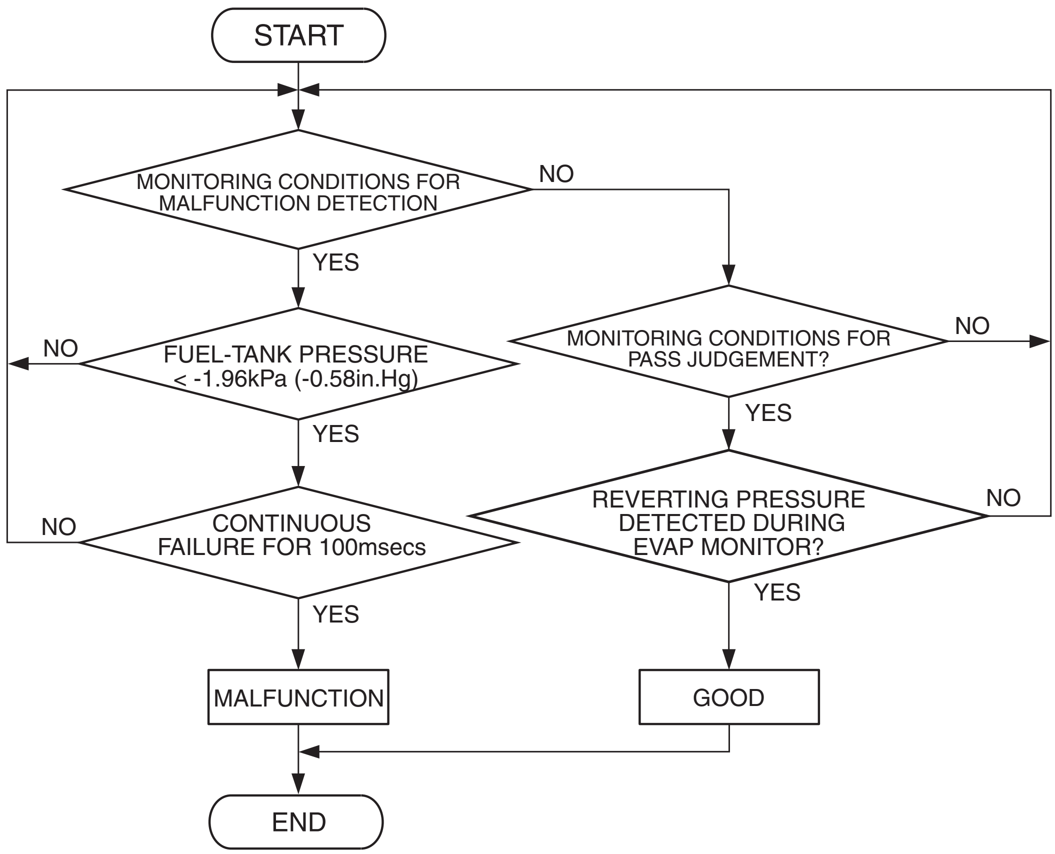
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Engine is running.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 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 –1.96 kPa (–0.58 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

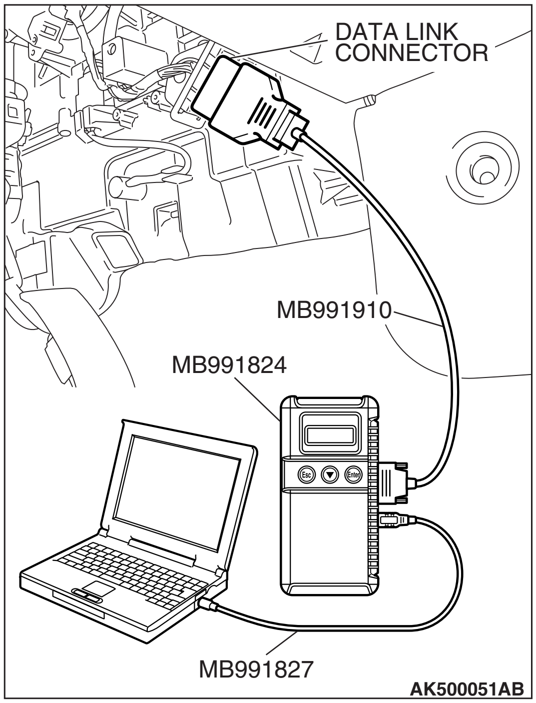
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-6.

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

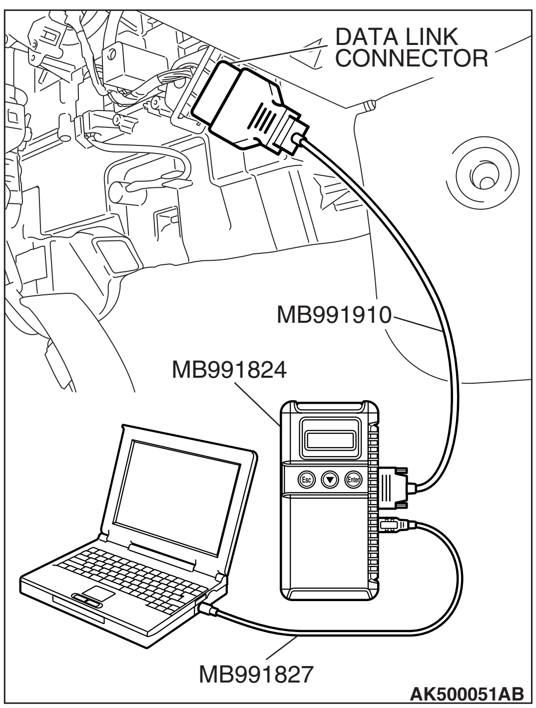
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(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.13A-679.

NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

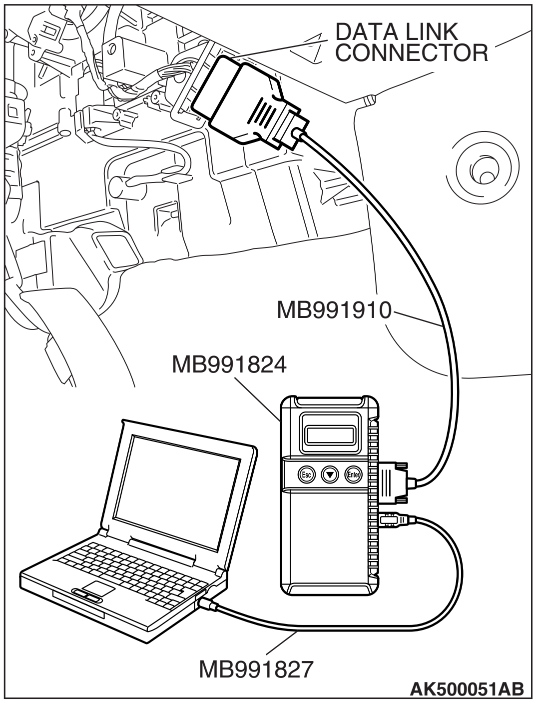
(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be 1,200 and 3,800 millivolts.

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

Q: Is the fuel tank pressure between 1,600 and 3,400 millivolts?

YES : Go to Step 3.

NO : Refer to DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-679.



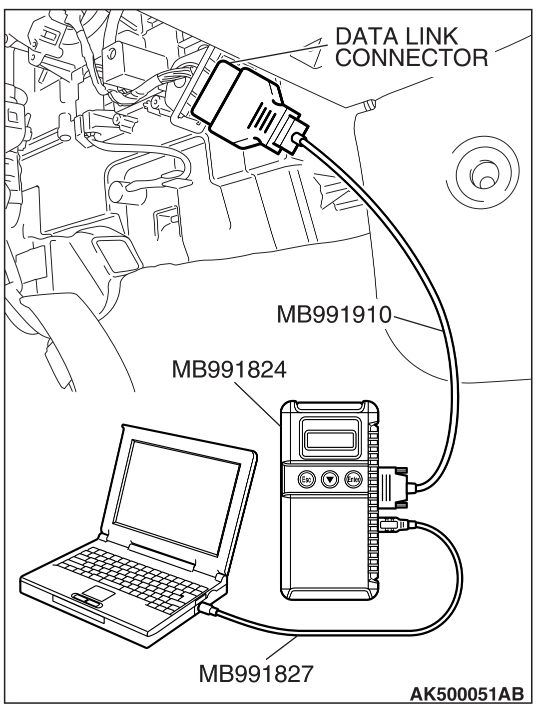
STEP 3. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

(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.13A-6.

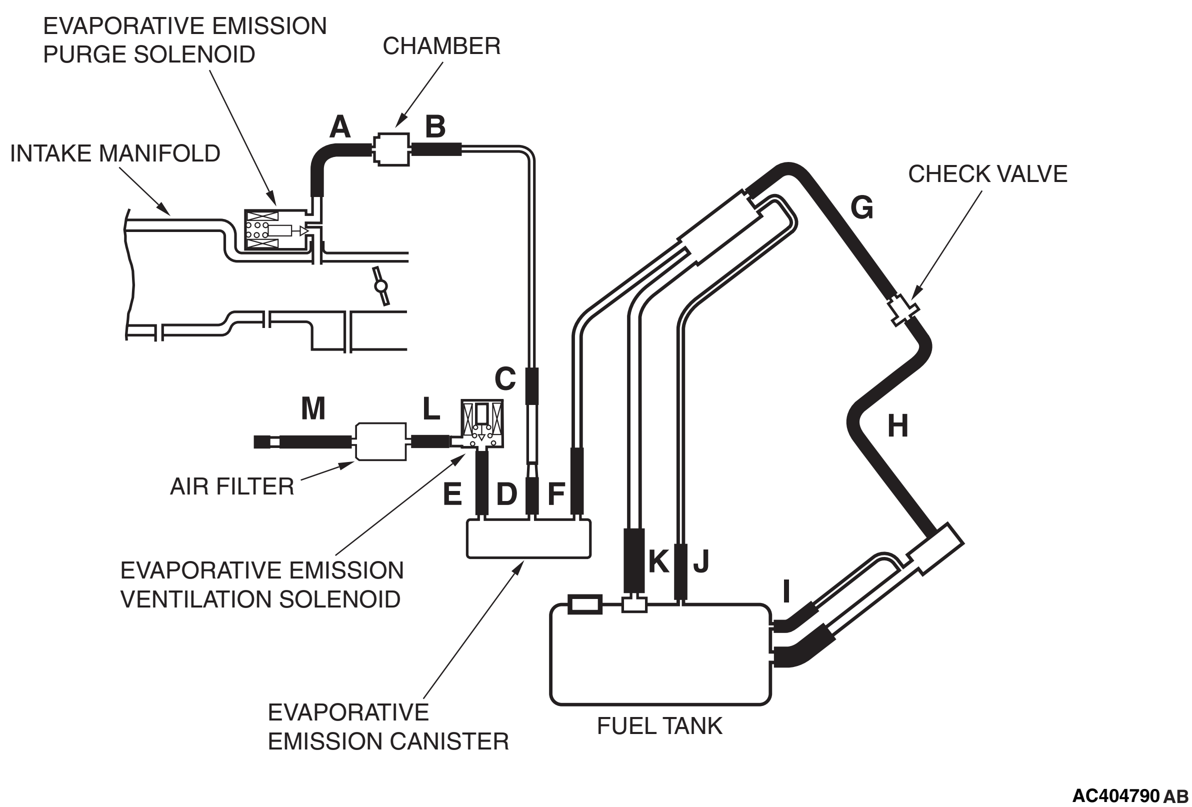
(2) Read the diagnostic trouble code.

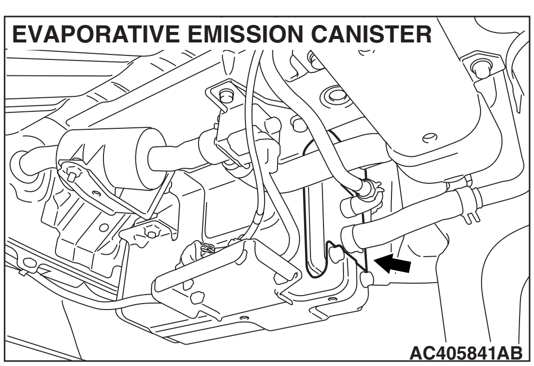
Q: Is DTC P0441 set?

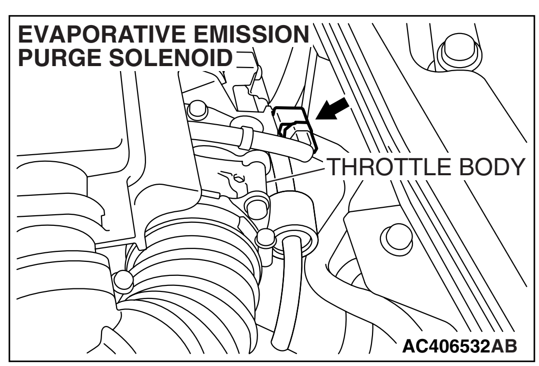
YES : Retry the troubleshooting.
NO : The inspection is complete.

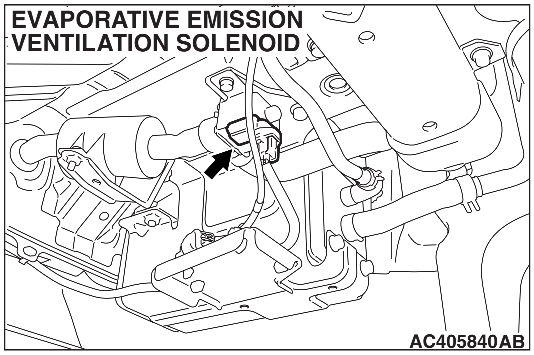
DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

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)

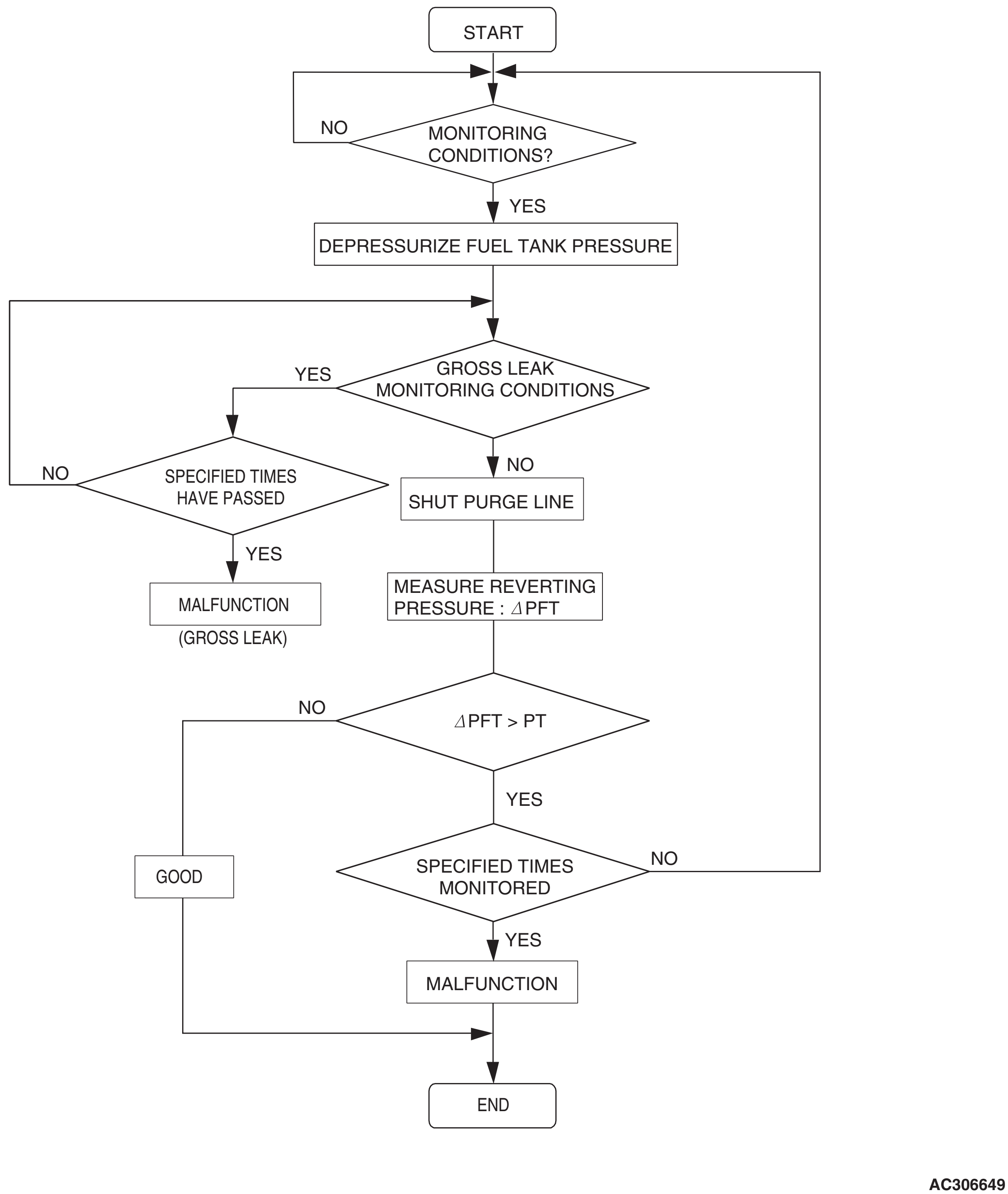
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

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



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 981 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 324 Pa (0.047 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.13A-6.

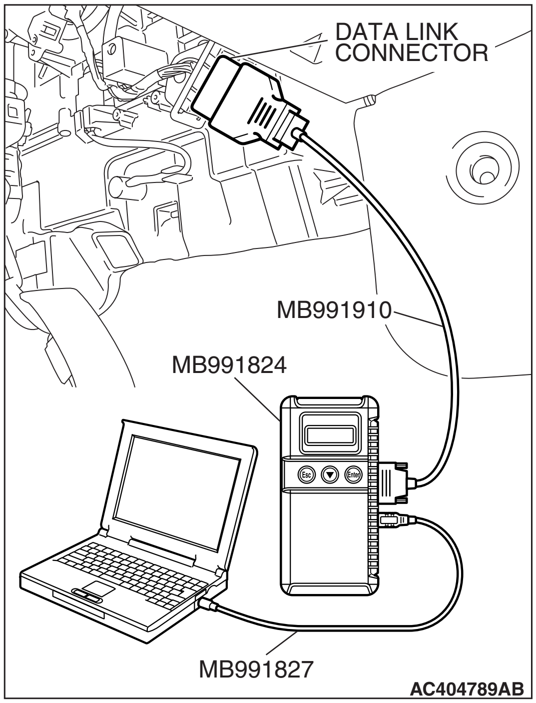
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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.

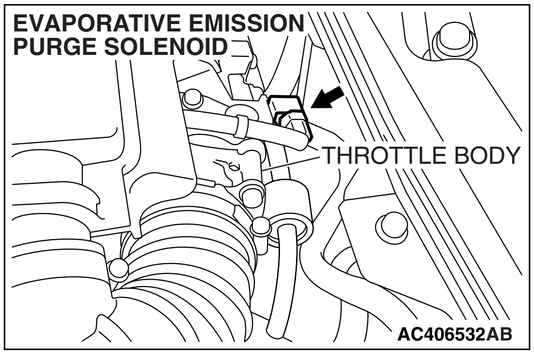
Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

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.13A-41. If no other DTC's have been set, go to Step 2.

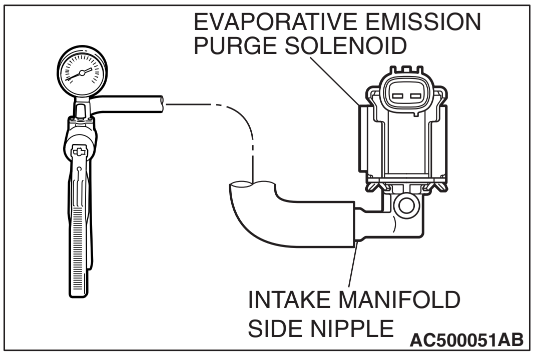
NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

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.15-10).

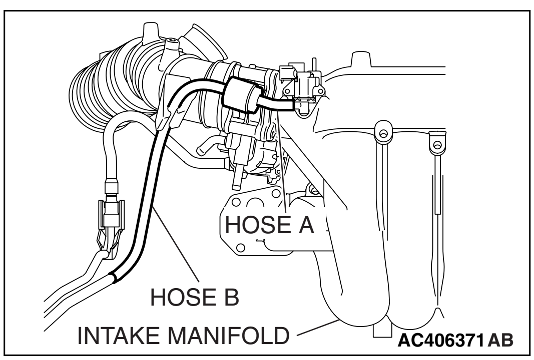


(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Install the evaporative emission purge solenoid to the intake manifold (Refer to GROUP 15, Intake Manifold P.15-10).

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid (Refer to GROUP 15, Intake Manifold P.15-10). Then go to Step 15.

STEP 3. Check for leaks in evaporative emission hoses A and B.

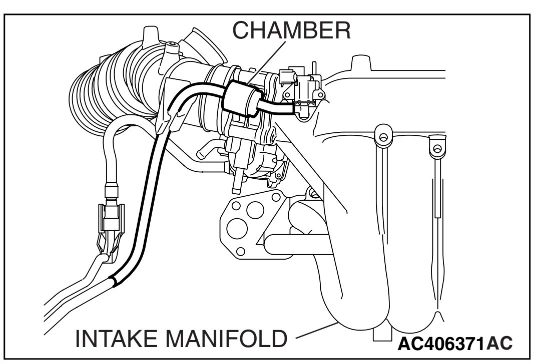


Use a hand vacuum pump to test each hose from hose A to hose B.

Q: Do the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Then go to Step 15.

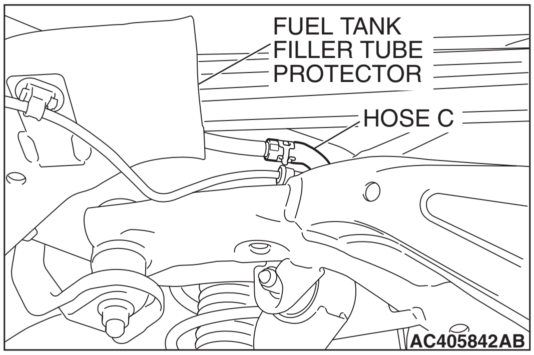
STEP 4. Check for leaks in the chamber.

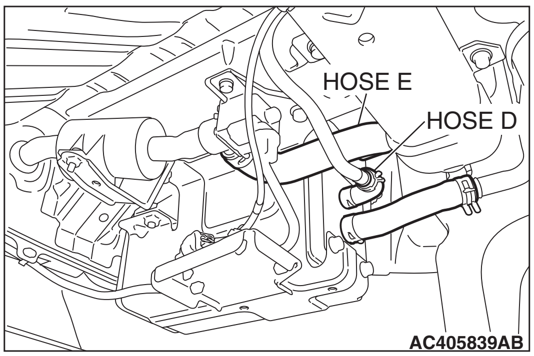


(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 15.





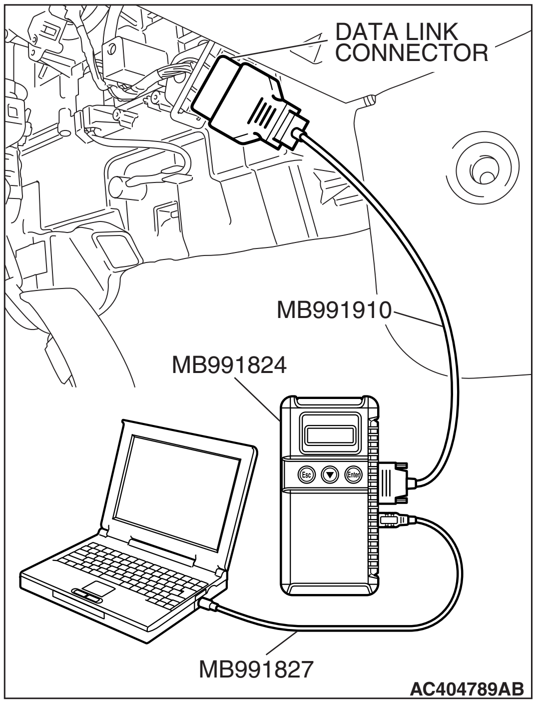
STEP 5. Check for leaks in evaporative emission hoses C through E.

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.

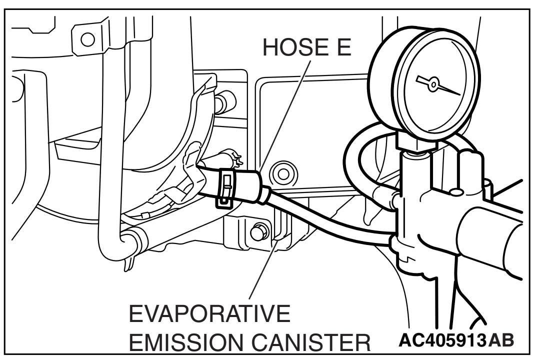
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.



⚠ **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).



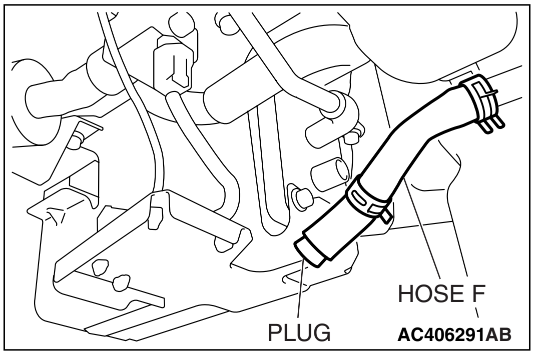
(3) Disconnect hose E from evaporative emission canister and connect hand vacuum pump to hose E.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid 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).

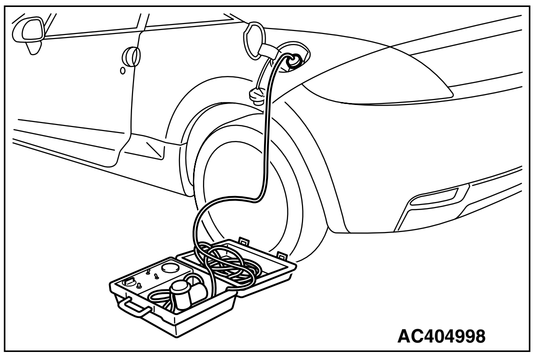
Q: Did the evaporative emission ventilation solenoid hold vacuum?

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.

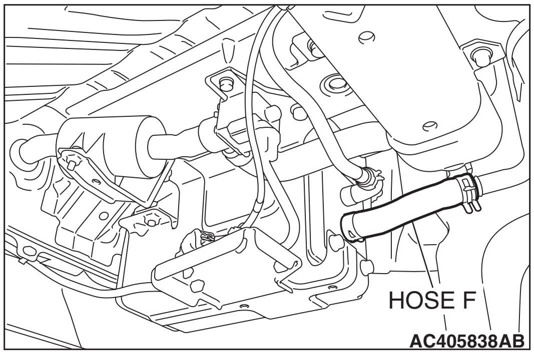
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(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.

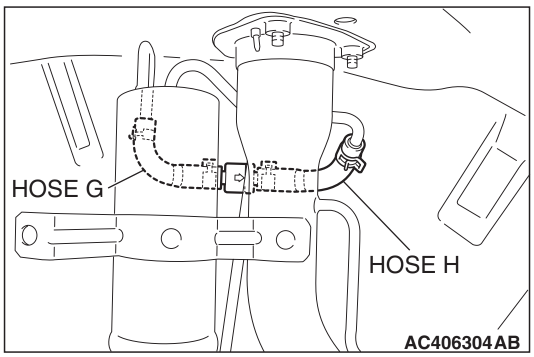
STEP 8. Check for leaks in evaporative emission hoses F through H.



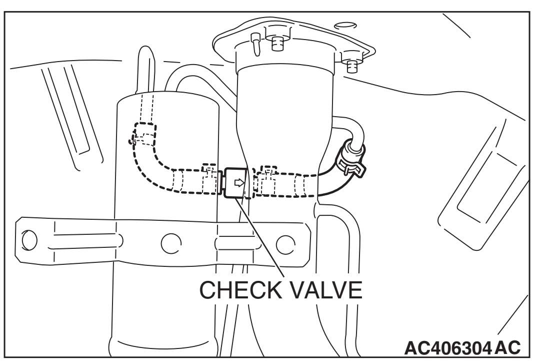
(1) Remove the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).
(2) Use a hand vacuum pump to test each hose from hose F to hose H.

Q: Do the hoses hold vacuum?

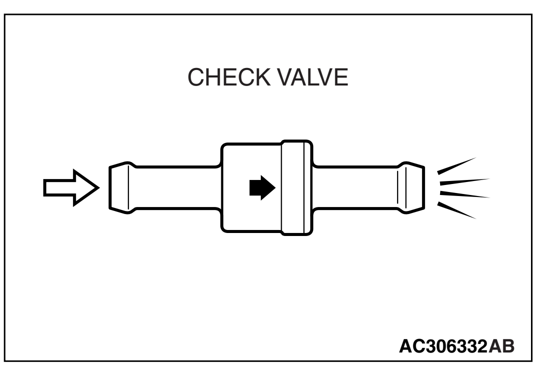
YES : Go to Step 9.
NO : Replace any damaged hose, and reinstall the splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 15.



STEP 9. Test check valve.



(1) Check valve is a one-way check valve.



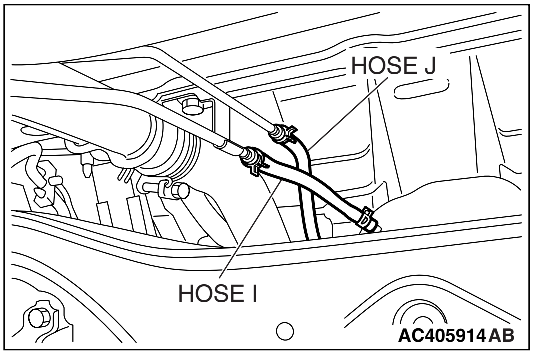
(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.
NO : Replace check valve, and reinstall the splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). 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.

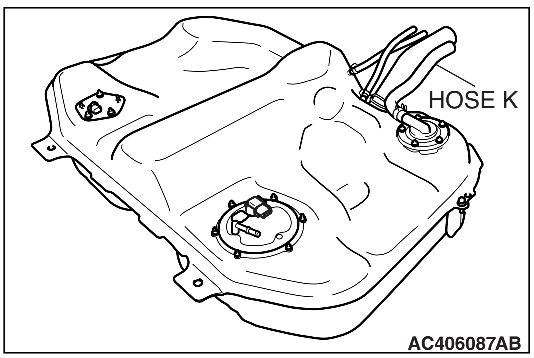


Q: Do the hoses hold vacuum?

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.



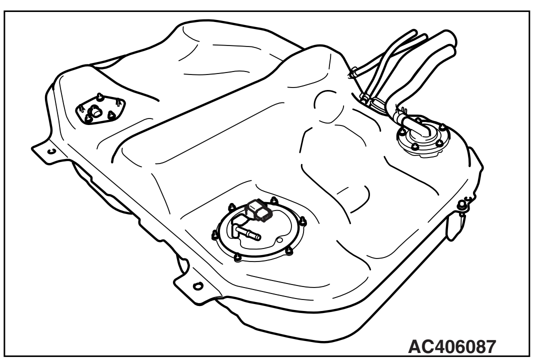
Q: Is the hose hold vacuum?

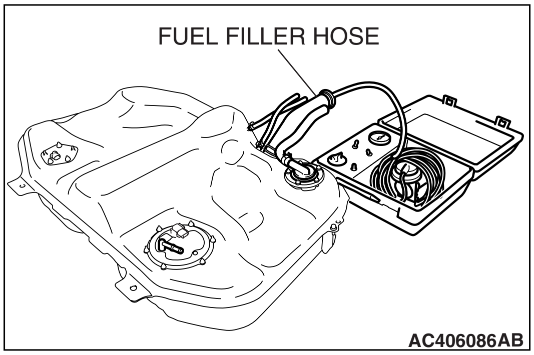
YES : Go to Step 12.
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.

STEP 12. Check for leaks in the fuel tank.

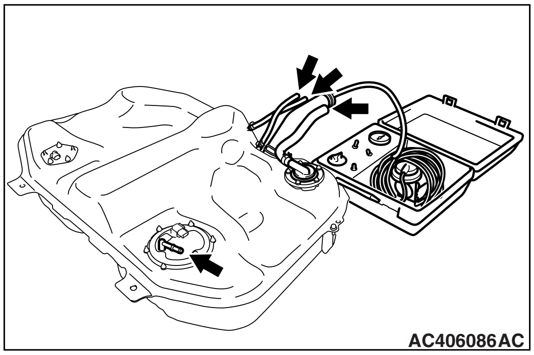
(1) Visually check for cracks or other leaks in the fuel tank.

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.

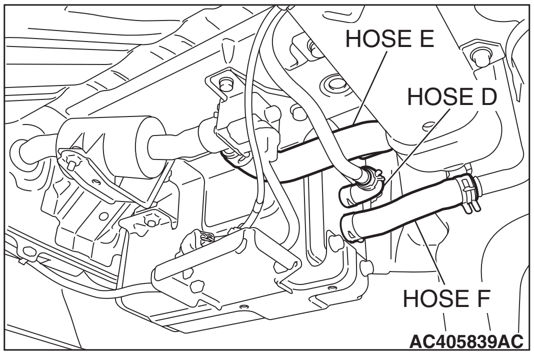
Q: Are any leaks found?

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.

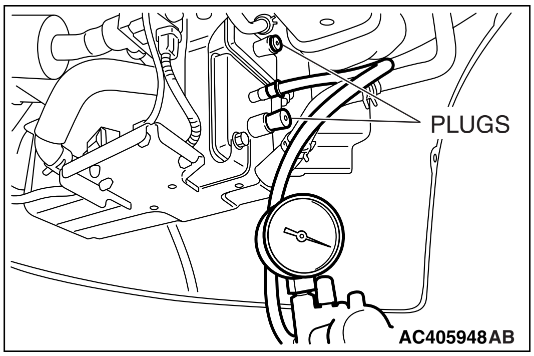
YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 15.

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.



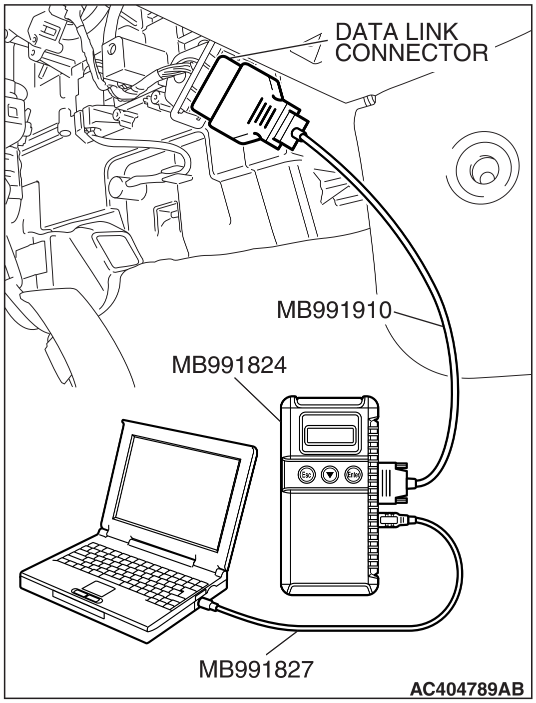
(1) Disconnect hoses D, E and F from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose D, and plug the other nipples.



(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 connect hoses D, E and F to the canister.

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.

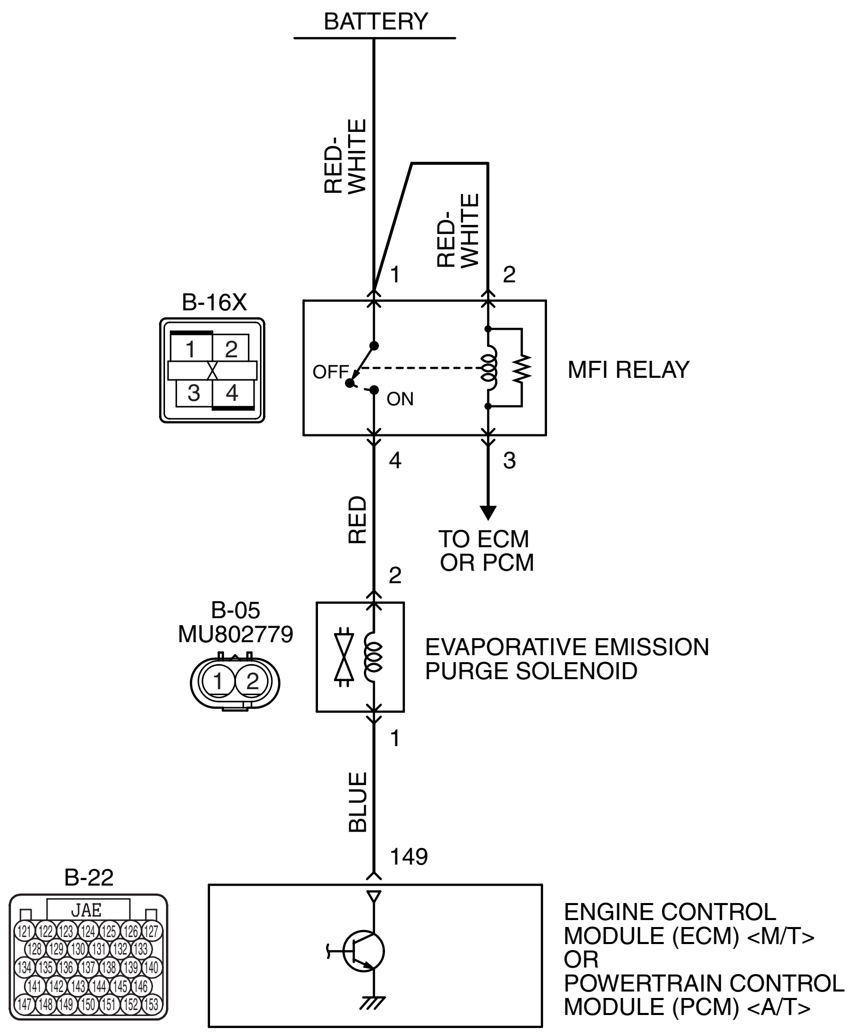
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

Q: Is DTC P0442 set?

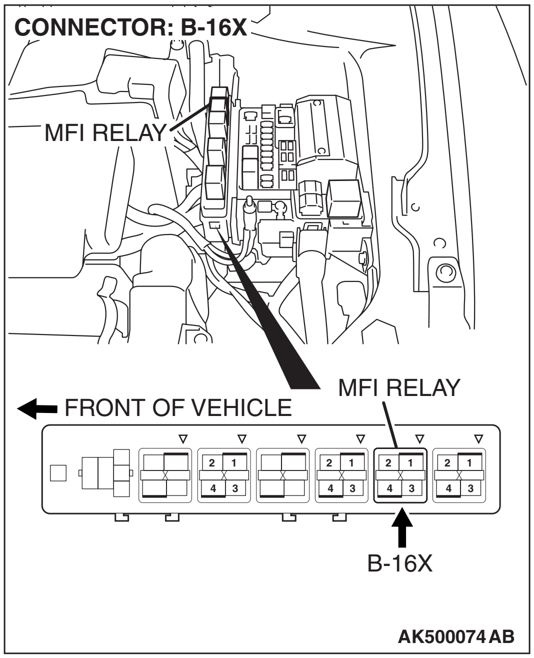
YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

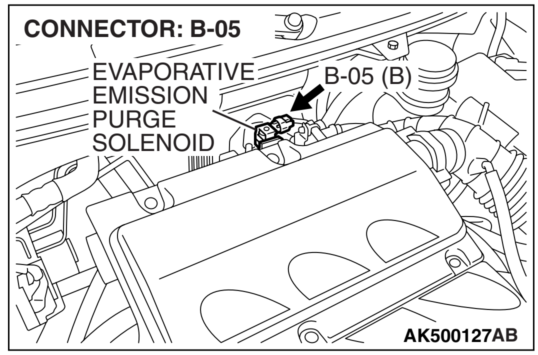
DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

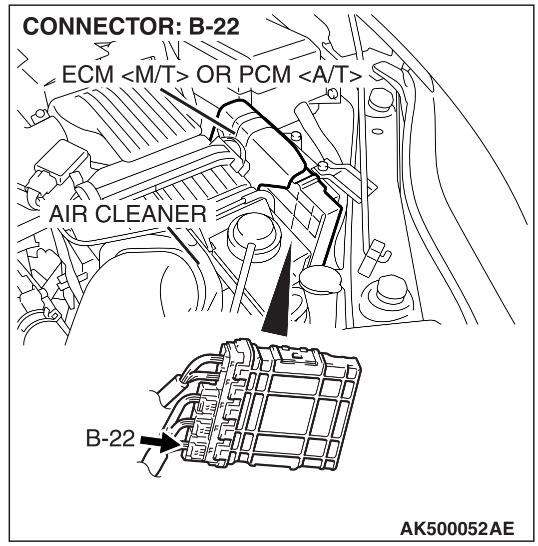
Evaporative Emission Purge Solenoid Circuit



AK403692







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)

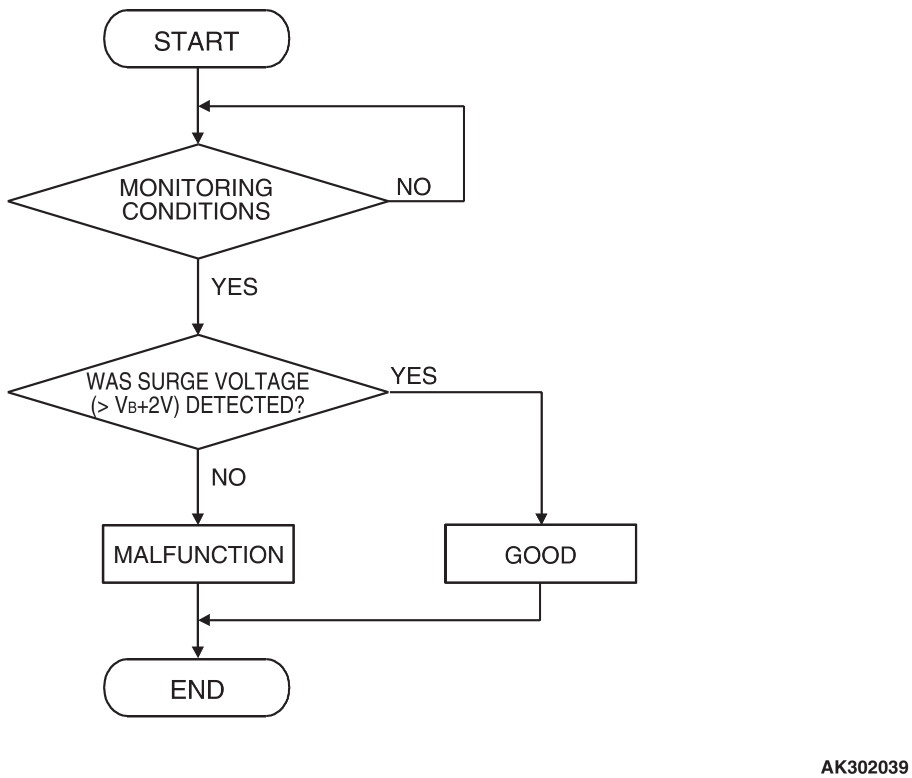
- Not applicable

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.13A-6.

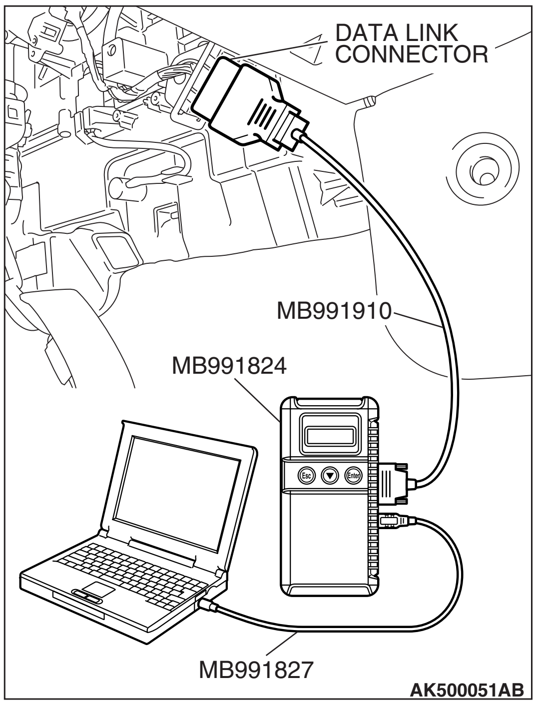
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.

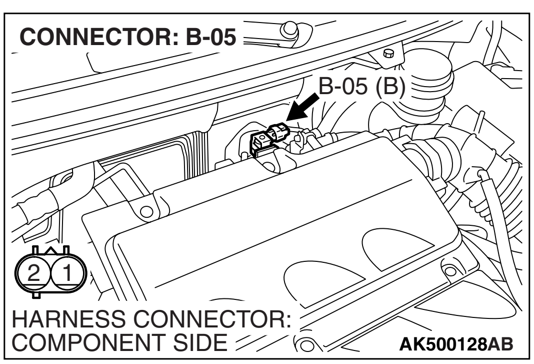
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission 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 Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.

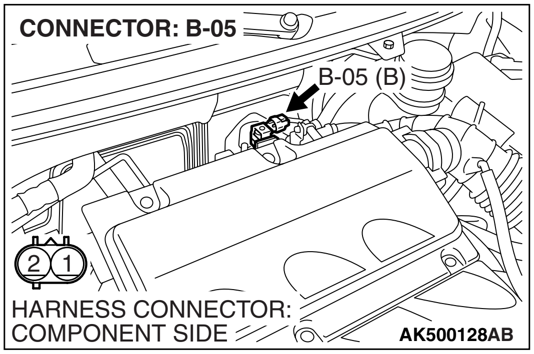


STEP 2 Check harness connector B-05 at the evaporative emission purge solenoid for damage.

Q: Is the harness connector in good condition?

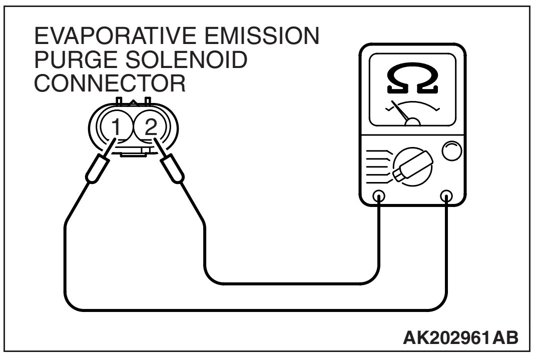
YES : Go to Step 3.

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.

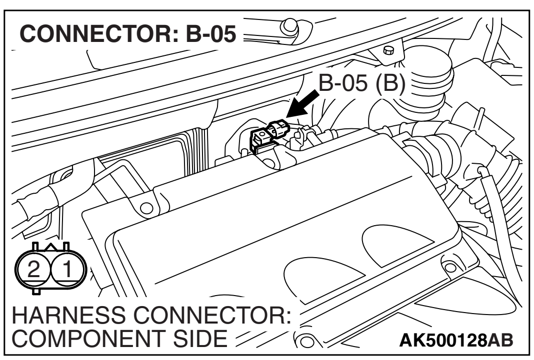


(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

Standard value: 30 – 34 ohms [at 20° C (68° F)]

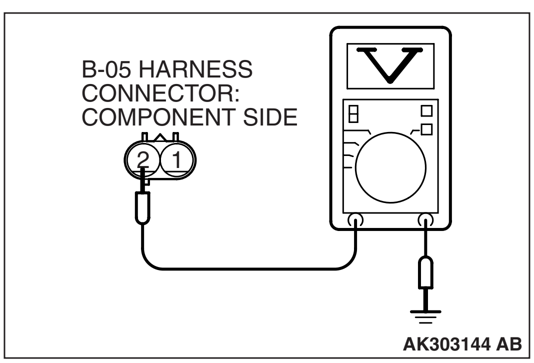
Q: Is the measured resistance between 30 and 34 ohms [at 20° C (68° F)]?

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.

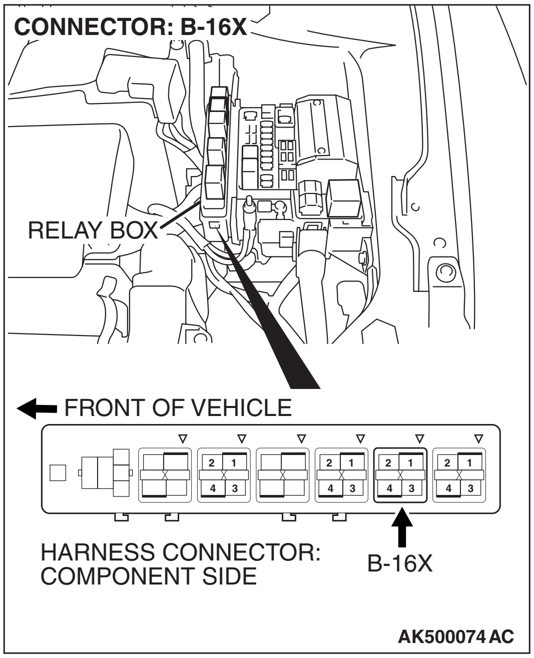


(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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.

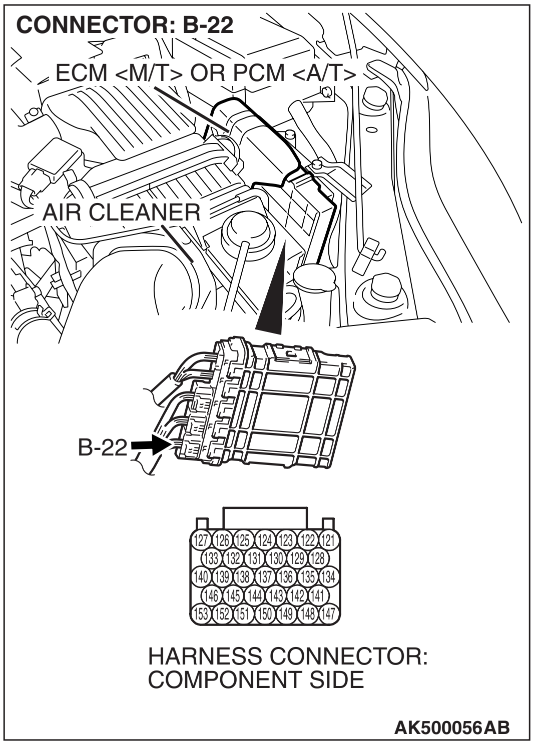


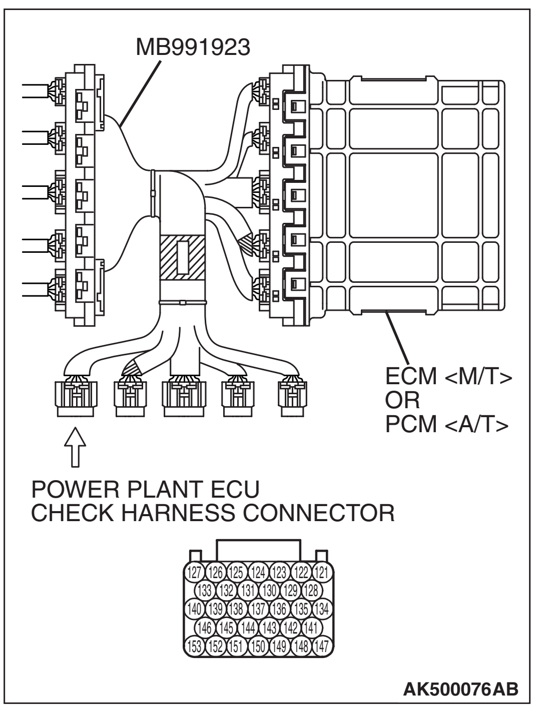
STEP 5. Check harness connector B-16X at MFI relay for damage.

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.

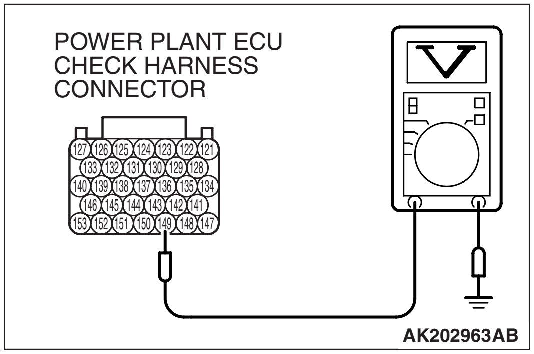
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





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.

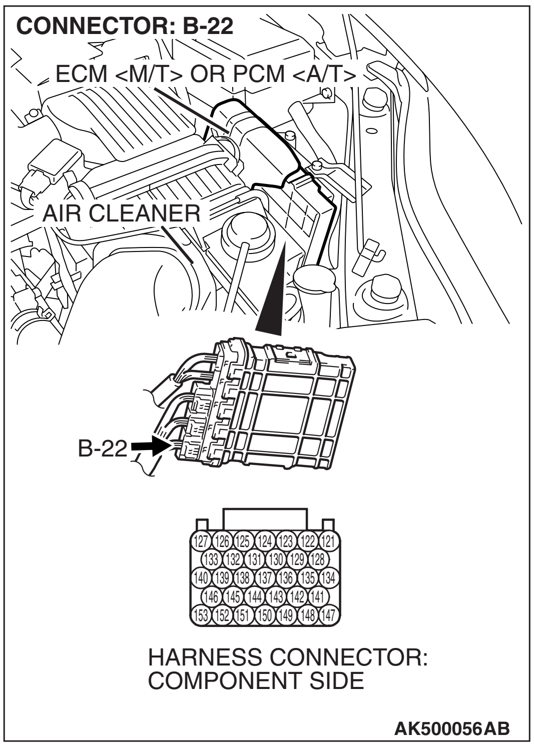
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 9.

NO : Go to Step 7.

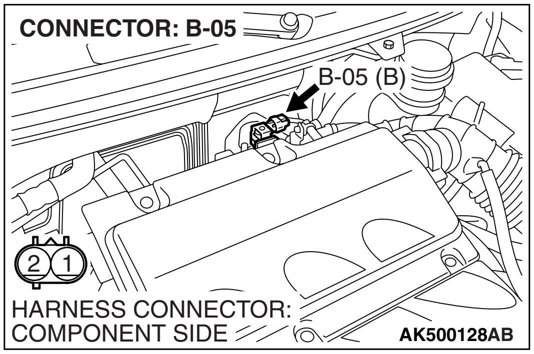
STEP 7. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

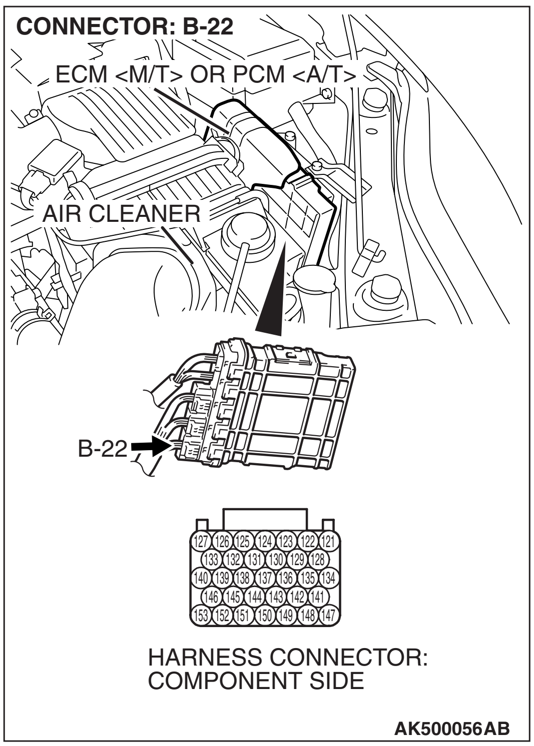


Q: Is the harness connector in good condition?

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.



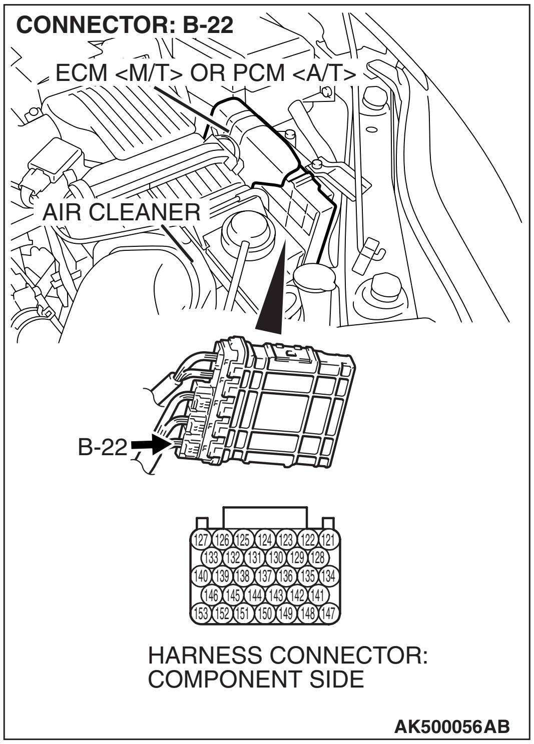


STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-05 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 149).

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.

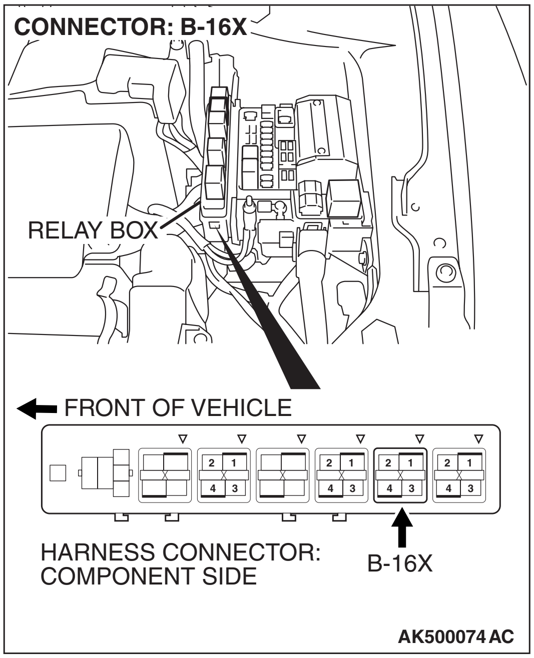


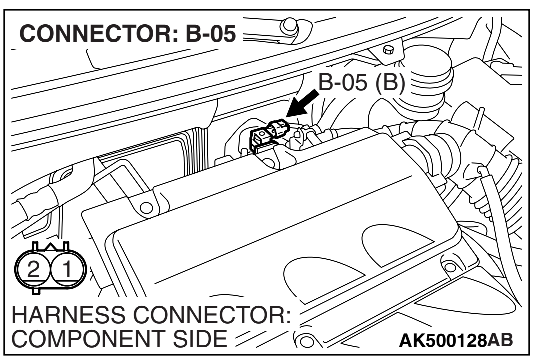
STEP 9. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

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.



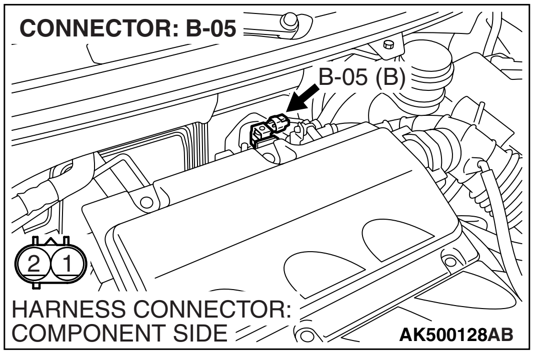


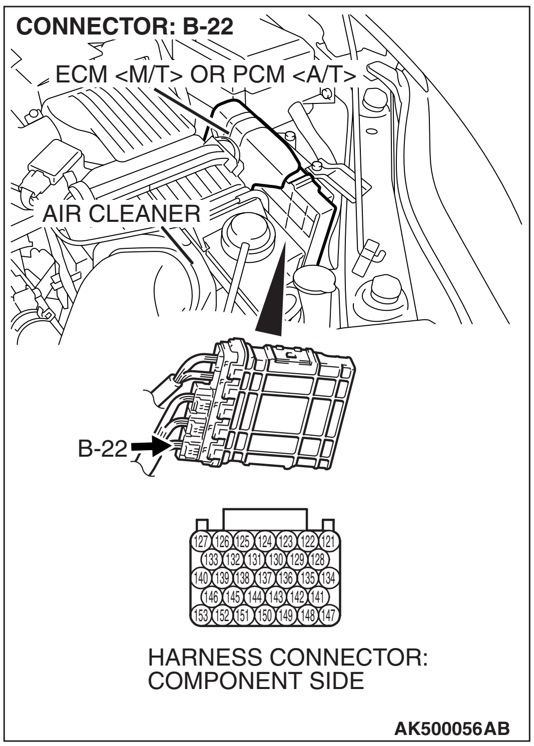
STEP 10. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and evaporative emission purge solenoid connector B-05 (terminal No. 2).

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.13A-6.

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

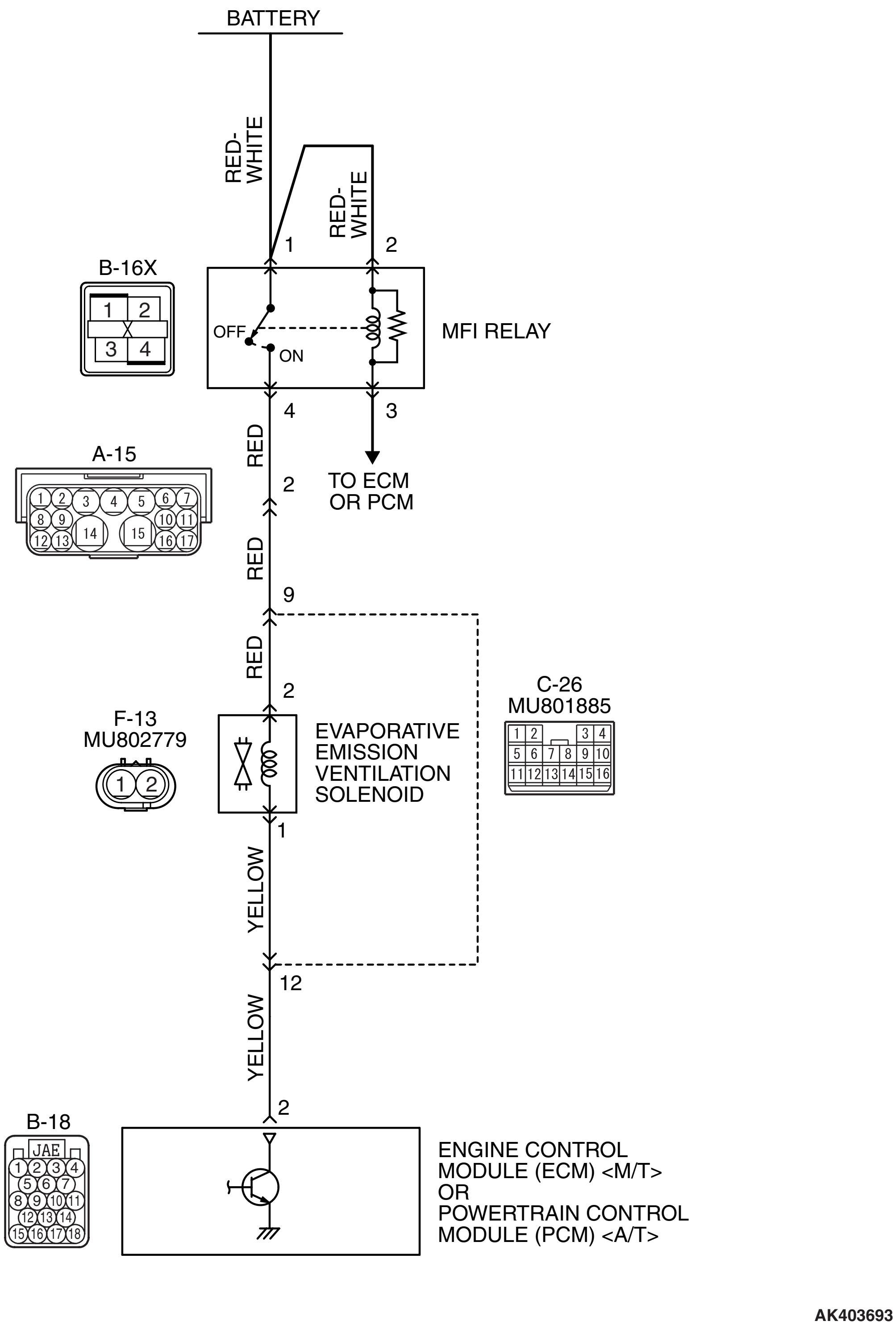
Q: Is DTC P0443 set?

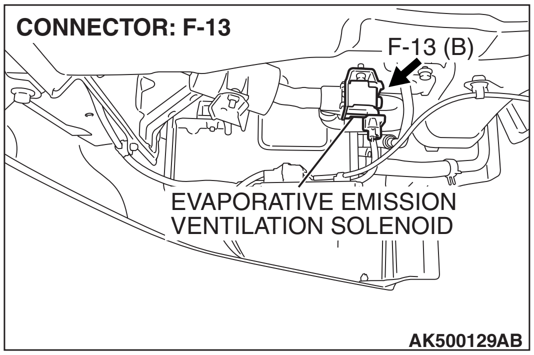
YES : Retry the troubleshooting.

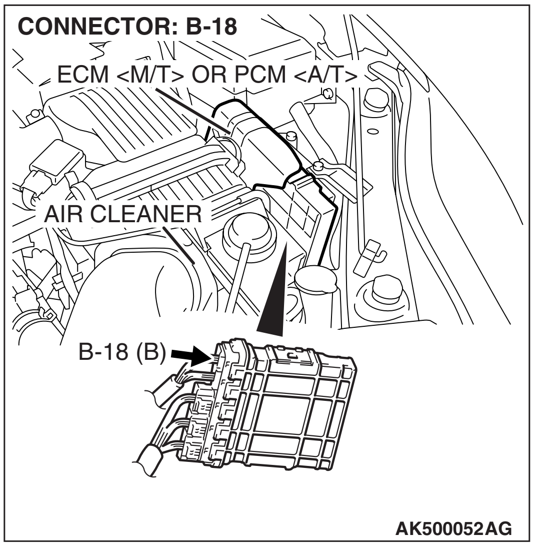
NO : The inspection is complete.

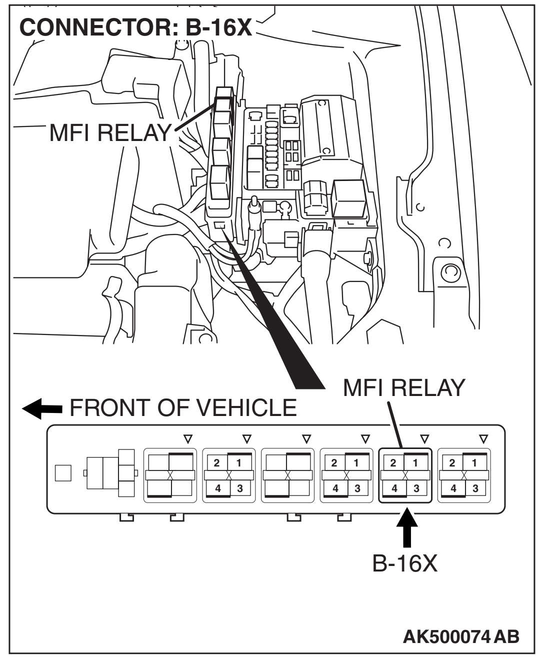
DTC P0446: Evaporative Emission Control System Vent Control Circuit

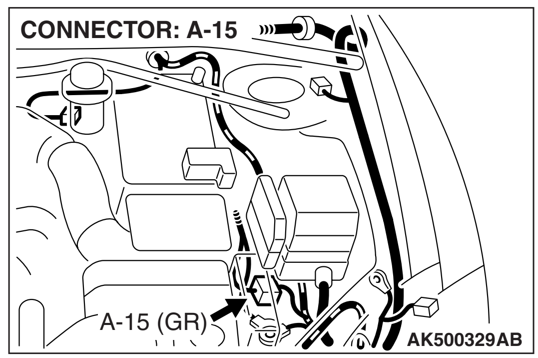
Evaporative Emission Ventilation Solenoid Circuit

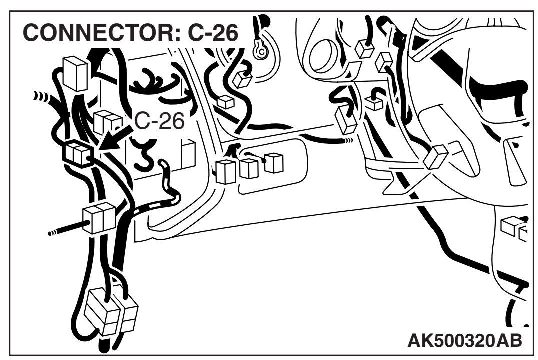












CIRCUIT OPERATION

- 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)

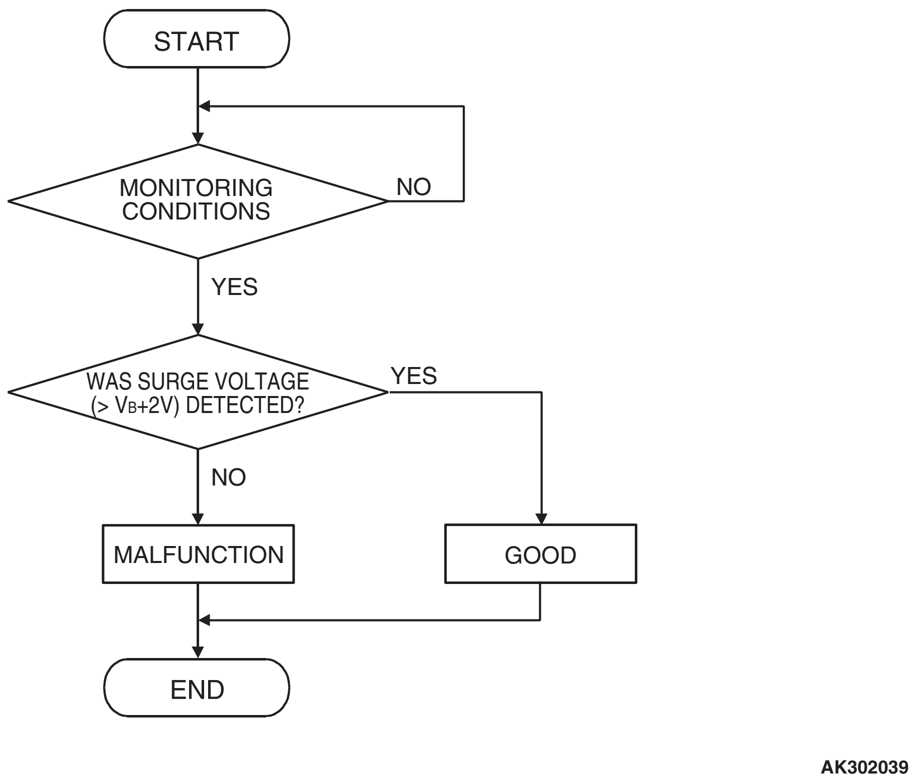
- Not applicable

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 at 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.13A-6.

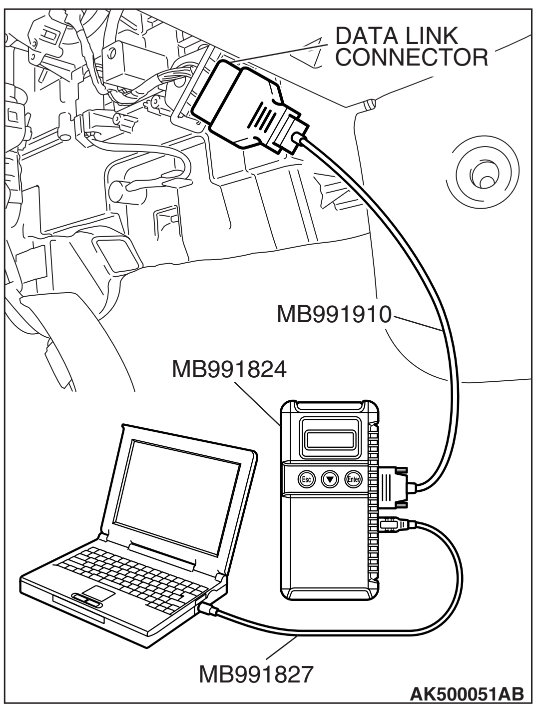
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.

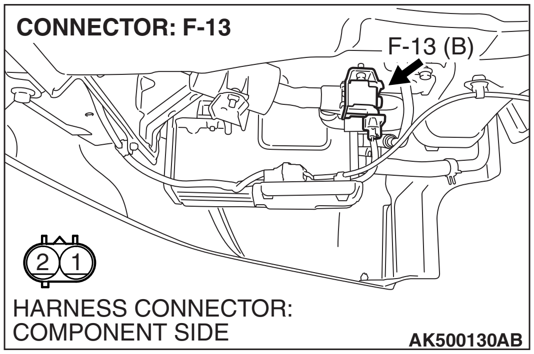
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative 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.

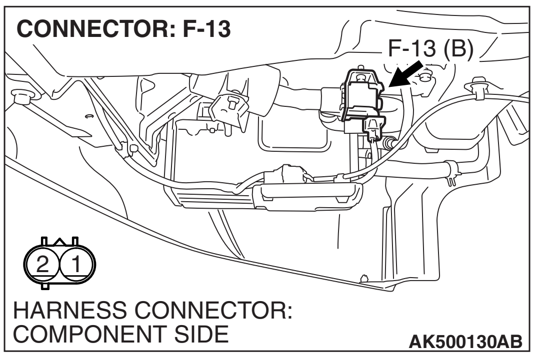


STEP 2. Check harness connector F-13 at the evaporative emission ventilation solenoid for damage.

Q: Is the harness connector in good condition?

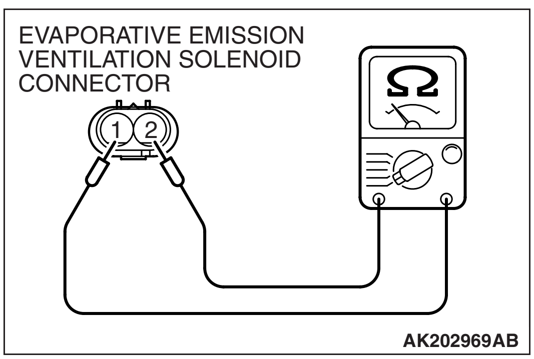
YES : Go to Step 3.

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.

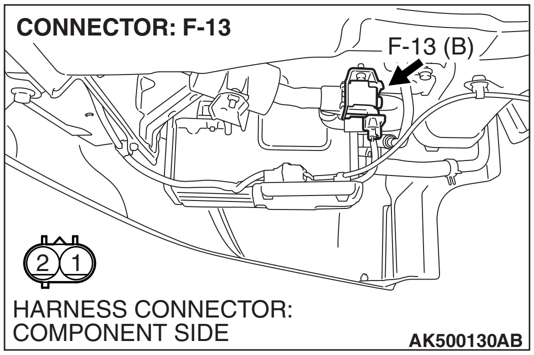
Standard value: 17 – 21 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 17 and 21 ohms [at 20° C (68° F)]?

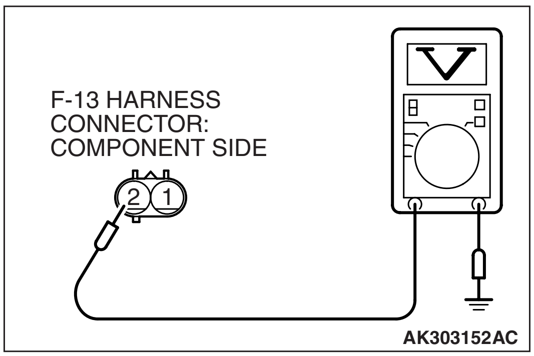
YES : Go to Step 4.

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.



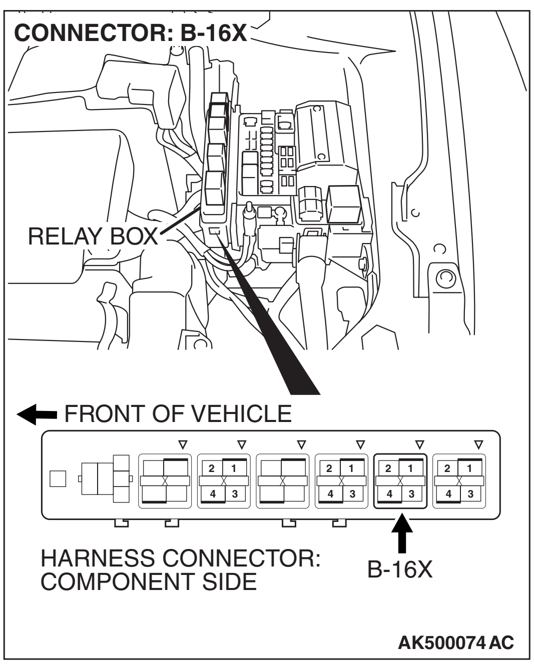
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(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.



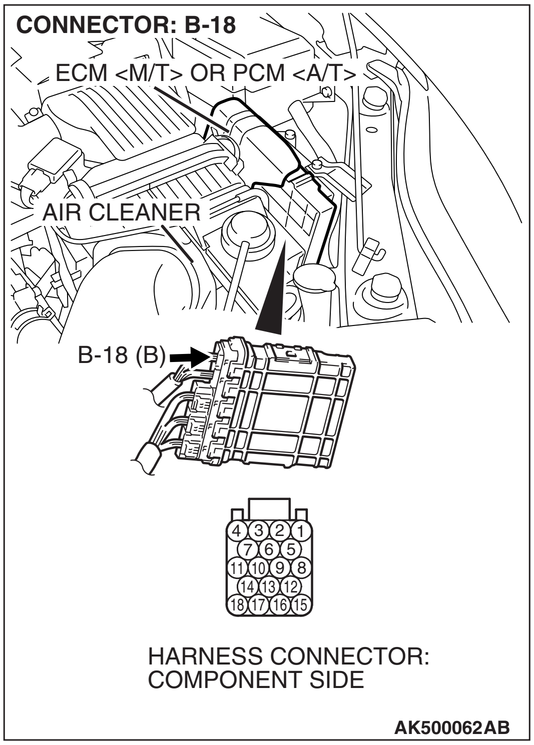
Q: Is the harness connector in good condition?

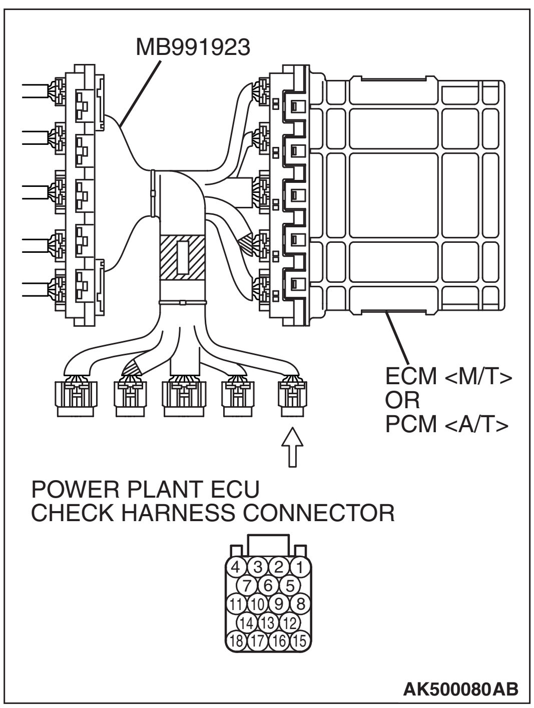
YES : Check connectors A-15 and C-26 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector B-16X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

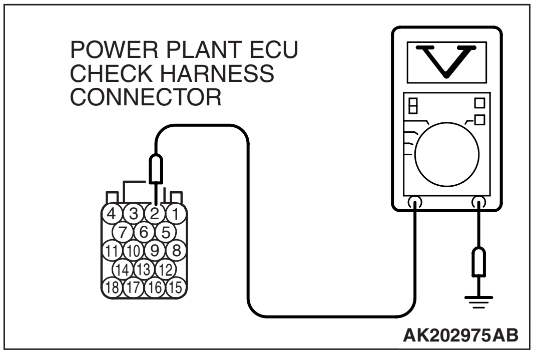
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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.

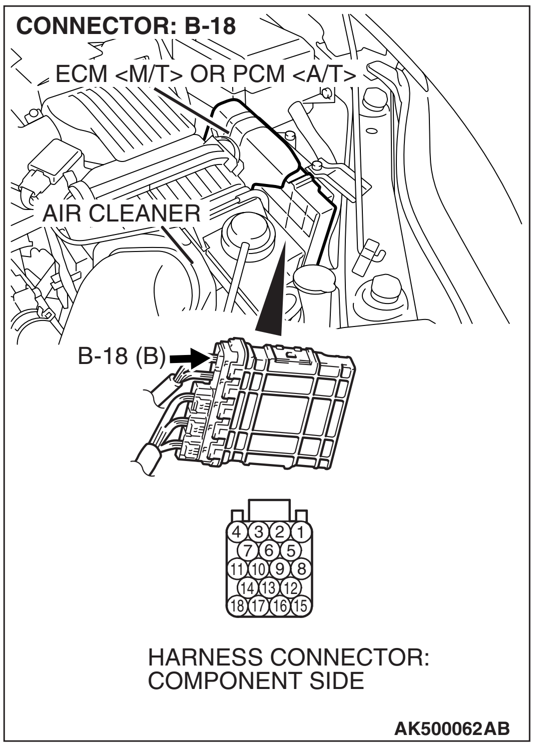
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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.

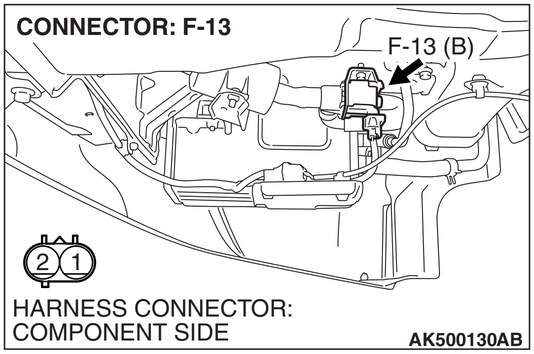


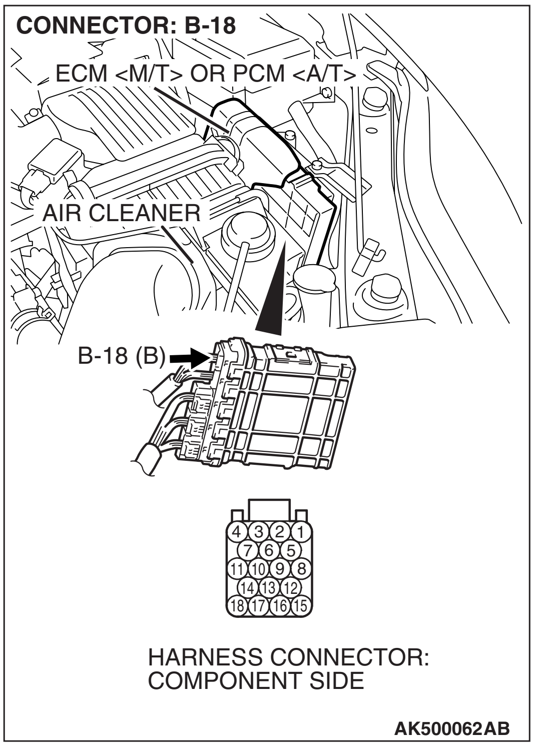
Q: Is the harness connector in good condition?

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).



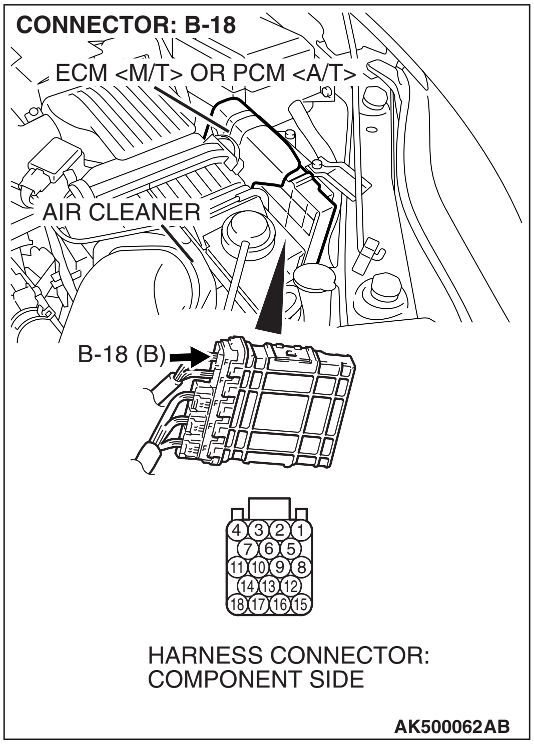


NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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.



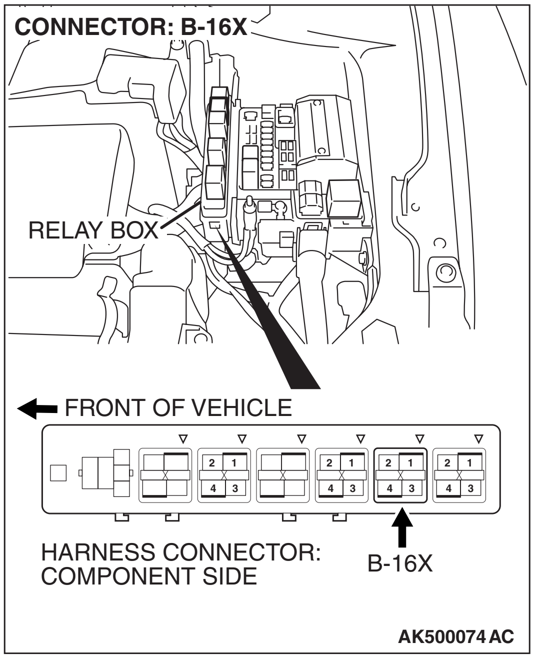
STEP 9. Check harness connector B-18 at ECM <M/T> or PCM <A/T> for damage.

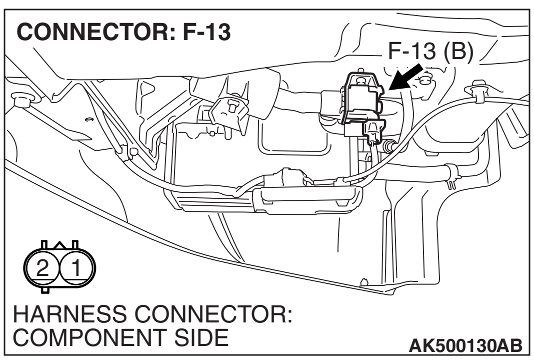
Q: Is the harness connector in good condition?

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).



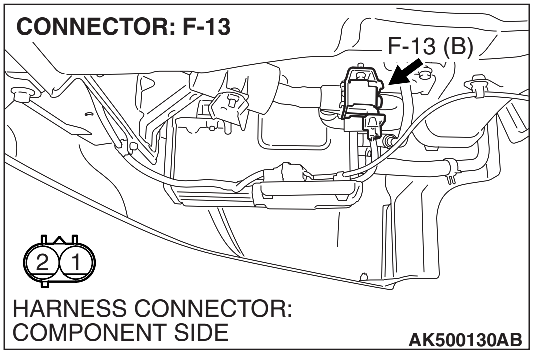


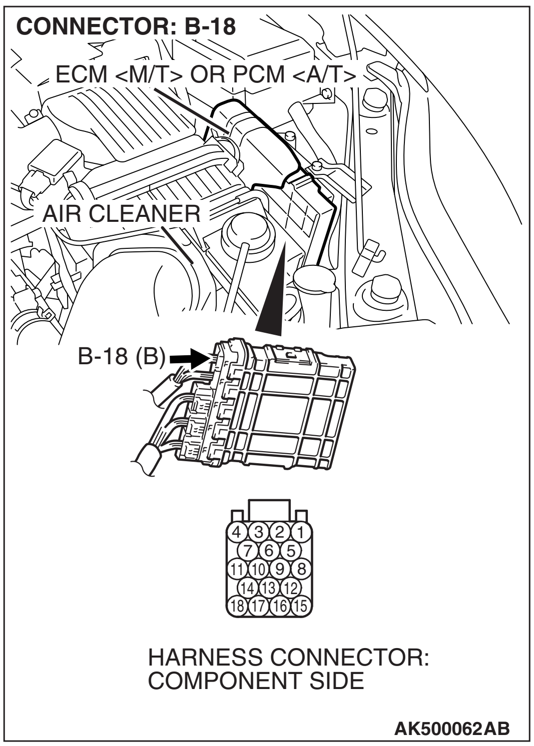
NOTE: Check harness after checking intermediate connectors A-15 and C-26. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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-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 22 P.13A-6.

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

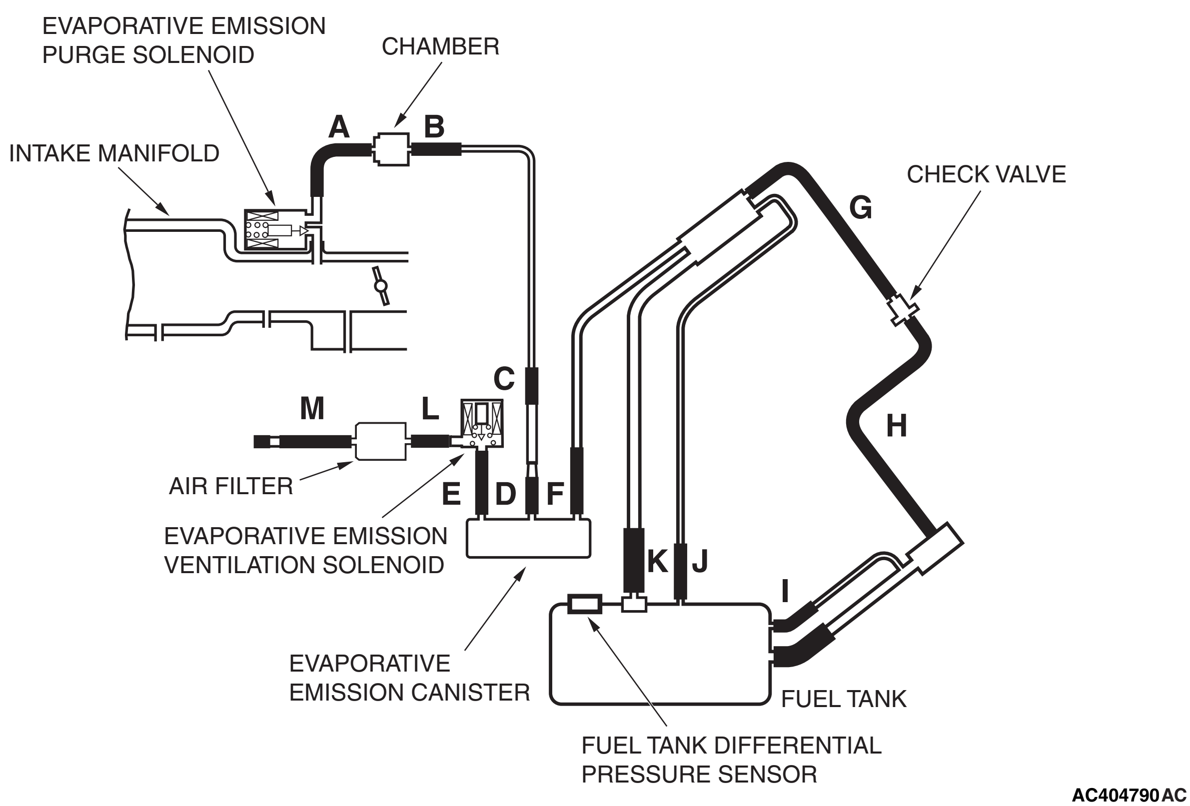
Q: Is DTC P0446 set?

YES : Retry the troubleshooting.

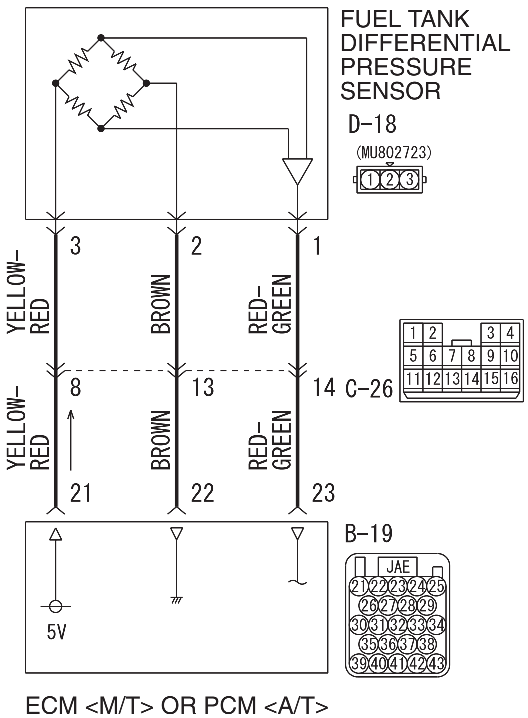
NO : The inspection is complete.

DTC P0450: Evaporative Emission System Pressure Sensor malfunction

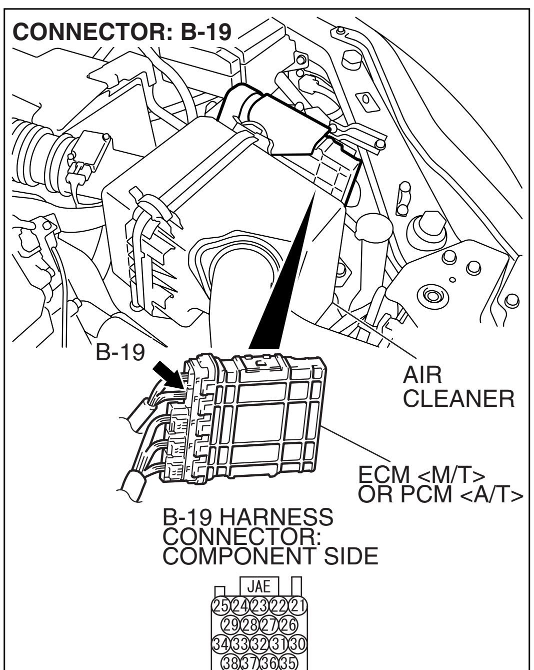
System Diagram



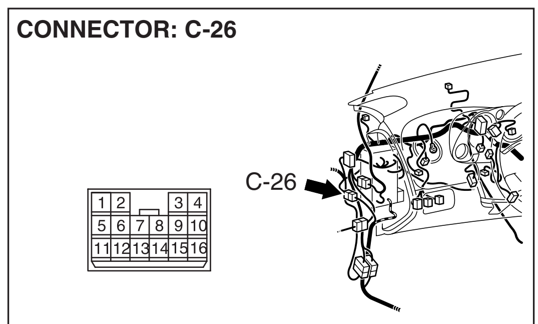
Fuel Tank Differential Pressure Sensor Circuit



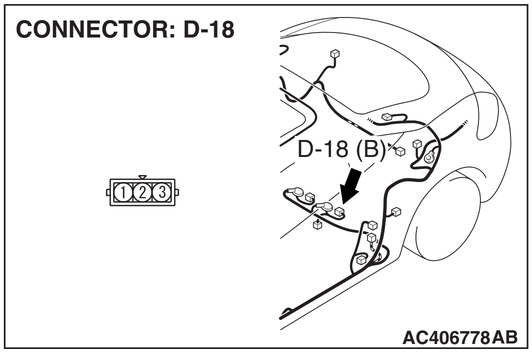
AC406365AB
W6P13M000A



AC407090AB



AC406442BF



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)

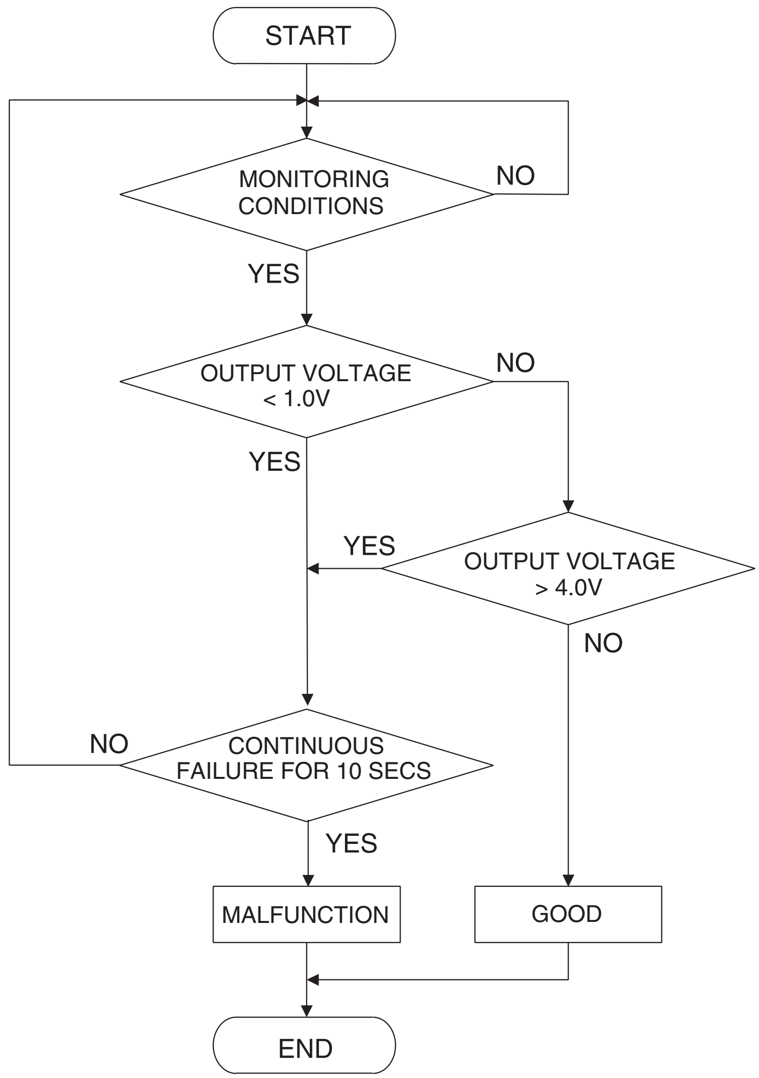
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

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.13A-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 52). 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

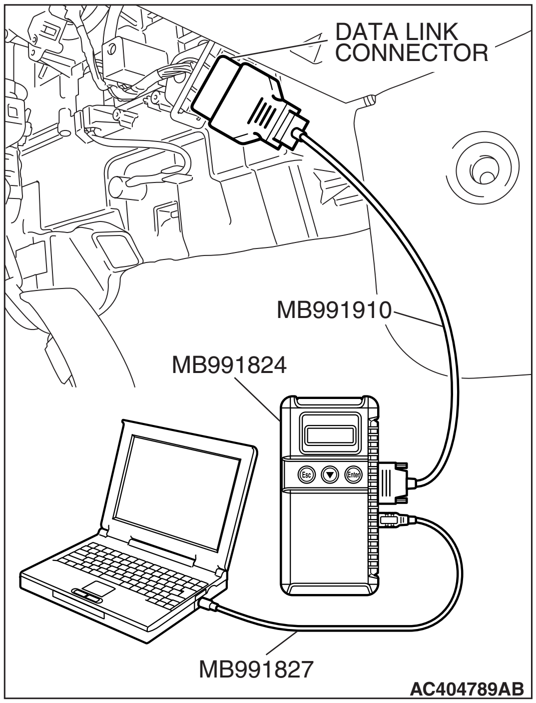
Required Special Tools:

- 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

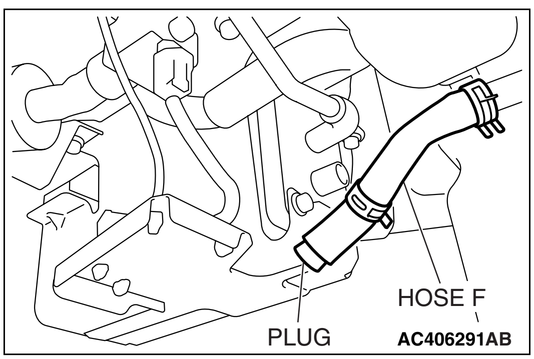
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

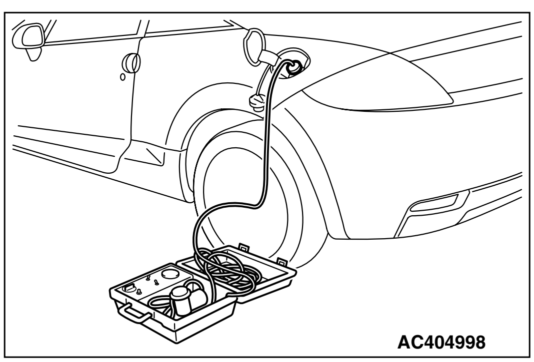
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(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.

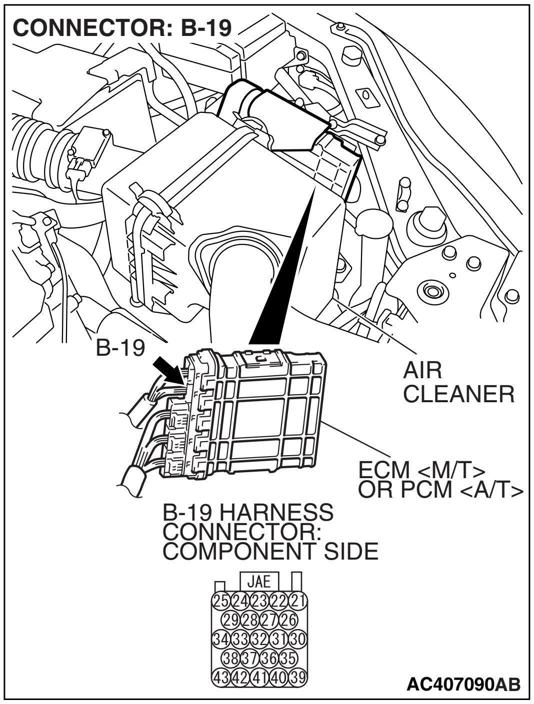
Q: Is the fuel tank pressure between 2050 and 2950 mV?

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.

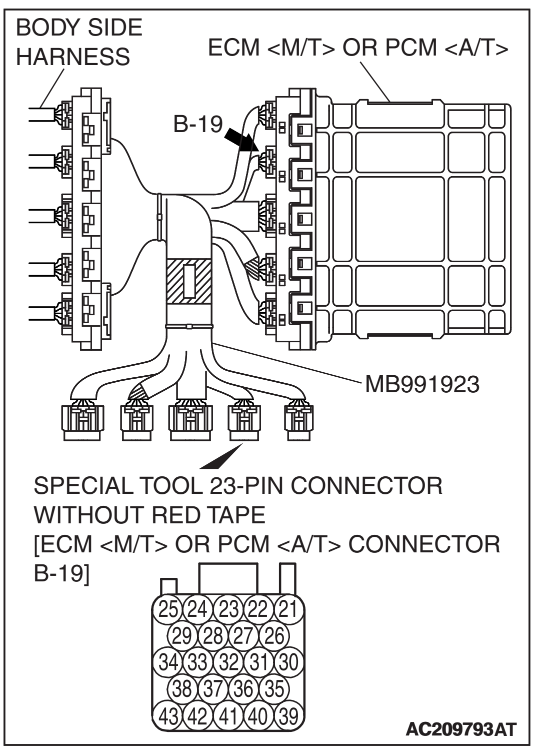
NO : Go to Step 2.

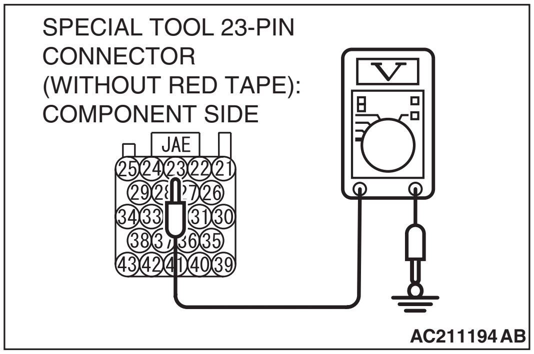
STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.





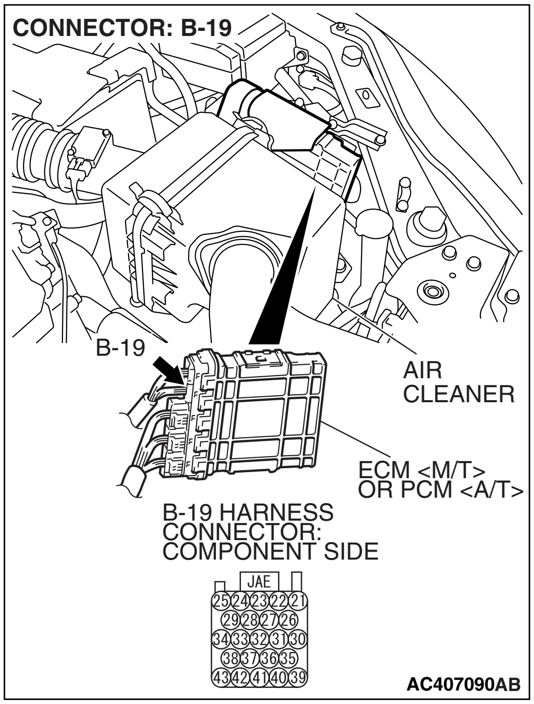
(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

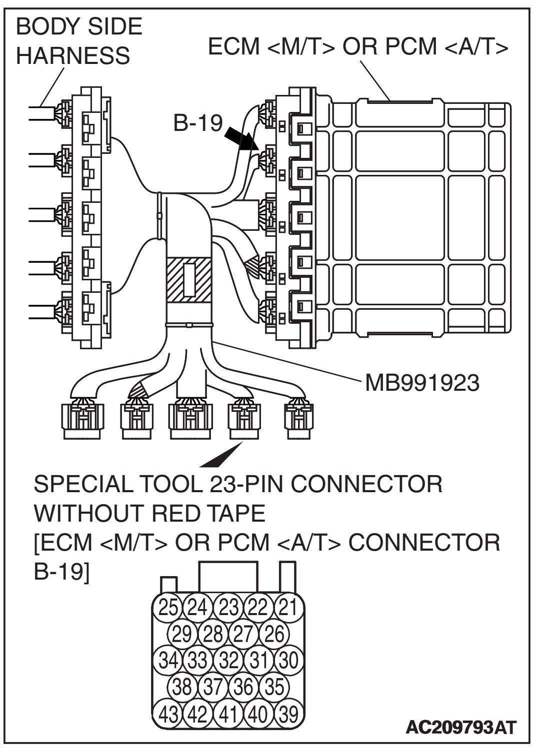
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

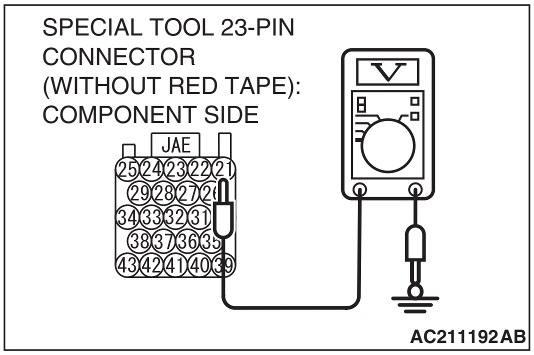
STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.

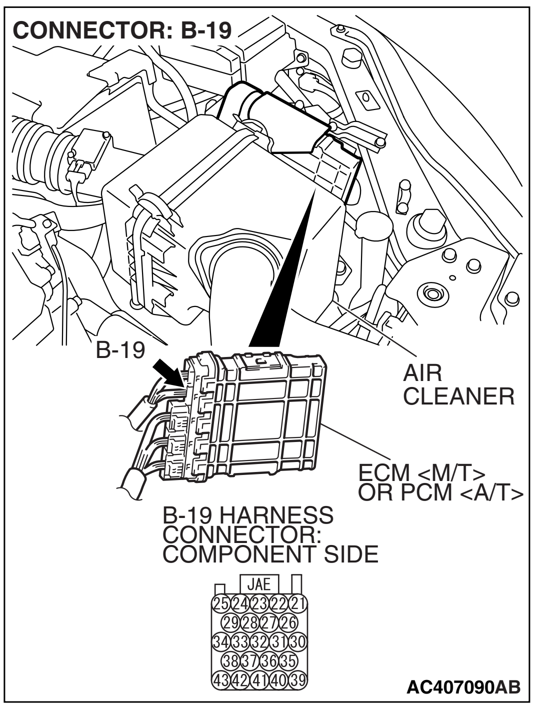
Q: Is the measured voltage between 4.9 and 5.1 volts?

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

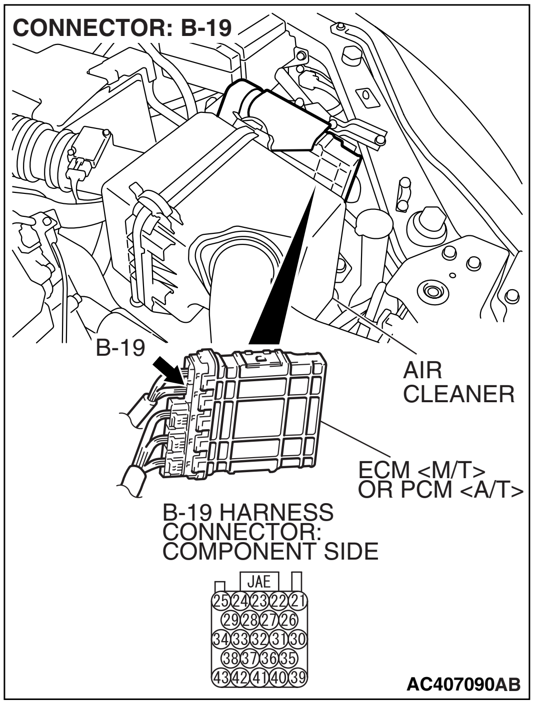
STEP 4. Check ECM <M/T> or PCM <A/T> connector B-19 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

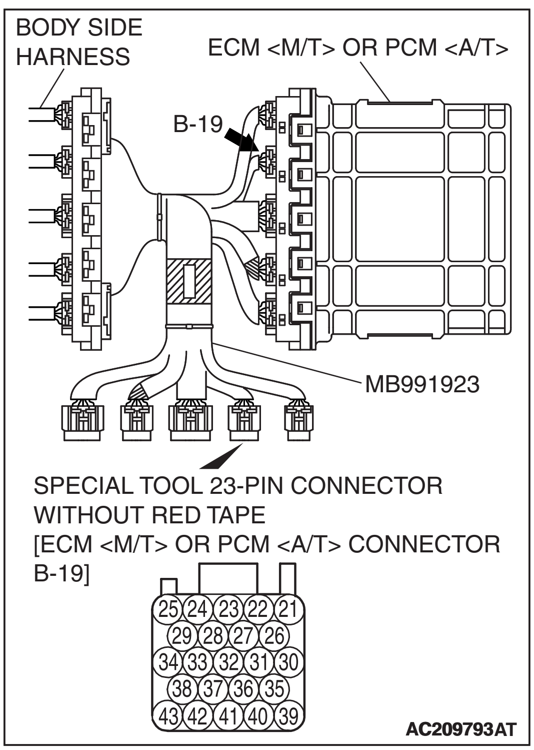
YES : Go to Step 16.
NO : Repair or replace the faulty components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



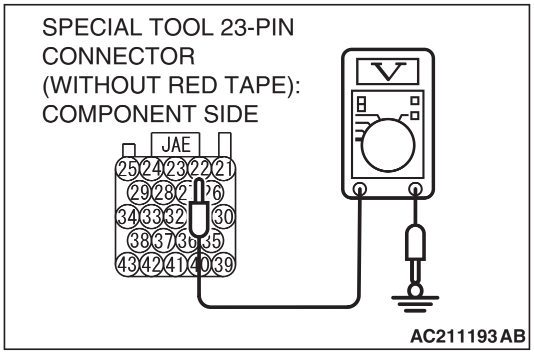
STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.

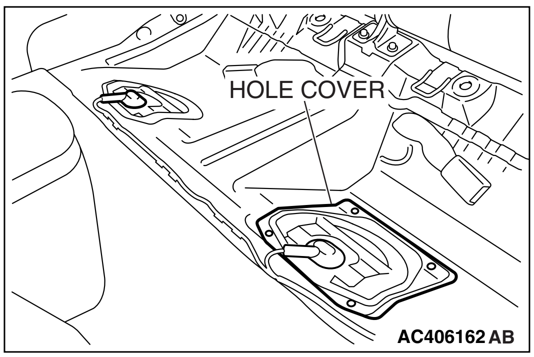
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

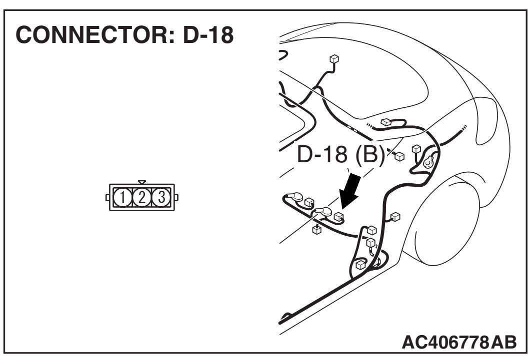
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

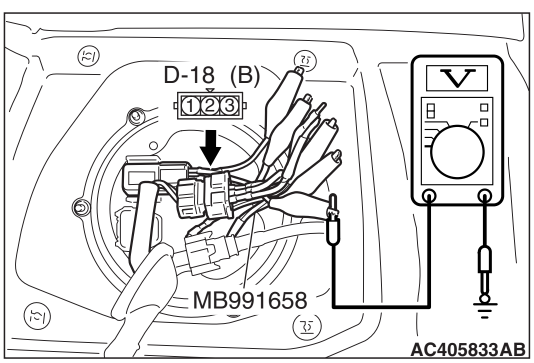
STEP 6. Measure the signal voltage at intermediate connector D-18.

(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.

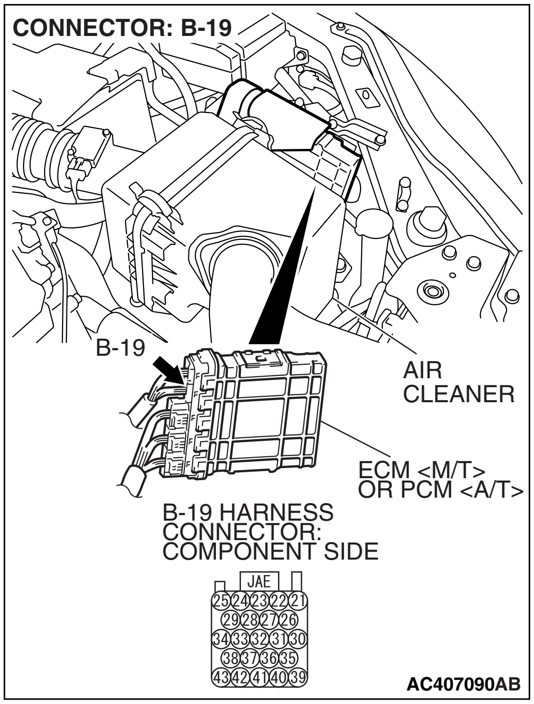


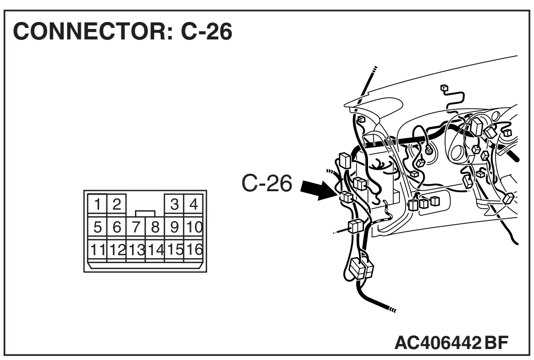
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-18 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

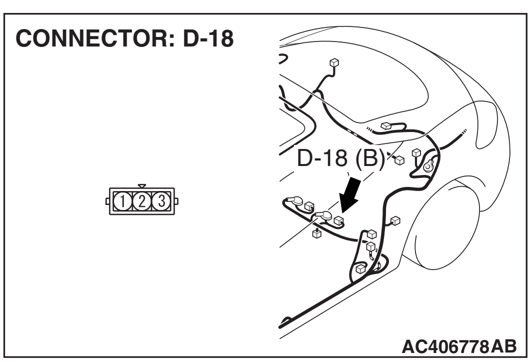
(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 7.
NO : Go to Step 15.





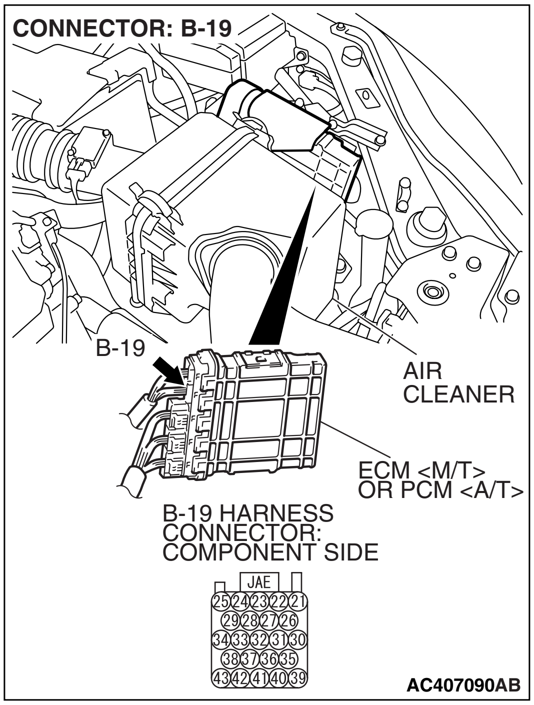


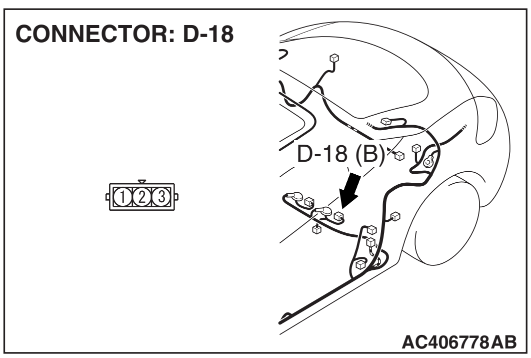
STEP 7. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.





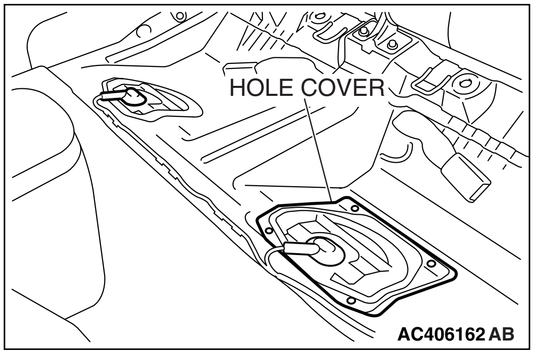
STEP 8. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 23 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

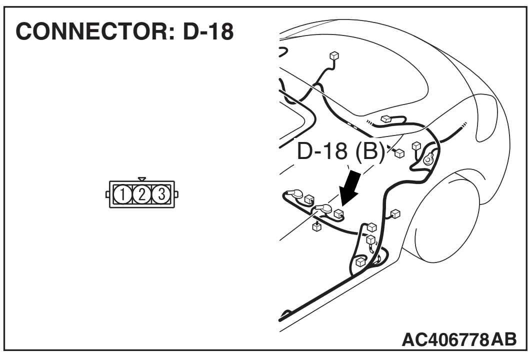
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wire. Then go to Step 17.

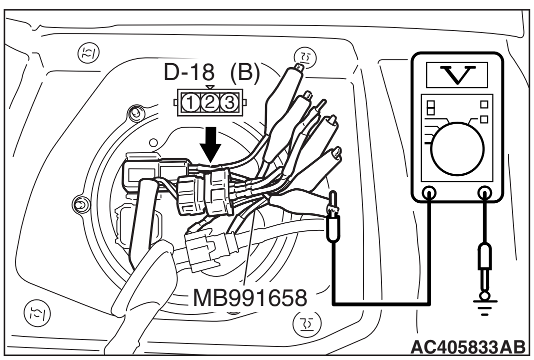
STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.



(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?

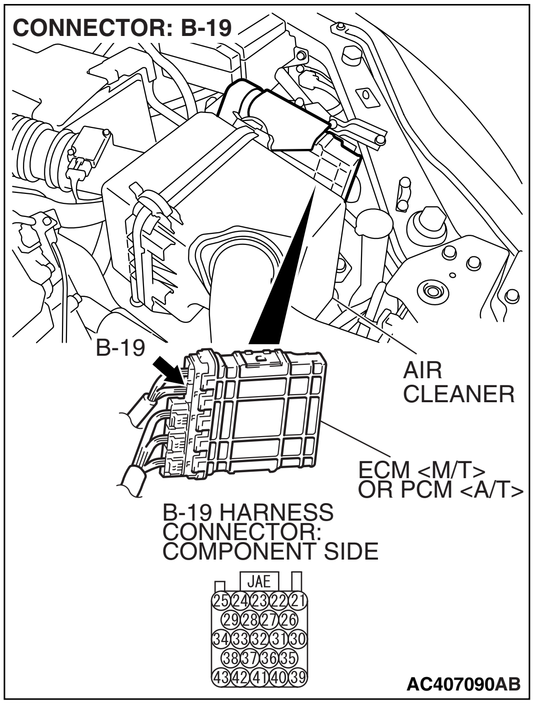
YES : Go to Step 12.
NO : Go to Step 10.

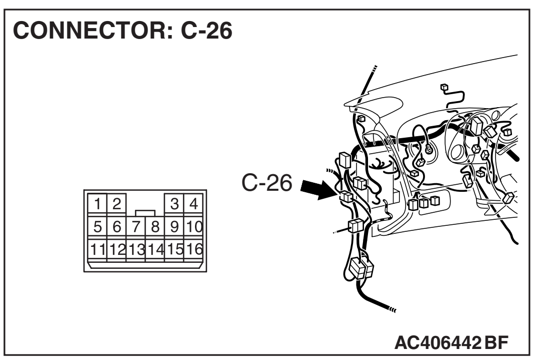
STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

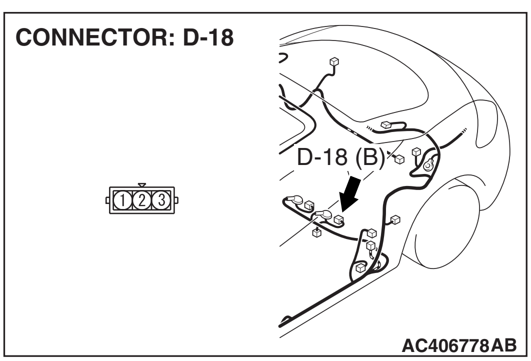
Q: Are the connectors and terminals in good condition?

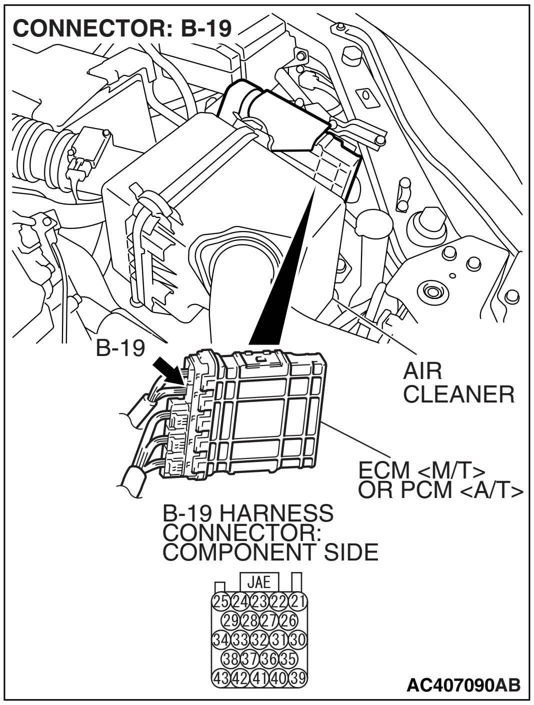
YES : Go to Step 11.

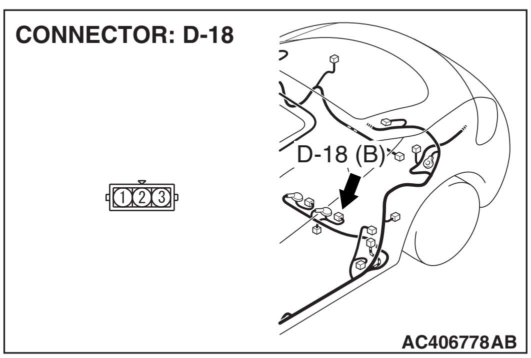
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











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?

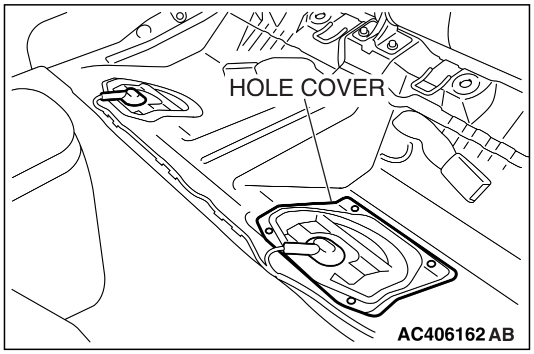
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

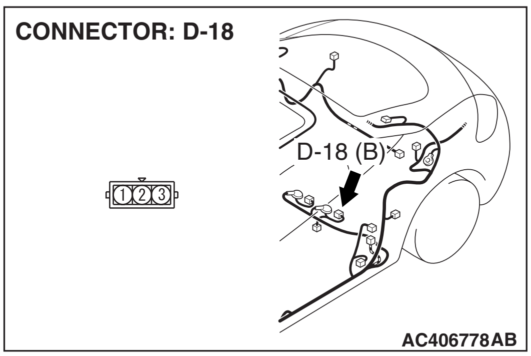
STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.

(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.



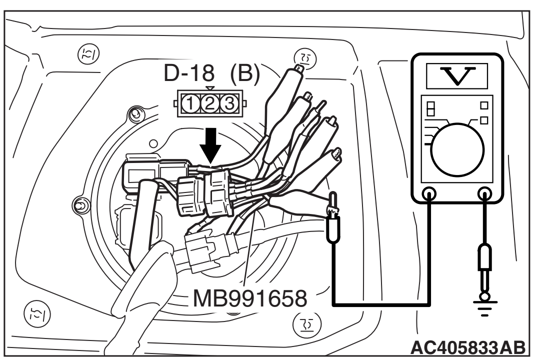
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.

(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?

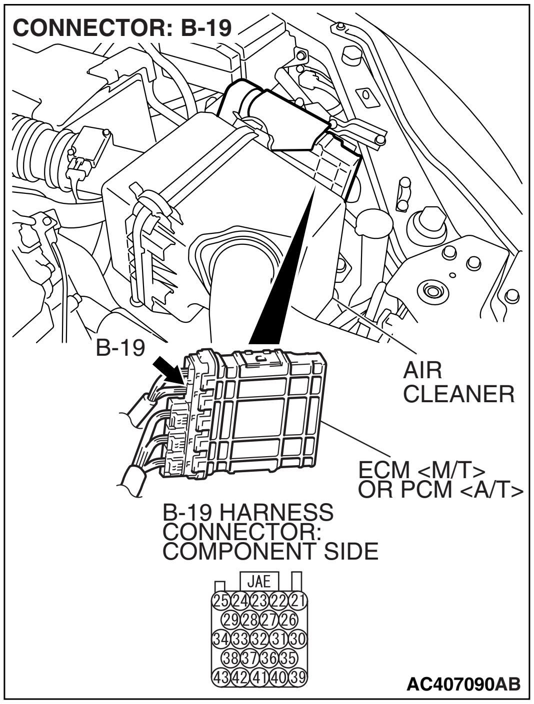
YES : Go to Step 13.
NO : Go to Step 17.

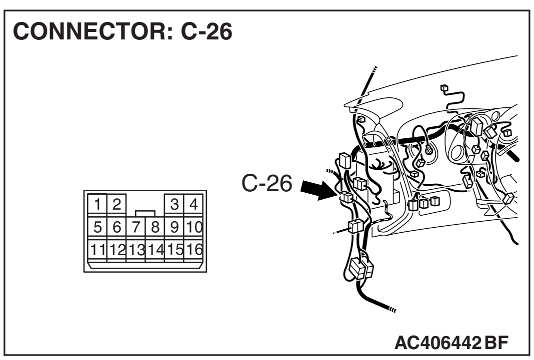
STEP 13. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

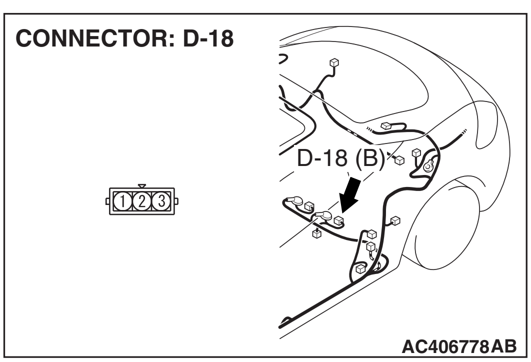
Q: Are the connectors and terminals in good condition?

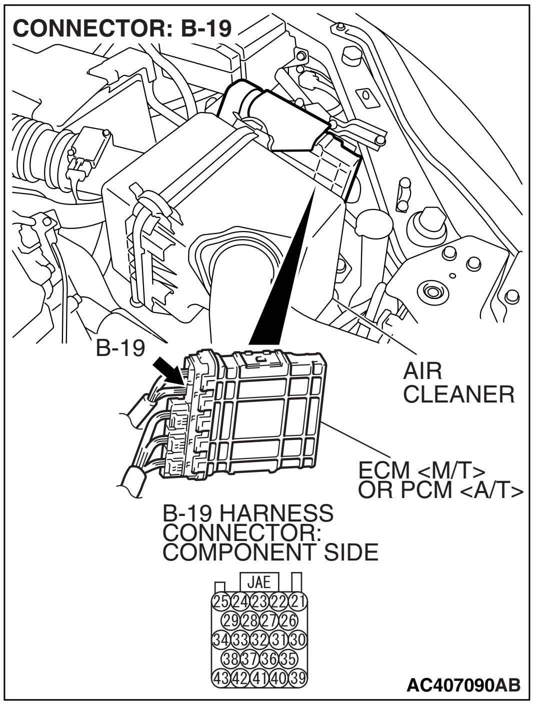
YES : Go to Step 14.

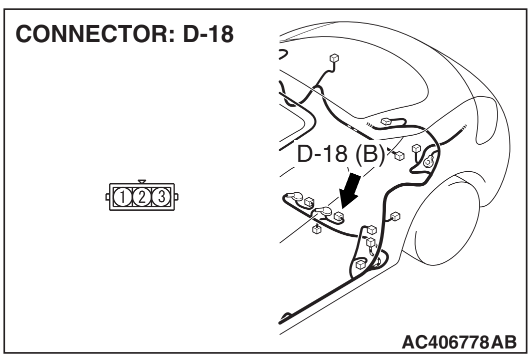
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.









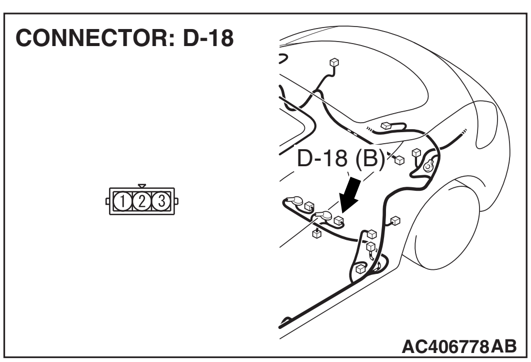


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

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.



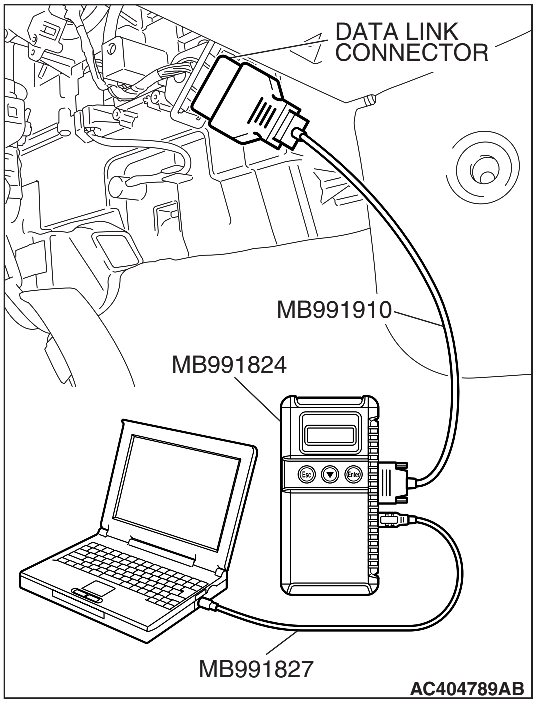
STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.

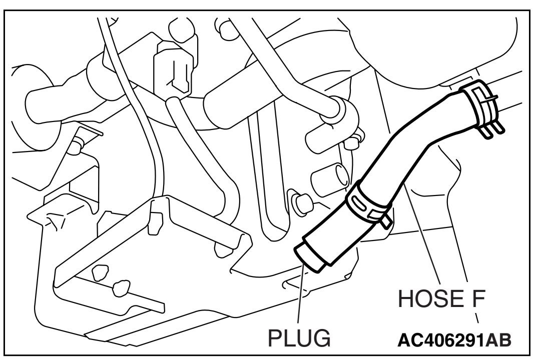
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



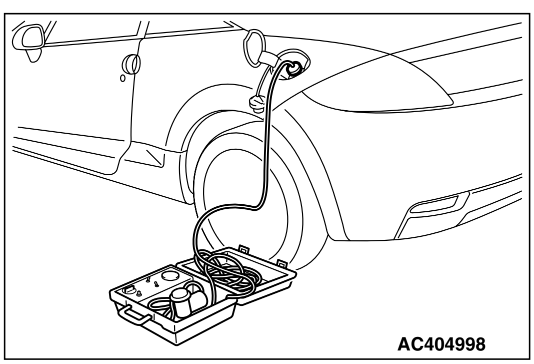
⚠ CAUTION

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.13A-6).

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

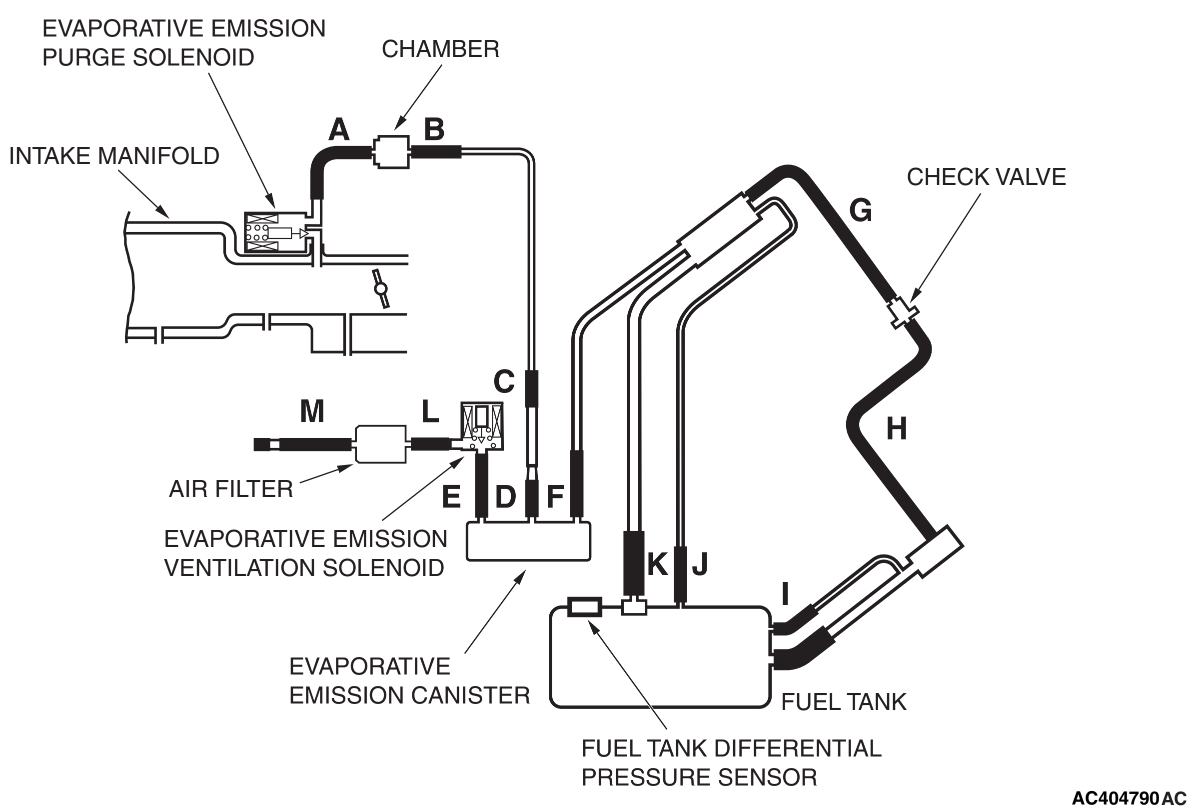
Q: Is DTC P0450 set?

YES : Repeat the troubleshooting from Step 2.

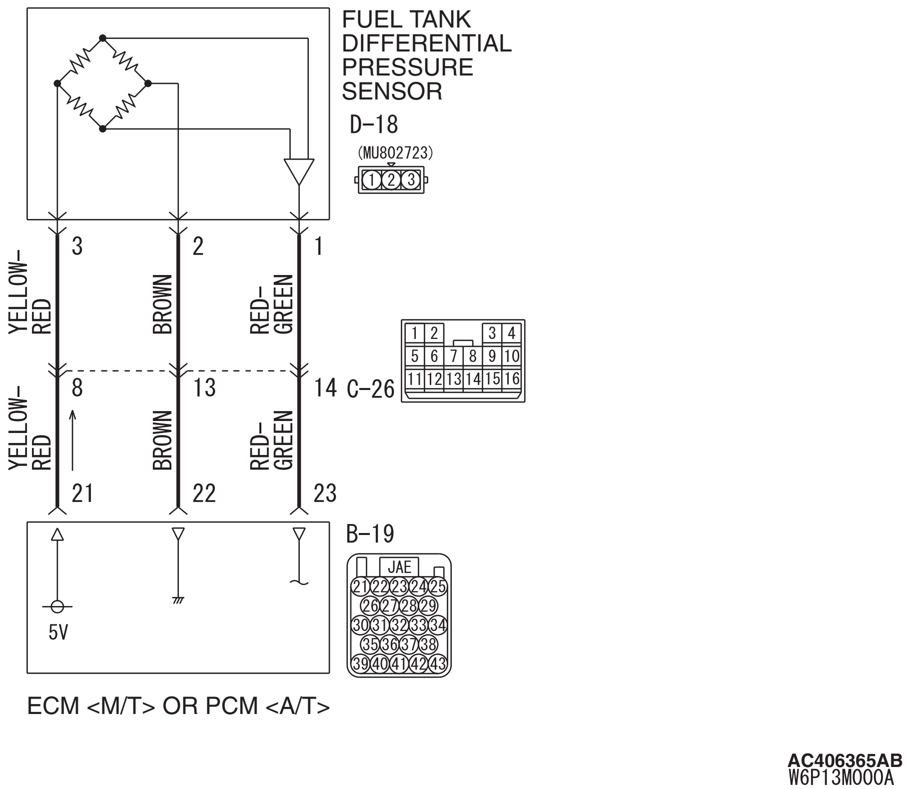
NO : The procedure is complete.

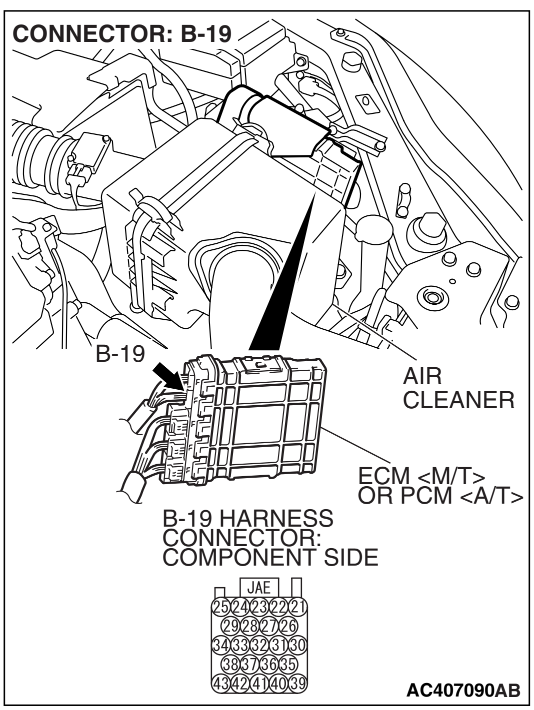
DTC P0451: Evaporative Emission System Pressure Sensor Range/Performance

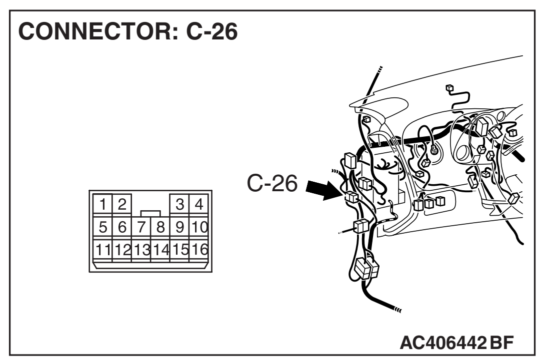
System Diagram

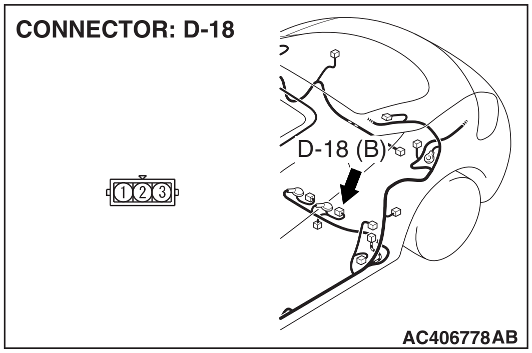


Fuel Tank Differential Pressure Sensor Circuit









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)

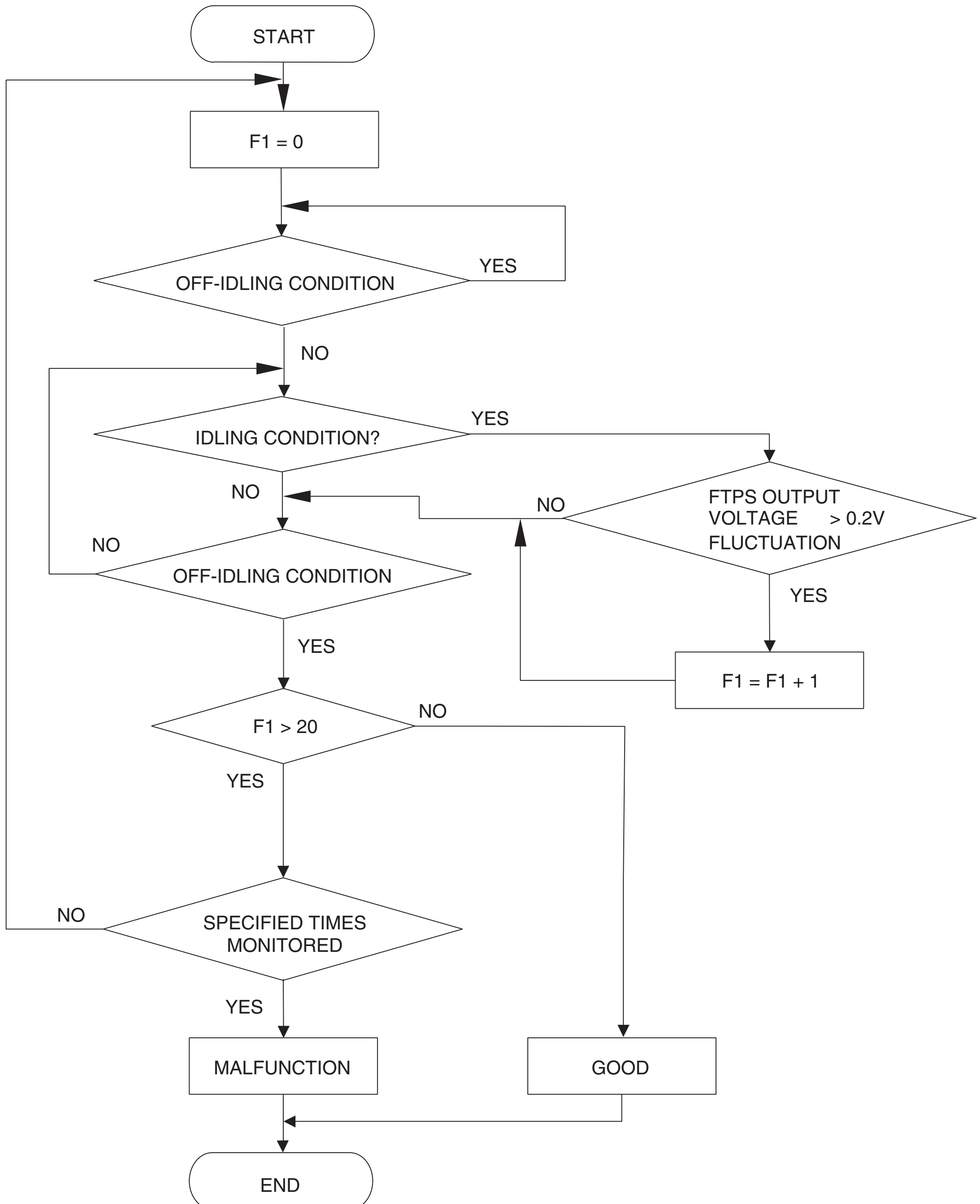
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

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 16 P.13A-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

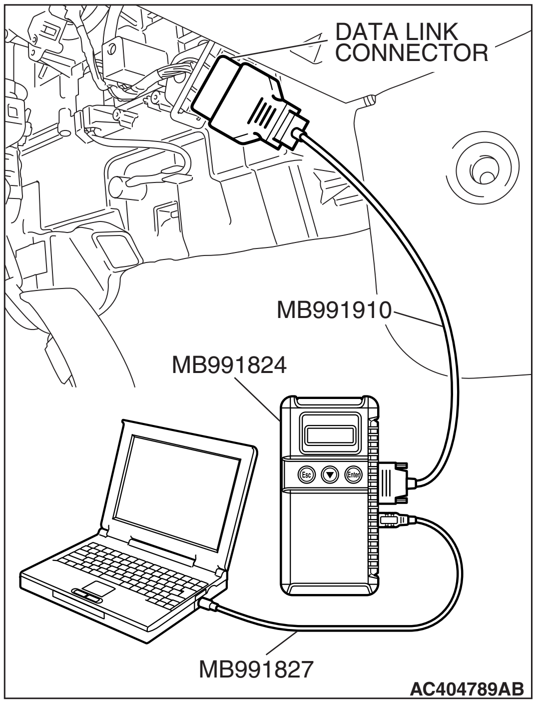
- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (TANK PRS 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

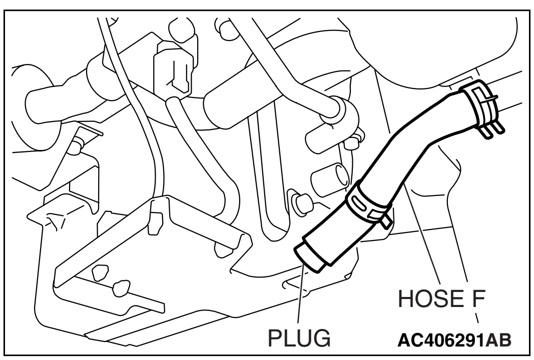
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



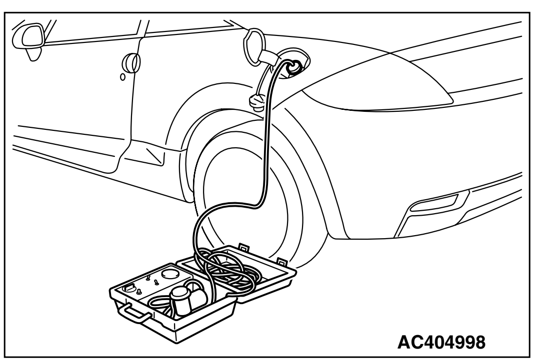
⚠ CAUTION

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.

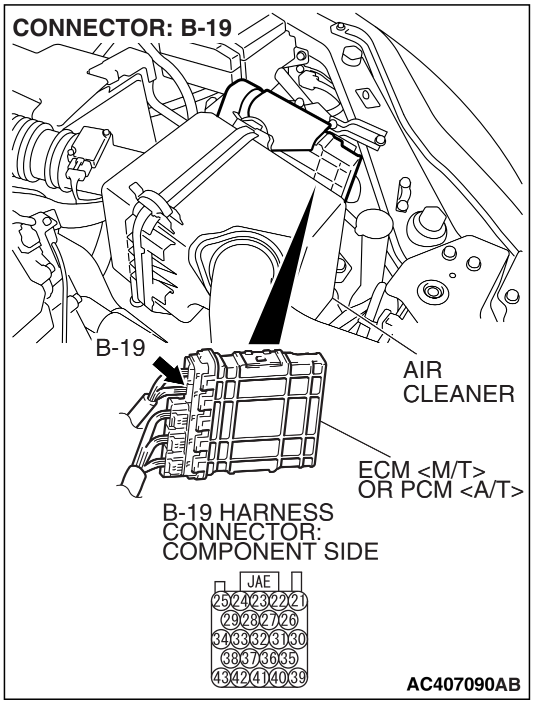
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

Q: Is the fuel tank pressure between 2050 and 2950 mV?

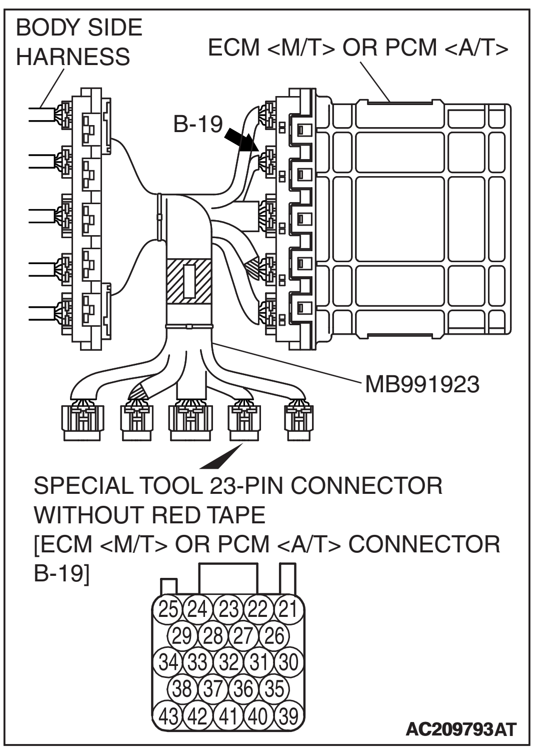
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

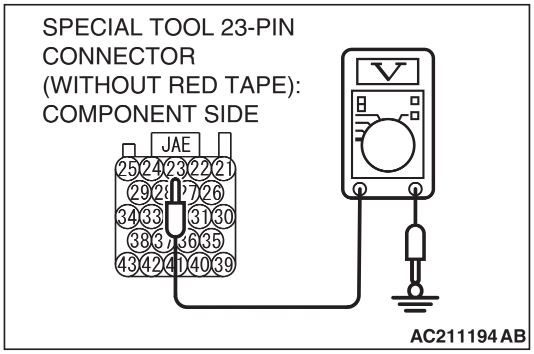
STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.



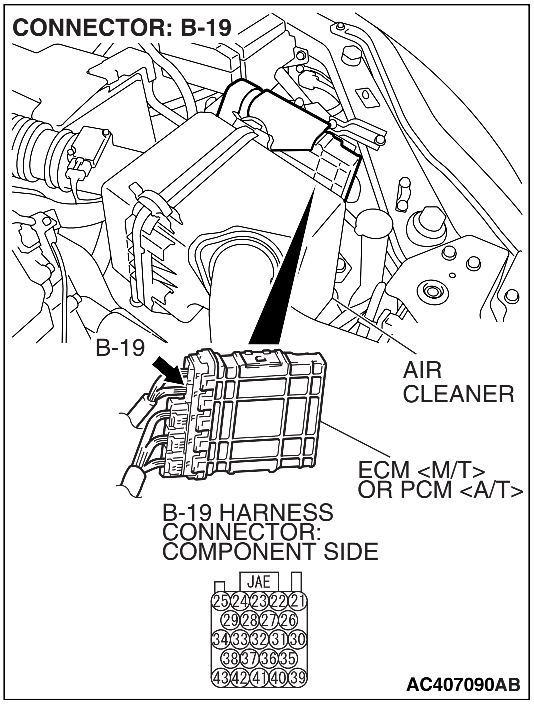
(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

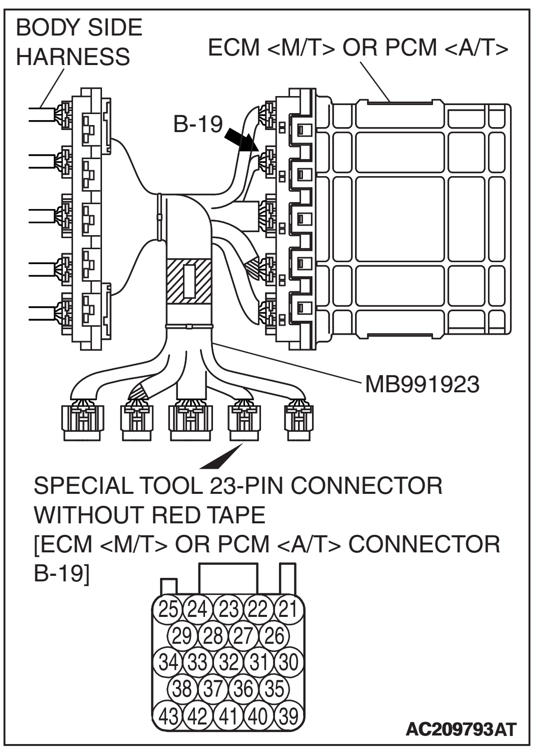
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

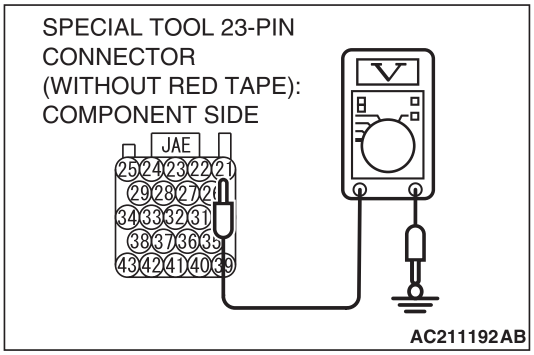
STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.

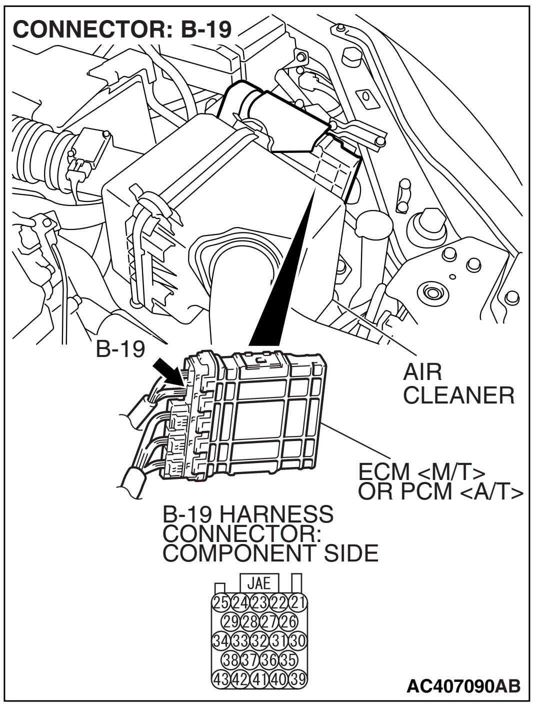


(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(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.

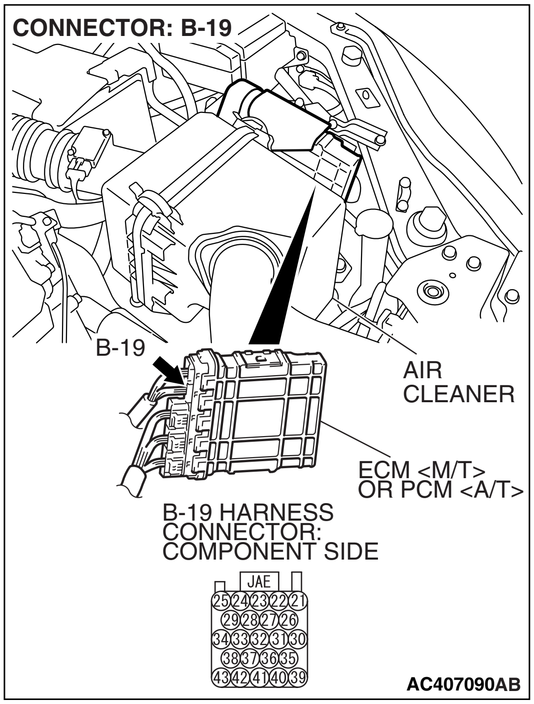


STEP 4. Check ECM <M/T> or PCM <A/T> connector B-19 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

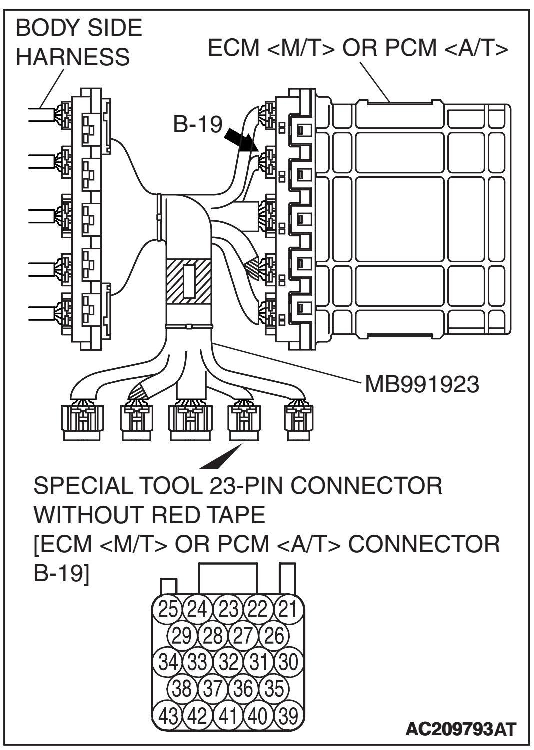
Q: Are the connector and terminals in good condition?

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.

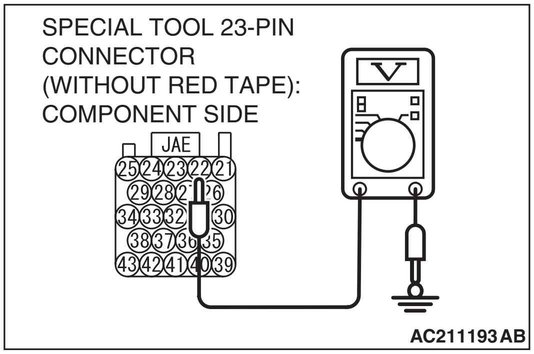
STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.

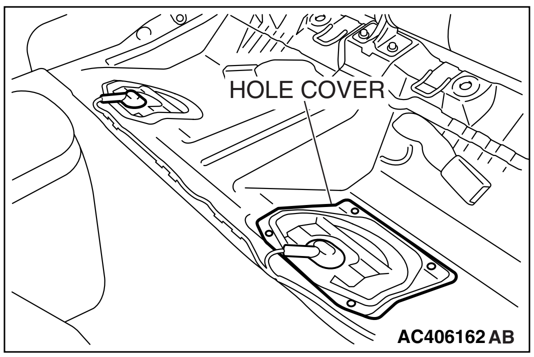
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

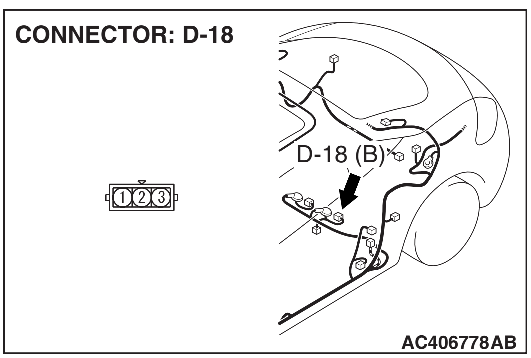
YES : Go to Step 6.
NO : Go to Step 9.

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.

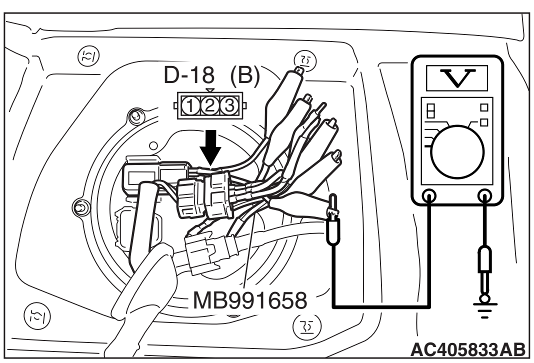


(3) Disconnect fuel tank differential pressure sensor connector D-18.



(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.

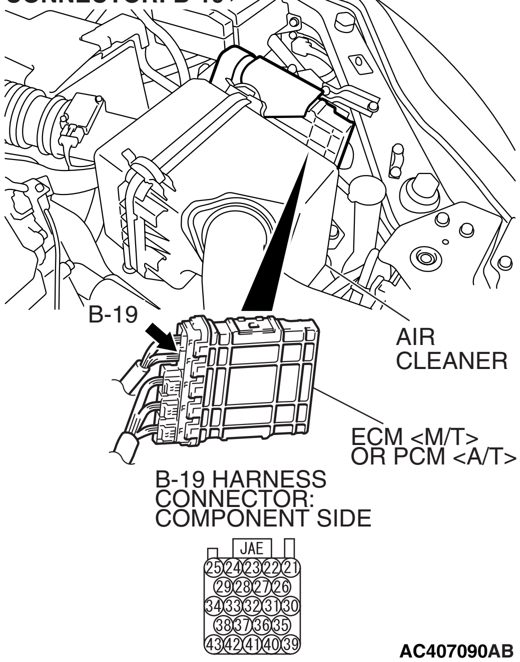
STEP 7. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

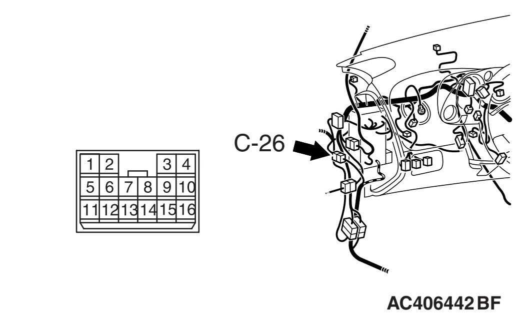
YES : Go to Step 8.

NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

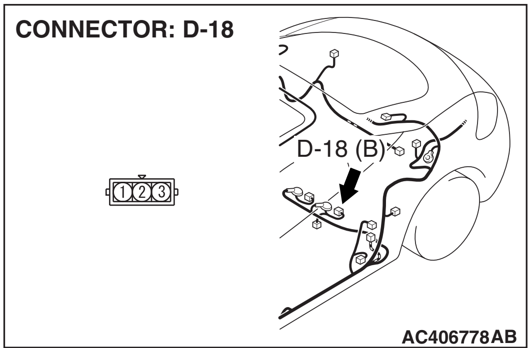
CONNECTOR: B-19

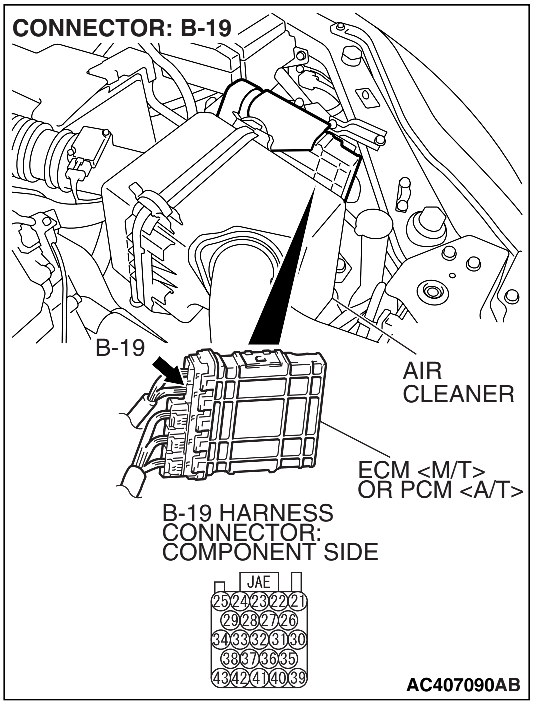


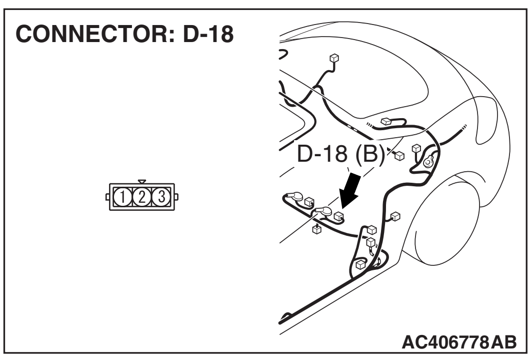
CONNECTOR: C-26



CONNECTOR: D-18







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?

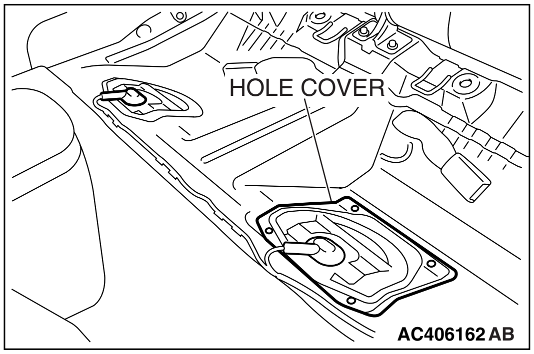
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wire. Then go to Step 17.

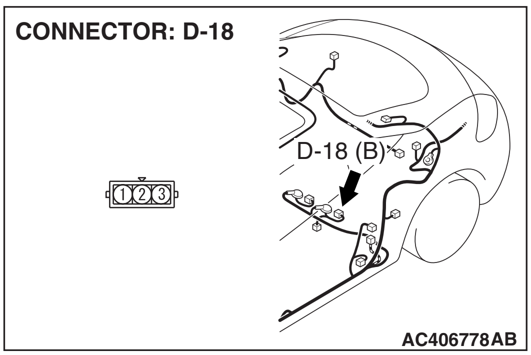
STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.

(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.



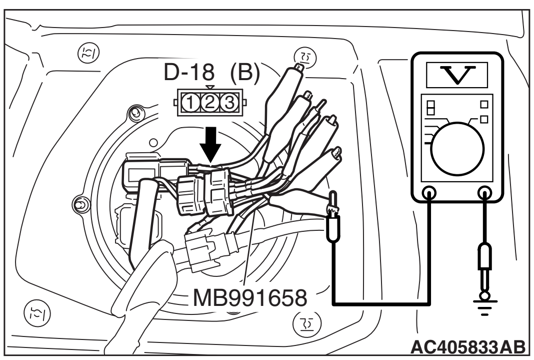
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.

(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.

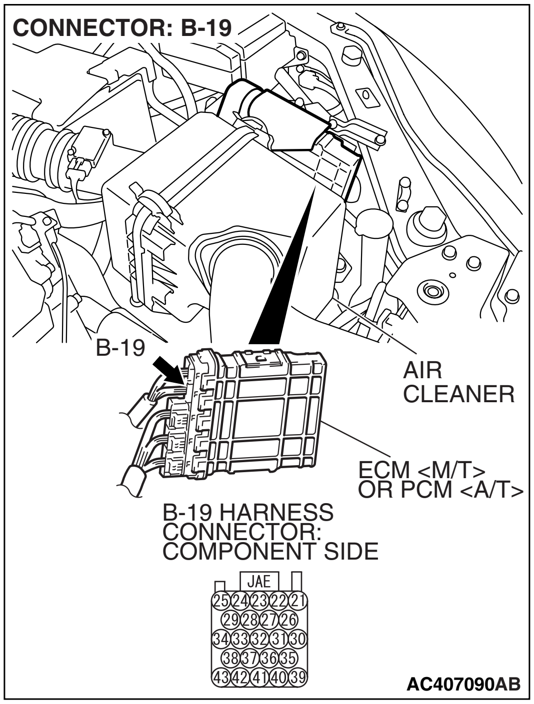
NO : Go to Step 10.

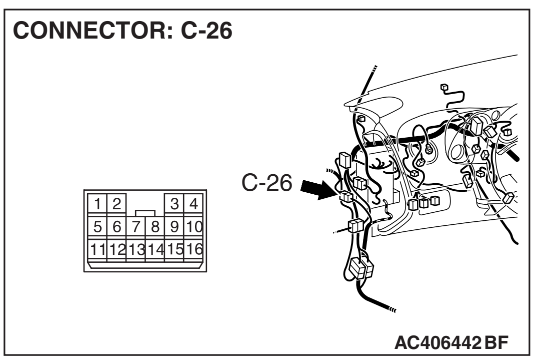
STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

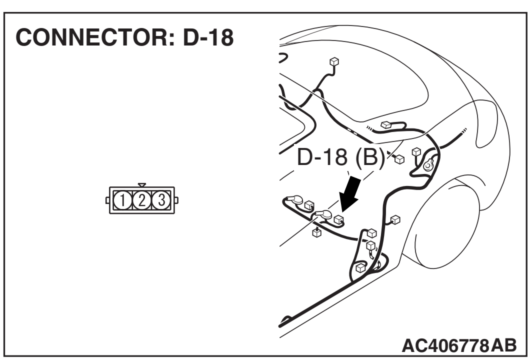
Q: Are the connectors and terminals in good condition?

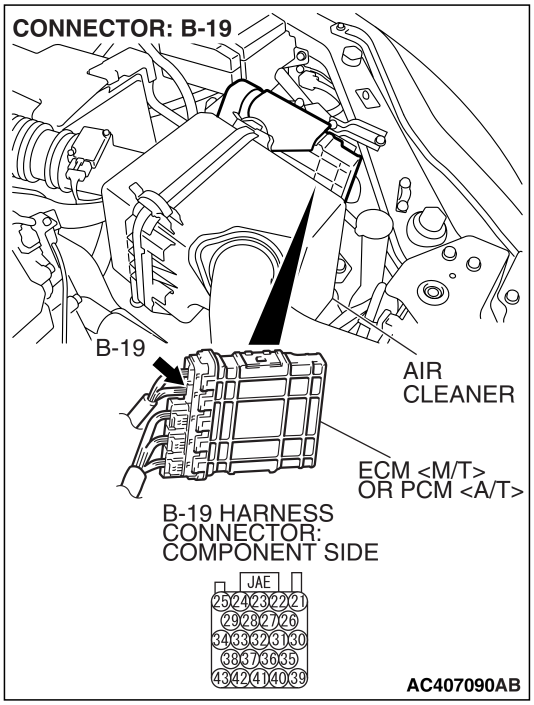
YES : Go to Step 11.

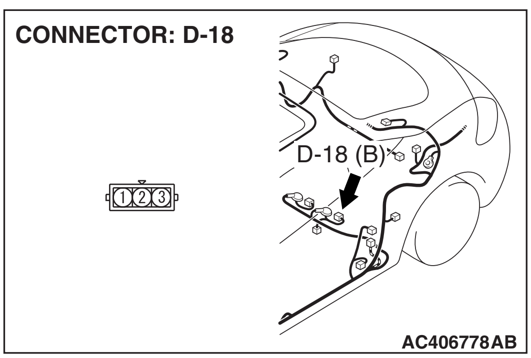
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











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?

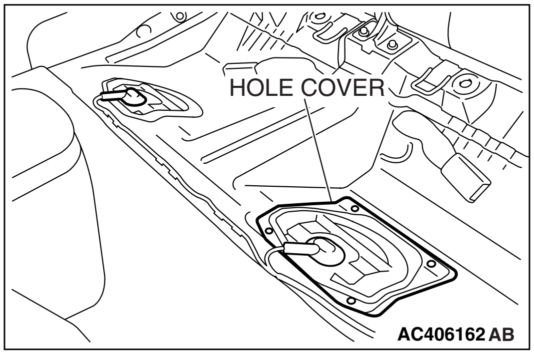
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

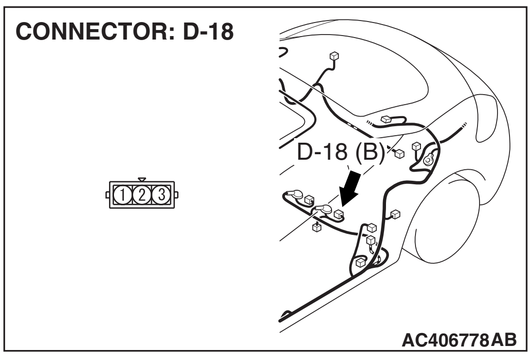
STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.

(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.



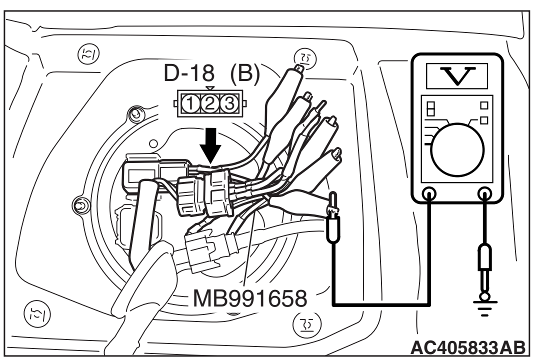
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.

(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.

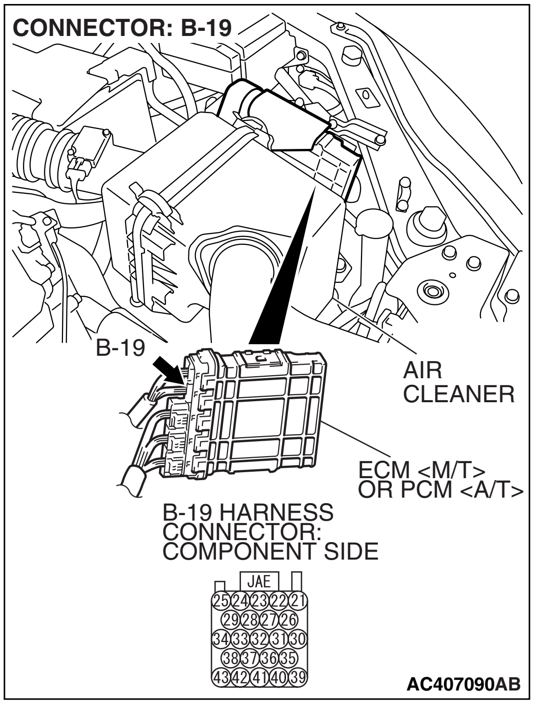


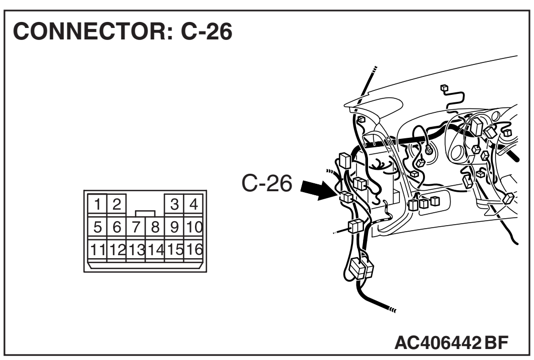
Q: Is the measured voltage 0.5 volt or less?

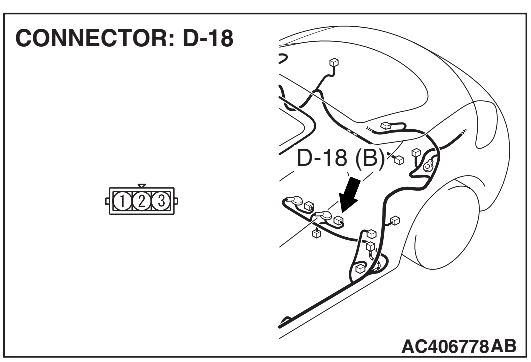
YES : Go to Step 13.

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.



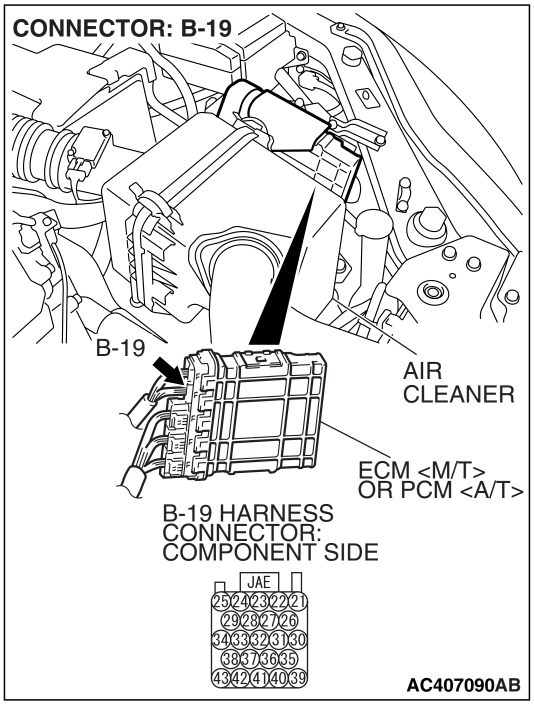


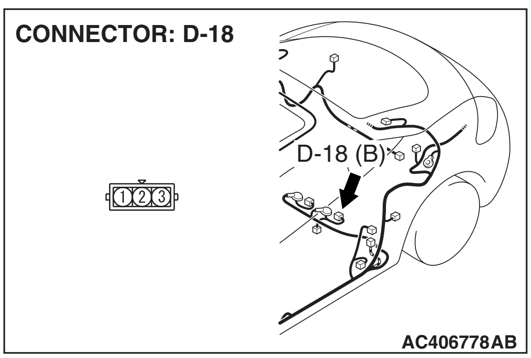


Q: Are the connectors and terminals in good condition?

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.



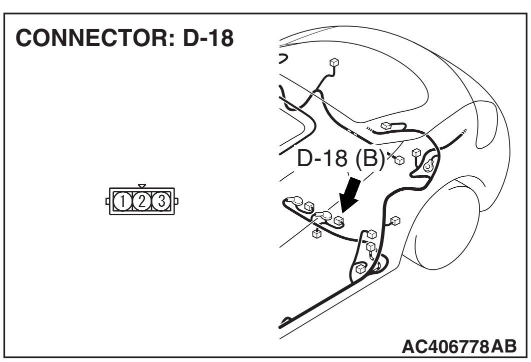


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

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.



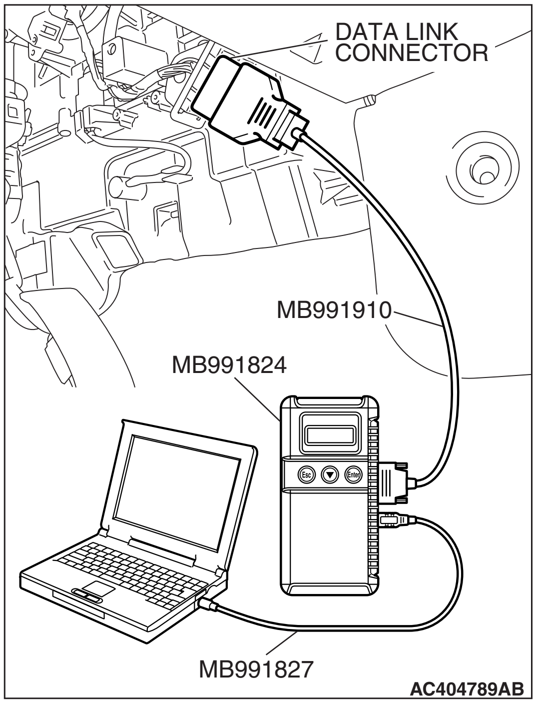
STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.

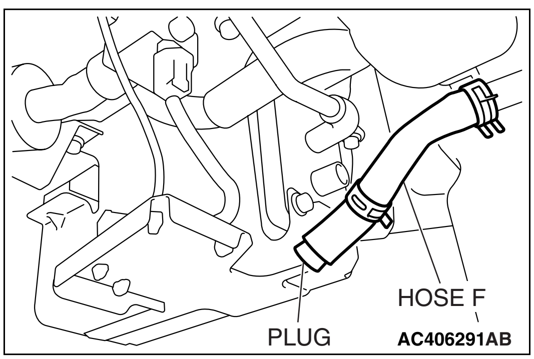
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



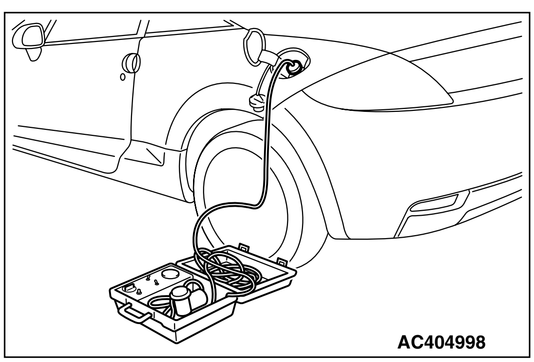
⚠ CAUTION

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 16 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

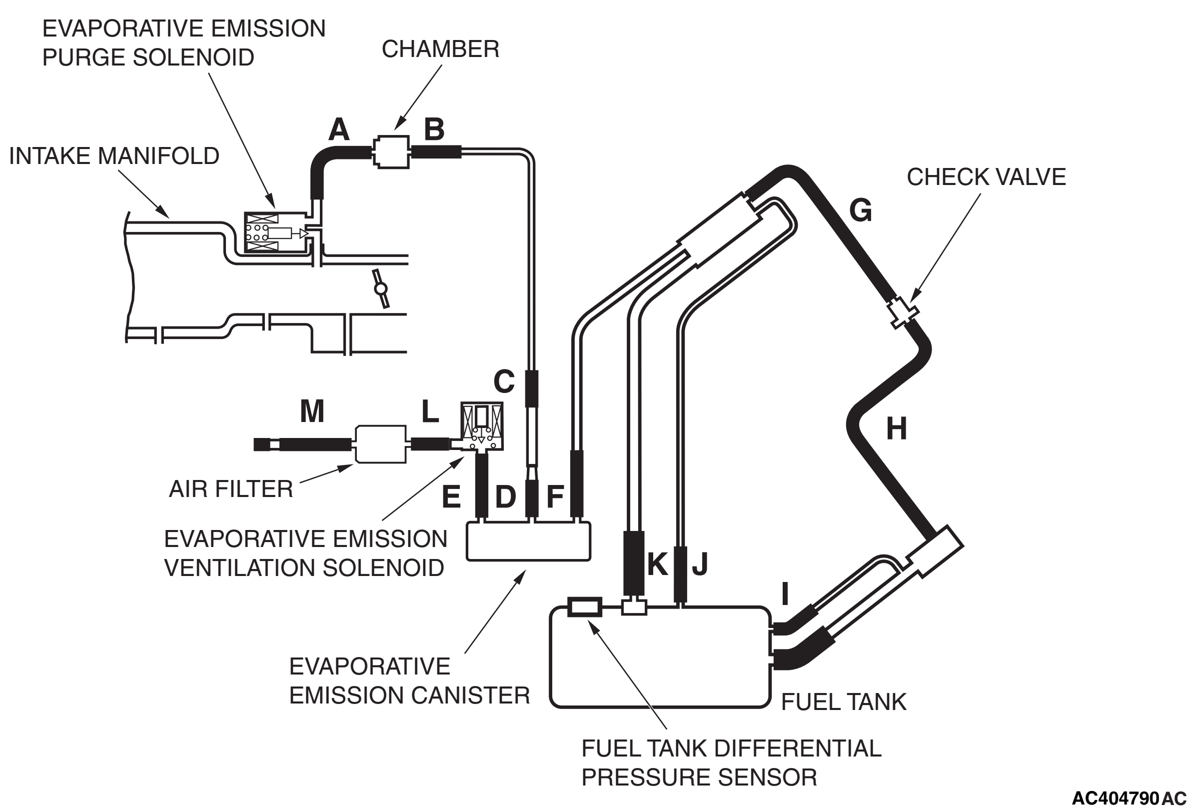
Q: Is DTC P0451 set?

YES : Repeat the troubleshooting from Step 2.

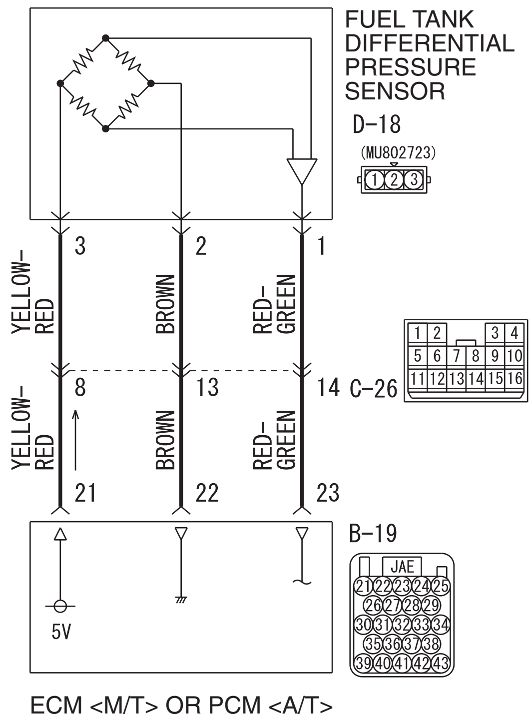
NO : The procedure is complete.

DTC P0452: Evaporative Emission System Pressure Sensor Low Input

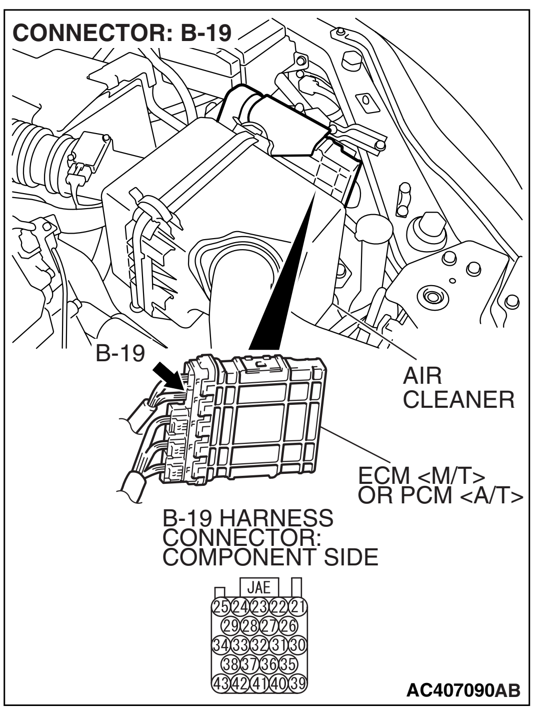
System Diagram

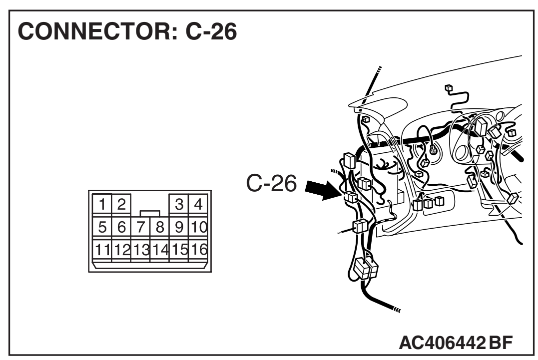


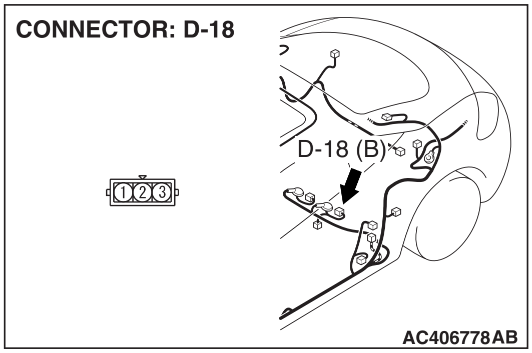
Fuel Tank Differential Pressure Sensor Circuit



AC406365AB
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 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)

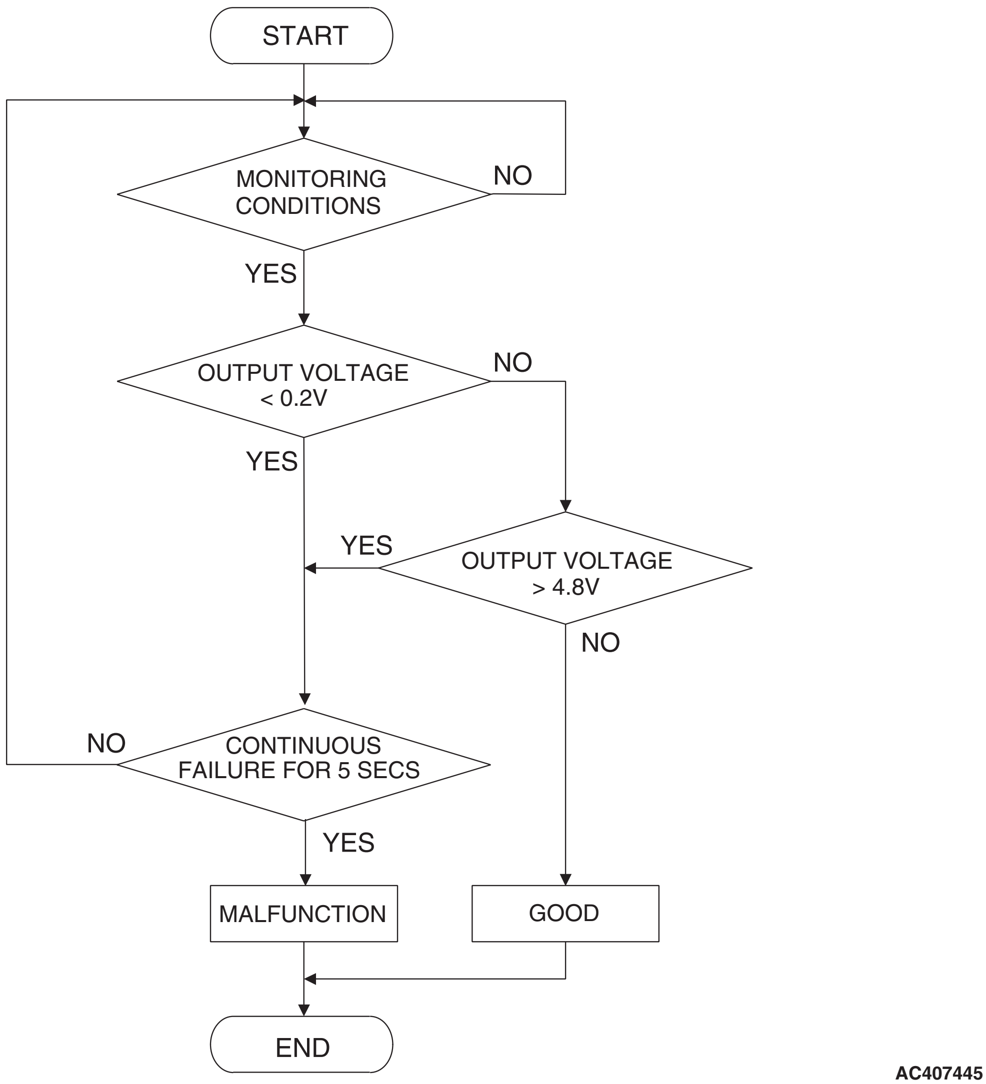
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

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)

RANGE CHECK - MIN. / MAX.



DTC SET CONDITIONS

Check Conditions

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

Judgement Criteria

- The fuel tank differential pressure sensor output voltage remains 0.2 volt or less for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-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>.

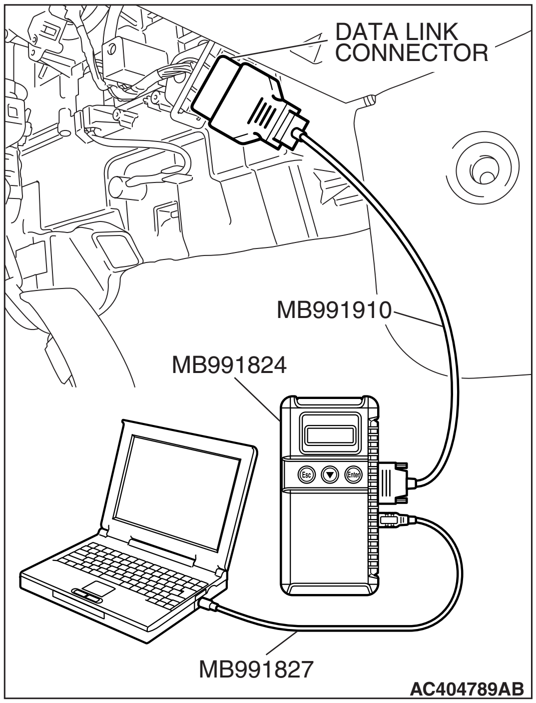
OVERVIEW OF TROUBLESHOOTING

- DTC P0452 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

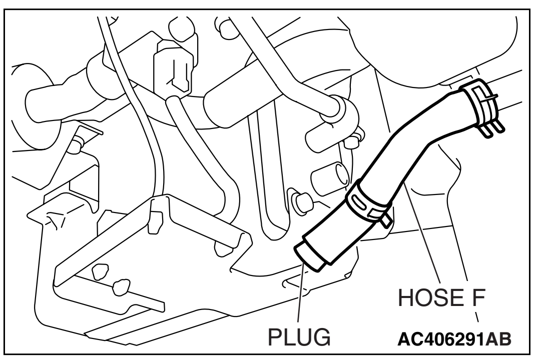


STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

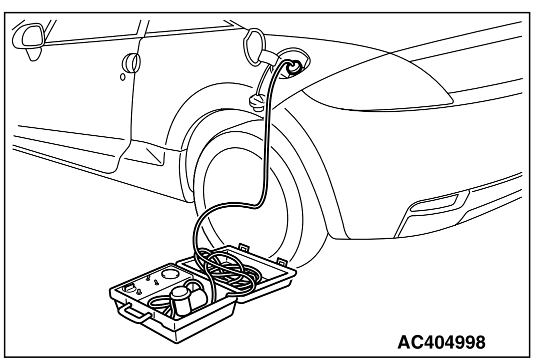
⚠ CAUTION

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.

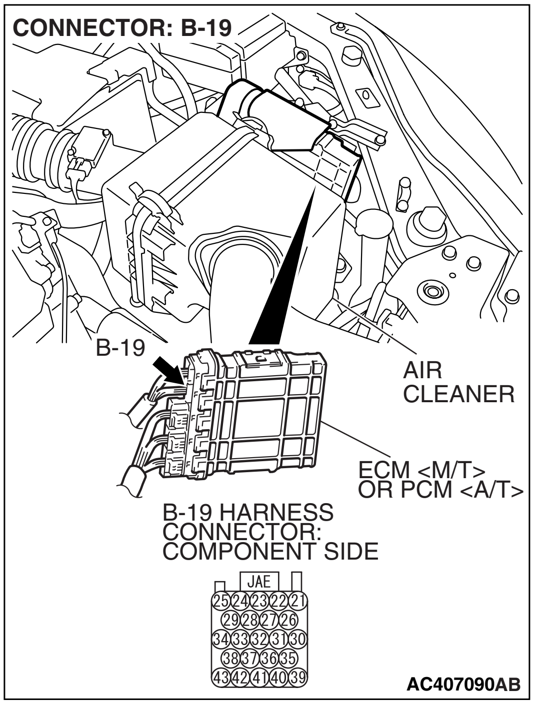
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose F to the evaporative emission canister.

Q: Is the fuel tank pressure between 2050 and 2950 mV?

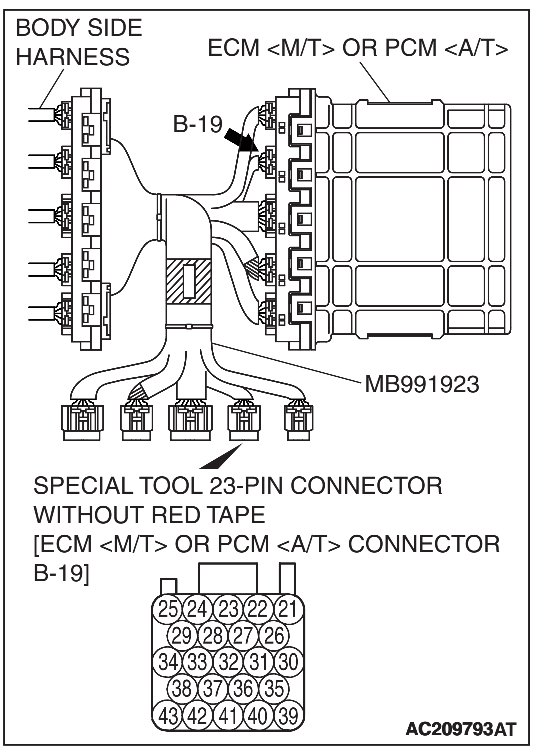
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

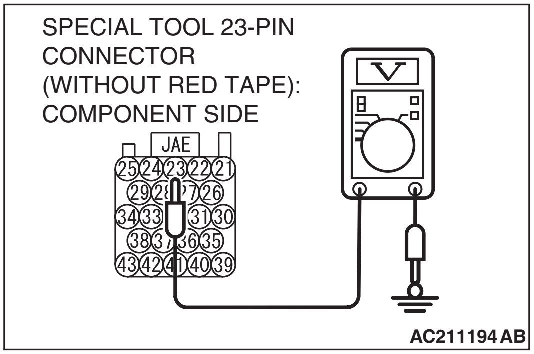
STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.



(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.

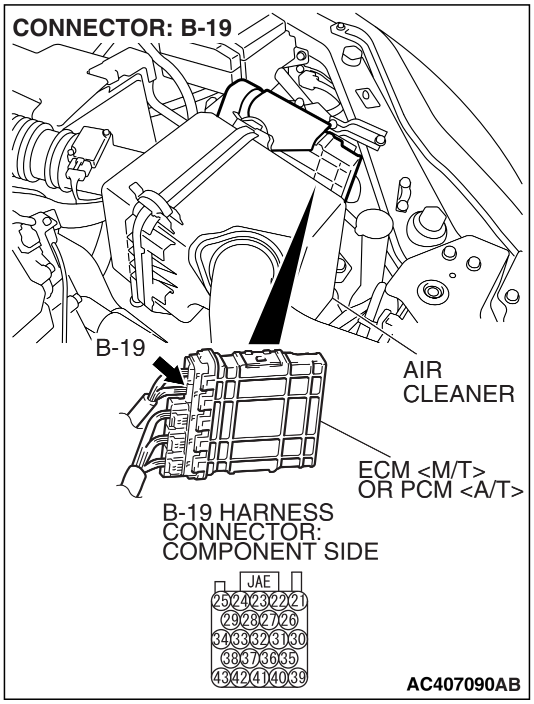


(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

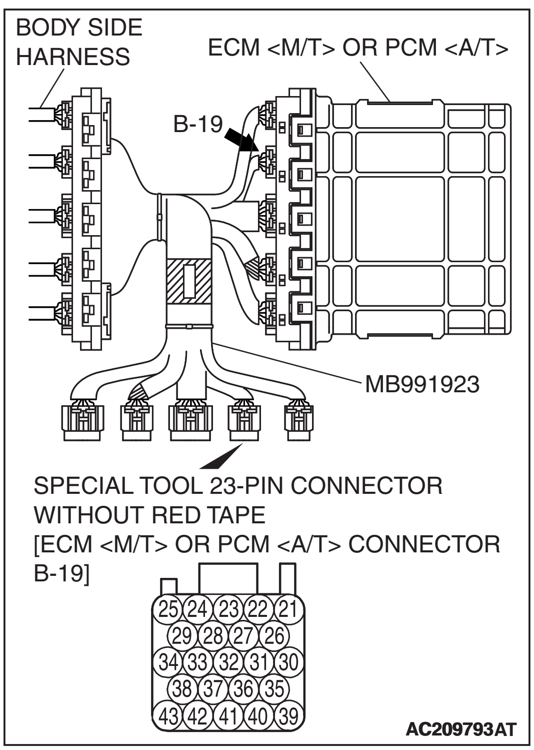
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.



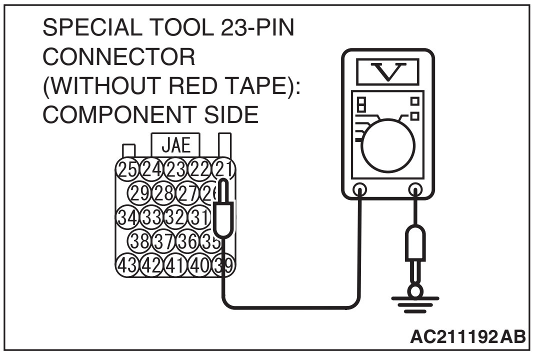
STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.

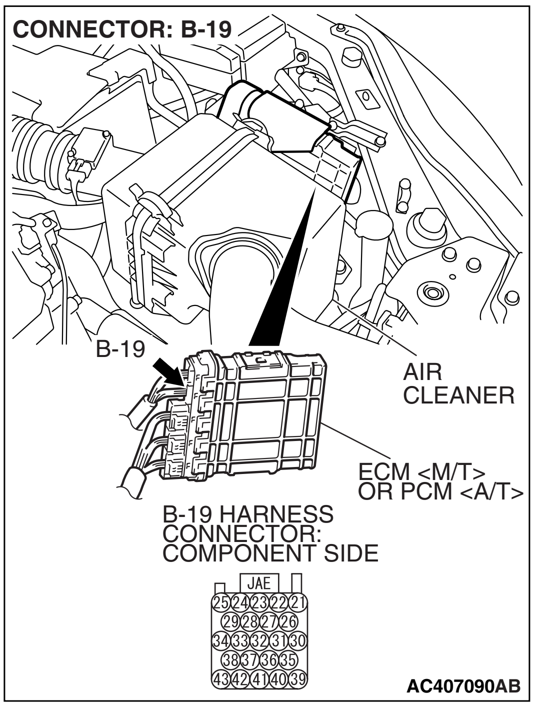
Q: Is the measured voltage between 4.9 and 5.1 volts?

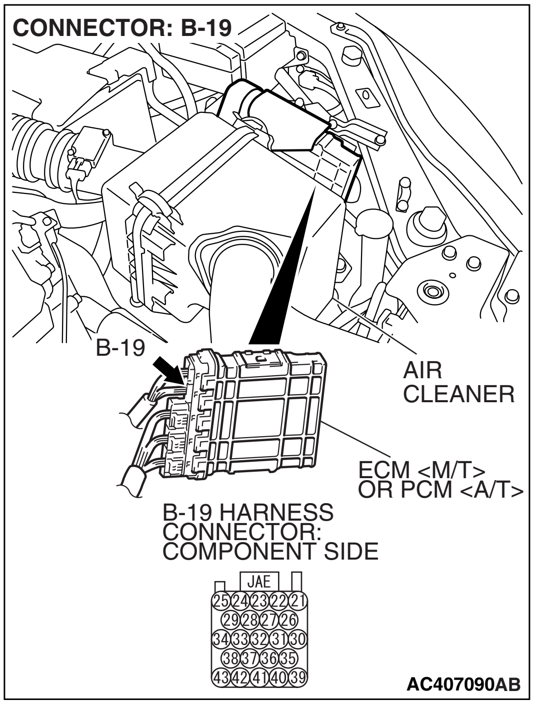
YES : Go to Step 5.
NO : Go to Step 4.

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?

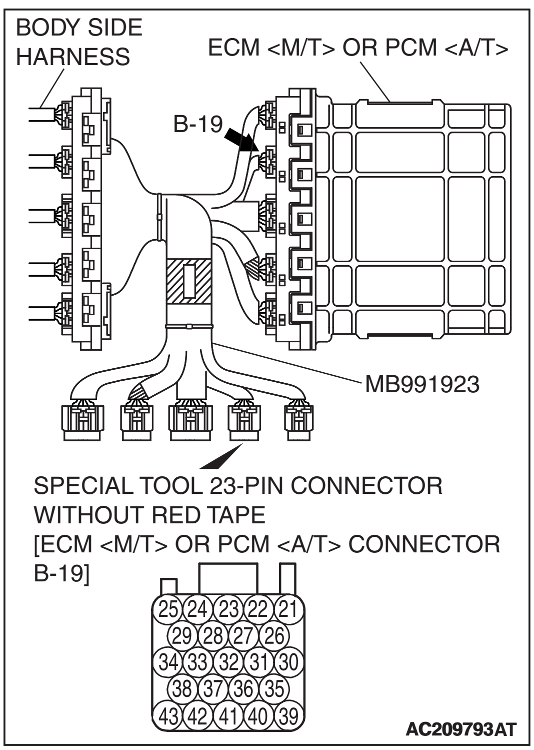
YES : Go to Step 16.
NO : Repair or replace the faulty components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.



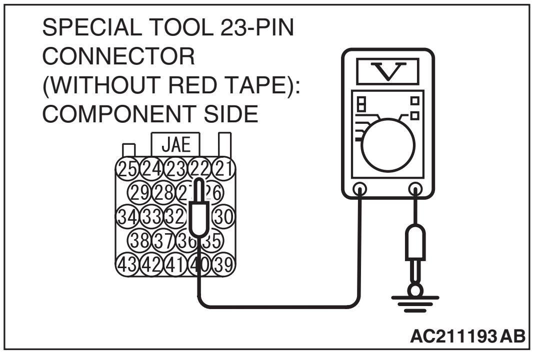


STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.

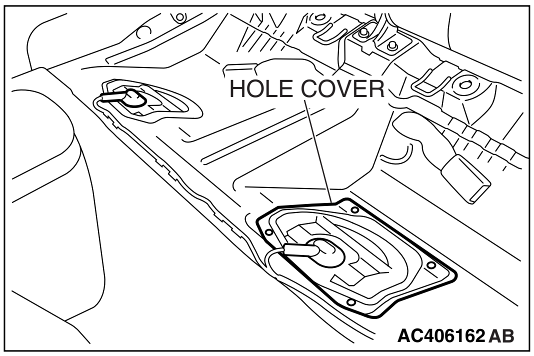
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

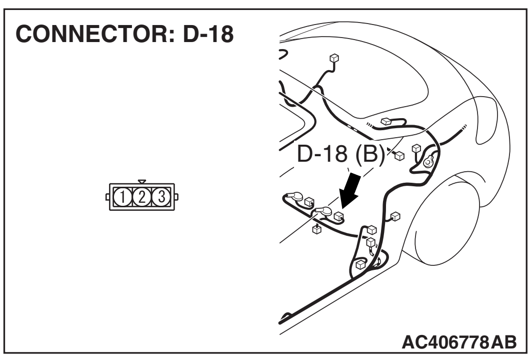
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 9.

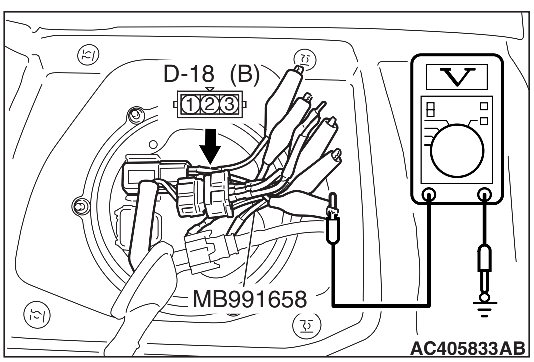
STEP 6. Measure the signal voltage at intermediate connector D-18.

(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.

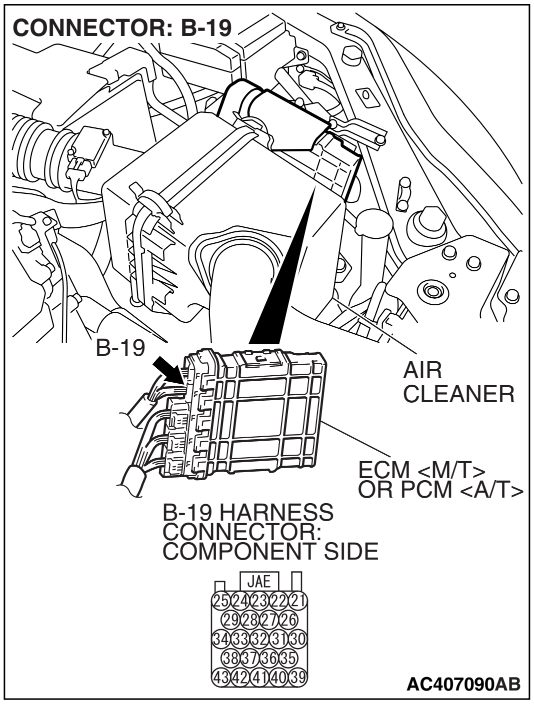


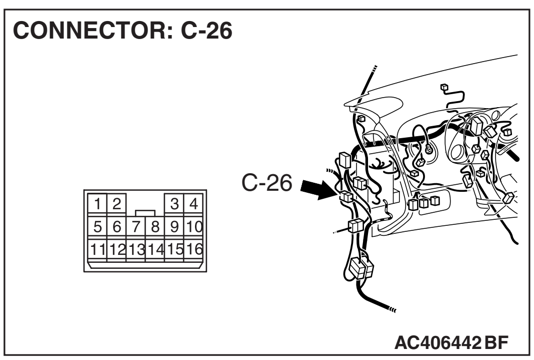
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between connector D-18 terminal 1 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

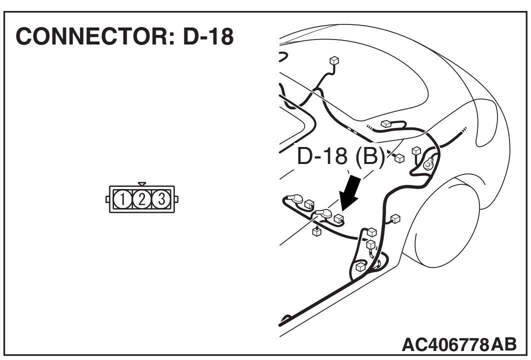
(8) Turn the ignition switch to the "LOCK" (OFF) position.

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.

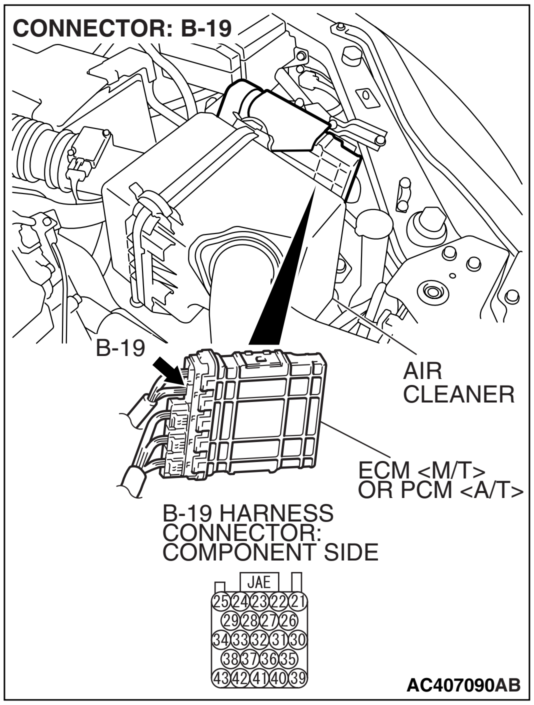
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

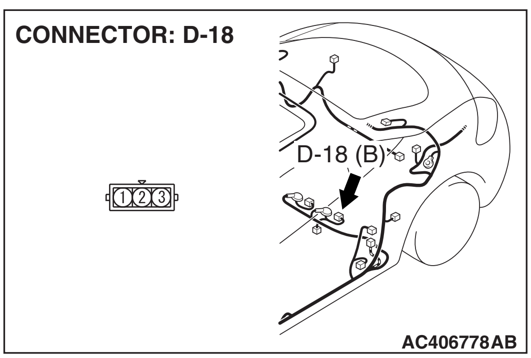
STEP 8. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 23 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

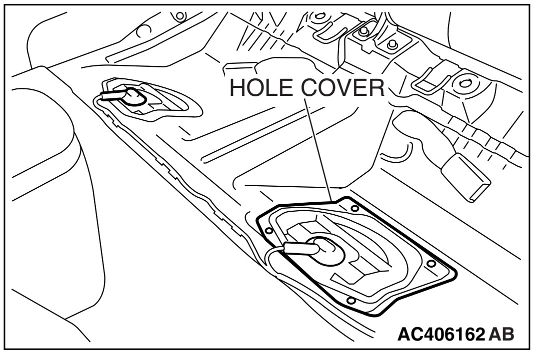
YES : This malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wire. Then go to Step 17.

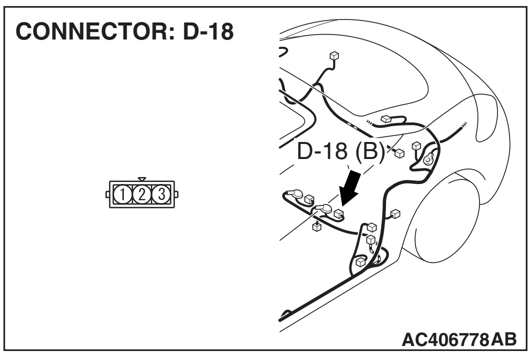




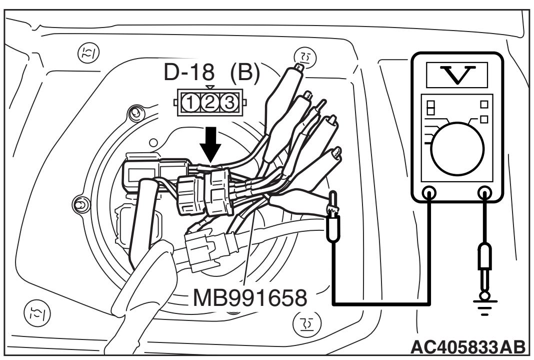
STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.



(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?

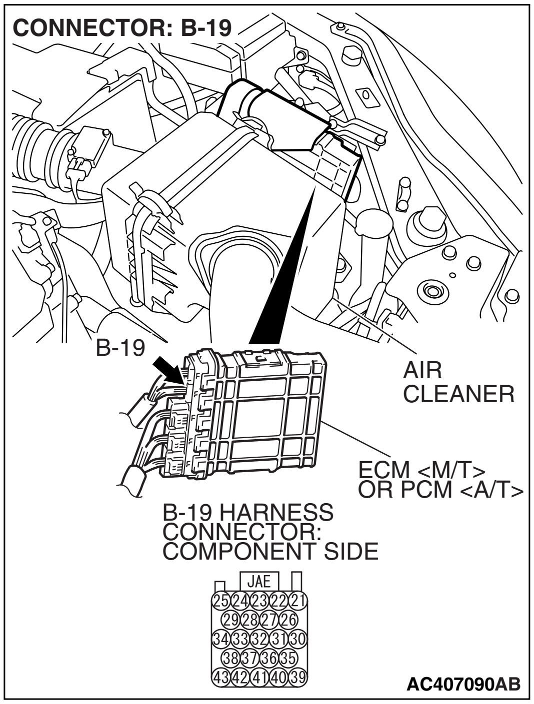
YES : Go to Step 12.
NO : Go to Step 10.

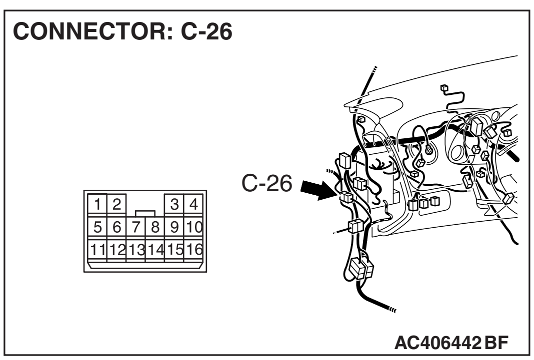
STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

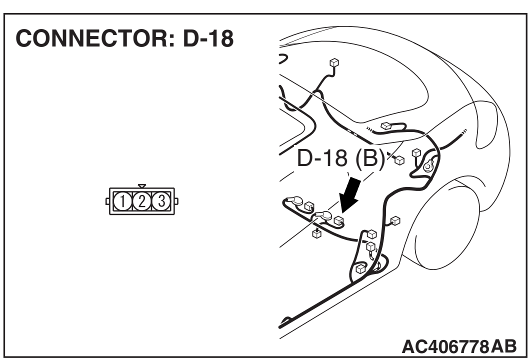
Q: Are the connectors and terminals in good condition?

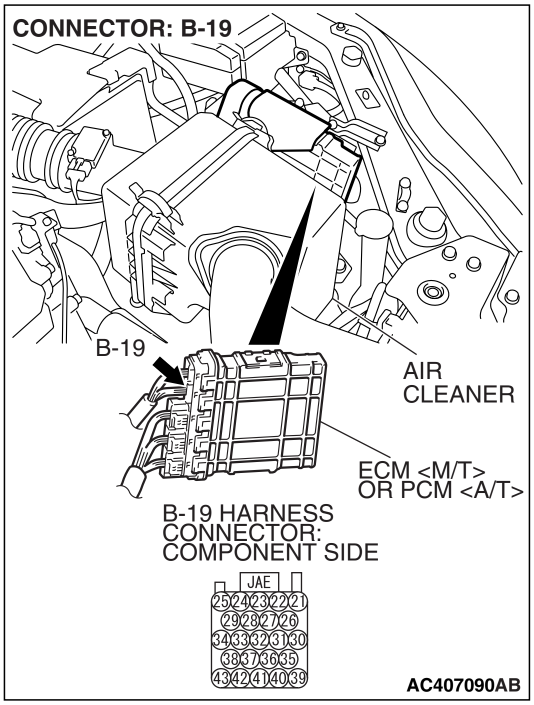
YES : Go to Step 11.

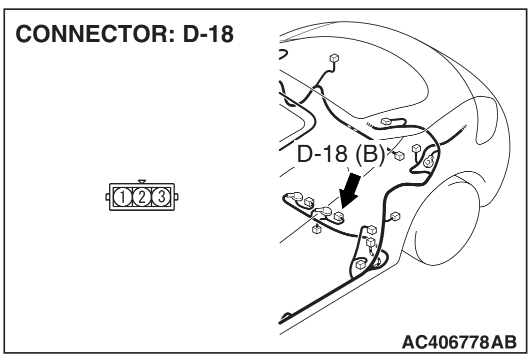
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











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?

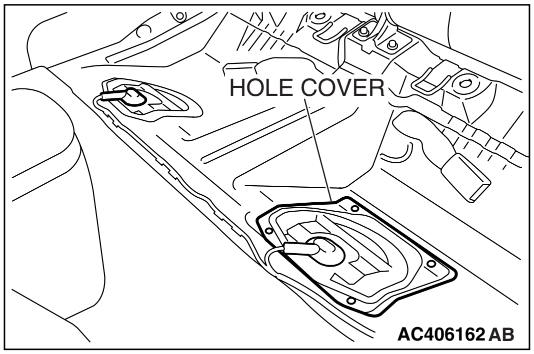
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

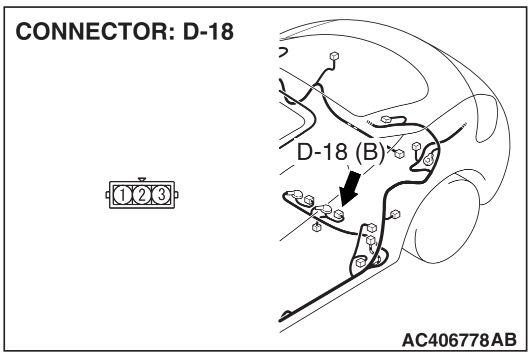
STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.

(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.



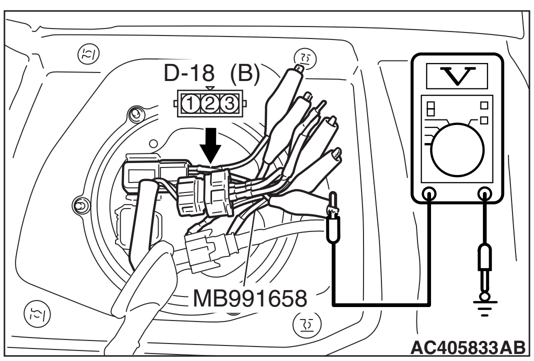
(4) Use special tool MB991658 to connect terminals 1, 2 and 3 of the fuel tank differential pressure sensor connector D-18.

(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.

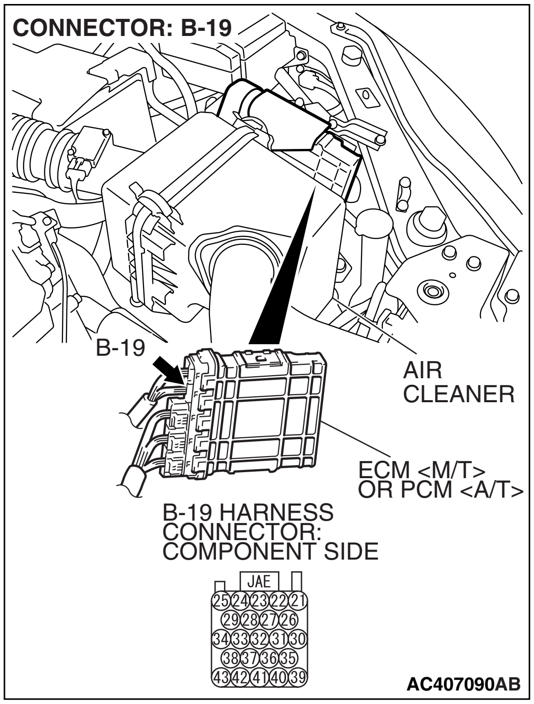
NO : Go to Step 17.

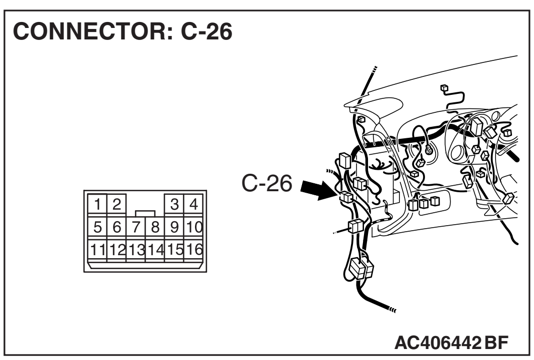
STEP 13. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

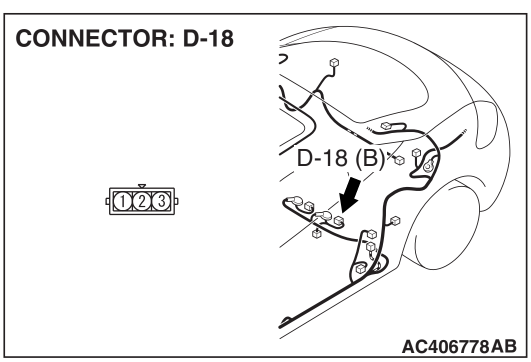
Q: Are the connectors and terminals in good condition?

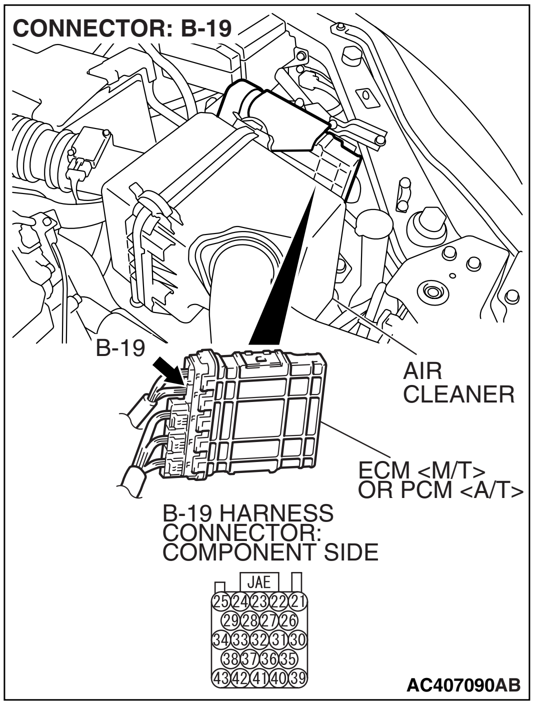
YES : Go to Step 14.

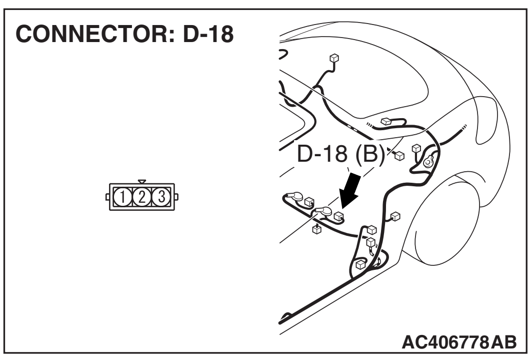
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.









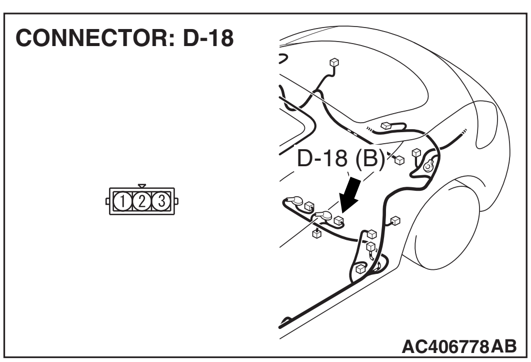


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

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.



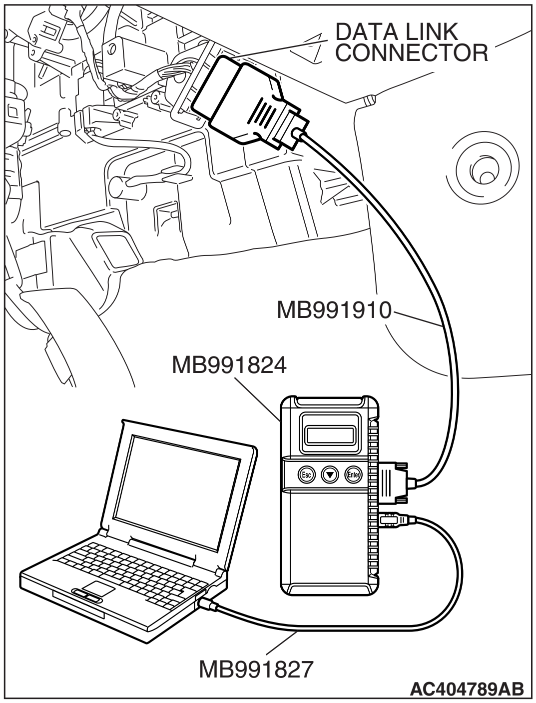
STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.

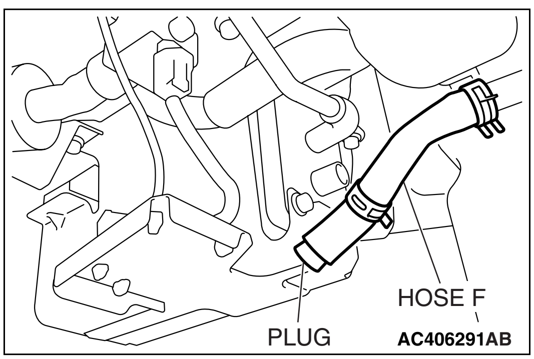
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



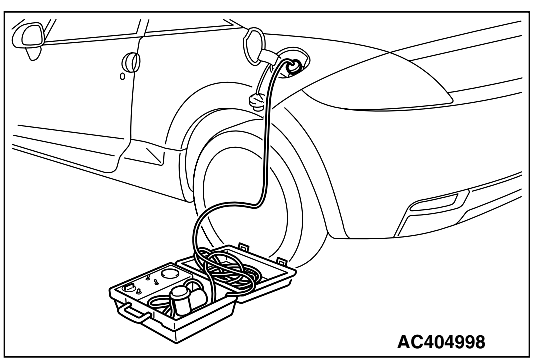
⚠ CAUTION

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.

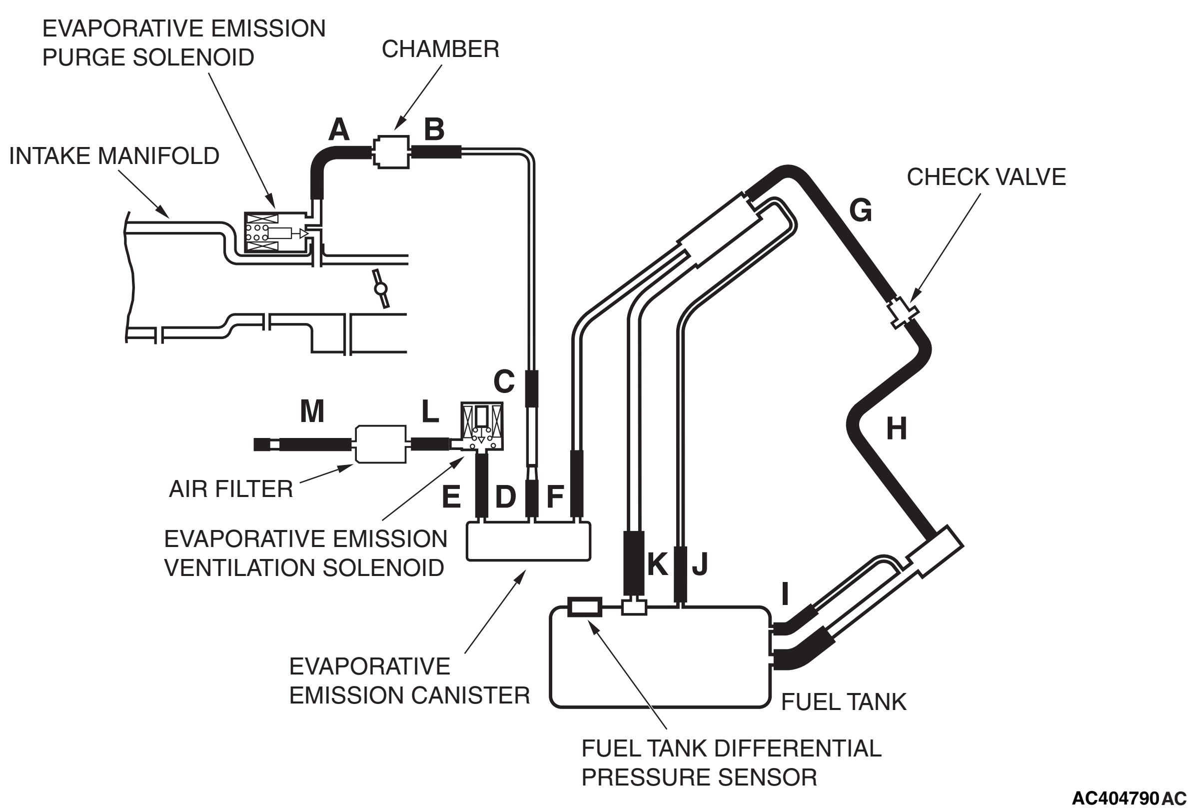
(1) Carry out a test drive with the drive cycle pattern (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

Q: Is DTC P0452 set?

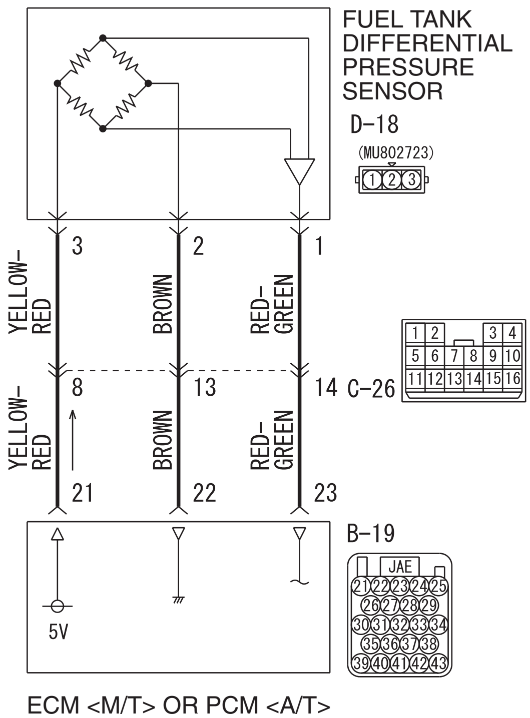
YES : Repeat the troubleshooting from Step 2.
NO : The procedure is complete.

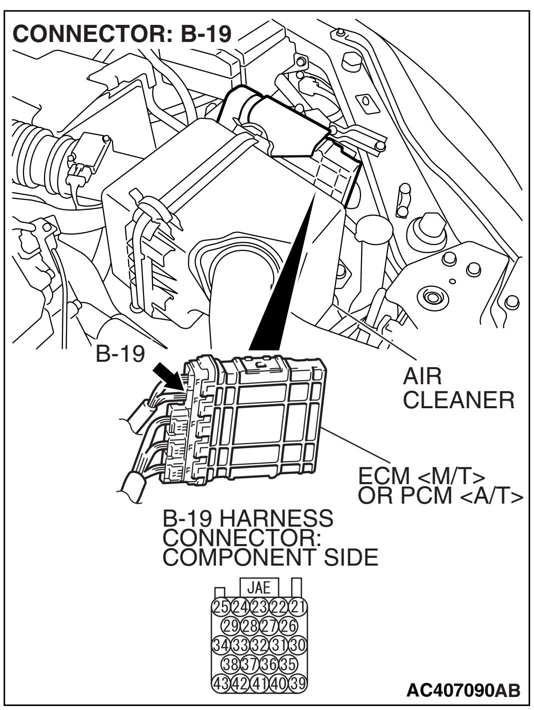
DTC P0453: Evaporative Emission System Pressure Sensor High Input

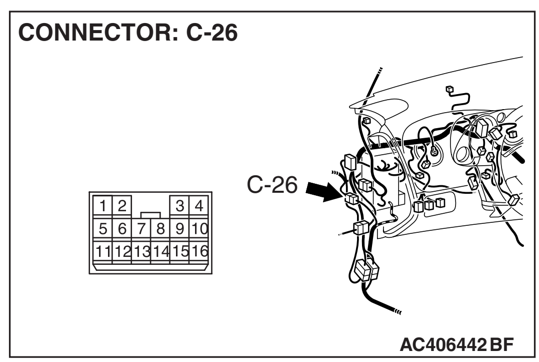
System Diagram

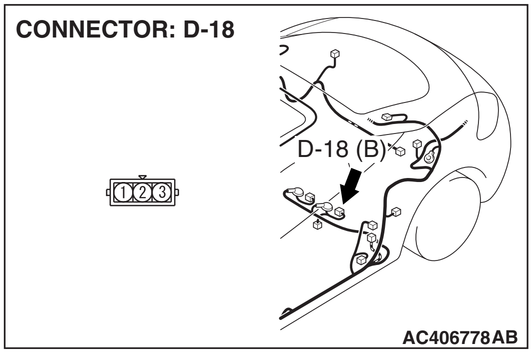


Fuel Tank Differential Pressure Sensor Circuit









CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> (terminal 21) supplies a 5-volt reference voltage to the fuel tank differential pressure sensor (terminal 3). The ECM <M/T> or PCM <A/T> (terminal 22) supplies a ground to the fuel tank differential pressure sensor (terminal 2).
- The ECM <M/T> or PCM <A/T> (terminal 23) receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal 1).

TECHNICAL DESCRIPTION

- To determine whether the fuel tank differential pressure sensor is defective, 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> judges if the fuel tank differential pressure sensor output voltage is normal.

NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

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)

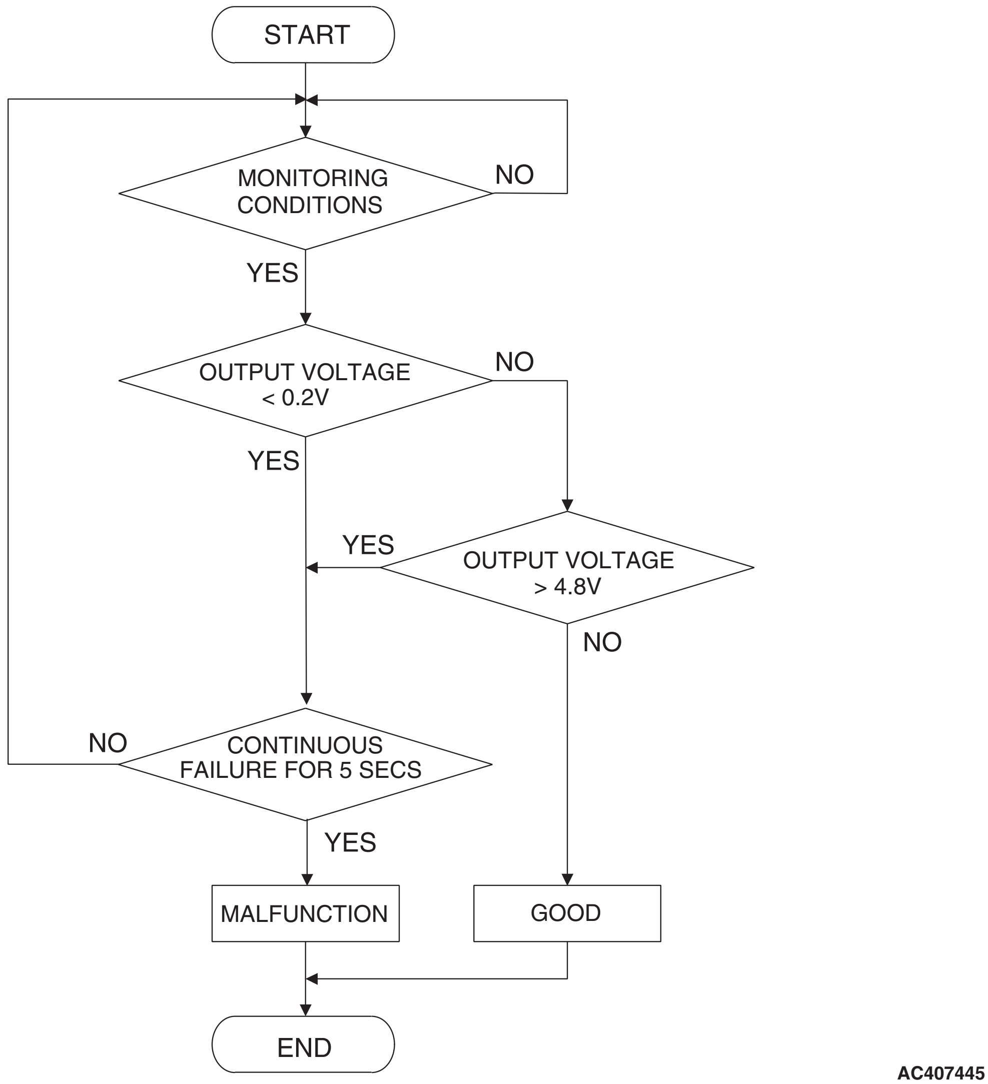
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

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)

RANGE CHECK - MIN. / MAX.



DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- The fuel temperature is 36° C (97° F) or less.
- Remaining fuel level is 85 percent or less when the engine is started.

Judgement Criteria

- The fuel tank differential pressure sensor output voltage remains 4.8 volt or greater for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

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

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the fuel tank differential pressure sensor.
- Open or shorted fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

OVERVIEW OF TROUBLESHOOTING

- DTC P0453 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 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

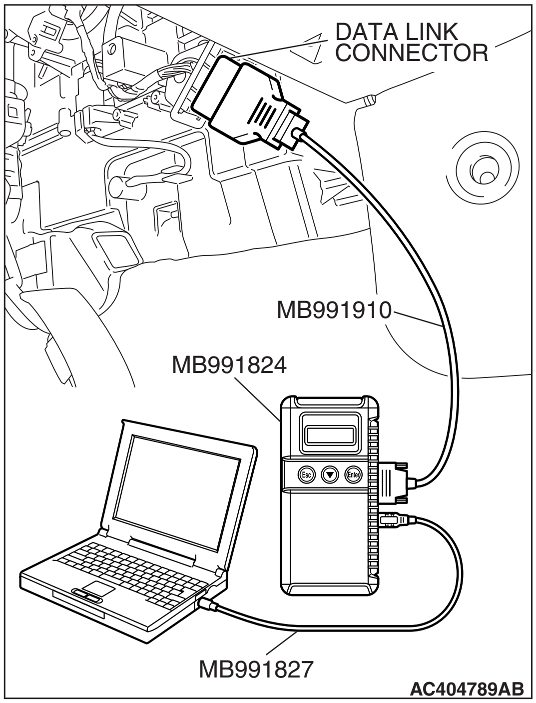
Required Special Tools:

- 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

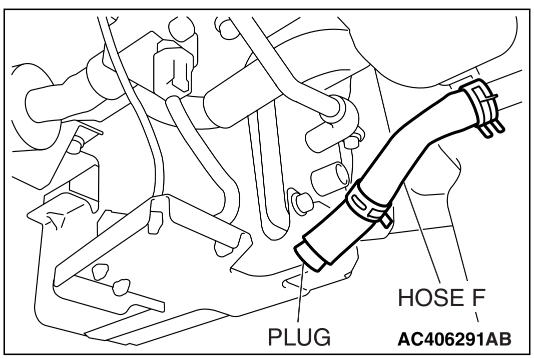
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

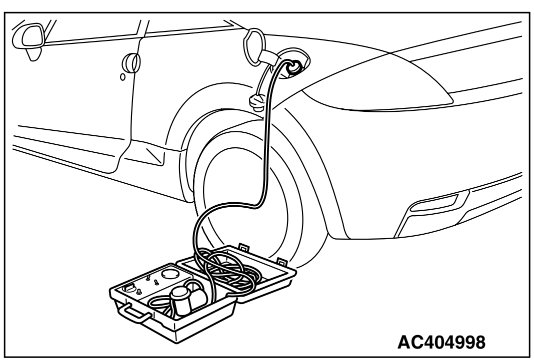
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(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.



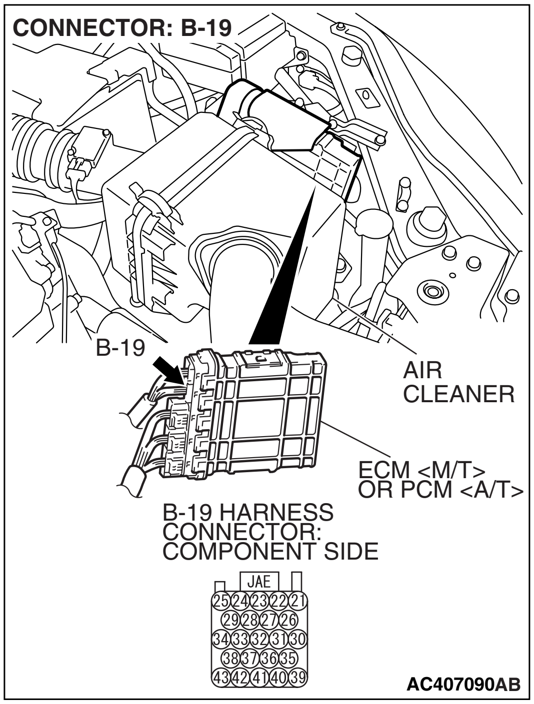
(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(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?

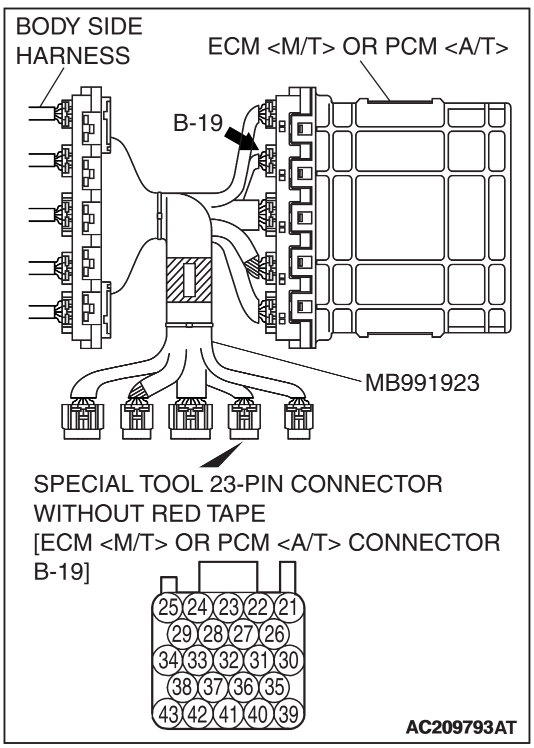
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Go to Step 2.

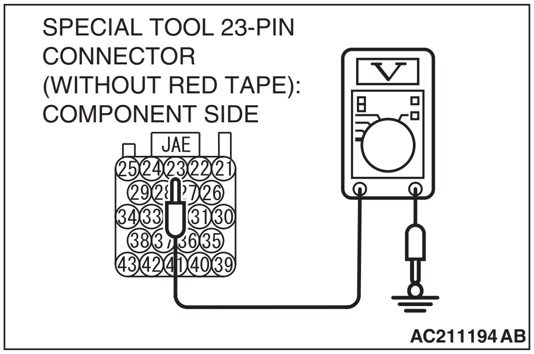


STEP 2. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.

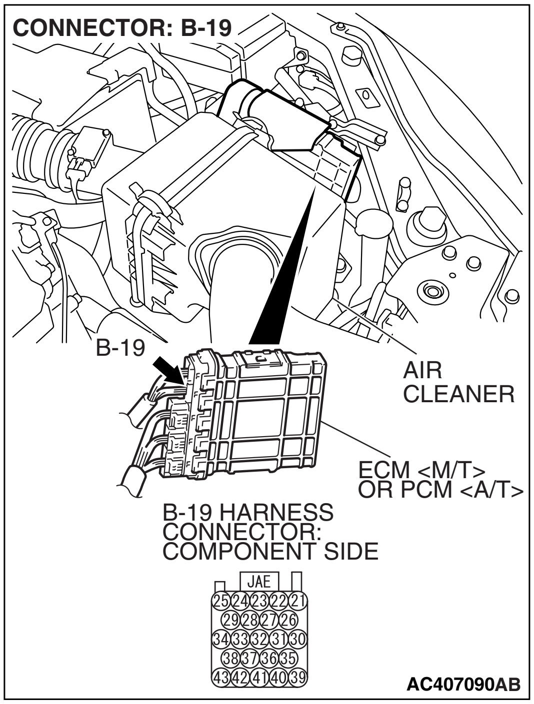


(5) Measure the voltage between terminal 23 and ground.
- The voltage should measure between 2.0 and 3.0 volts.

(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

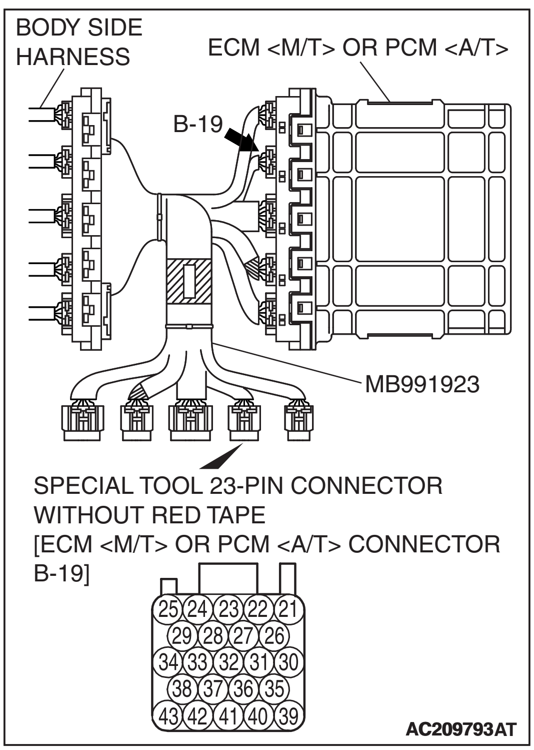
Q: Is the measured voltage between 2.0 and 3.0 volts?

YES : Go to Step 16.
NO : Go to Step 3.

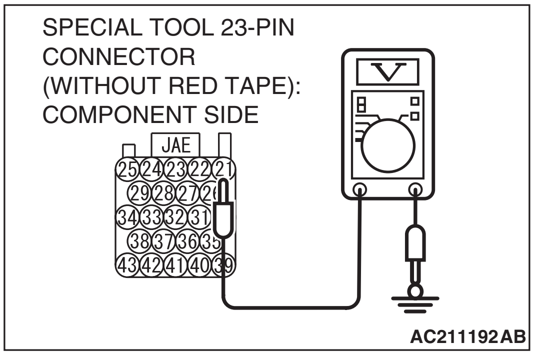


STEP 3. Measure the 5-volt reference signal at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.



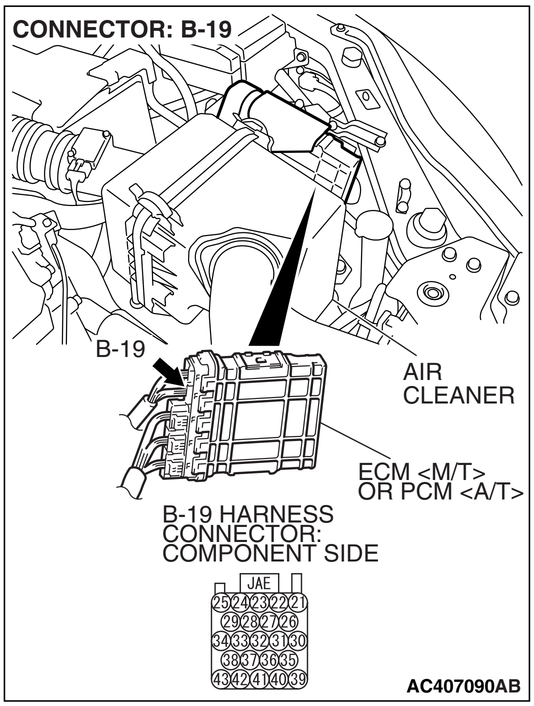
(4) Measure the voltage between terminal 21 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(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.

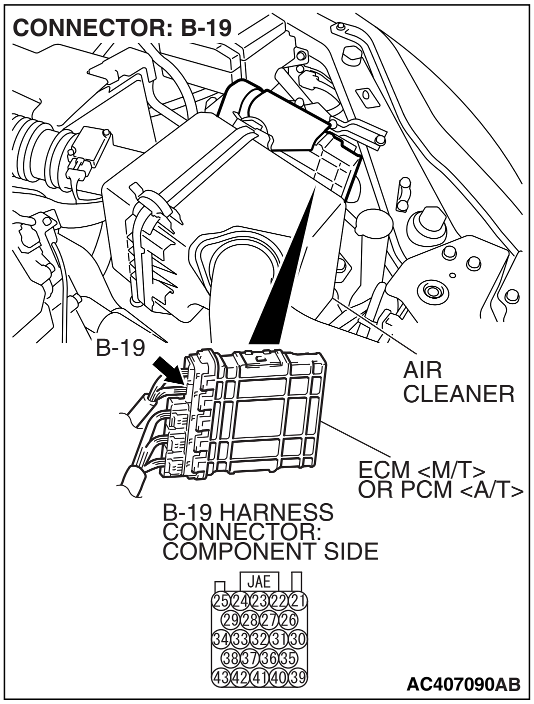


Q: Are the connector and terminals in good condition?

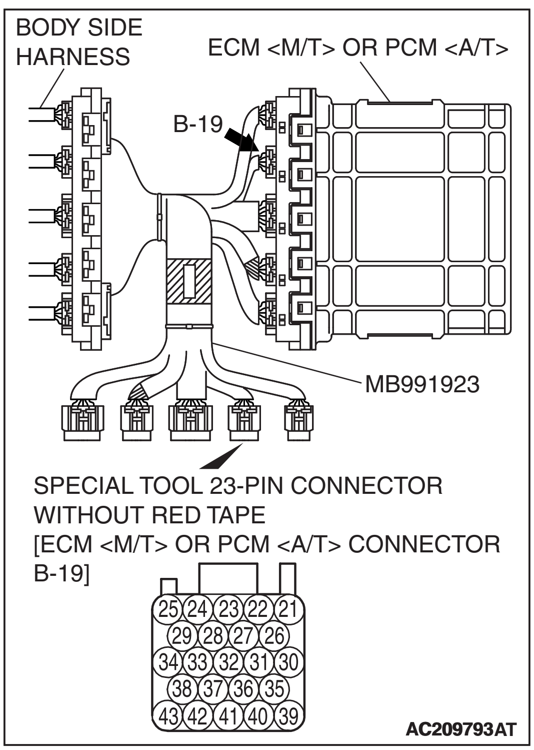
YES : Go to Step 16.
NO : Repair or replace the faulty components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.

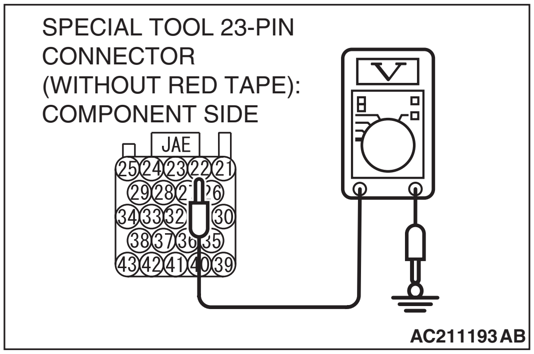
STEP 5. Measure the sensor output voltage at ECM <M/T> or PCM <A/T> connector B-19 by using check harness special tool MB991923.

(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.

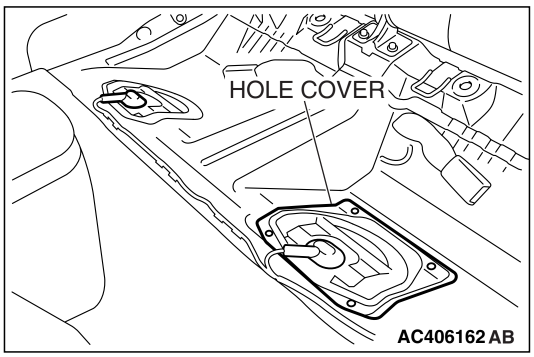
(6) Install the fuel cap.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

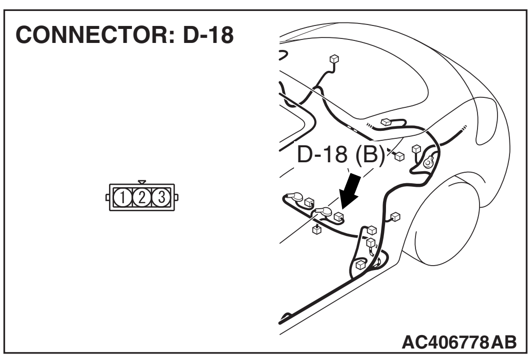
YES : Go to Step 6.
NO : Go to Step 9.

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.

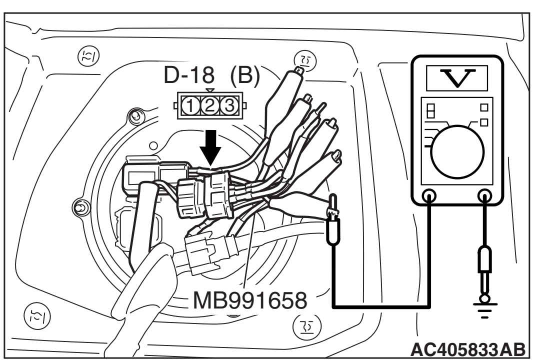


(3) Disconnect fuel tank differential pressure sensor connector D-18.



(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?

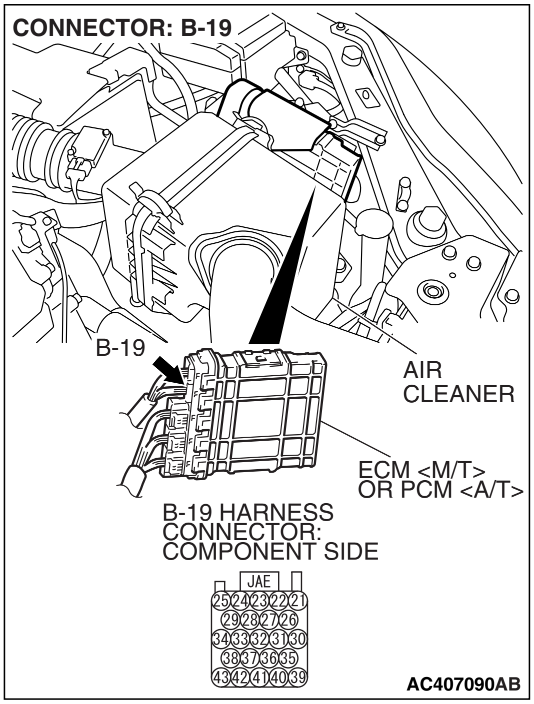
YES : Go to Step 7.
NO : Go to Step 15.

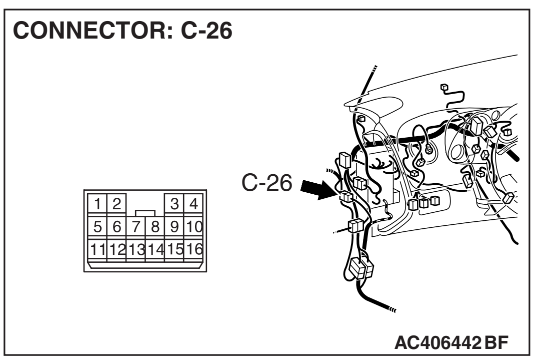
STEP 7. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

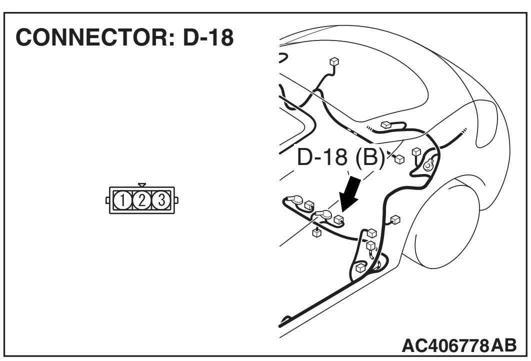
Q: Are the connectors and terminals in good condition?

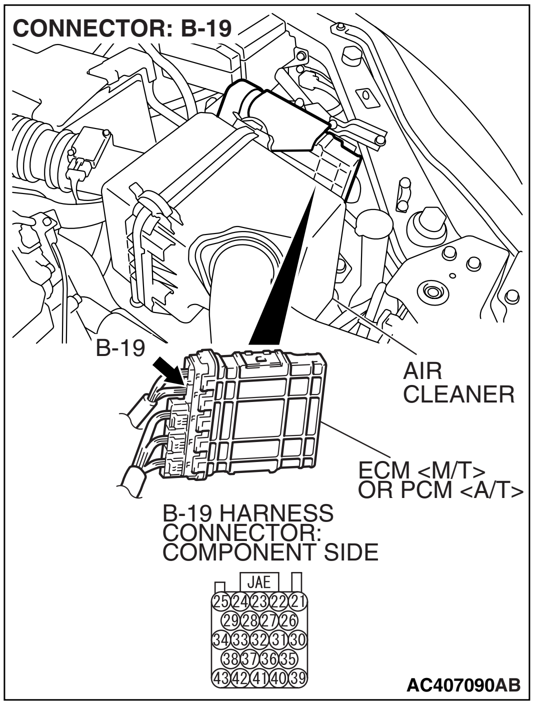
YES : Go to Step 8.

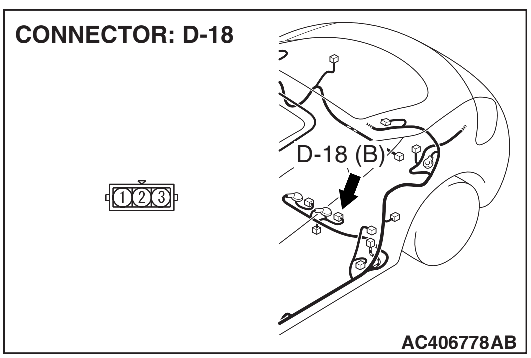
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











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.

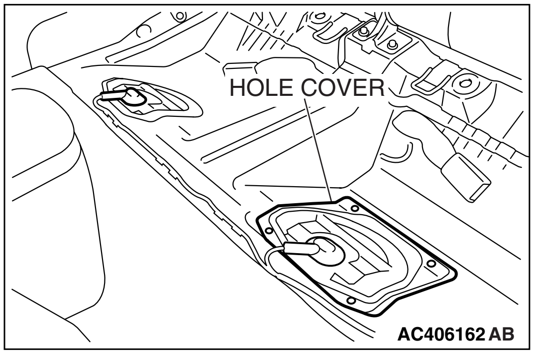
Q: Is the harness wire in good condition?

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.

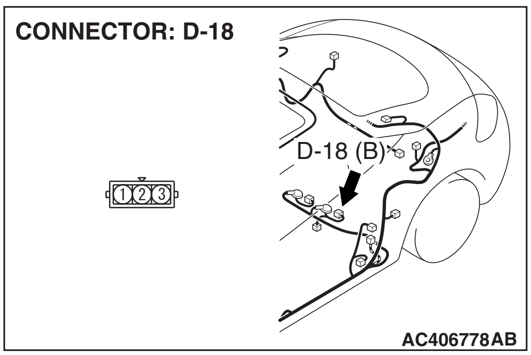
NO : Repair the damaged harness wire. Then go to Step 17.

STEP 9. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-18.

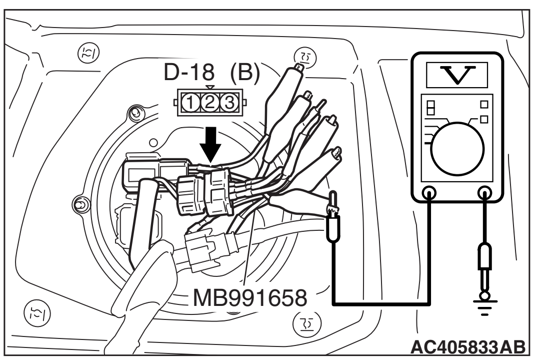
(1) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).
(2) Remove the hole cover.



(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?

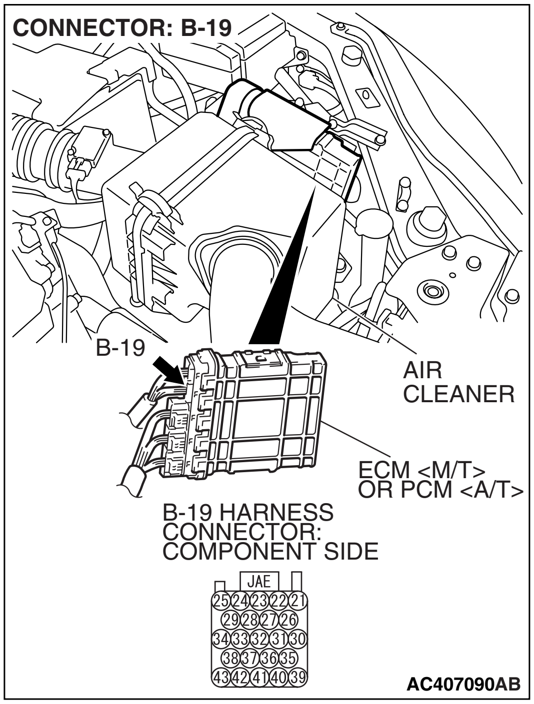
YES : Go to Step 12.
NO : Go to Step 10.

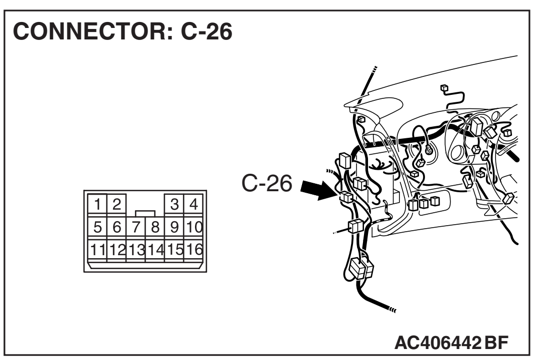
STEP 10. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

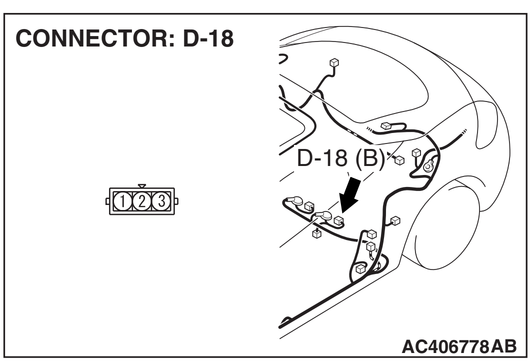
Q: Are the connectors and terminals in good condition?

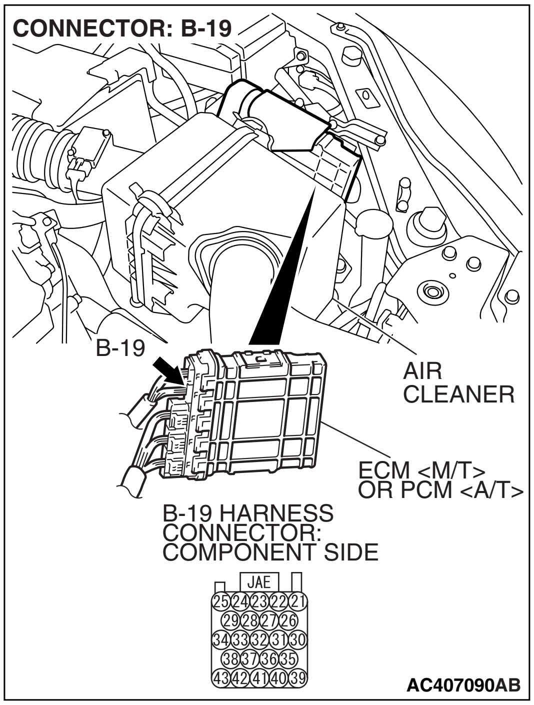
YES : Go to Step 11.

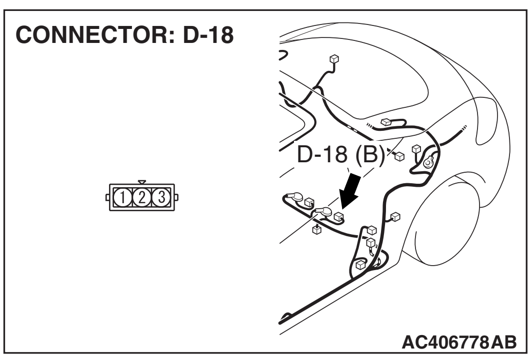
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.











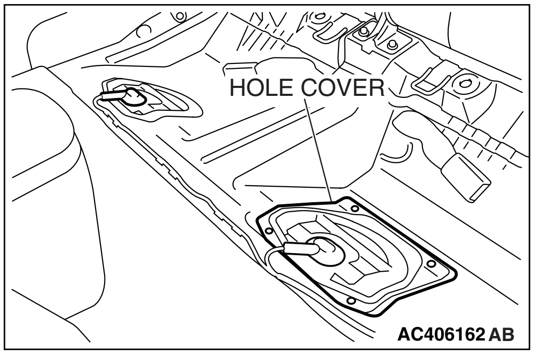
STEP 11. Check the harness wire between ECM <M/T> or PCM <A/T> connector B-19 terminal 21 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

Q: Are the harness wires in good condition?

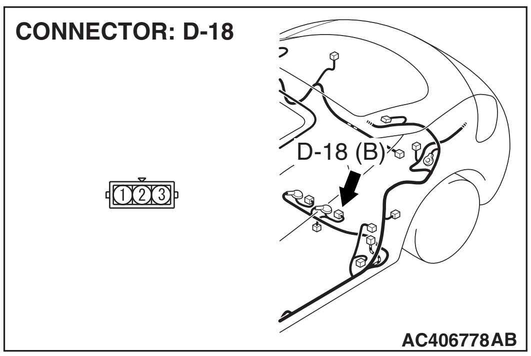
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14). Go to Step 17.

NO : Repair the damaged harness wires. Then go to Step 17.

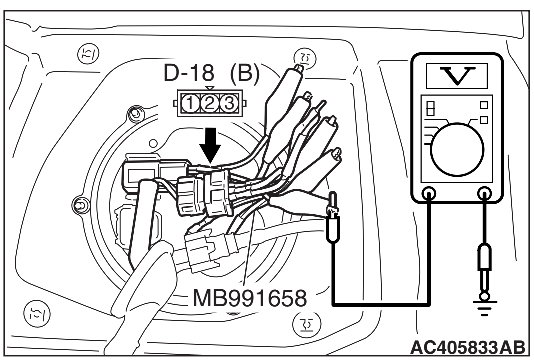
STEP 12. Measure the fuel tank differential pressure sensor return voltage at fuel tank differential pressure sensor connector D-18.



(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?

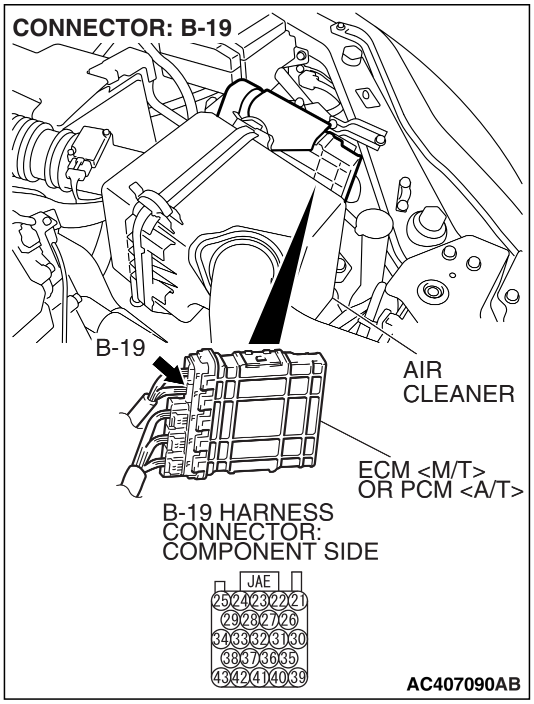
YES : Go to Step 13.
NO : Go to Step 17.

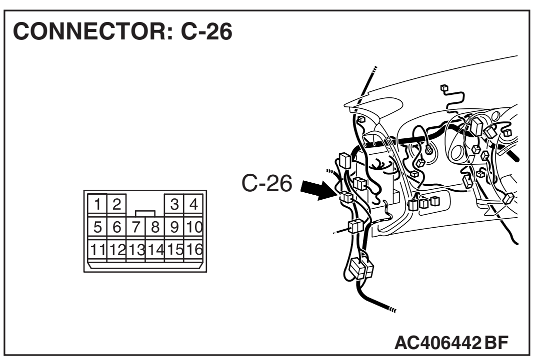
STEP 13. Check ECM <M/T> or PCM <A/T> connector B-19, intermediate connector C-26 and fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

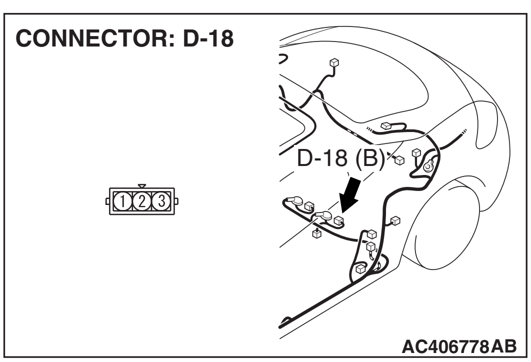
Q: Are the connectors and terminals in good condition?

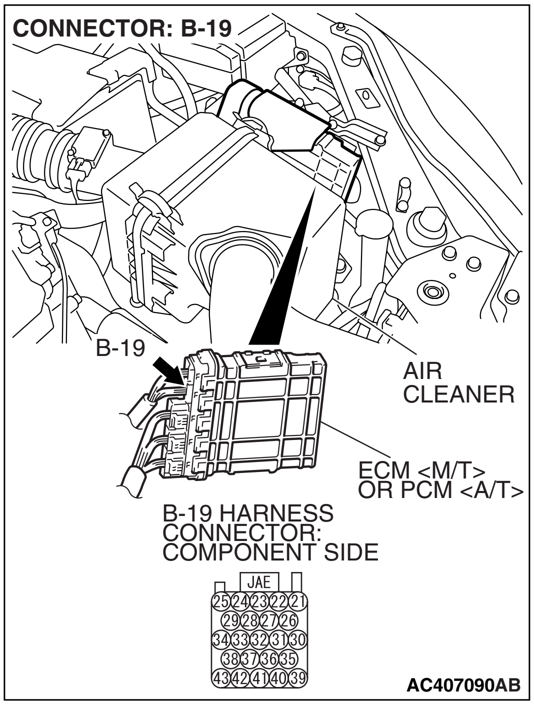
YES : Go to Step 14.

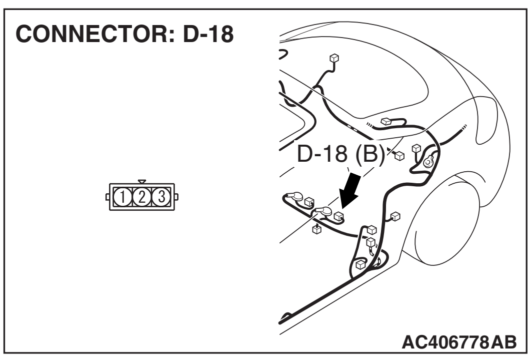
NO : Repair or replace the faulty components (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 17.









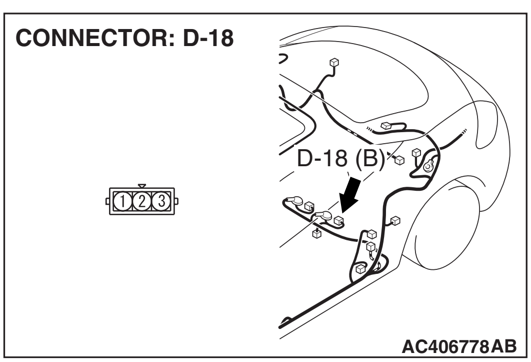


STEP 14. Check the harness wires between ECM <M/T> or PCM <A/T> connector B-19 terminal 22 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

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.



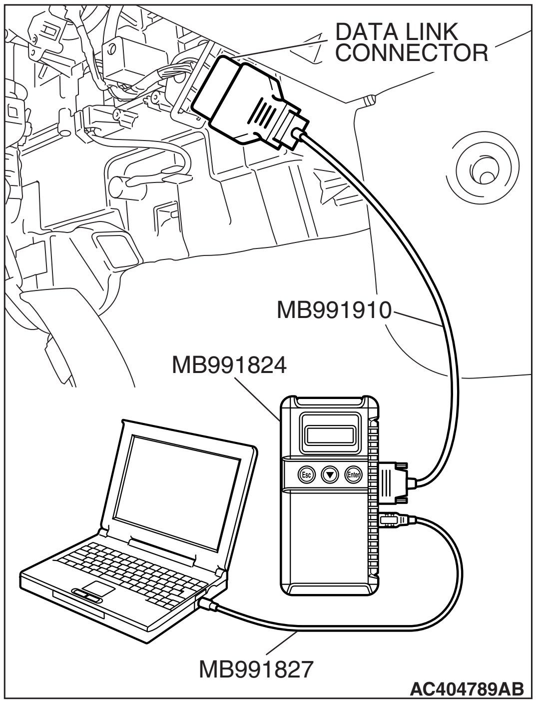
STEP 15. Check fuel tank differential pressure sensor connector D-18 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.

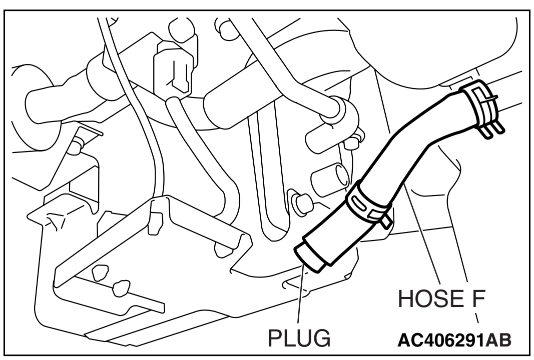
STEP 16. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.



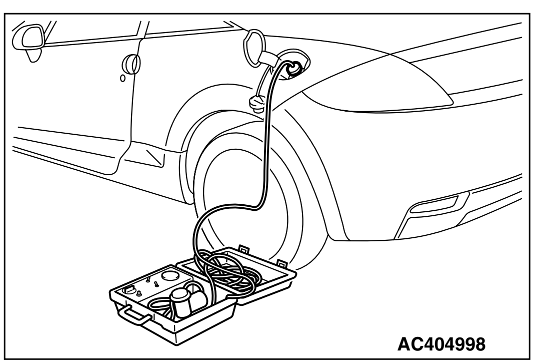
⚠ CAUTION

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 22 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

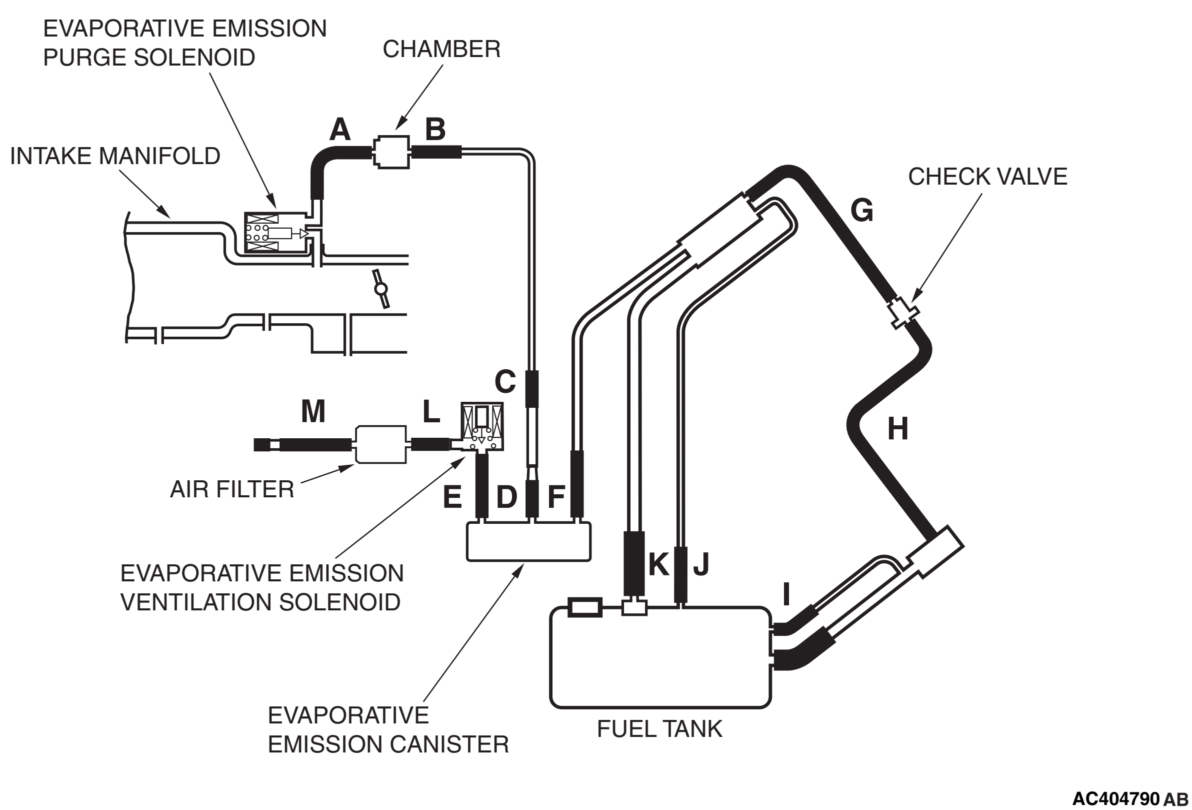
Q: Is DTC P0453 set?

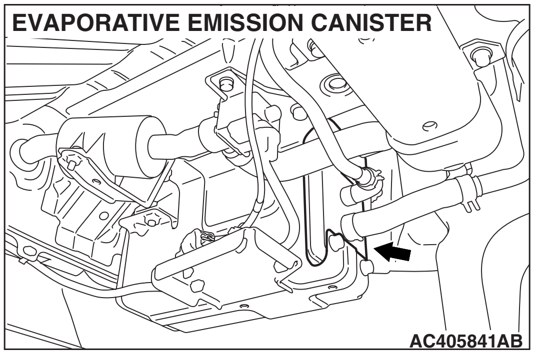
YES : Repeat the troubleshooting from Step 2.

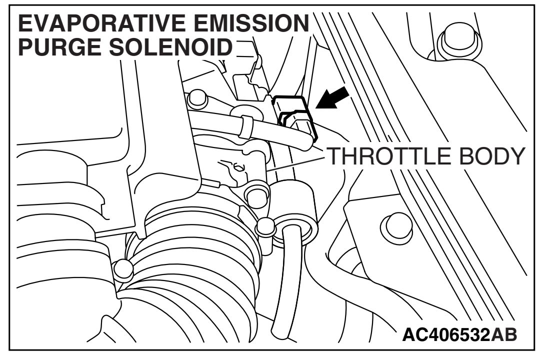
NO : The procedure is complete.

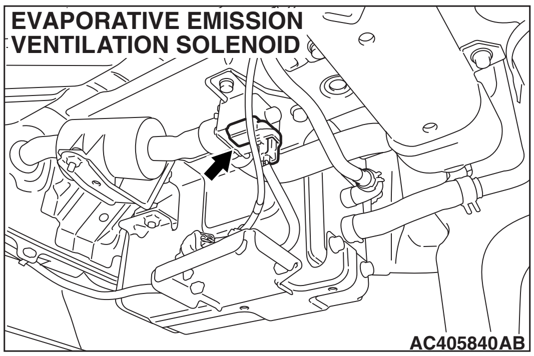
DTC P0455: Evaporative Emission System Leak Detected (Gross Leak)

System Diagram









TECHNICAL DESCRIPTION

- The fuel tank may be under a slight pressure or vacuum depending on the state of the Evaporative Emission (EVAP) System. The ECM <M/T> or PCM <A/T> monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the ECM <M/T> or PCM <A/T> will set DTC P0455.
- The ECM <M/T> or PCM <A/T> energizes the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- The evaporative emission purge solenoid is activated to apply engine manifold vacuum to the EVAP system.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" 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 or clog in the fuel system by measuring the change in vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is determined to be too high.

DESCRIPTIONS OF MONITOR METHODS

- Depressurizing EVAP system by intake manifold negative pressure is impossible within specified period.

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)

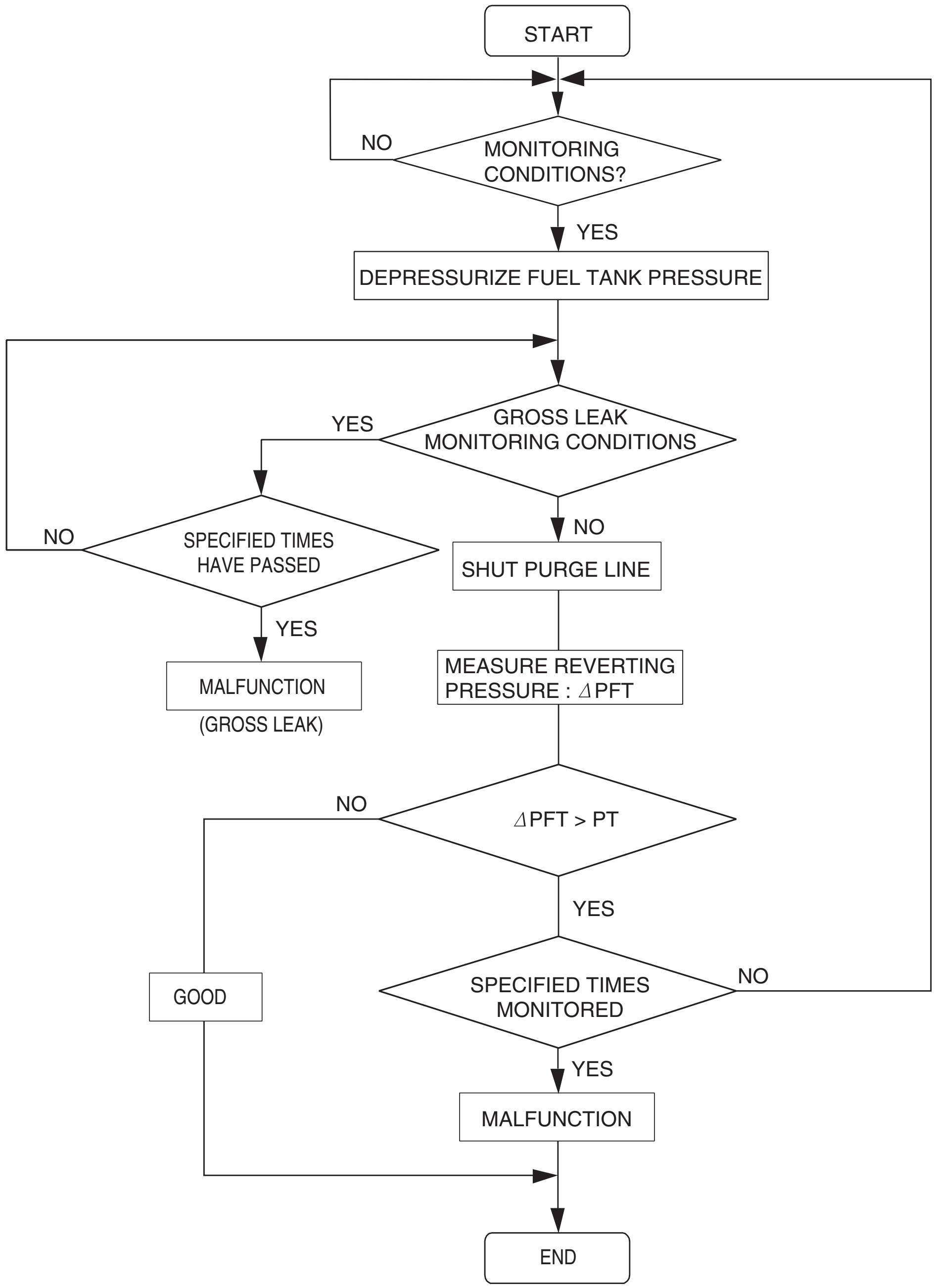
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

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



AC306649

DTC SET CONDITIONS

Check Conditions A: At Start up

- Intake air temperature is 36° C (97° F) or less upon engine start up.
- The engine coolant temperature is 36° C (97° F) or less upon engine start up.

Check Conditions B: For Test to Run

- The engine coolant temperature is 60° C (140° F) or greater and the fuel tank is 15 – 40 percent full.
- The engine coolant temperature is 20° C (68° F) or greater and the fuel tank is 40 – 85 percent full.
- The engine speed is greater than or equal to 1,600 r/min.
- Barometric pressure is greater than 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 70 percent.
- The fuel temperature is 36° C (97° F) or less.
- The fuel tank differential pressure sensor output voltage is 1 – 4 volts.

Check Conditions C: For Test to Stop

- The intake air temperature is greater than 5° C (41° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 451 Pa (0.065 psi) or less and the amount of remaining fuel is 15 – 40 percent of capacity upon engine start-up.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 324 Pa (0.047 psi) or less and the amount of remaining fuel is 40 – 85 percent of capacity upon engine start-up.
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 150 seconds.

Judgment Criteria

- The fuel tank internal pressure is 2 kPa (0.29 psi) or more after the evaporative emission purge solenoid valve has been driven when the fuel tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-6.

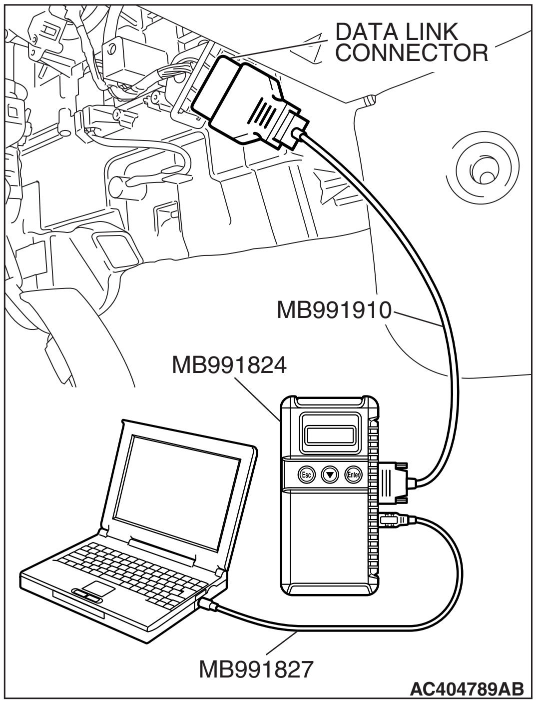
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid valve failed.
- Evaporative emission ventilation solenoid valve failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

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.13A-41. If no other DTC's have been set, go to Step 2.

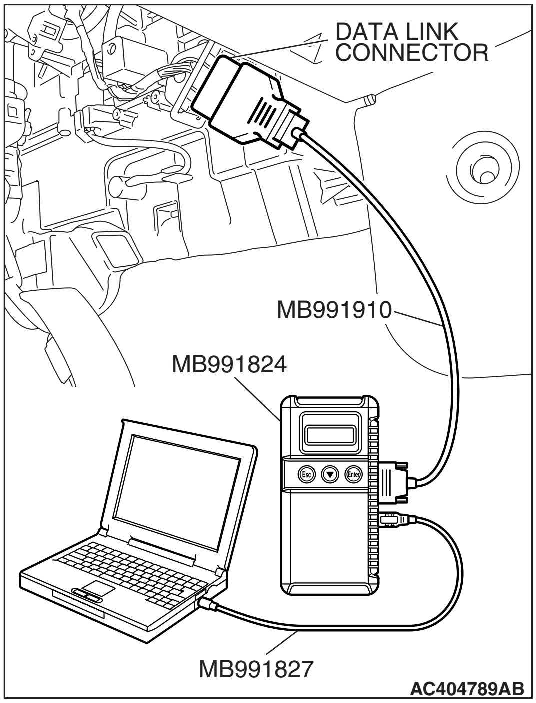
NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

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.

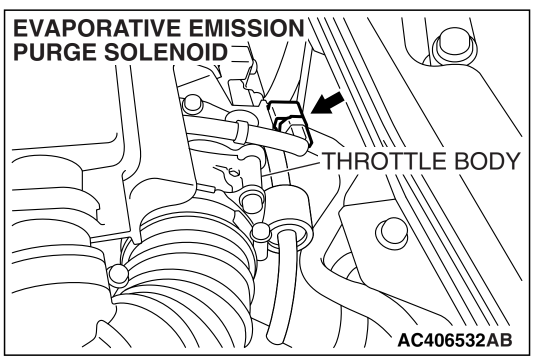
STEP 2. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid Valve.

⚠ CAUTION

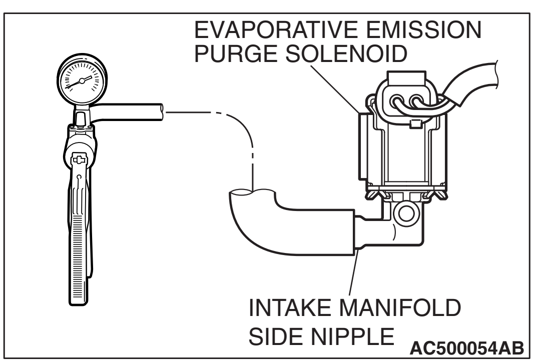
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.



(2) Remove the evaporative emission purge solenoid from the intake manifold (Refer to GROUP 15, Intake Manifold P.15-10).
(3) Connect the harness connector to the evaporative emission purge solenoid.



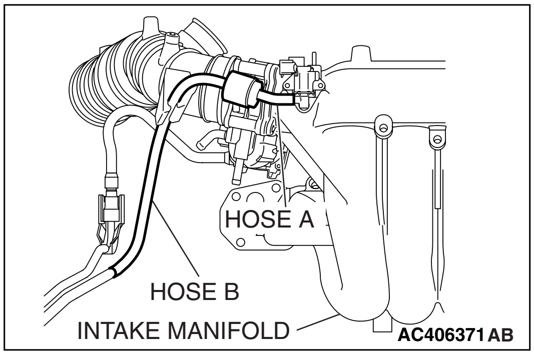
(4) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958 to actuator test mode.
- Item 10: Evaporative Emission Purge Solenoid Valve.
  - When the evaporative emission purge solenoid valve is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.

(7) Turn the ignition switch to the "LOCK" (OFF) position.
(8) Remove the hose of the hand vacuum pump from the evaporative emission purge solenoid valve.
(9) Remove the harness connector from the evaporative emission purge solenoid.

(10)Install the evaporative emission purge solenoid to the intake manifold (Refer to GROUP 15, Intake Manifold P.15-10).

Q: Is the solenoid valve in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid valve (Refer to GROUP 15, Intake Manifold P.15-10). Then go to Step 19.

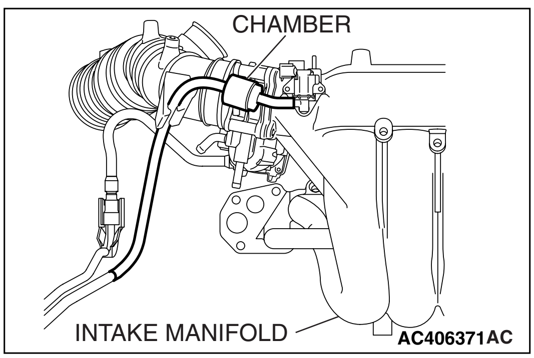


STEP 3. Check for leaks and clogging in evaporative emission hoses A through B.

Use a hand vacuum pump to test each hose from hose A to hose B.

Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace the damaged hose. Then go to Step 19.

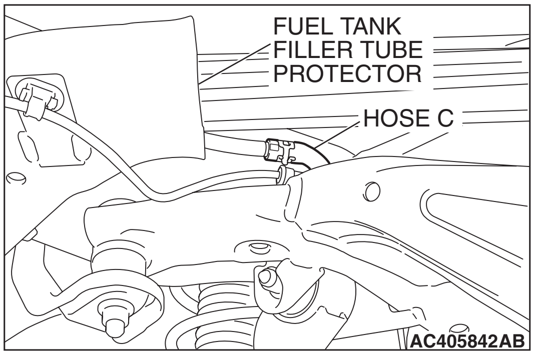


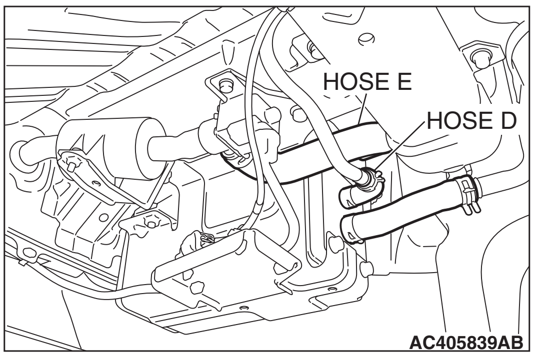
STEP 4. Check for leaks and clogging in the chamber.

(1) When you blow into the chamber, it should pass less air.
(2) When you blow into the chamber, no air should leak from the chamber body.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 19.





STEP 5. Check for leaks and clogging in evaporative emission hoses C through E.

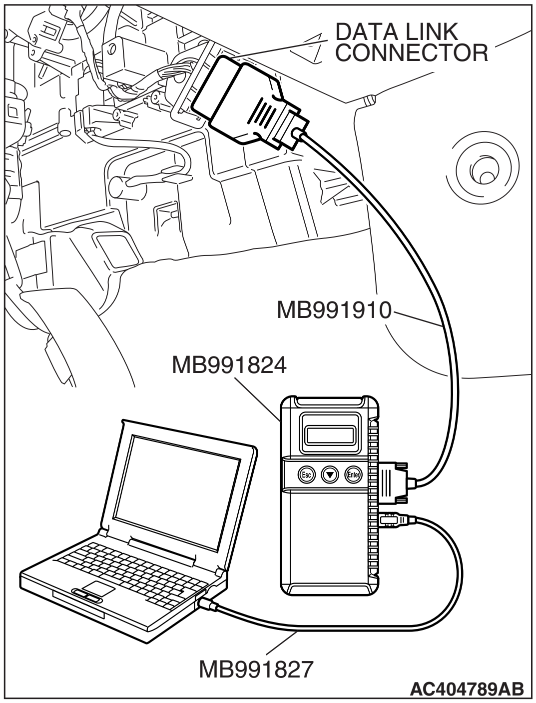
Perform a vacuum test using a hand vacuum pump on hoses C through E.

Q: Are the hoses in good condition?

YES : Go to Step 6.

NO : Replace the damaged hose. Then go to Step 19.

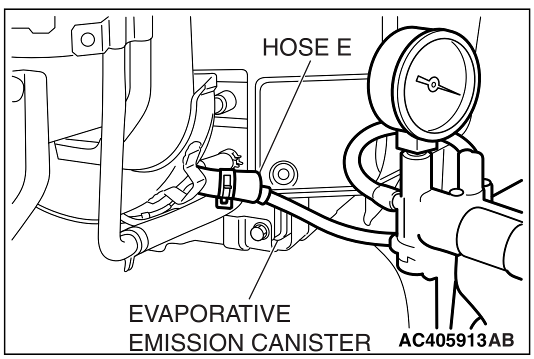
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.



⚠ 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.

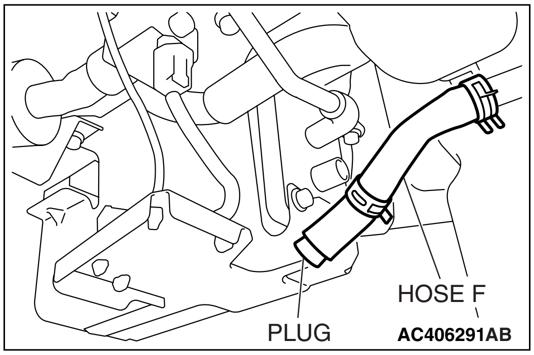
(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.
(7) Disconnect the hand vacuum pump, and connect hose E to the evaporative emission canister.
(8) Reinstall the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).

Q: Did the evaporative emission ventilation solenoid hold vacuum?

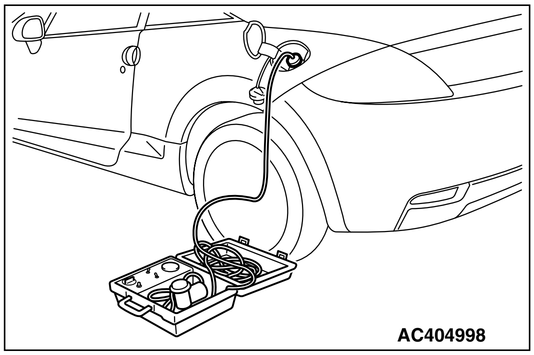
YES : Go to Step 7.

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 19.

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.

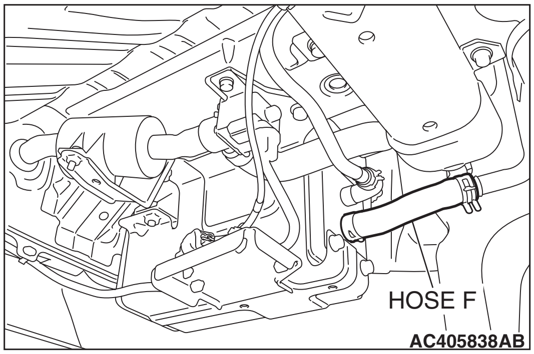
Q: Is the evaporative emission system line free of leaks?

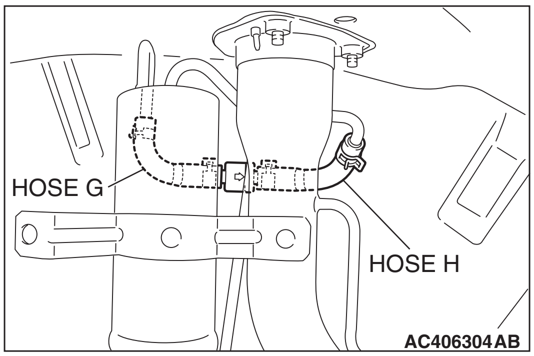
YES : Go to Step 13.
NO : Go to Step 8.

STEP 8. Check for leaks in evaporative emission hoses F through H.

(1) Remove the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).

(2) Use a hand vacuum pump to test each hose from hose F to hose H.





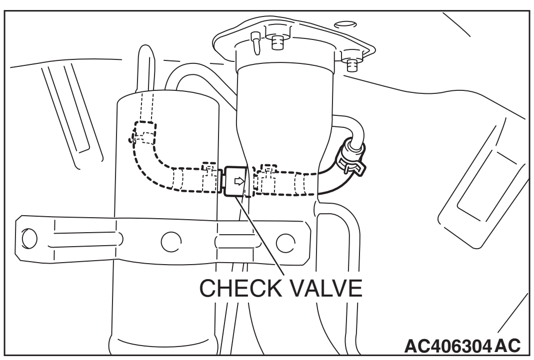
Q: Do the hoses hold vacuum?

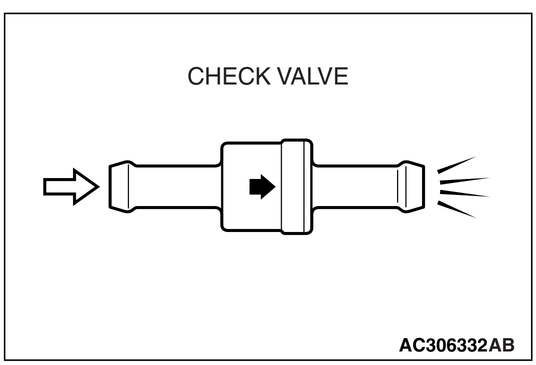
YES : Go to Step 9.

NO : Replace any damaged hose, and reinstall rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 19.

STEP 9. Test check valve.

(1) Check valve is a one-way check valve.



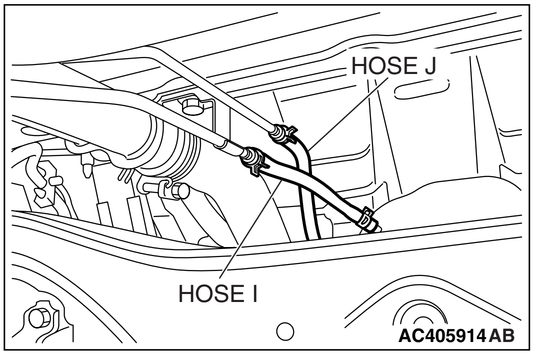


(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 10.

NO : Replace check valve, and reinstall the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 19.

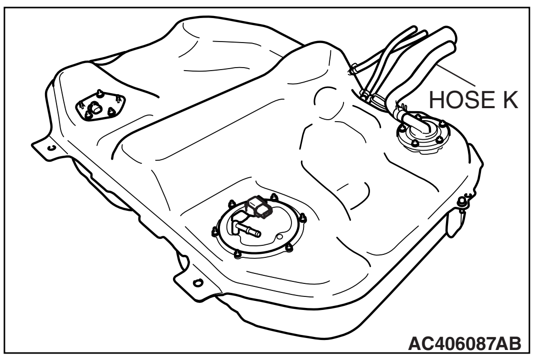


STEP 10. Check for leaks in evaporative emission hoses I and J.

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 19.

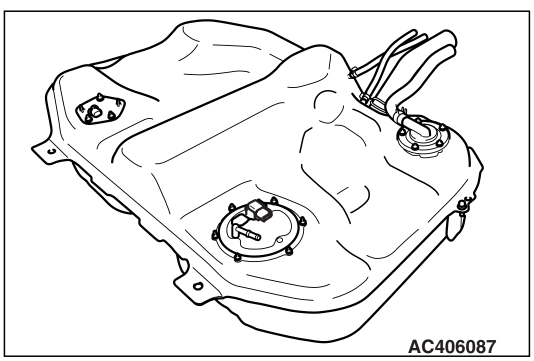


STEP 11. Check for leaks in evaporative emission hose K.

(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: Is the hose hold vacuum?

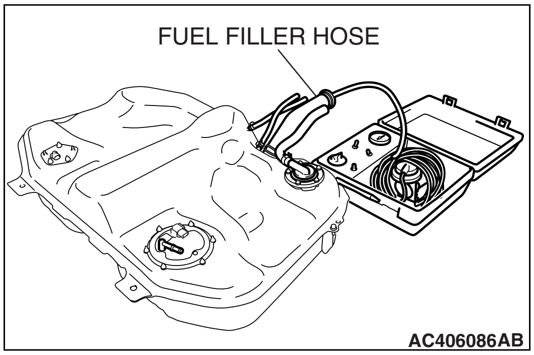
YES : Go to Step 12.
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.



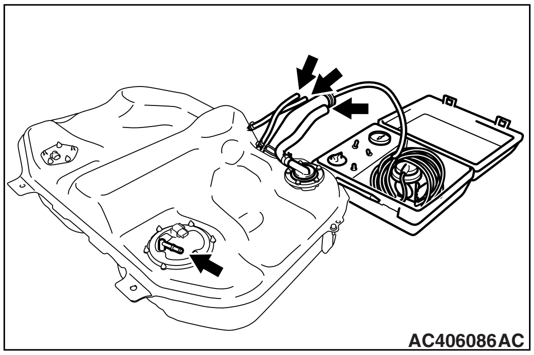
STEP 12. Check for leaks in the fuel tank.

(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.

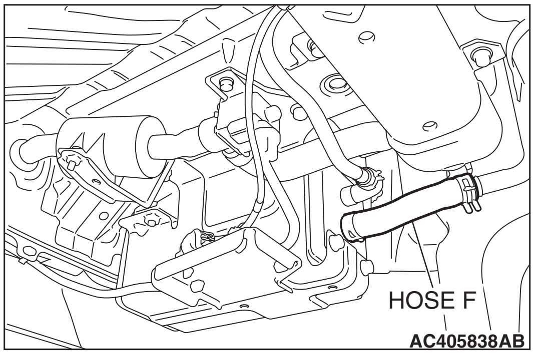
Q: Are any leaks found?

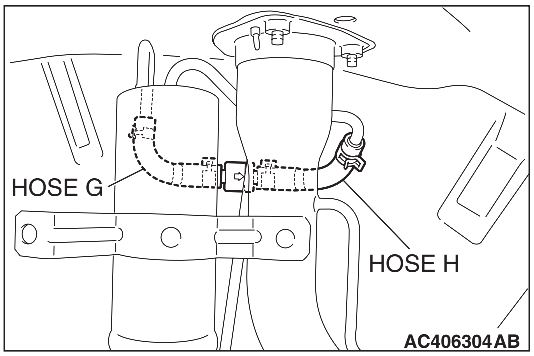
YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor (sub) or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.

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 19.

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 18.

STEP 13. Check for clogging in evaporative emission system hoses F through H.



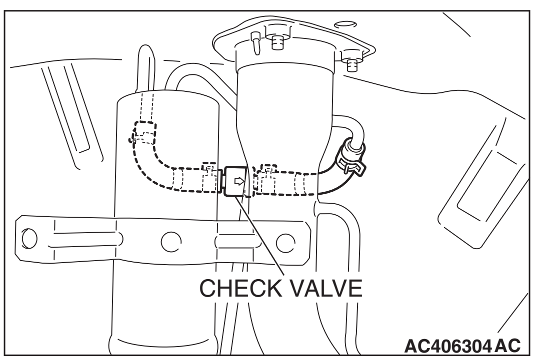


(1) Remove the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).
(2) Use a hand vacuum pump on each hose from hoses F to H.

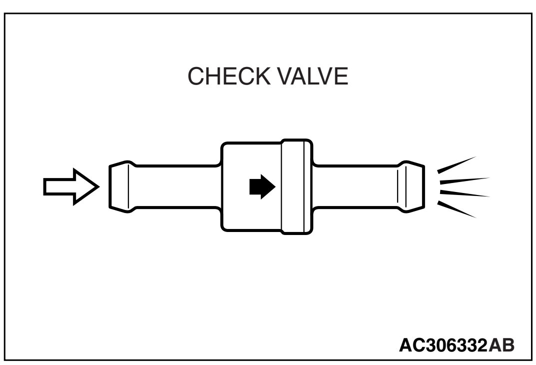
Q: Are the hoses in good condition?

YES : Go to Step 14.
NO : Replace the damaged hose, and reinstall the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 19.

STEP 14. Test check valve.



(1) Check valve is a one-way check valve.

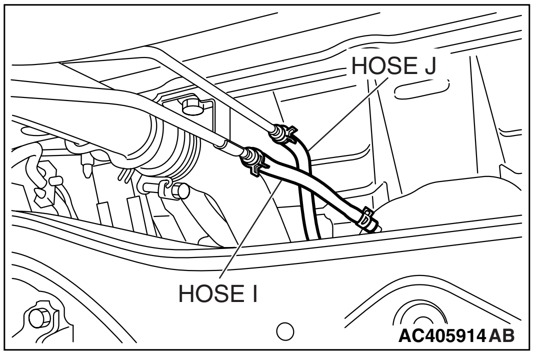


(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 15.
NO : Replace check valve, and reinstall the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 19.

STEP 15. Check for clogging in evaporative emission hoses I and J.

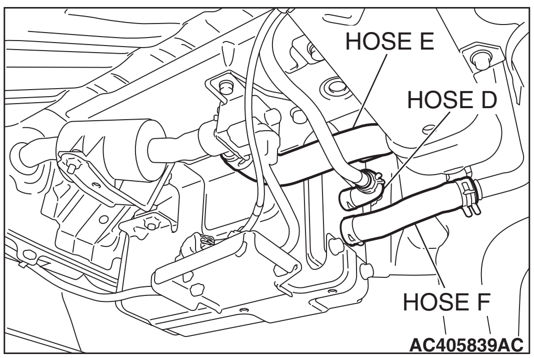


Use a hand vacuum pump to test each hose I and J.

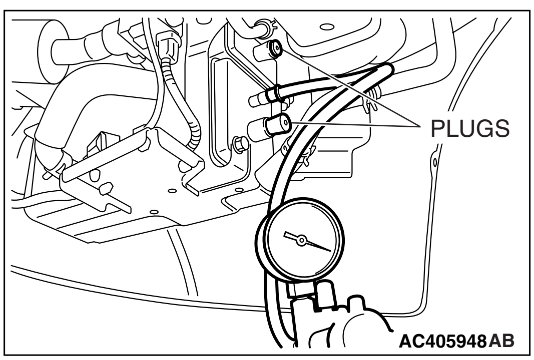
Q: Are the hoses in good condition?

YES : Go to Step 16.
NO : Replace any damaged hose. Then go to Step 19.

STEP 16. Check the evaporative emission canister for leaks and clogging.



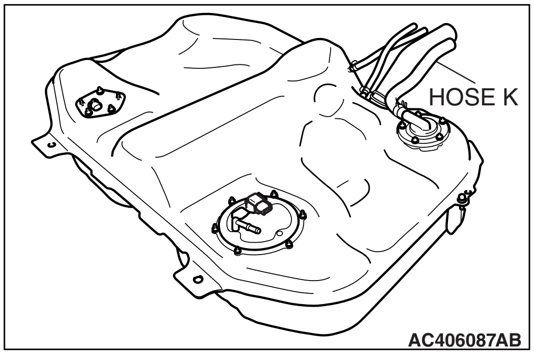
(1) Disconnect hoses D, E and F from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose D, and plug the other nipples.



(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) When the plugs are removed, check for air leakage.
(5) Disconnect the hand vacuum pump, and connect hoses D, E and F to the canister.

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 17.
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 19 .



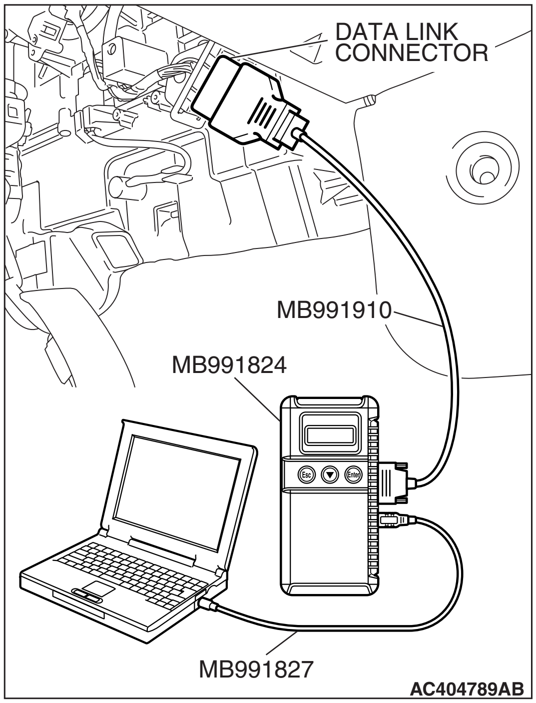
STEP 17. Check for clogging in evaporative emission hose K.

(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: Is the hose in good condition?

YES : Reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 18.

NO : Replace any damaged hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 19.



STEP 18. 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 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 19.

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 19 .

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 18.

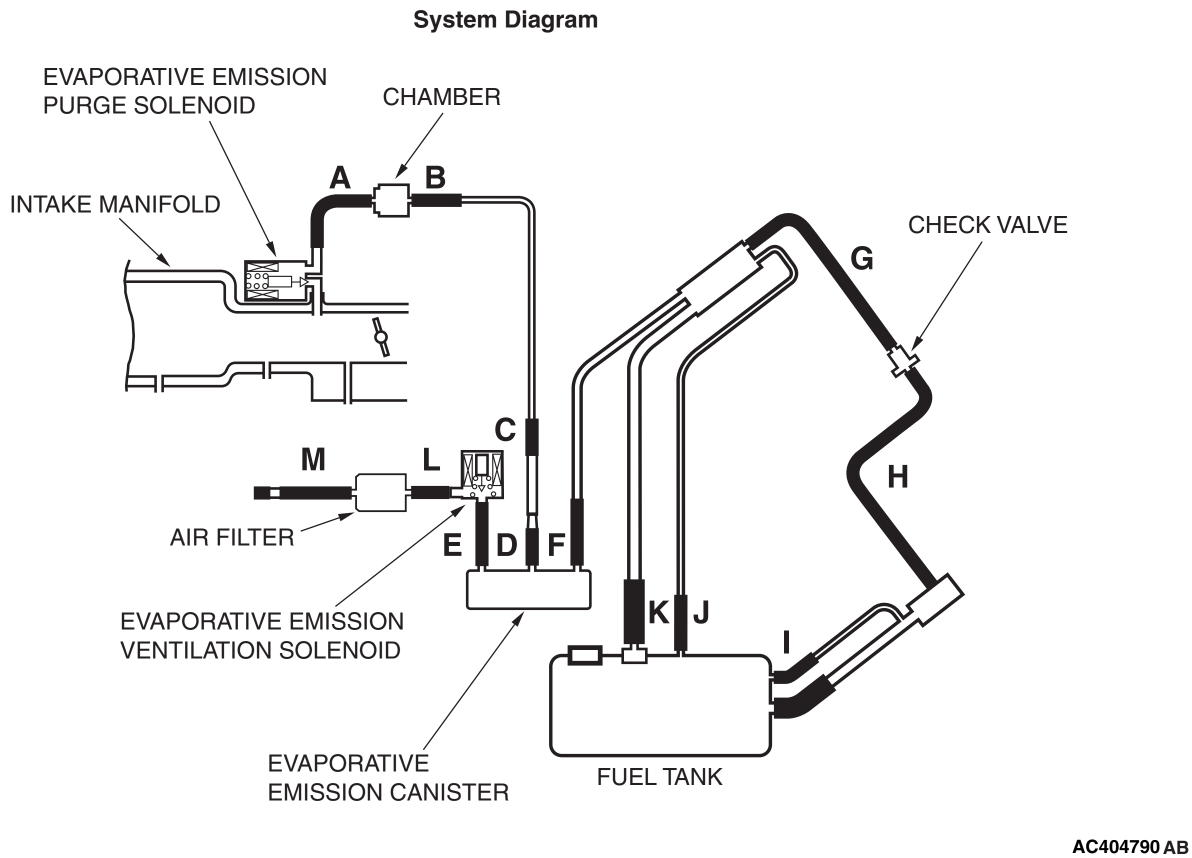
STEP 19. Perform the OBD-II drive cycle.

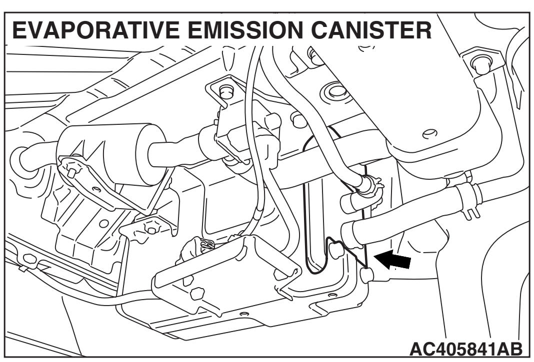
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

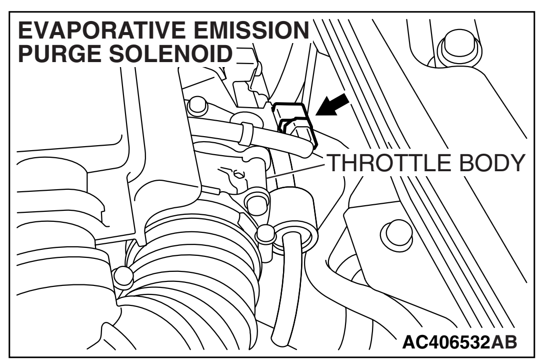
Q: Is DTC P0455 set?

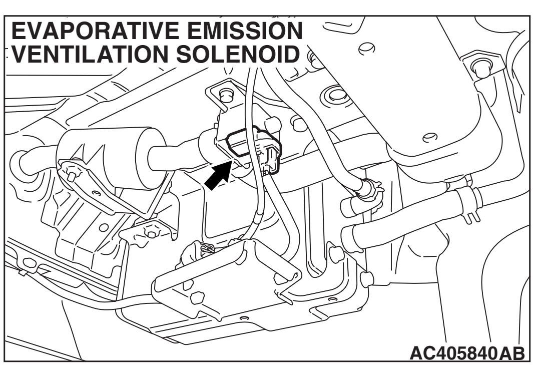
YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC P0456: Evaporative Emission System Leak Detected (Very Small Leak)









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)

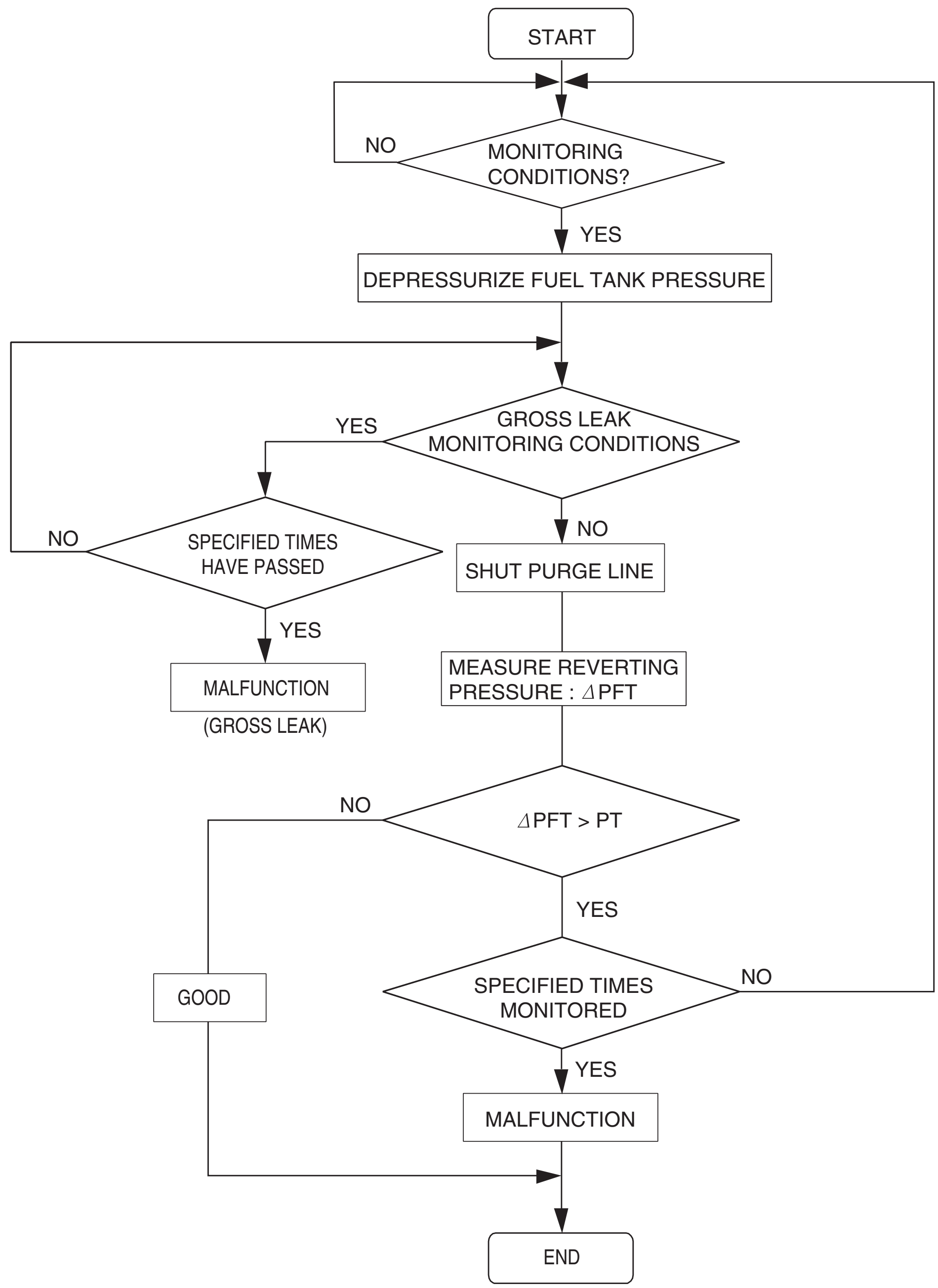
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

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



AC306649

DTC SET CONDITIONS

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.
- The fuel level sensor output voltage is 2.4 – 3.7 volts when the engine starts and the amount of remaining fuel is 40 – 85 percent of capacity.

Check Conditions B: For Test to Run

- Barometric pressure is greater than 76 kPa (11 psi).
- The fuel temperature is 33° C (91° F) or less.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Check Conditions C: For Test to Stop

- Engine coolant temperature is greater than 20 ° C (68 ° F).
- 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 rises in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 –14 minutes.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 1,177 – 1,373 Pa (0.177 – 0.199 psi) in 128 seconds after the tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

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

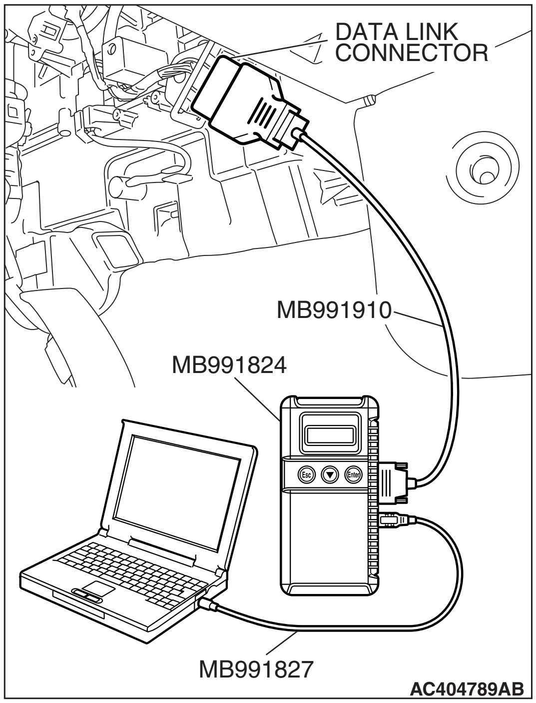
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Malfunction of the evaporative emission canister seal.
- Malfunction of the fuel tank, purge line or vapor line seal.
- Malfunction of the evaporative emission ventilation solenoid.

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.

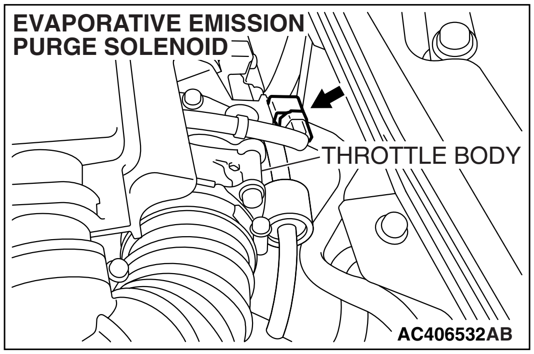
Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

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.13A-41. If no other DTC's have been set, go to Step 2.

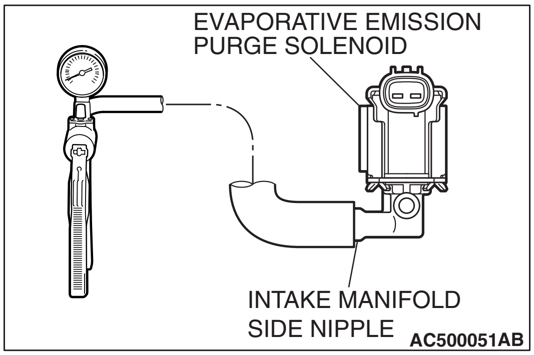
NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

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.15-10).

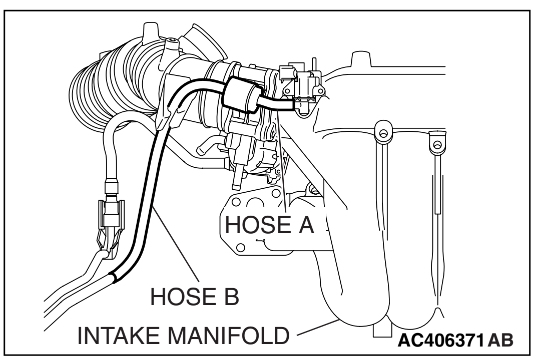


(2) Connect the hose of the hand vacuum pump to the intake manifold side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Install the evaporative emission purge solenoid to the intake manifold (Refer to GROUP 15, Intake Manifold P.15-10).

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.

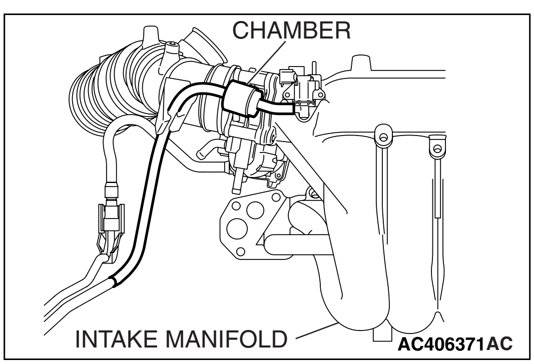


Use a hand vacuum pump to test each hose from hose A to hose B.

Q: Do the hoses hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose. Then go to Step 15.

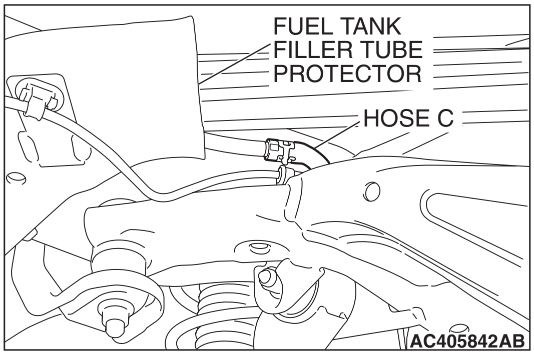
STEP 4. Check for leaks in the chamber.

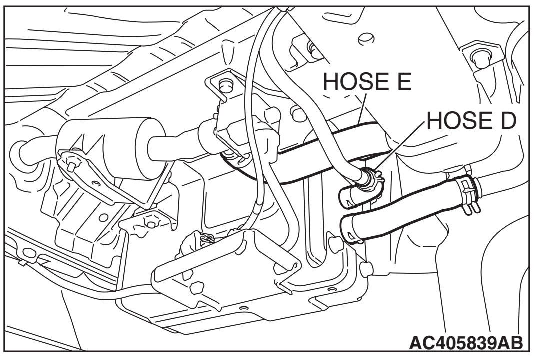


(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

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.

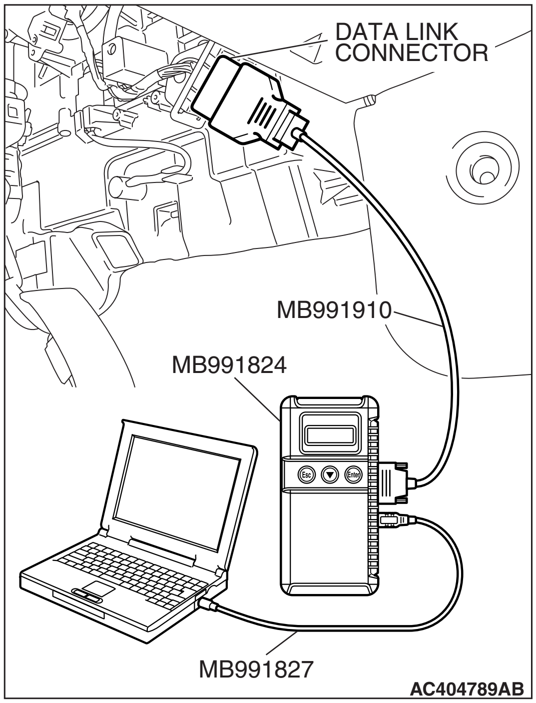
Use a hand vacuum pump to test each hose from hose C to hose E.

Q: Do the hoses hold vacuum?

YES : Go to Step 6.

NO : Replace any damaged hose. Then go to Step 15.

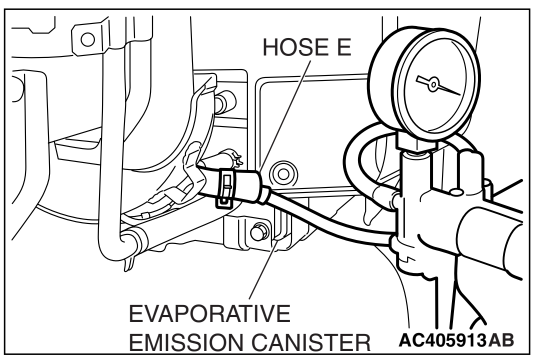
STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.



⚠ 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).



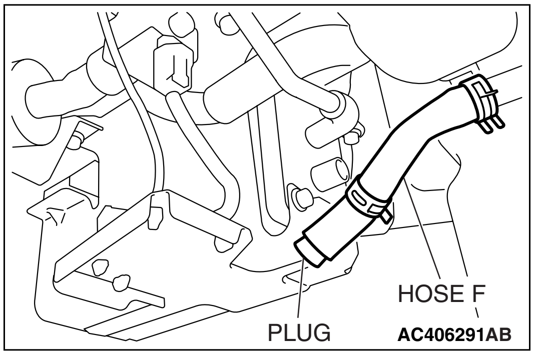
(3) Disconnect hose E from evaporative emission canister and connect hand vacuum pump to hose E.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid 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).

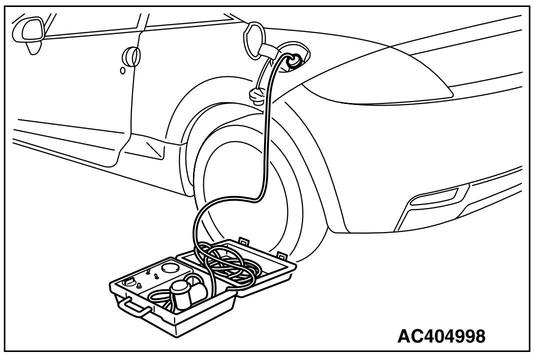
Q: Did the evaporative emission ventilation solenoid hold vacuum?

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.

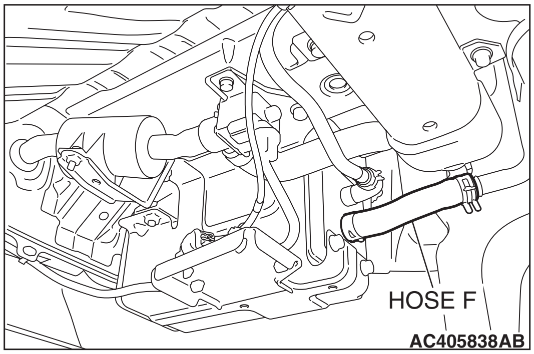
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

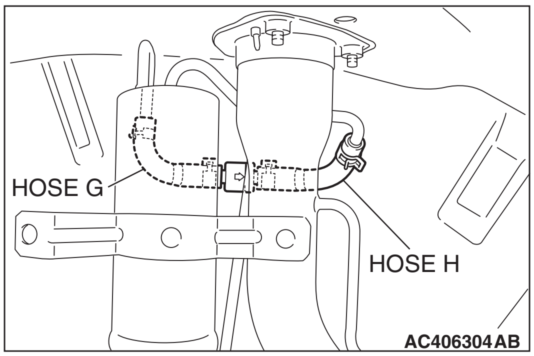
(6) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(7) Connect hose F to the evaporative emission canister.

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.



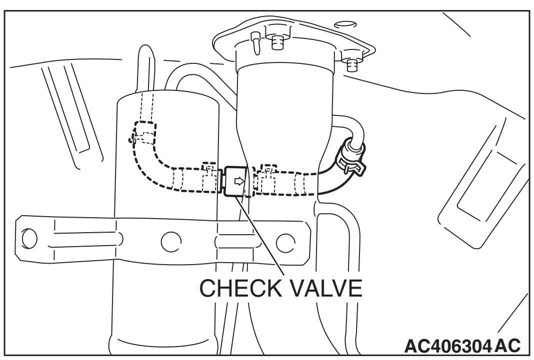


(1) Remove the rear splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4).
(2) Use a hand vacuum pump to test each hose from hose F to hose H.

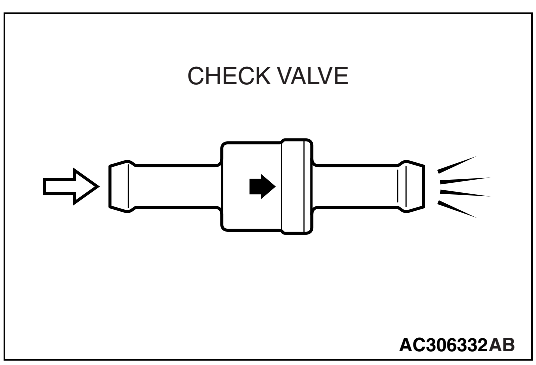
Q: Do the hoses hold vacuum?

YES : Go to Step 9.
NO : Replace any damaged hose, and reinstall the splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 15.

STEP 9. Test check valve.



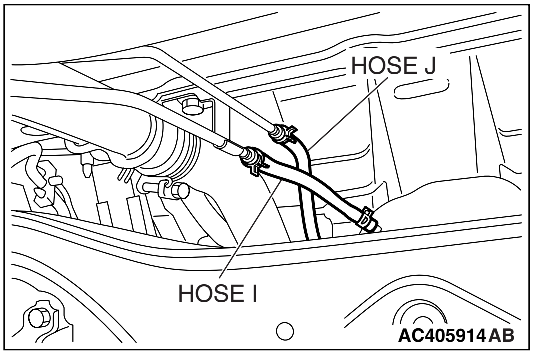
(1) Check valve is a one-way check valve.



(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 splash shield (Refer to GROUP 51, Rear Bumper Assembly P.51-4). Then go to Step 15.

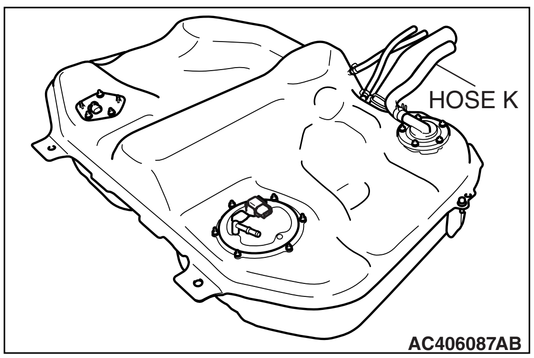


STEP 10. Check for leaks in evaporative emission hoses I and J.

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.

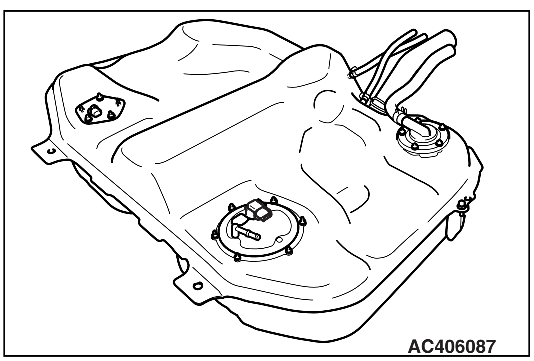


STEP 11. Check for leaks in evaporative emission hose K.

(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: Is the hose hold vacuum?

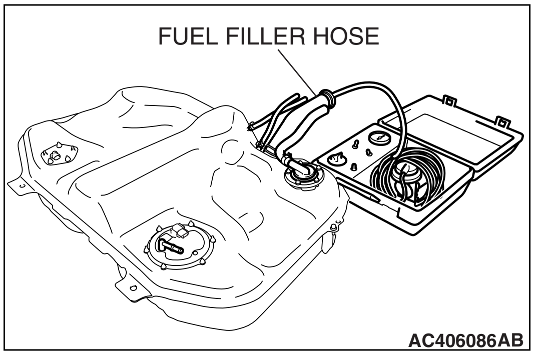
YES : Go to Step 12.
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13C, Fuel Tank P.13C-9). Then go to Step 15.



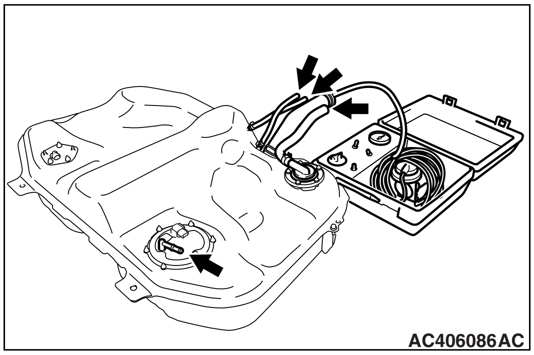
STEP 12. Check for leaks in the fuel tank.

(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.

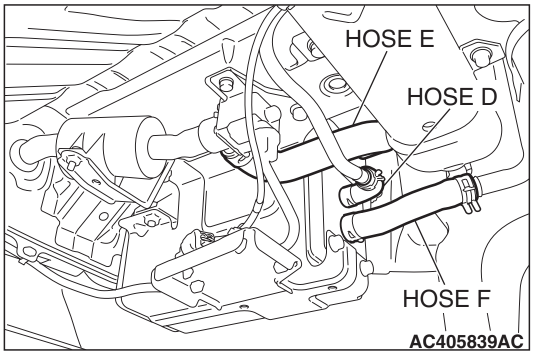
Q: Are any leaks found?

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.

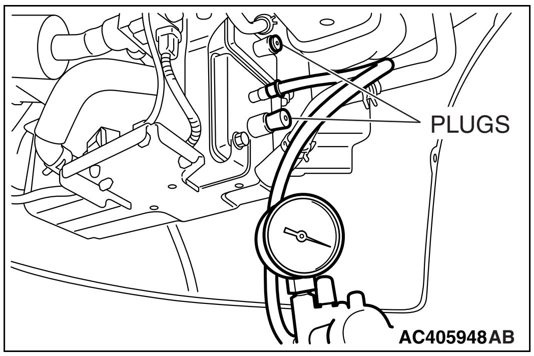
YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13C, Fuel Tank P.13C-9). Go to Step 15.

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.



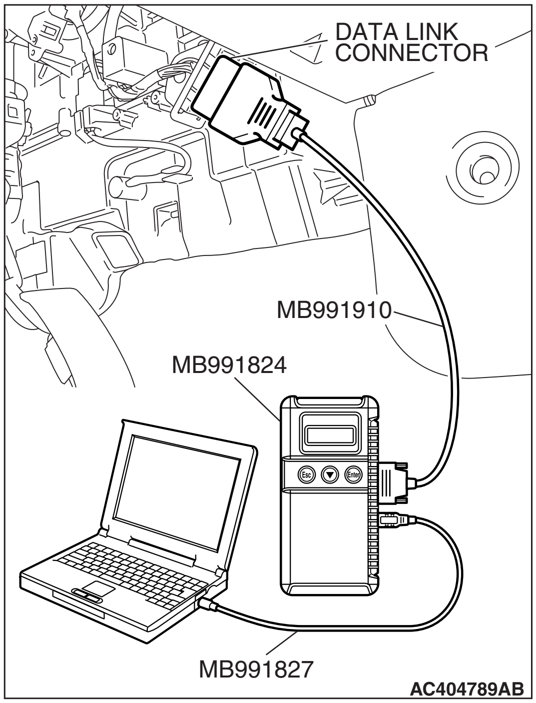
(1) Disconnect hoses D, E and F from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose D, and plug the other nipples.



(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 connect hoses D, E and F to the canister.

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> 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 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 6 P.13A-6).
(2) Read the diagnostic trouble code (DTC).

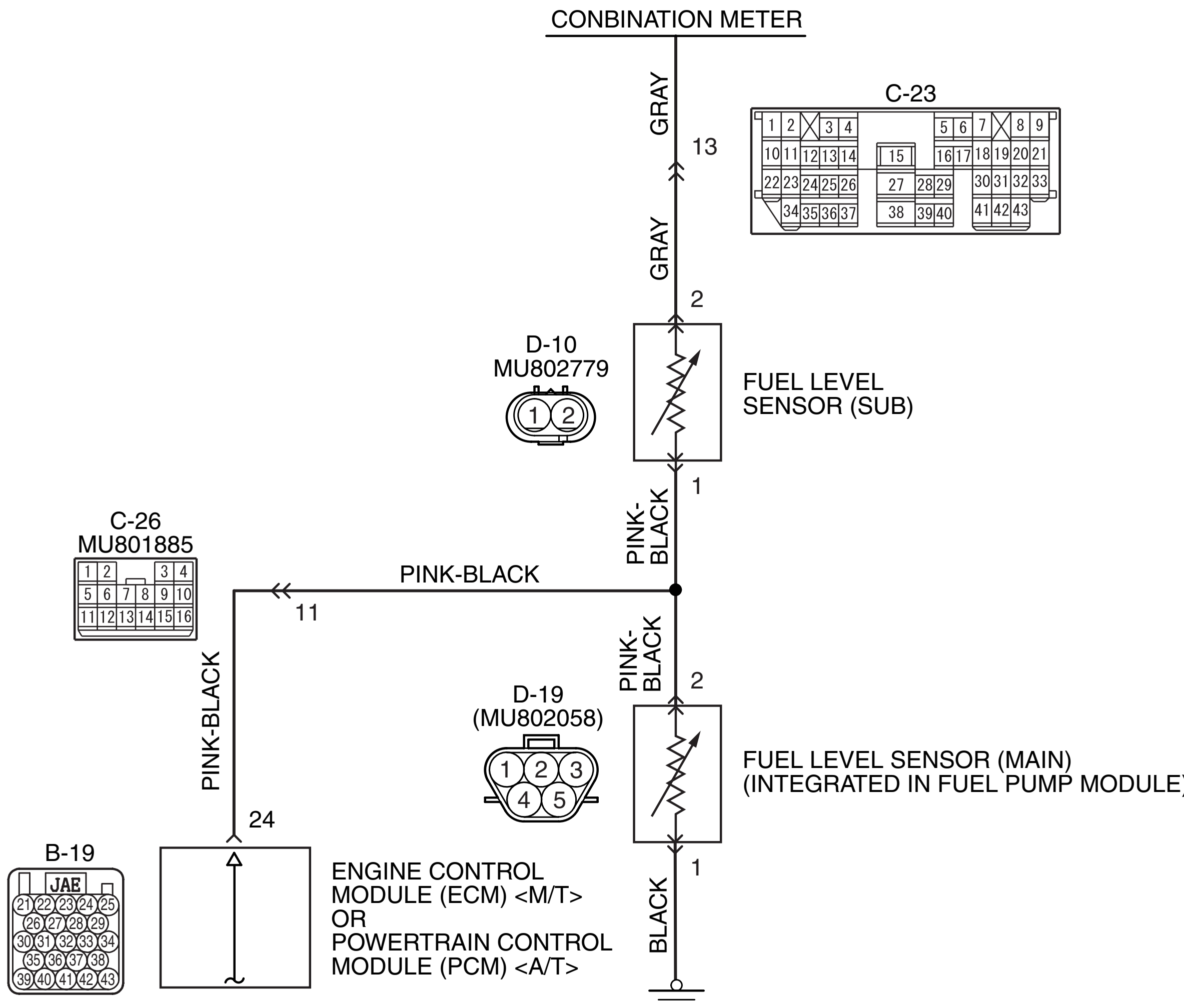
Q: Is DTC P0456 set?

YES : Repeat the troubleshooting from Step 1.

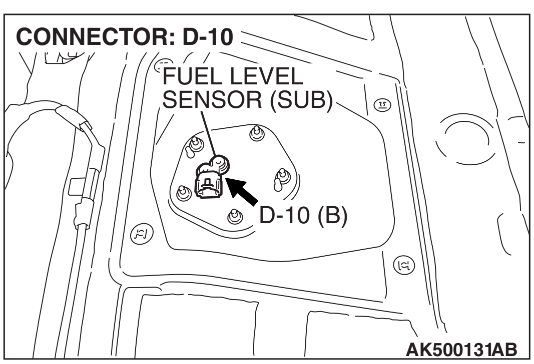
NO : The procedure is complete.

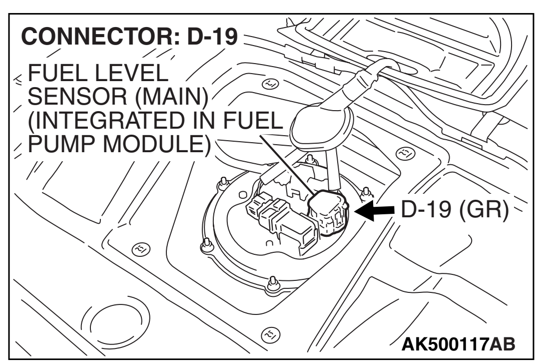
DTC P0461: Fuel Level Sensor (main) Circuit Range/Performance

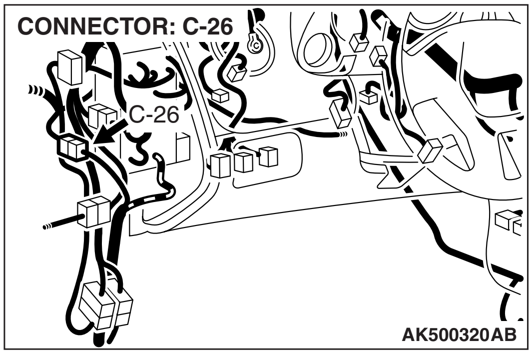
Fuel Level Sensor Circuit

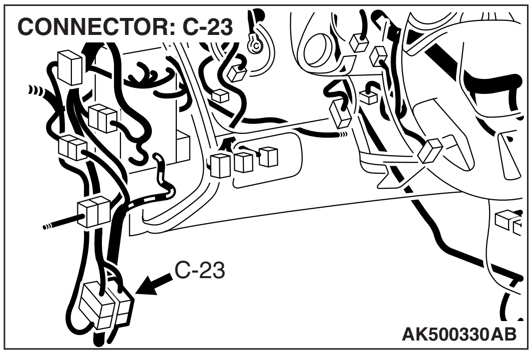


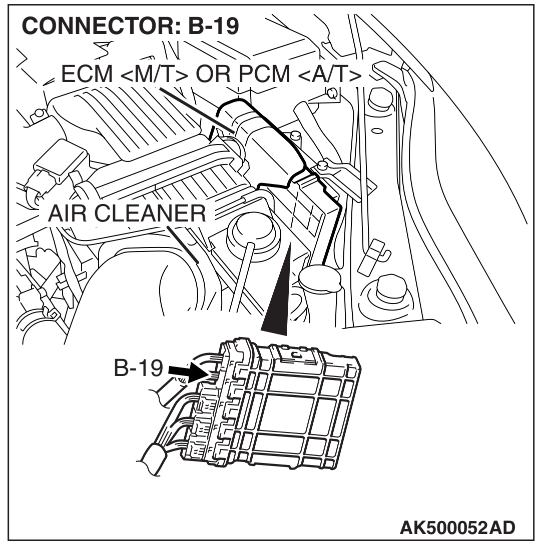
AK403694











CIRCUIT OPERATION

- The fuel level sensor (main) output voltage is input in ECM <M/T> or PCM <A/T> (terminal No. 24).

TECHNICAL DESCRIPTION

- Branch the output voltage from the fuel level sensor circuit, and input it into ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or the PCM <A/T> detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection 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)

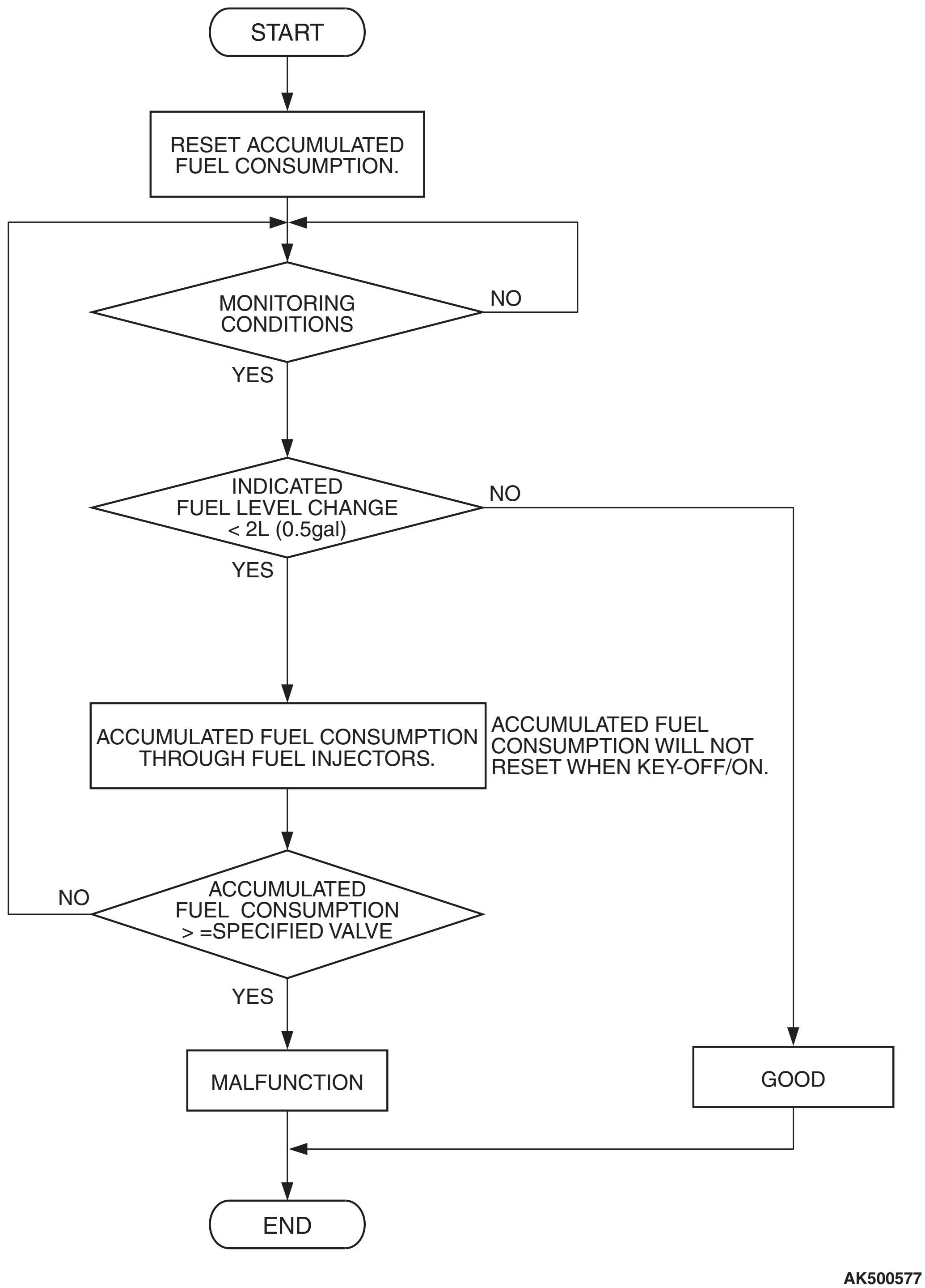
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 30 liters, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liters or less.

OBD-II DRIVE CYCLE PATTERN

None.

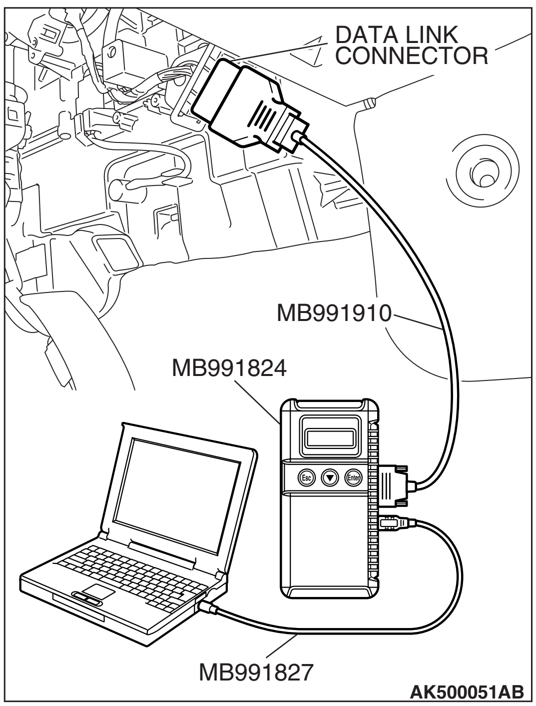
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel pump module or fuel level sensor failed.
- Harness damage or connector damage in fuel level sensor circuit.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

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



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

⚠ **CAUTION**

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

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

Q: Is DTC P2066 set?

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

STEP 2. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly –Symptom Chart P.54A-93.

STEP 3. Check the trouble symptoms.

Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

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.

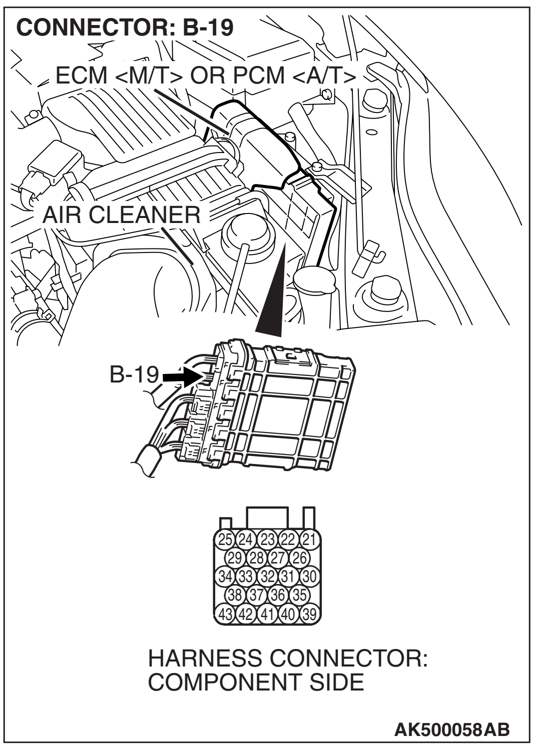
NO : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 8.

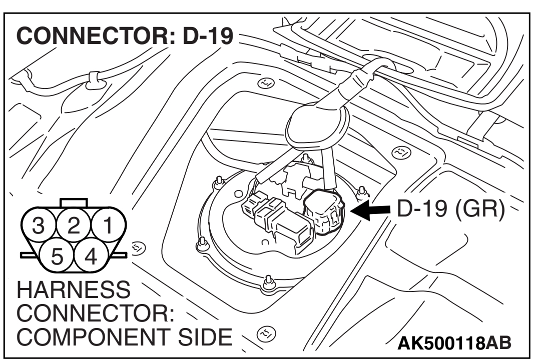
STEP 4. Check harness connector D-19 at fuel level sensor (main) and harness connector B-19 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

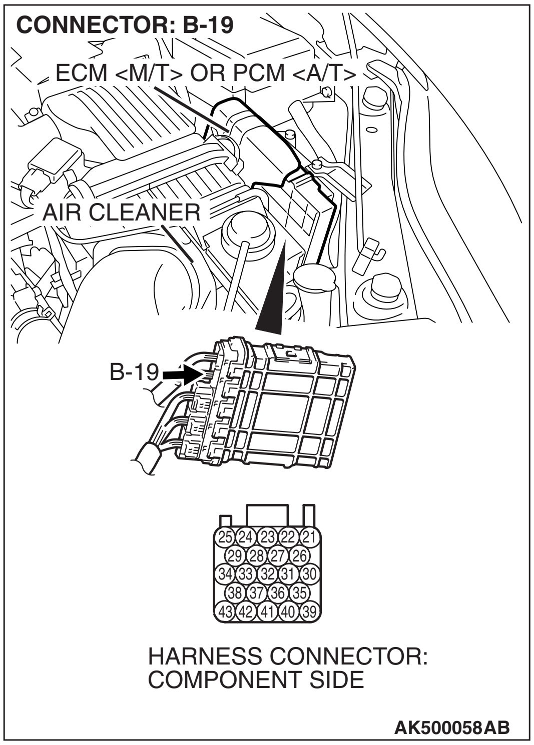
YES : Go to Step 5.

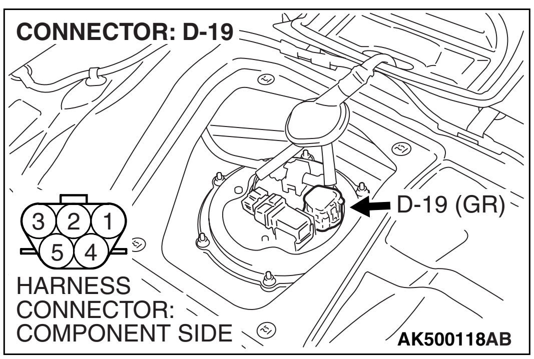
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.





STEP 5. Check for harness damage between fuel level sensor (main) connector D-19 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 24).





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 8.

Q: Is the harness wire in good condition?

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

STEP 6. Check the fuel pump module.

Check to see if the fuel pump module is normal. Refer to GROUP 54A, Chassis Electrical –Combination Meters Assembly and Vehicle Speed Sensor –On-Vehicle Service –Fuel Level Sensor Check P.54A-129.

Q: Is the fuel pump module normal?

YES : Go to Step 7.
NO : Replace the fuel pump module. Then go to Step 8.

STEP 7. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operate correctly?

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 8. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

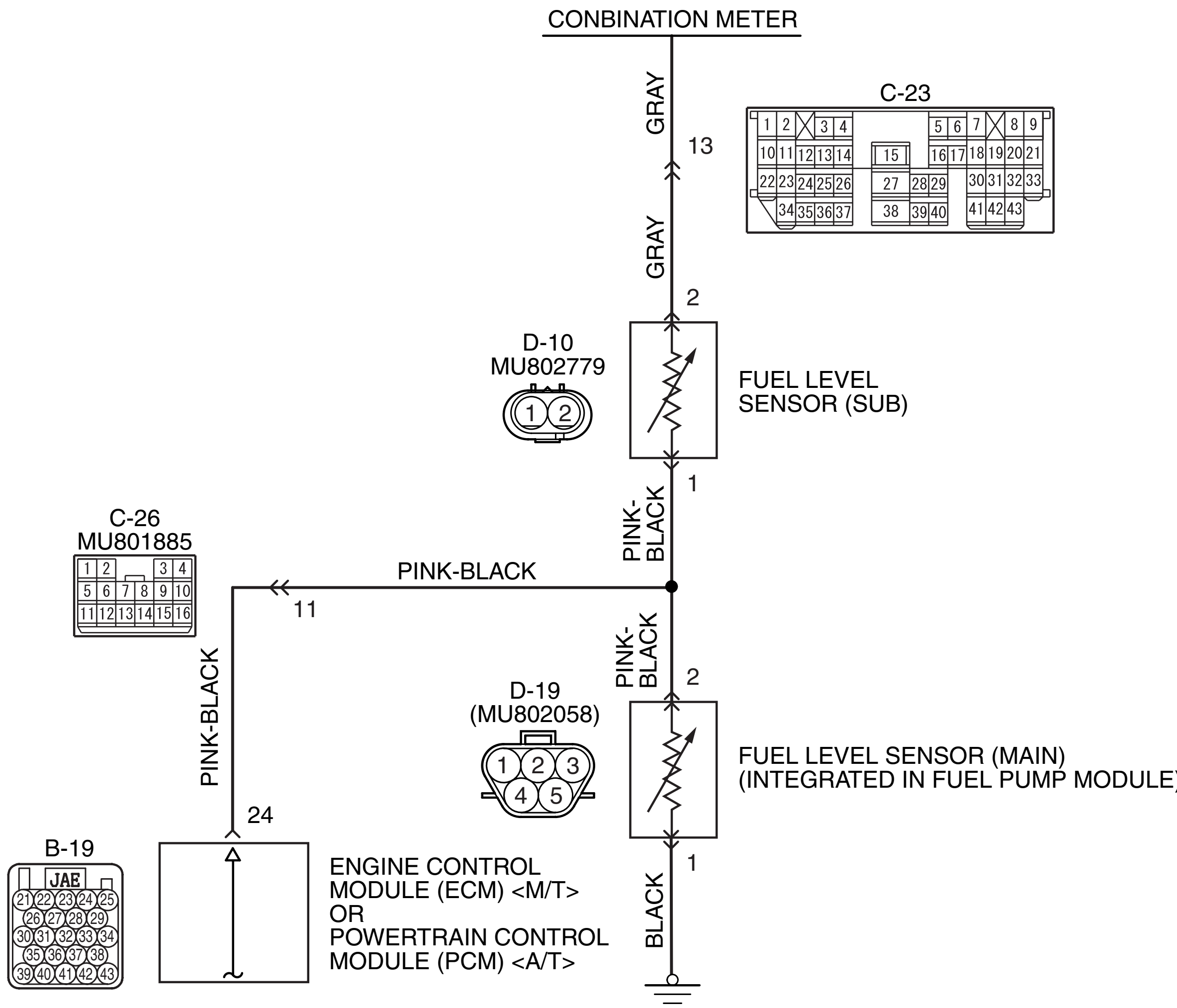
Q: Does the fuel gauge operate correctly?

YES : The inspection is complete.

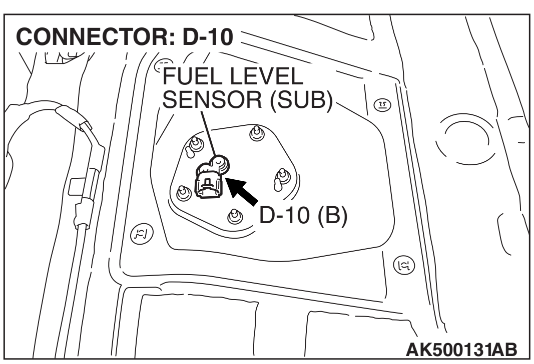
NO : Retry the troubleshooting.

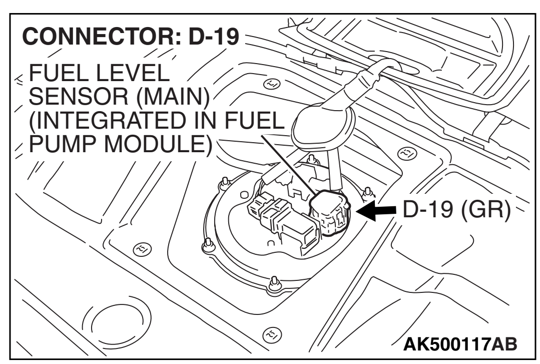
DTC P0462: Fuel Level Sensor Circuit Low Input

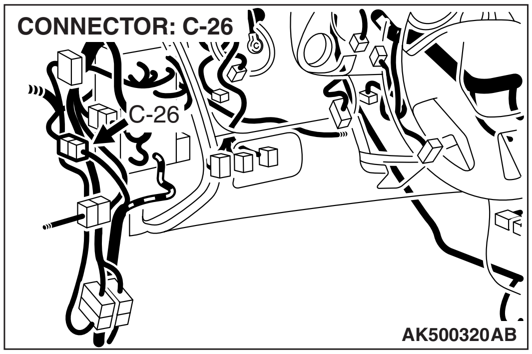
Fuel Level Sensor Circuit

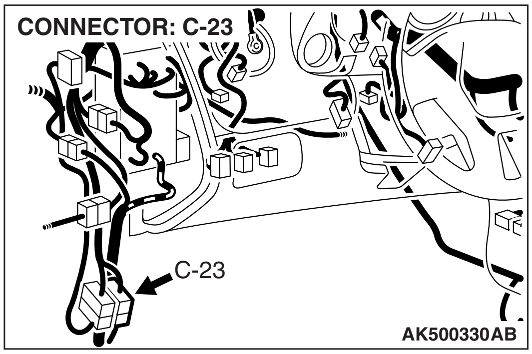


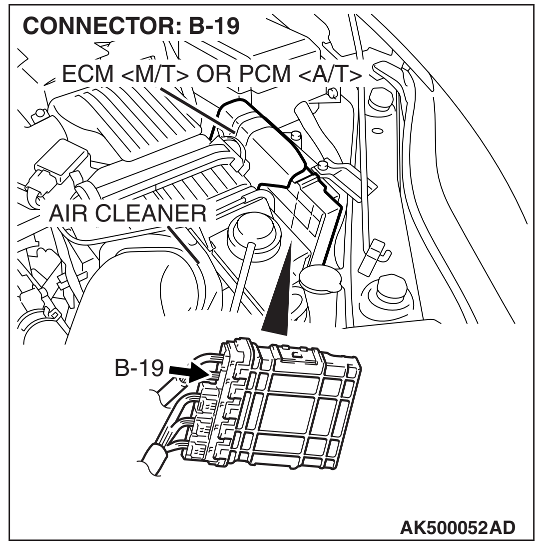
AK403694











CIRCUIT OPERATION

- The fuel level sensor output voltage is input in combination meter (terminal No. 13).

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage.
- The combination meter sends the data regarding the rest of the fuel to the ECM <M/T> or the PCM <A/T>.
- The ECM <M/T> or the PCM <A/T> checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

A short circuit is detected while monitoring the fuel level sensor output.

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)

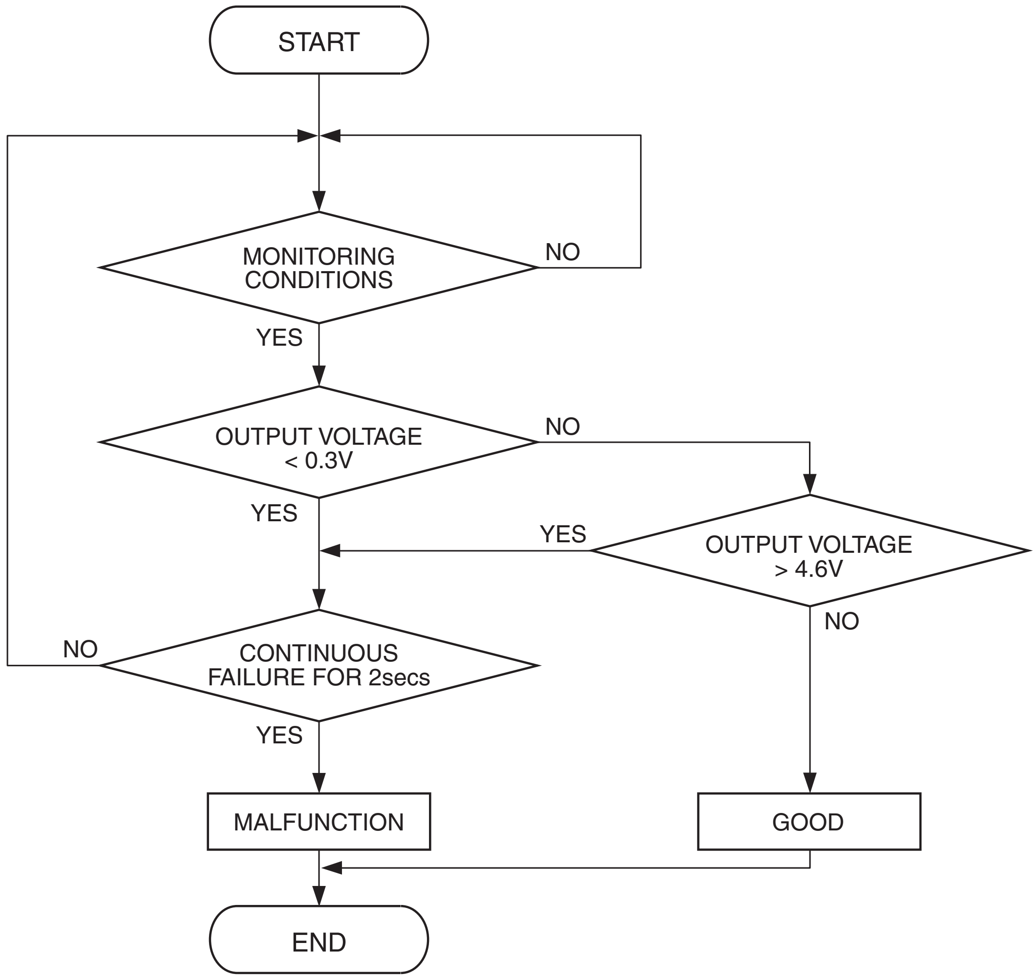
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Fuel level sensor output voltage has continued to be lower than 0.3 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Fuel level sensor failed.
- Shorted fuel level 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. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 2.

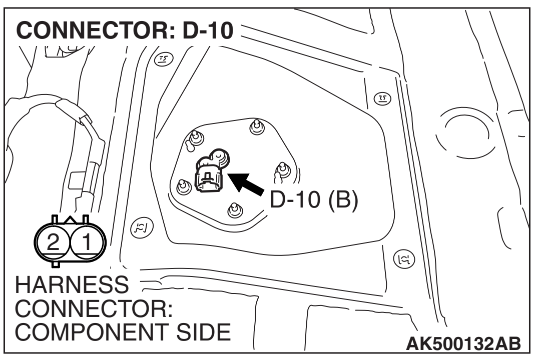
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly –Symptom Chart P.54A-93.

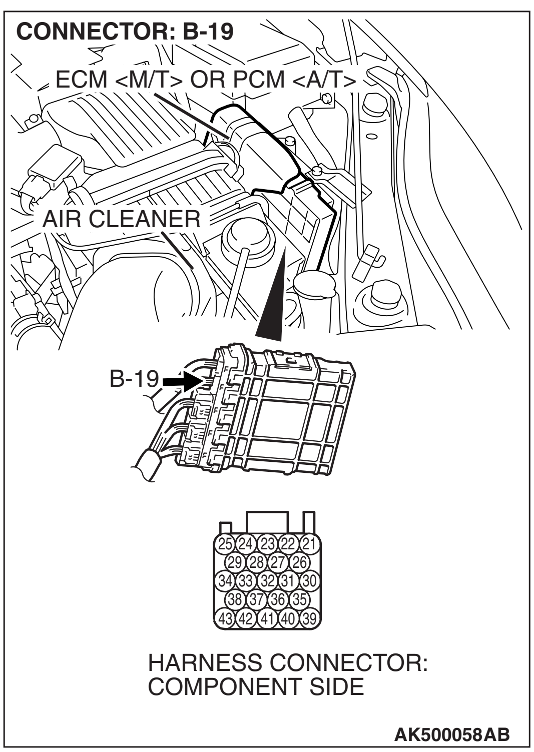
STEP 2. Check harness connector B-19 at ECM <M/T> or PCM <A/T> and harness connector D-10 at fuel level sensor (sub) for damage.

Q: Is the harness connector in good condition?

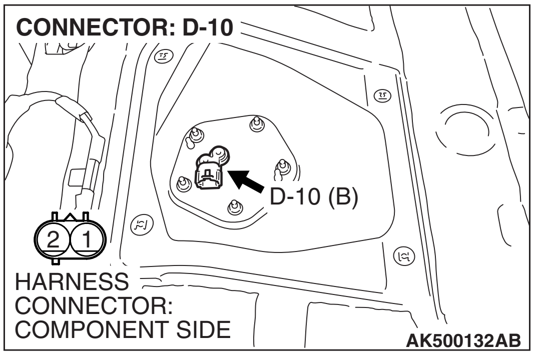
YES : Go to Step 3.

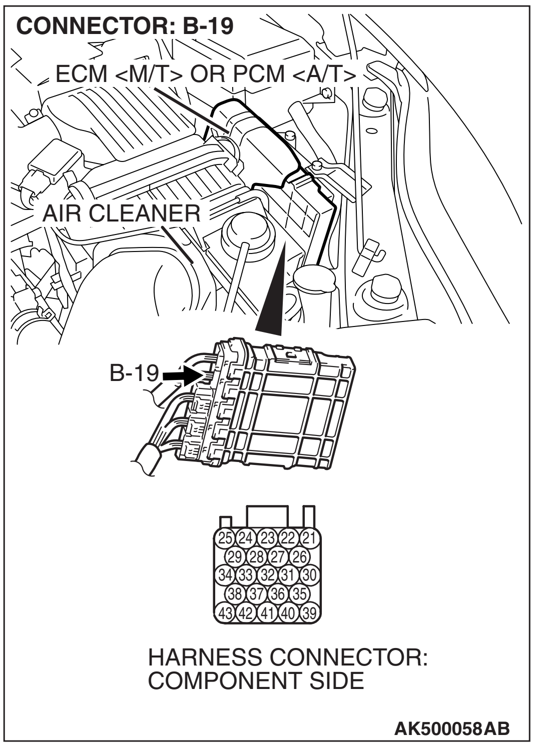
NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2 Then go to Step 7.





STEP 3. Check for short circuit to ground between ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 24) and fuel level sensor (sub) connector D-10 (terminal No. 1).

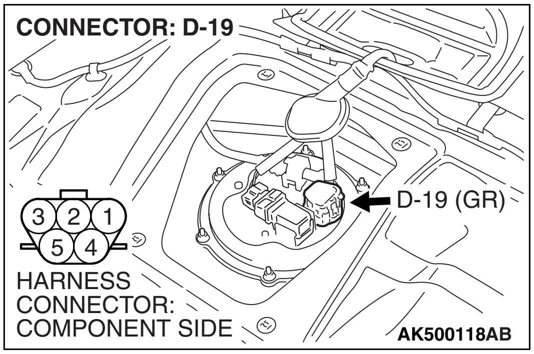




NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair it. Then go to Step 7.

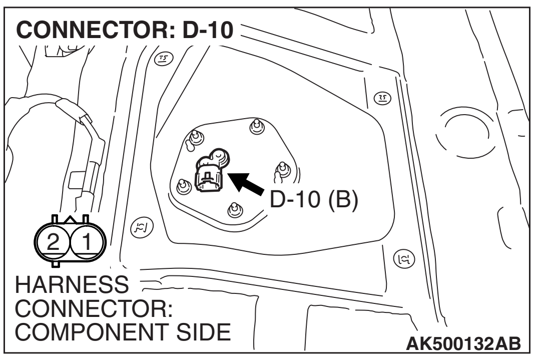


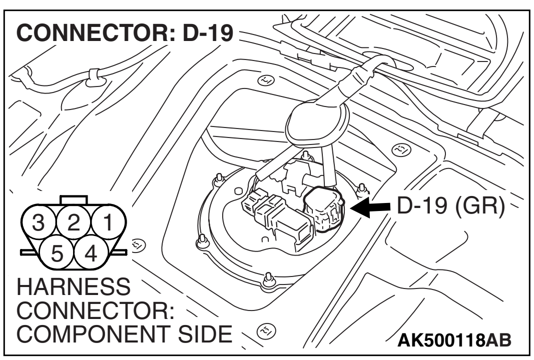
STEP 4. Check harness connector D-19 at fuel level sensor (main) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

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





STEP 5. Check for short circuit to ground between fuel level sensor (main) connector D-19 (terminal No. 2) and fuel level sensor (sub) connector D-10 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.

STEP 6. 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.13A-6.

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

Q: Is DTC P0462 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 7.

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 7. Test the OBD-II drive cycle.

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

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

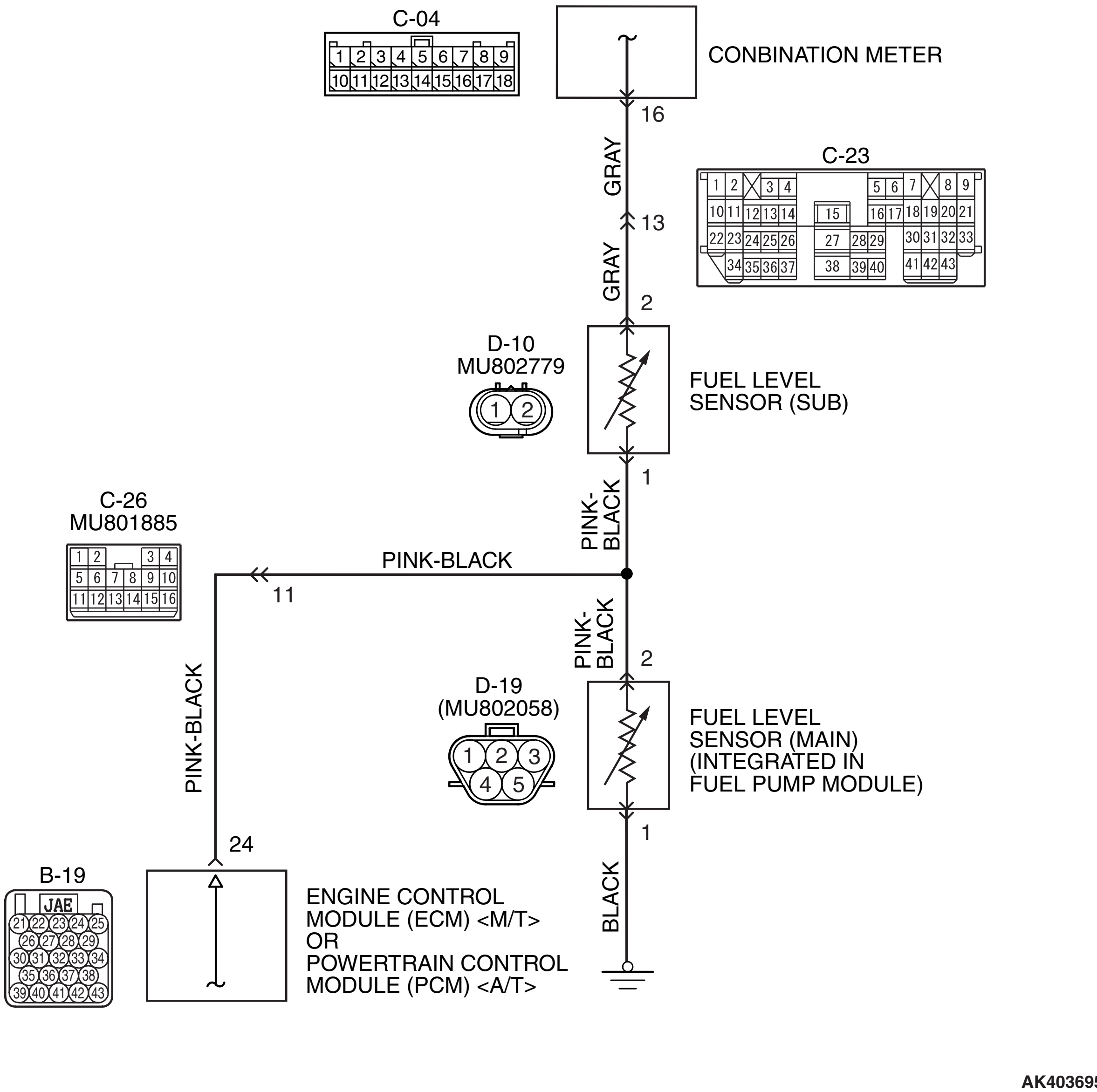
Q: Is DTC P0462 set?

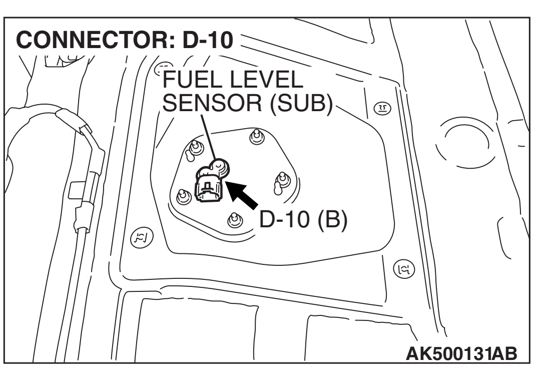
YES : Retry the troubleshooting.

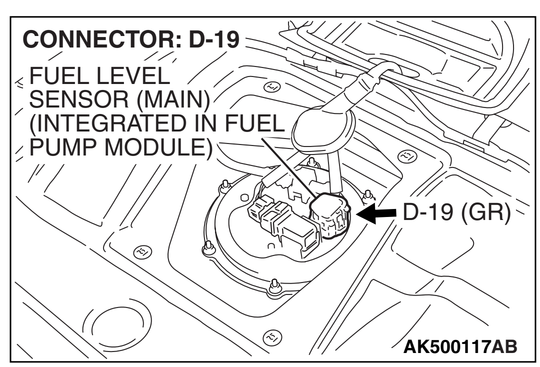
NO : The inspection is complete.

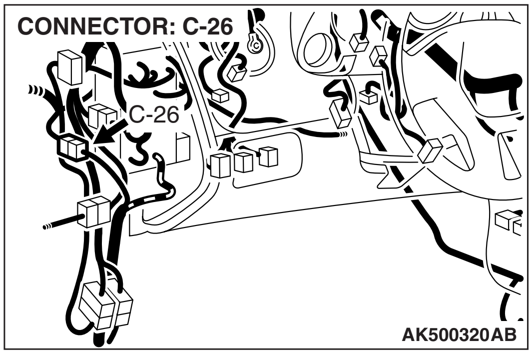
DTC P0463: Fuel Level Sensor Circuit High Input

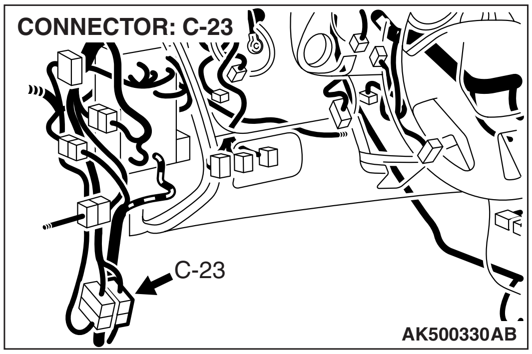
Fuel Level Sensor Circuit

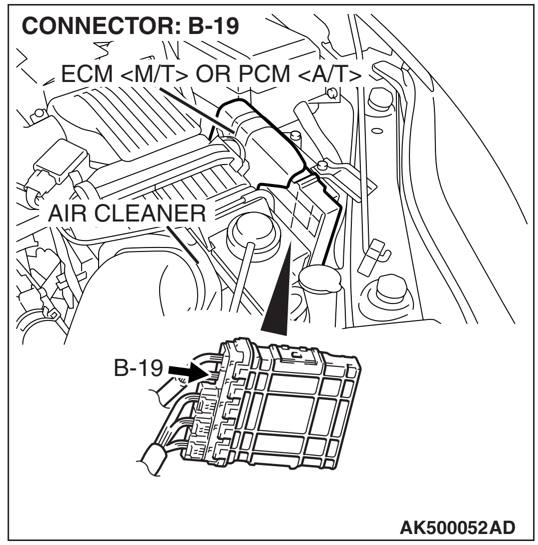












CIRCUIT OPERATION

- The fuel level sensor output voltage is input in combination meter (terminal No. 13).

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage.
- The combination meter sends the data regarding the rest of the fuel to the ECM <M/T> or the PCM <A/T>.
- The ECM <M/T> or the PCM <A/T> checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

An open circuit is detected while monitoring the intake air temperature sensor output.

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)

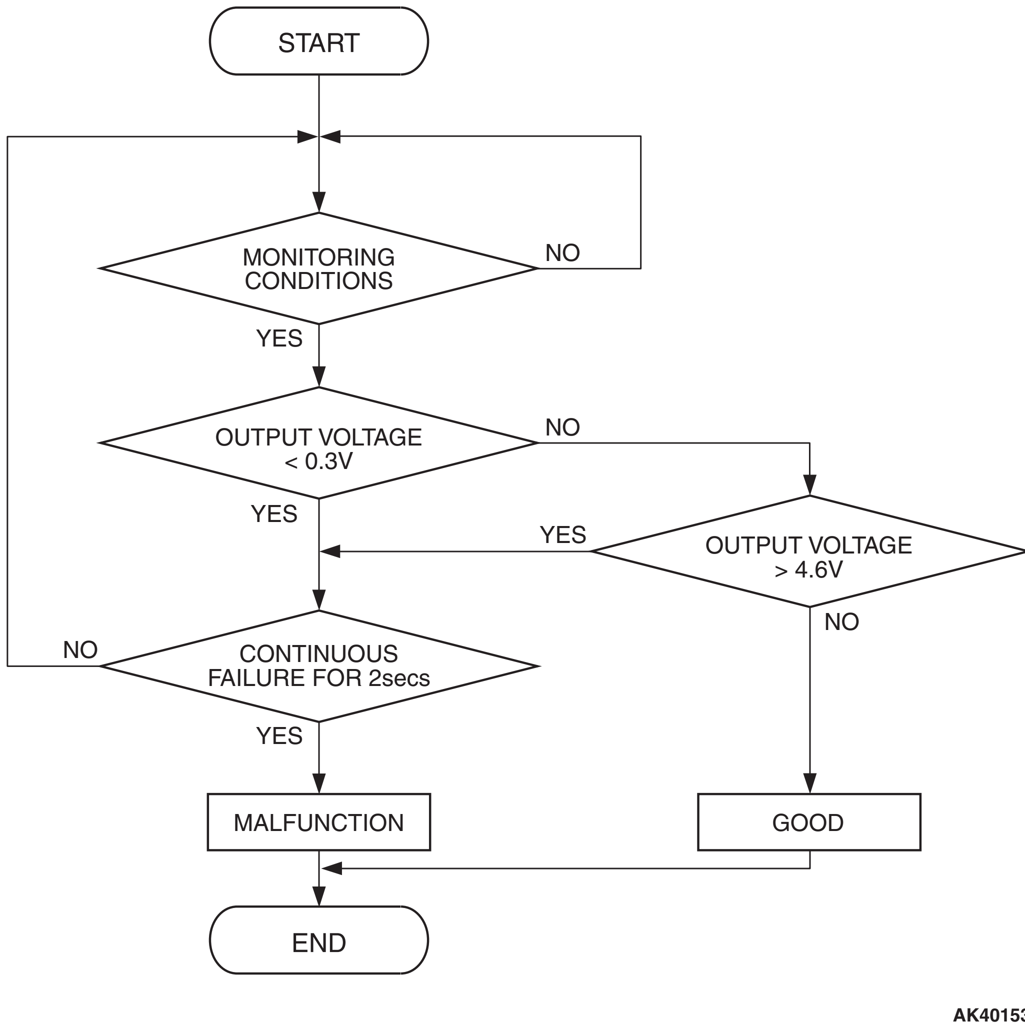
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine staring sequence was completed.

Judgement Criterion

- Fuel level sensor output voltage has continued to be higher than 4.6 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

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

DIAGNOSIS

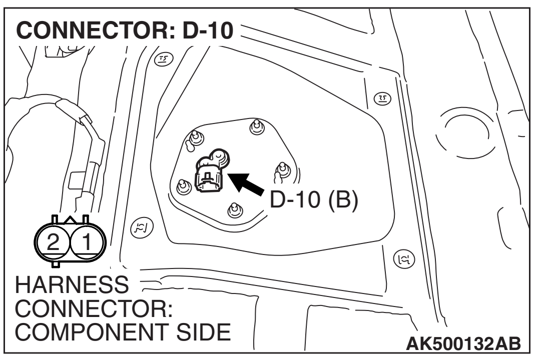
Required Special Tools:

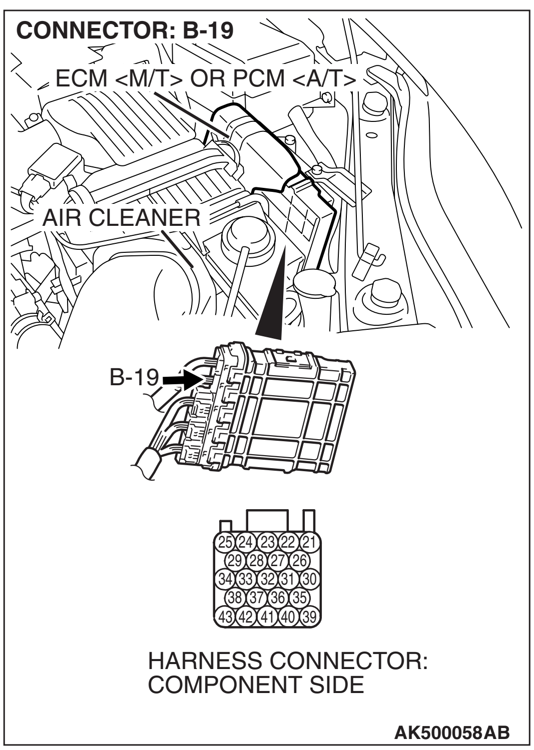
- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 2.
NO : Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly –Symptom Chart P.54A-93.



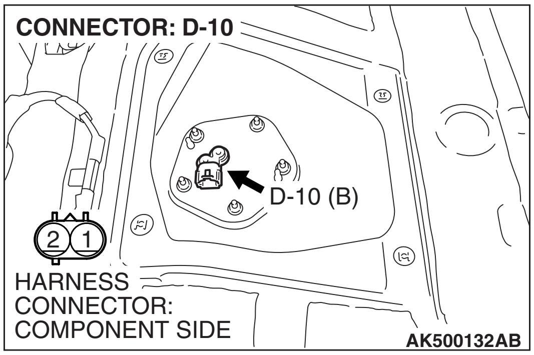


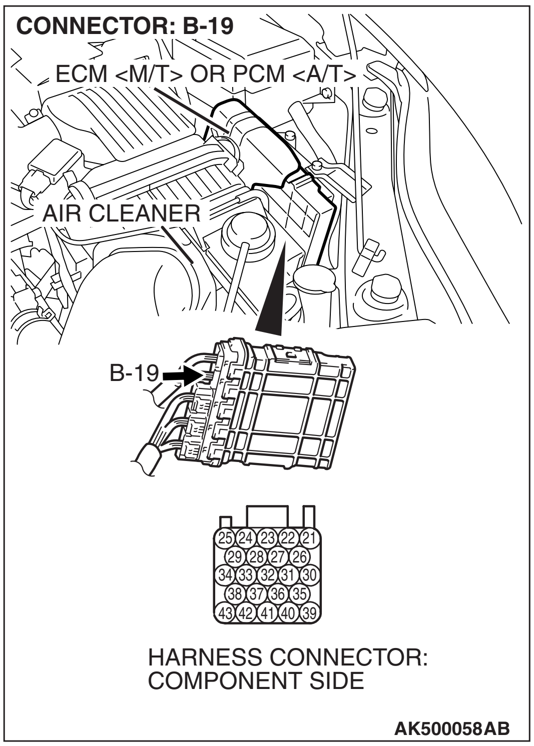
STEP 2. Check harness connector B-19 at ECM <M/T> or PCM <A/T> and harness connector D-10 at fuel level sensor (sub) for damage.

Q: Is the harness connector in good condition?

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

STEP 3. Check for short circuit to ground between ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 24) and fuel level sensor (sub) connector D-10 (terminal No. 1).

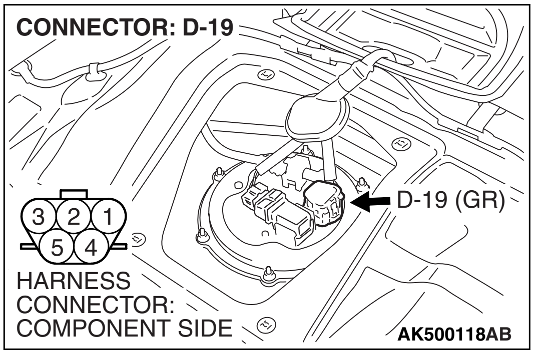




NOTE: Check harness after checking intermediate connector C-26. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair it. Then go to Step 7.

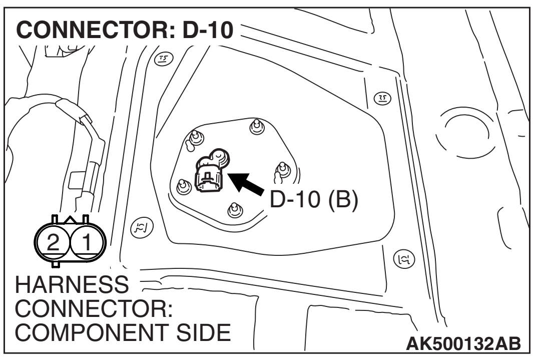


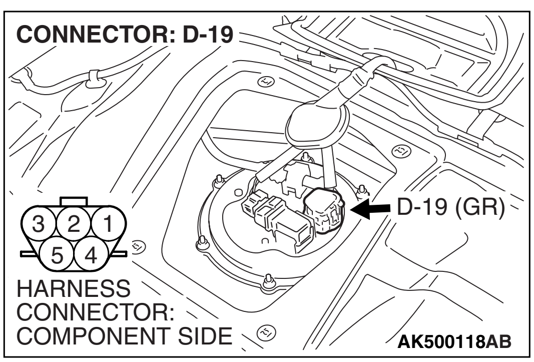
STEP 4. Check harness connector D-19 at fuel level sensor (main) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

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





STEP 5. Check for open circuit and short circuit to ground between fuel level sensor (main) connector D-19 (terminal No. 2) and fuel level sensor (sub) connector D-10 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it. Then go to Step 7.

STEP 6. 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.13A-6.

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

Q: Is DTC P0463 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 7.

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 7. Test the OBD-II drive cycle.

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

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

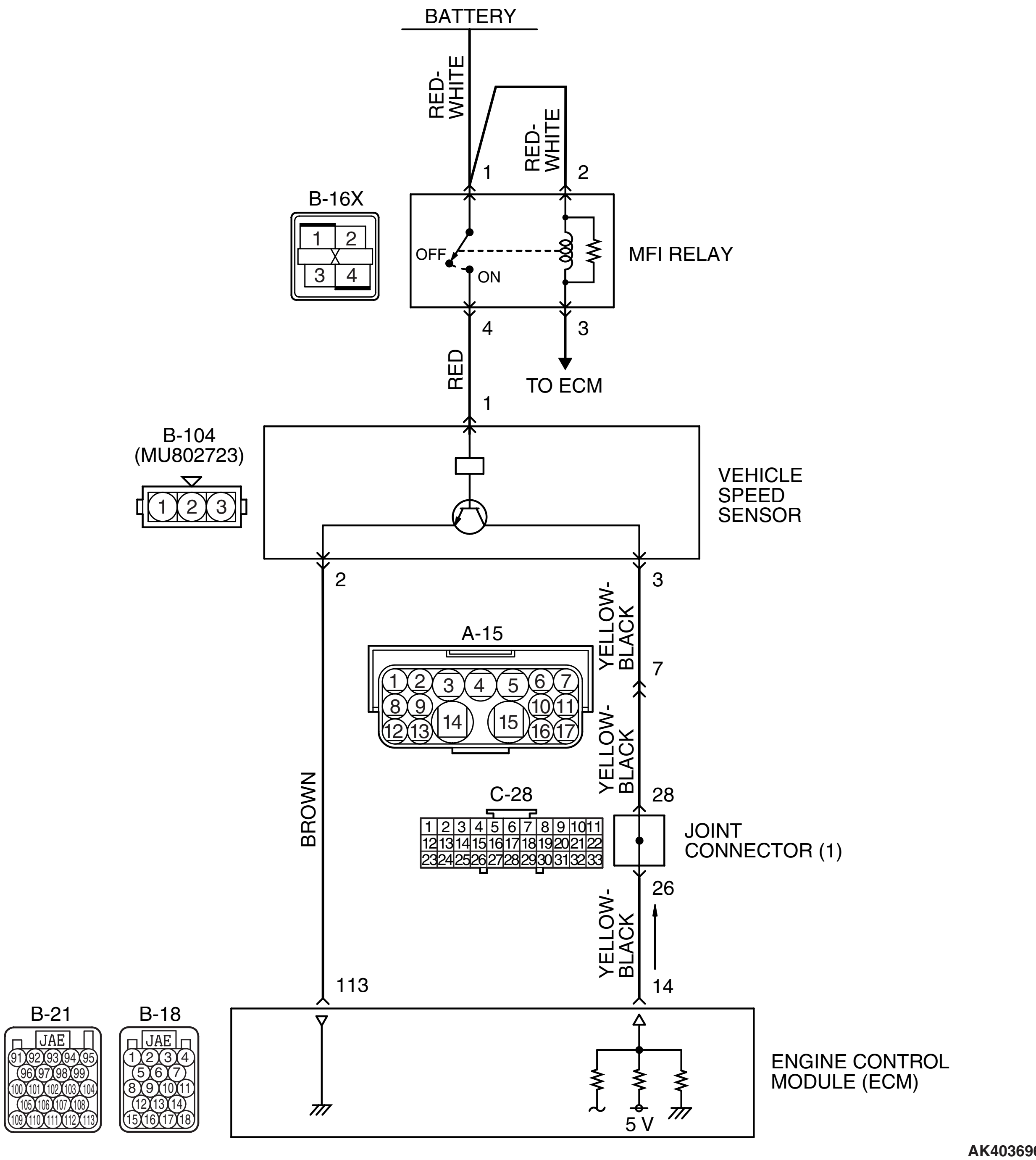
Q: Is DTC P0463 set?

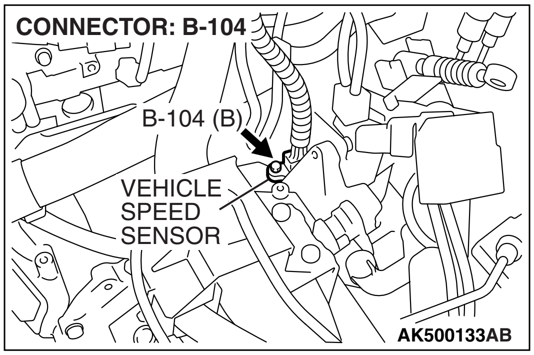
YES : Retry the troubleshooting.

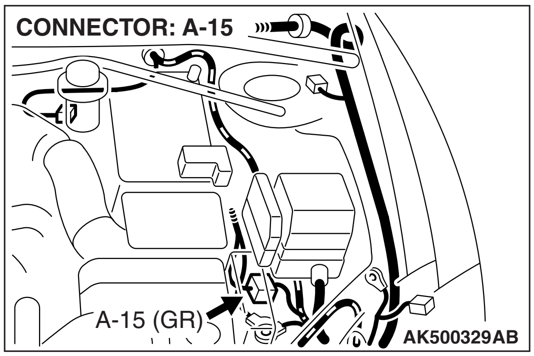
NO : The inspection is complete.

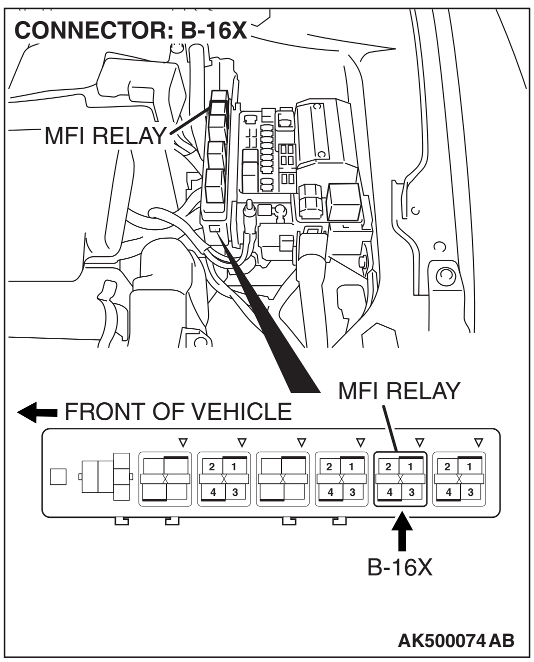
DTC P0500: Vehicle Speed Sensor Malfunction <M/T>

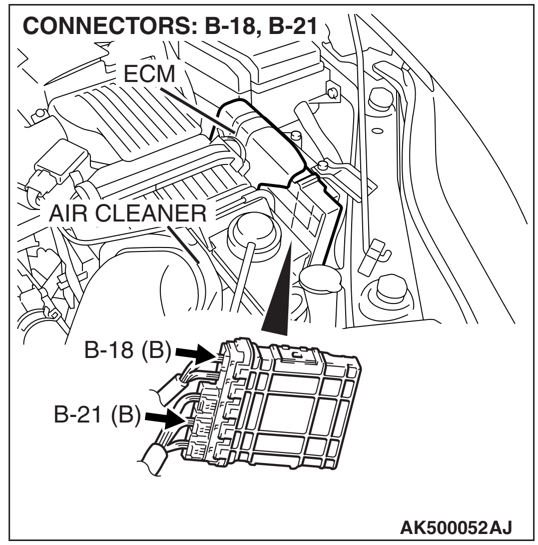
Vehicle Speed Sensor Circuit

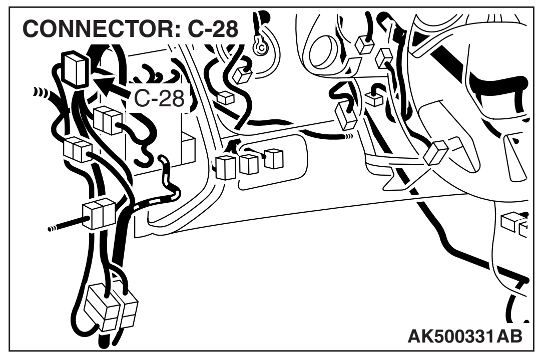












CIRCUIT OPERATION

- A 5-volt voltage is applied to the vehicle speed sensor output terminal (terminal No. 1) from the ECM (terminal No. 14). The vehicle speed sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The vehicle speed sensor converts the vehicle speed into pulse signals and inputs them to the ECM.
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
- The ECM checks whether the pulse signal is output.

DESCRIPTIONS OF MONITOR METHODS

- If the vehicle speed sensor output does not change while the vehicle is being driven in the medium- to high-speed range, a malfunction is determined to have occurred.

MONITOR EXECUTION

- Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

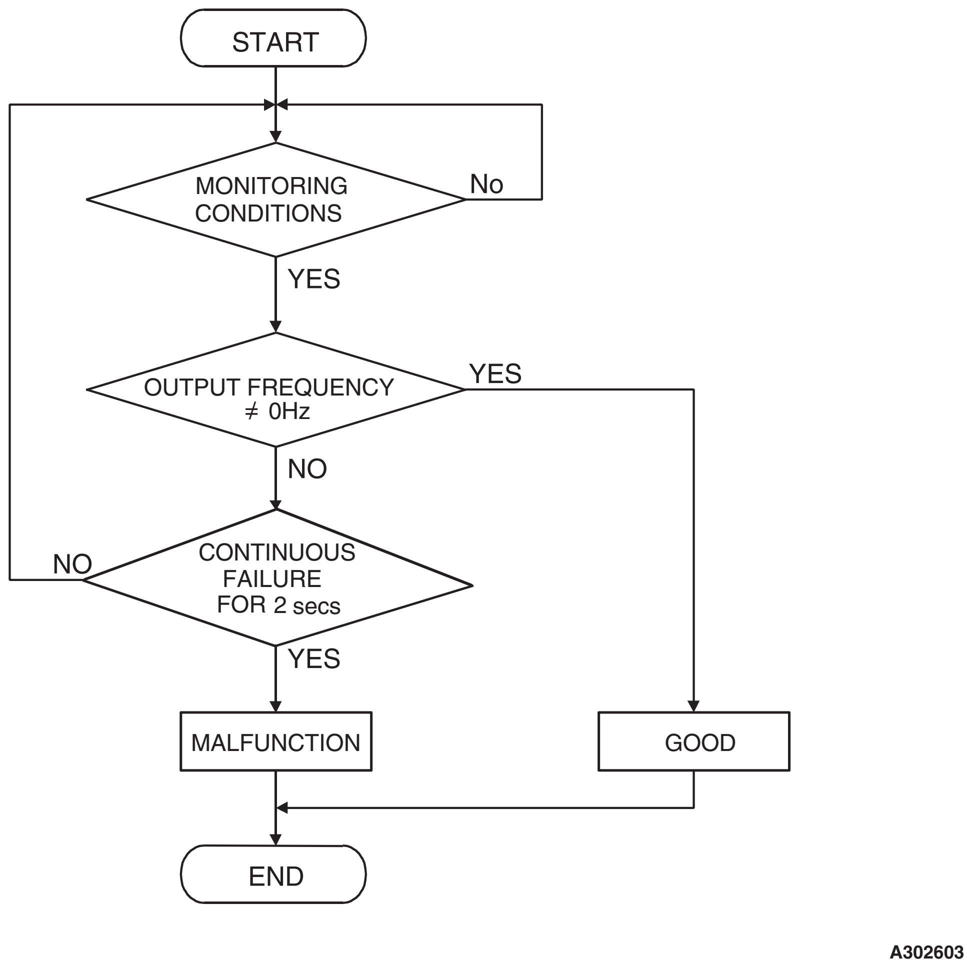
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

DTC SET CONDITIONS (Entry Conditions and Malfunction Thresholds)

Logic Flow Chart



Check Conditions

- 2 seconds or more have passed the engine starting sequence was completed.
- Engine speed is at between 2,000 and 4,000 r/min.
- Volumetric efficiency is at between 48 and 75 percent.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

None

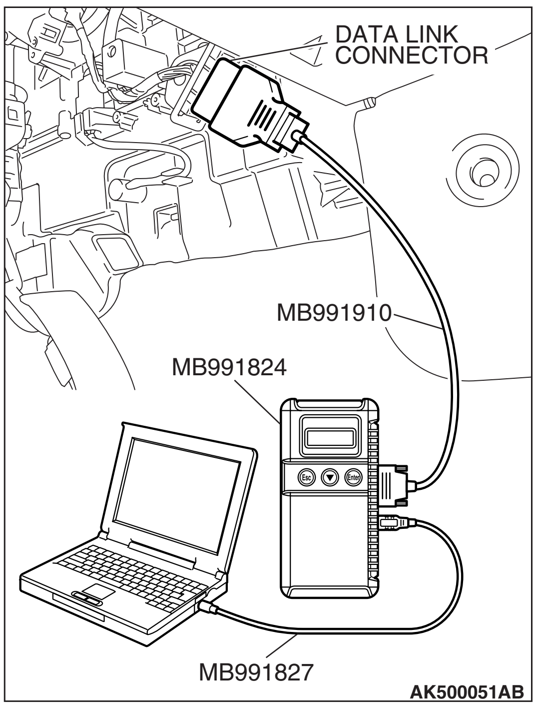
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or harness damage, or connector damage.
- ECM 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, check data list item 4: Vehicle Speed 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.

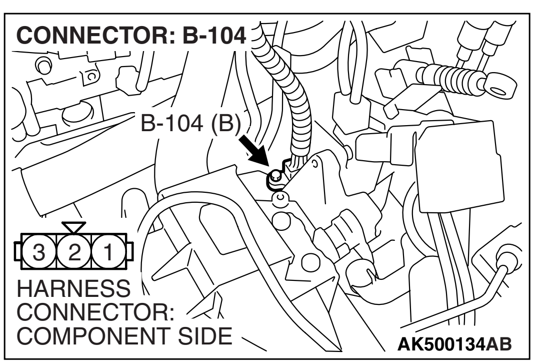
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and MUT-III display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(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.

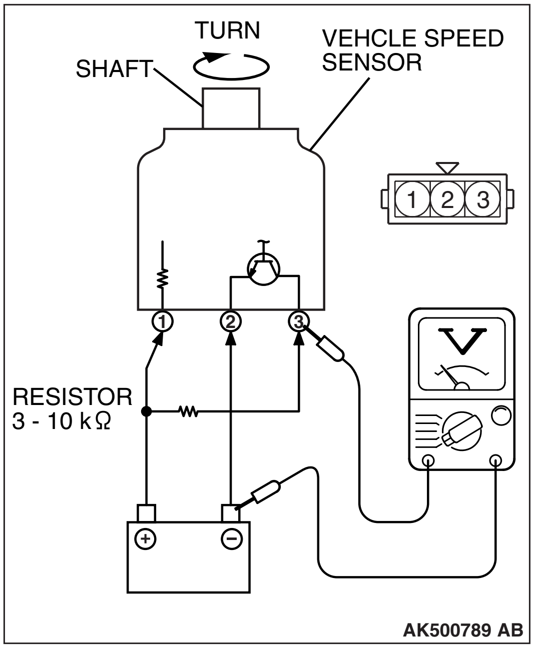


STEP 2. Check connector B-104 at vehicle speed sensor for damage.

Q: Is the 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 17.



STEP 3. Check the vehicle speed sensor.

1.Remove the vehicle speed sensor and connect a 3 –10 kΩ resistor as shown in the illustration.

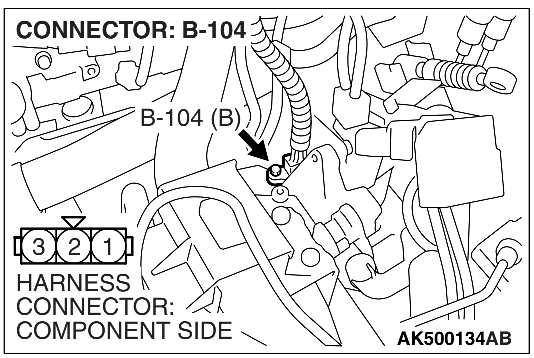
2.Turn the shaft of the vehicle speed sensor and check that there is voltage between terminals 2 – 3. (1 turn = 4 pulses)

Standard value: 0 or Battery Voltage (1 turn = 4pulses)

Q: Is the vehicle speed sensor normal?

YES : Go to Step 4.

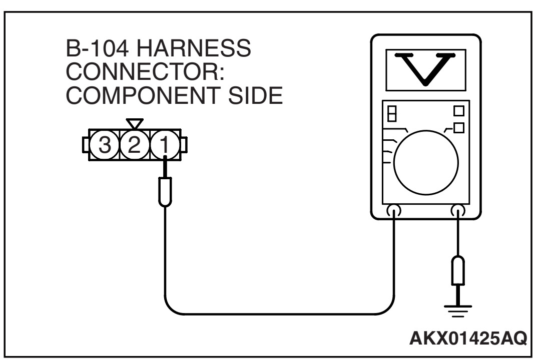
NO : Replace the vehicle speed sensor. Then go to Step 17.



STEP 4. Measure the power supply voltage at vehicle speed sensor connector B-104.

(1) Disconnect the connector B-104 and measure at the harness side.

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



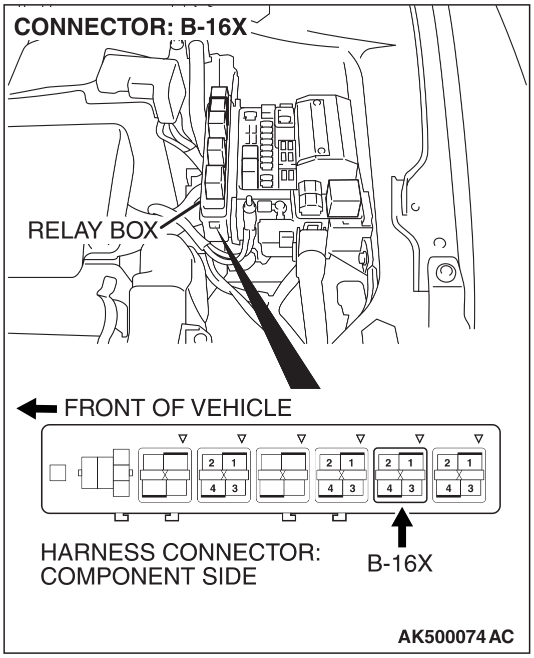
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(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.

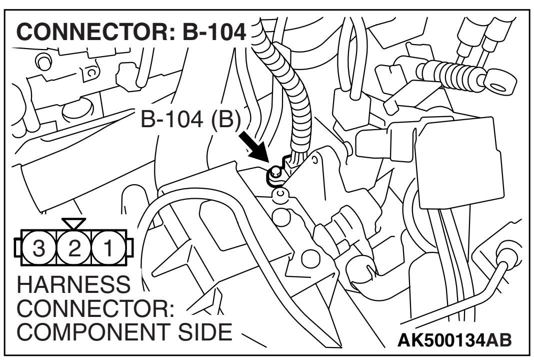


STEP 5. Check harness connector B-16X at MFI relay for damage.

Q: Is the harness connector in good condition?

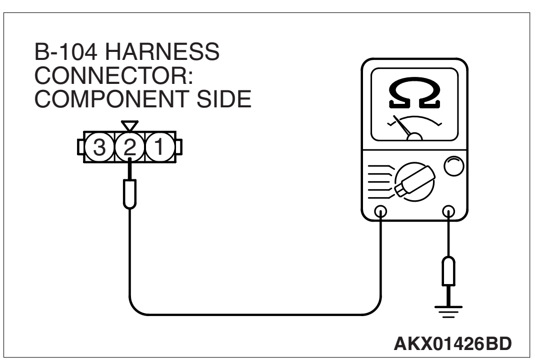
YES : Repair harness wire between MFI relay connector B-16X (terminal No. 4) and vehicle speed sensor connector B-104 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



STEP 6. Check the continuity at vehicle speed sensor harness side connector B-104.

(1) Disconnect the connector B-104 and measure at the harness side.



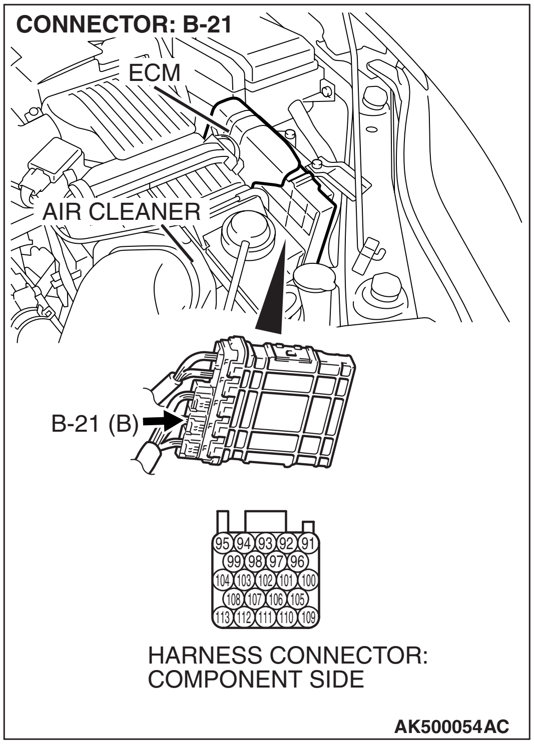
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Does the continuity exist?

YES : Go to Step 10.

NO : Go to Step 7.

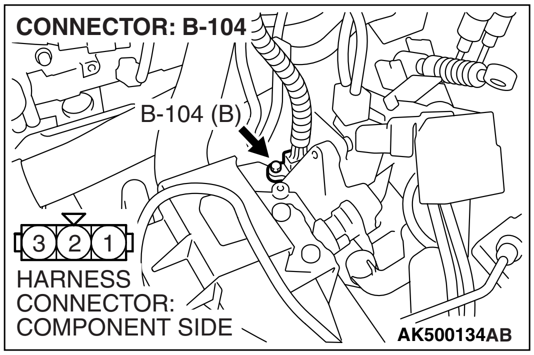


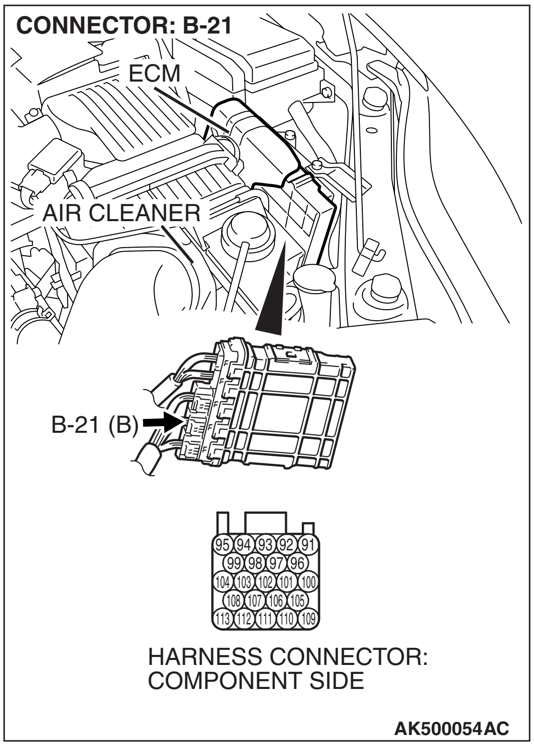
STEP 7. Check connector B-21 at ECM for damage.

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 17.





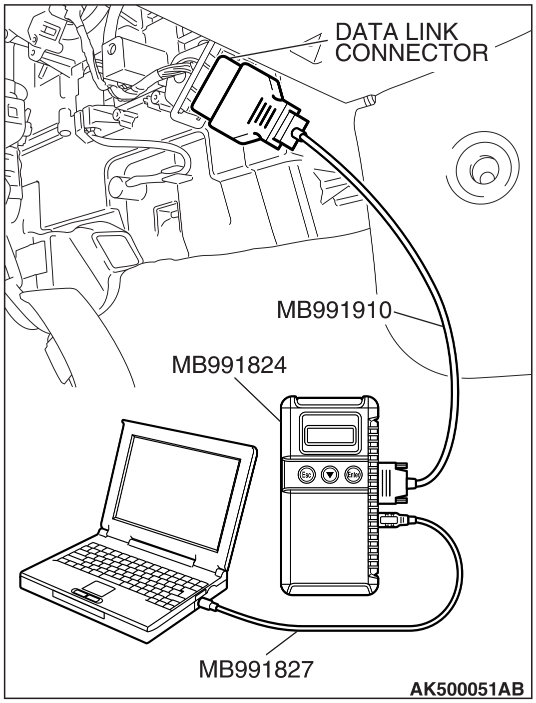
STEP 8. Check for open circuit and harness damage between vehicle speed sensor connector B-104 (terminal No. 2) and ECM connector B-21 (terminal No. 113).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 17.

STEP 9. Using scan tool MB991958, check data list item 4: Vehicle Speed 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.
(3) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and MB991958 display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

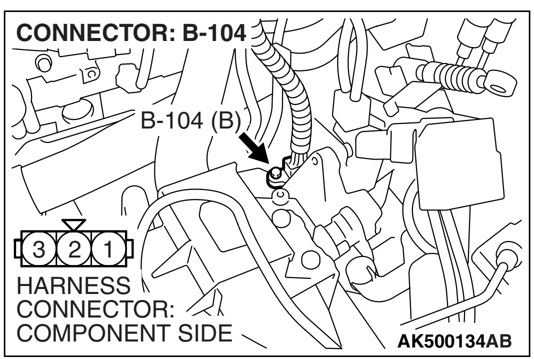
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

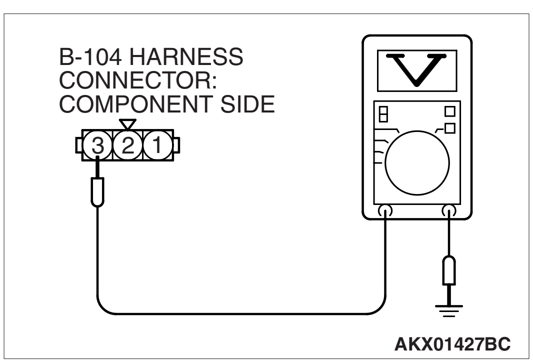
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Replace the ECM. When the ECM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 17.

STEP 10. Measure the sensor supply voltage at vehicle speed sensor harness side connector B-104.



(1) Disconnect the vehicle speed sensor connector B-104 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



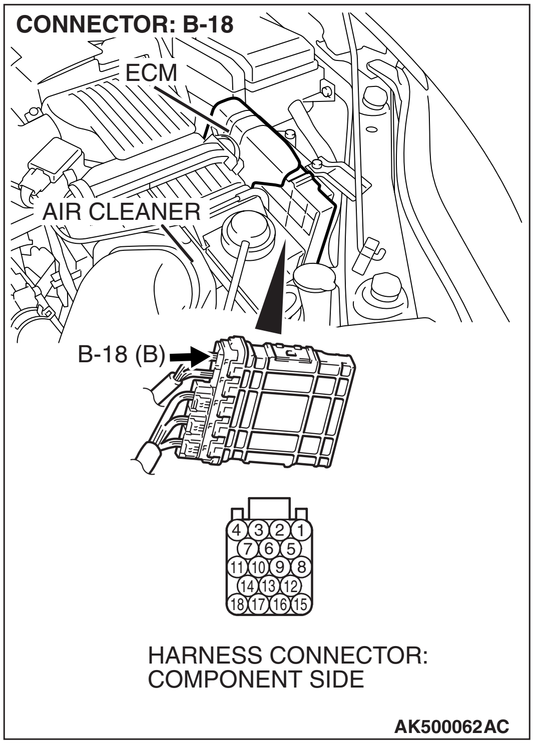
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(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 14.

NO : Go to Step 11.

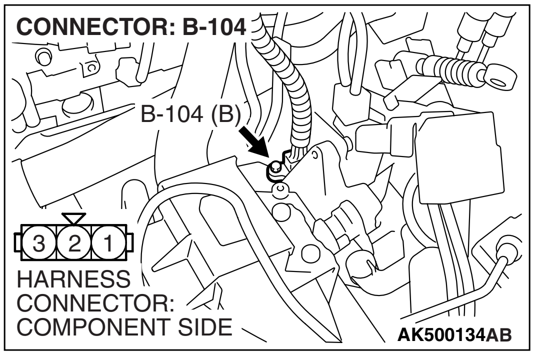


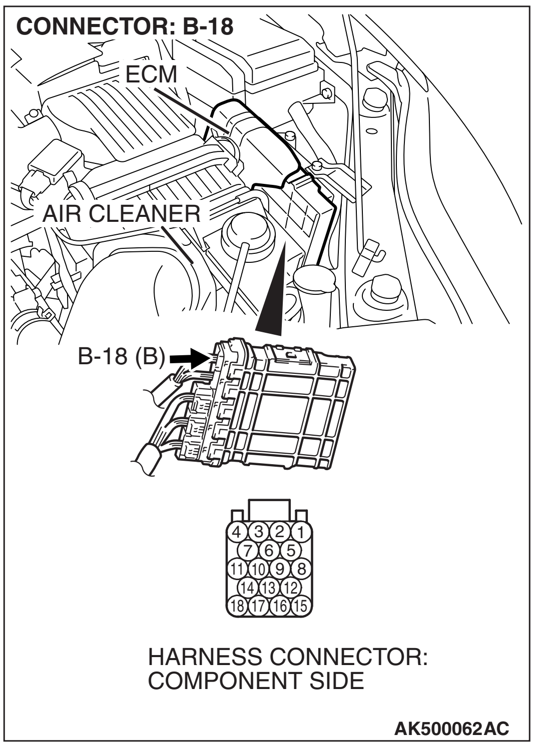
STEP 11. Check connector B-18 at ECM for damage.

Q: Is the 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 17.



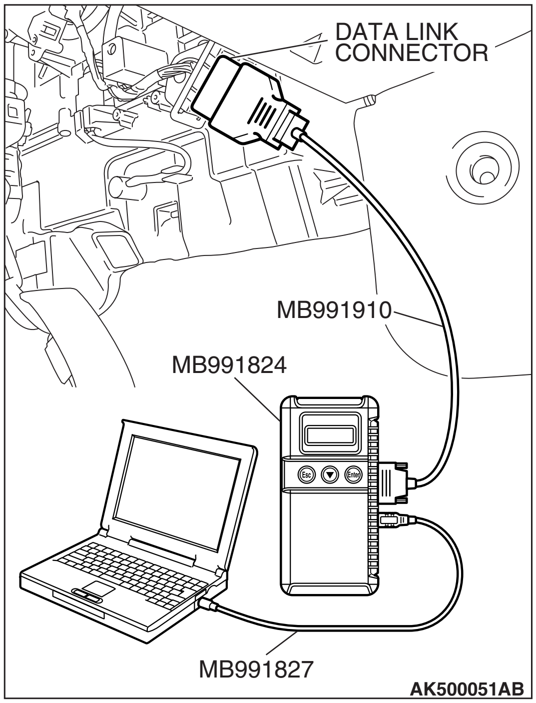


STEP 12. Check for open circuit and short circuit to ground between vehicle speed sensor connector B-104 (terminal No. 3) and ECM connector B-18 (terminal No. 14).

Q: Is the harness wire in good condition?

YES : Then go to Step 13.

NO : Repair it. Then go to Step 17.



STEP 13. Using scan tool MB991958, check data list item 4: Vehicle Speed 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.

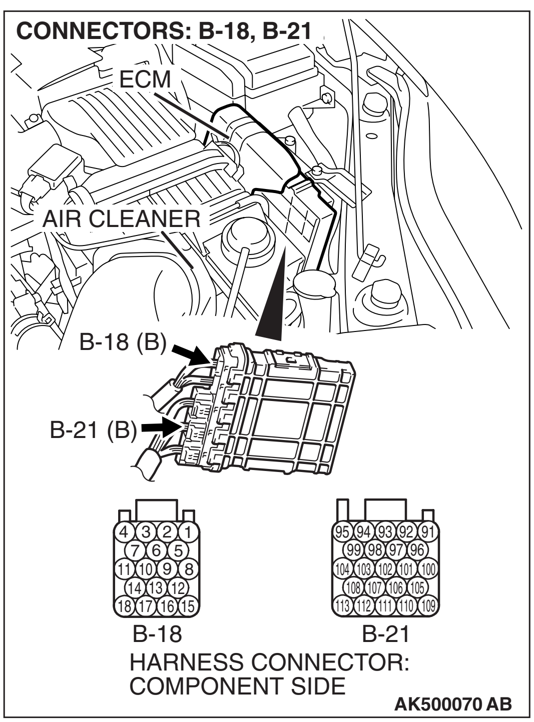
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and MB991958 display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(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. When the ECM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 17.

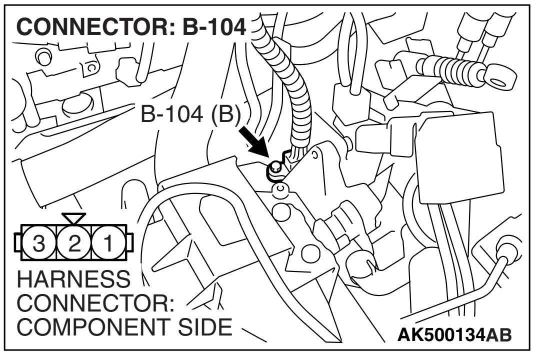


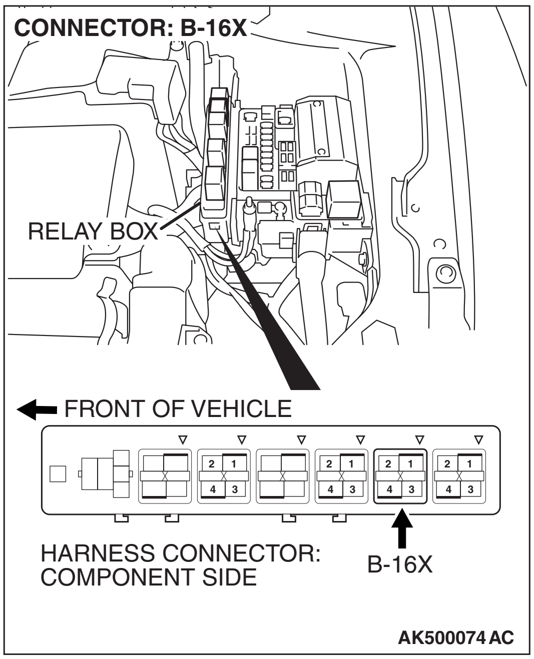
STEP 14. Check connectors B-18 and B-21 at ECM for damage.

Q: Is the 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 17.





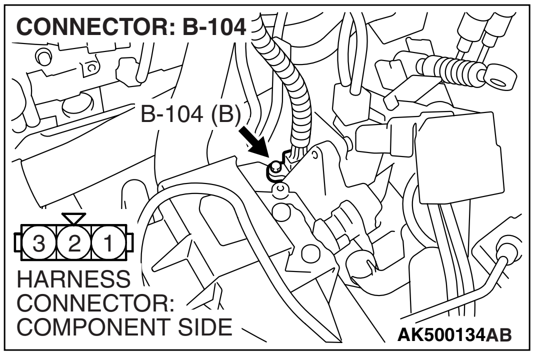
STEP 15. Check for harness damage between MFI relay connector B-16X (terminal No. 4) and vehicle speed sensor connector B-104 (terminal No. 1).

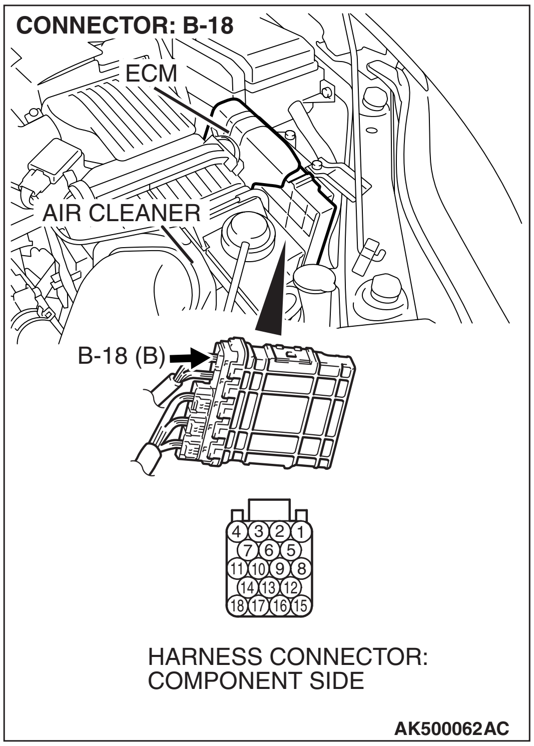
Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it. Then go to Step 17.

STEP 16. Check for harness damage between vehicle speed sensor connector B-104 (terminal No. 1) and ECM connector B-18 (terminal No. 14).

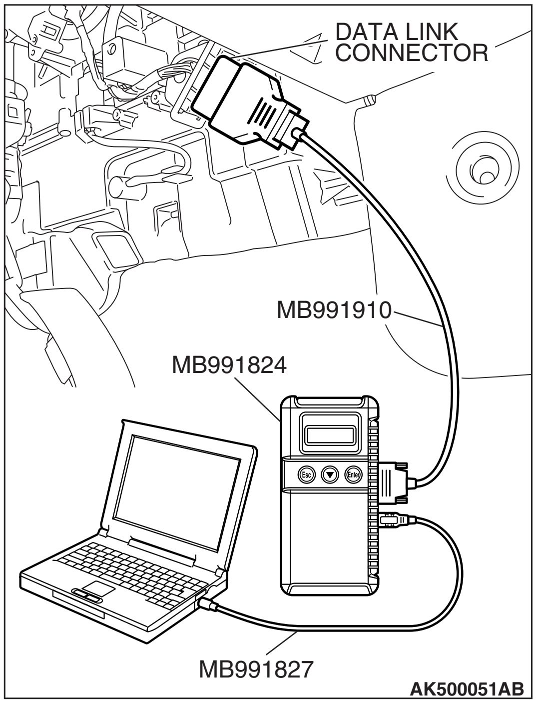




NOTE: Check harness after checking intermediate connectors A-15 and C-28 If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 17.



STEP 17. Using scan tool MB991958, check data list item 4: Vehicle Speed 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.
(3) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and MB991958 display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

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

Q: Is the sensor operating properly?

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

DTC P0506: Idle Control Sytem RPM Lower Than Expected

⚠ CAUTION

If DTC P0506 has been set, TCL related DTC U1120 is also set. After P0506 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM <M/T> or the PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

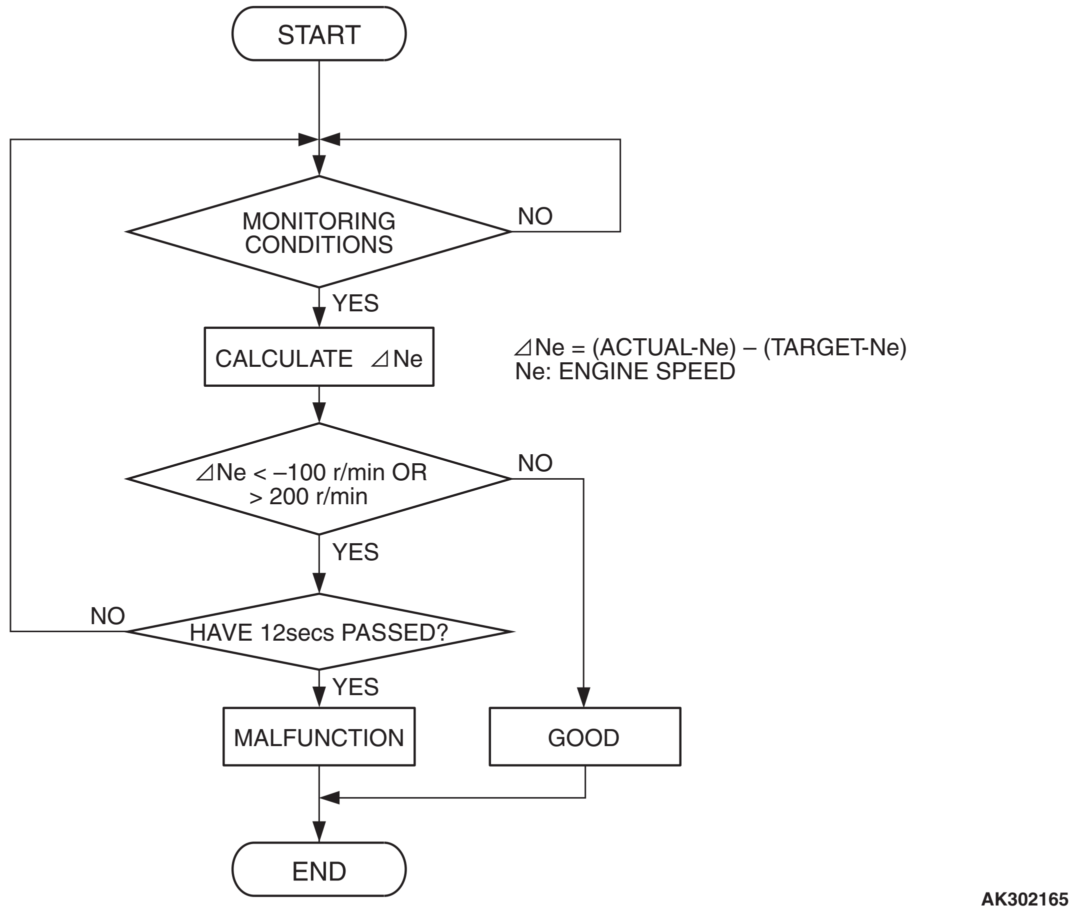
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than 77° C (171° F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: OFF
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target throttle actuator control motor position is more than 512 steps.

Judgement Criterion

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 18 P.13A-6.

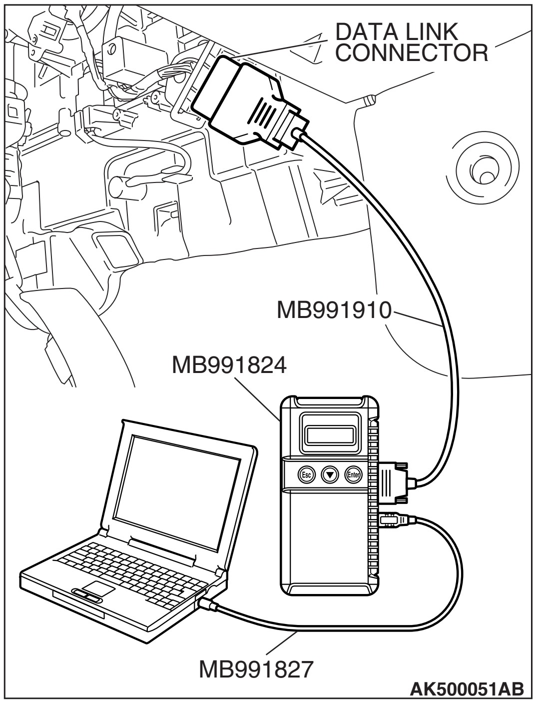
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle valve area is dirty.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

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



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

⚠ CAUTION

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

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

Q: Is the diagnostic trouble code other than P0506 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-41.
NO : Go to Step 2.

STEP 2. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle body (throttle valve area) cleaning P.13A-1197. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0506 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 4.
NO : The inspection is complete.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-6.

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

Q: Is DTC P0506 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0507: Idle Control Sytem RPM Higher Than Expected

⚠ CAUTION

If DTC P0507 has been set, TCL related DTC U1120 is also set. After P0507 has been diagnosed, don't forget to erase DTC U1120.

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM <M/T> or the PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

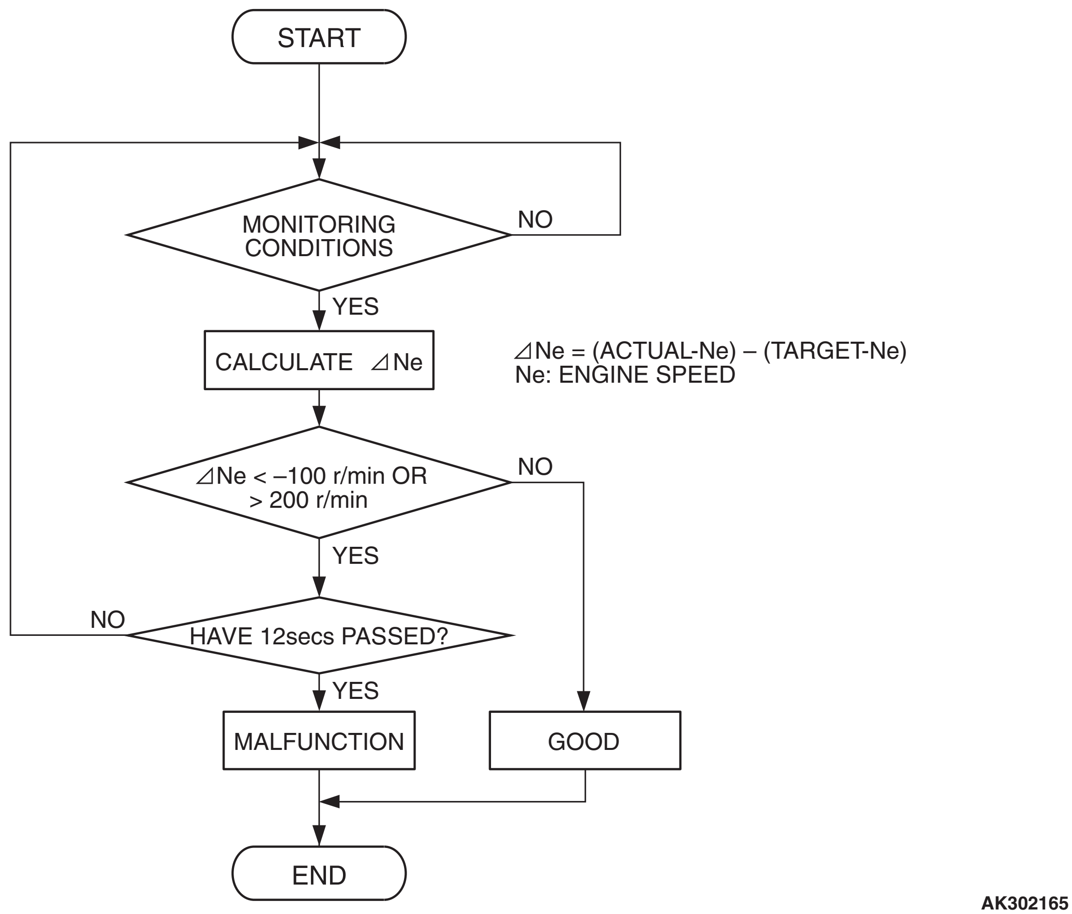
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Vehicle speed has reached 1.5 km/h (1.0 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 77° C (171° F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target throttle actuator control motor position is 0 steps.

Judgement Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 12 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45° C (113° F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-6.

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

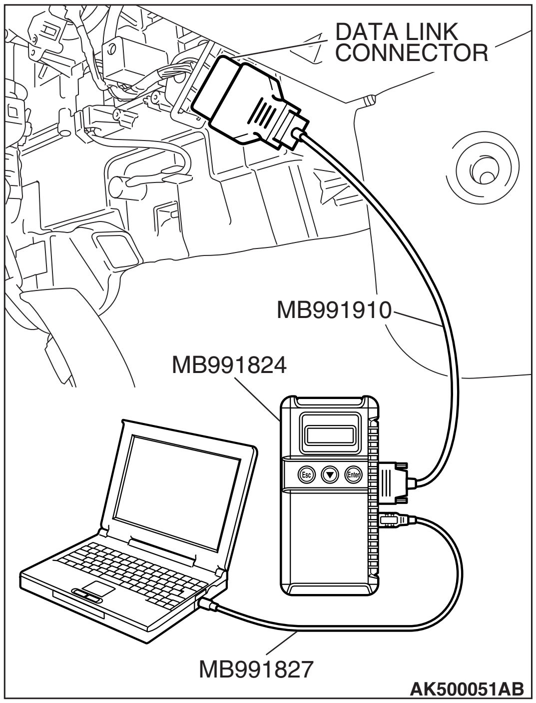
- Intake system vacuum leak.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

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

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



⚠ CAUTION

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

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

Q: Is the diagnostic trouble code other than P0507 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-41.
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0507 set?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then go to Step 4.
NO : The inspection is complete.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-6.

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

Q: Is DTC P0507 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> monitors the communication condition with the immobilizer-ECU. When an abnormality in communication is found, ECM <M/T> or PCM <A/T> prevents engine start.

DTC SET CONDITIONS

Check Condition

- Ignition switch: ON

Judgement Criterion

- When the communication error between ECM <M/T> or PCM <A/T> and the immobilizer-ECU continues for 2 seconds or more.

or

- When it was different in the encrypted code sent from immobilizer-ECU and operation result by ECM <M/T> or PCM <A/T>.

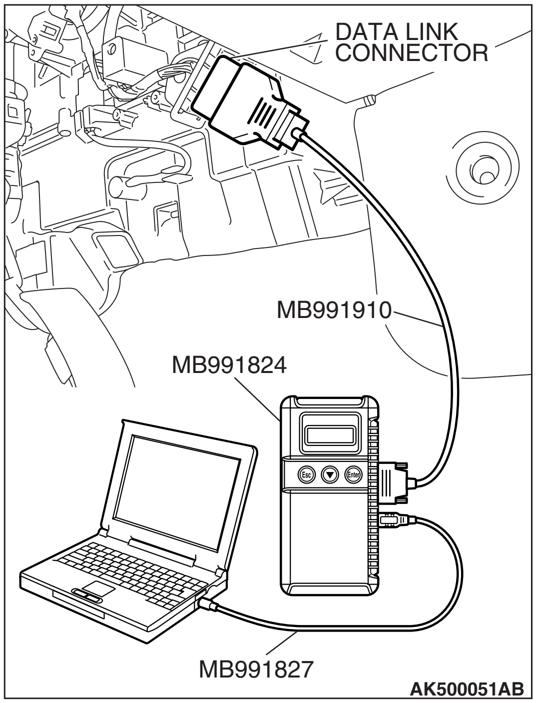
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, read the immobilizer 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.

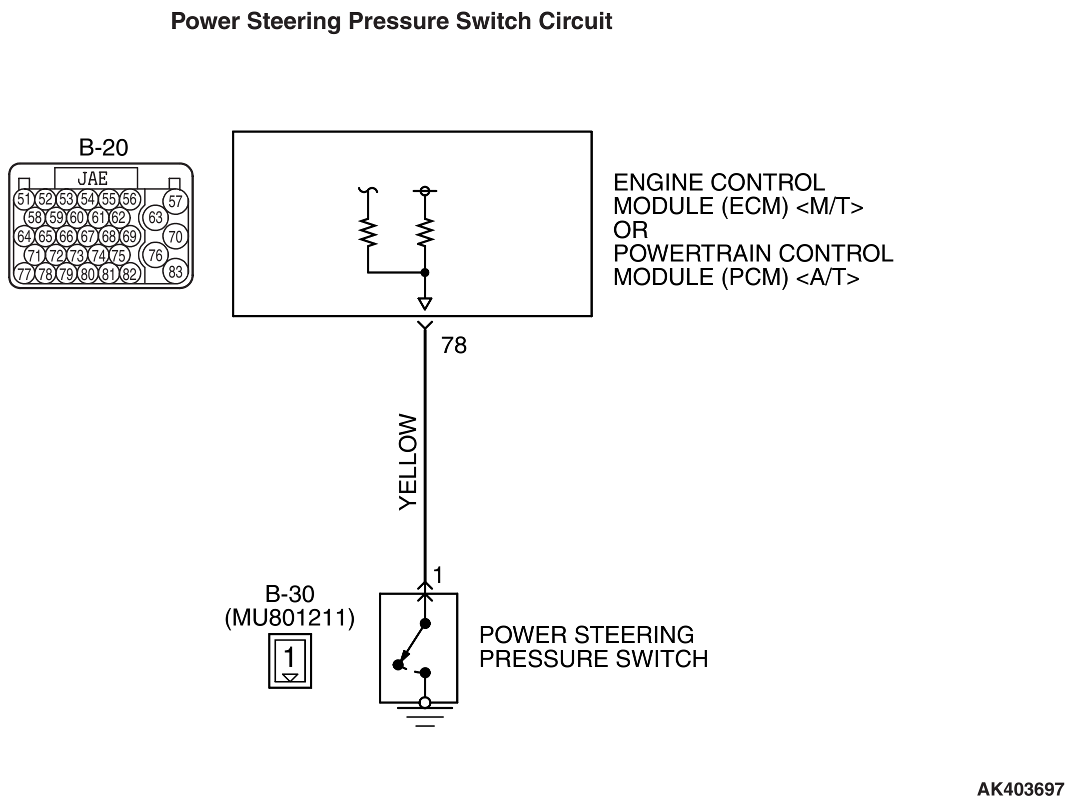
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the immobilizer-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

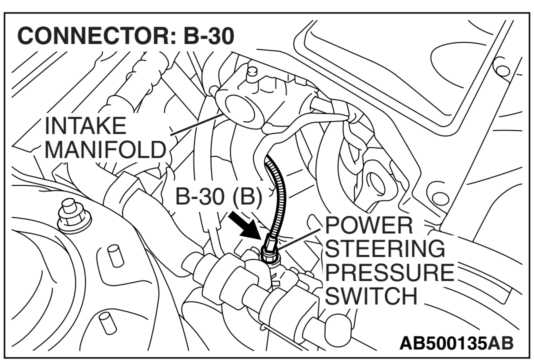
Q: Is the immobilizer-DTC set?

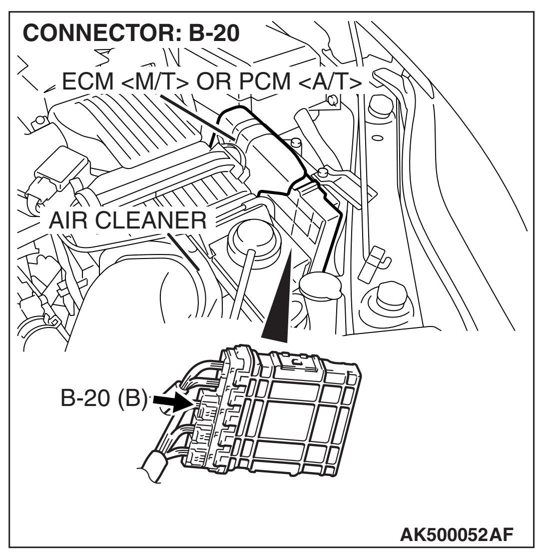
YES : Refer to GROUP 54A, Immobilizer System – Diagnostic Trouble Code Chart P.54A-17.

NO : If DTC P0513 is output again after the MFI-DTC has been erased, replace the ECM <M/T> or the PCM <A/T>. 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 check that the DTC P0513 does not reset.

DTC P0551: Power Steering Pressure Switch Circuit Range/Performance







CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 78) via the resistor in the ECM <M/T> or the PCM <A/T>.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or the PCM <A/T>.

- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM <M/T> or the PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch stays on 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)

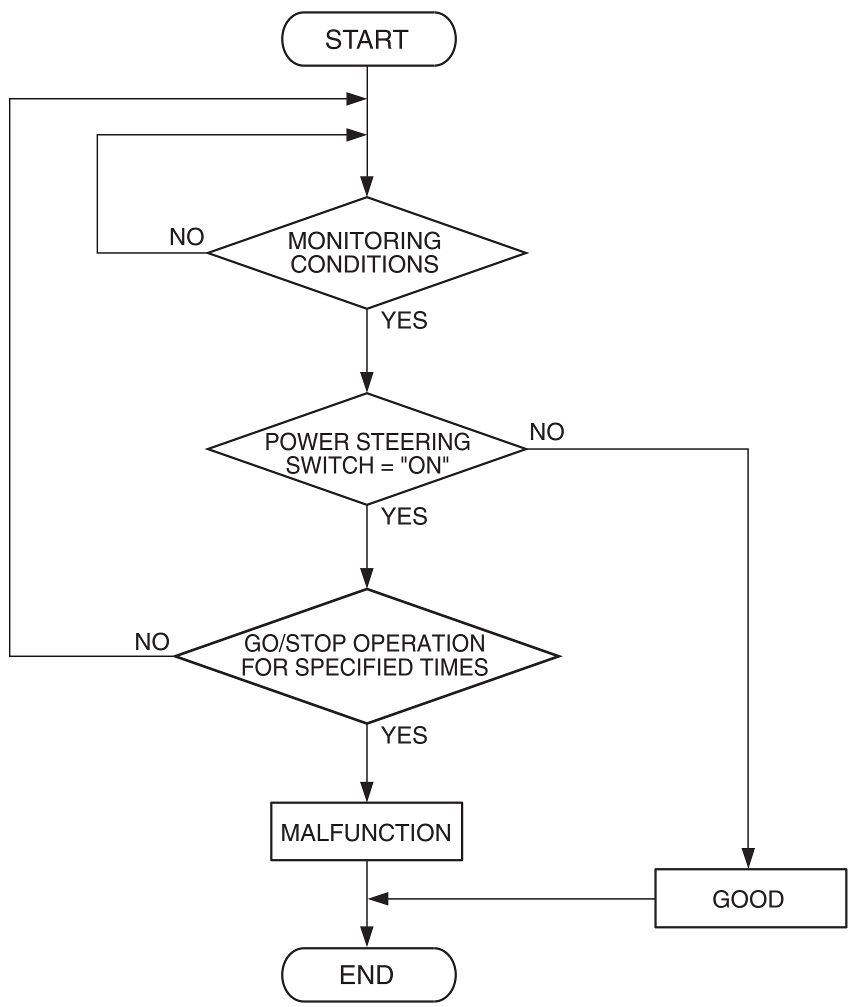
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Engine coolant temperature is higher than 20° C (68° F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (1.0 mph) or less]. Repeat 10 times or more.

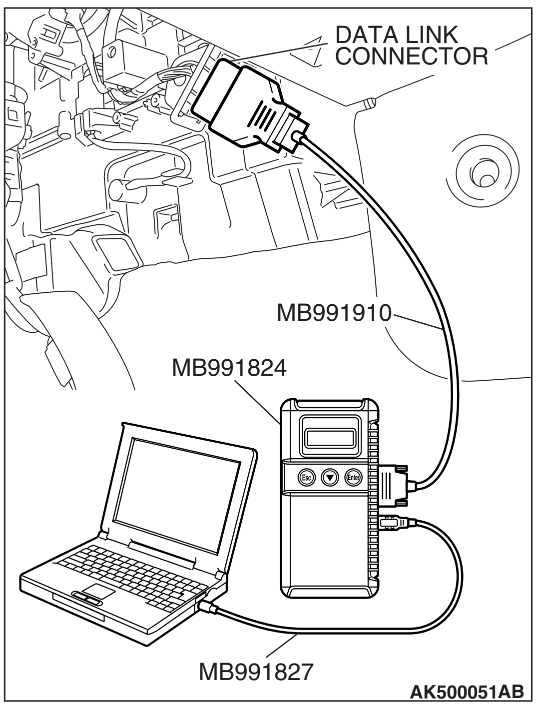
Judgement Criterion
- Power steering pressure switch continues to be "ON".

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Power steering pressure switch failed.
- Open or shorted power steering pressure switch 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



STEP 1. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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.

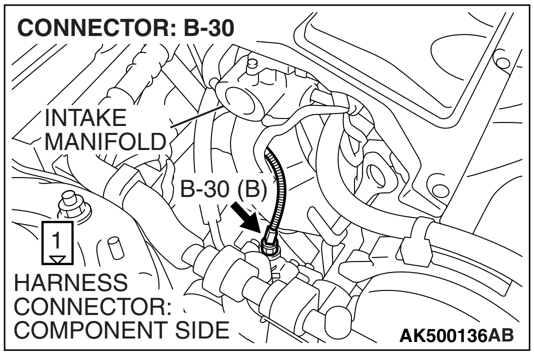
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

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

Q: Is the switch operating properly?

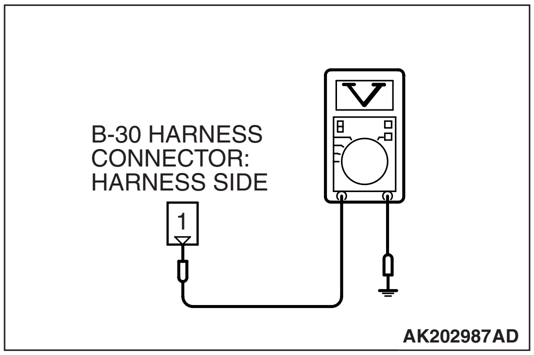
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-14.

NO : Go to Step 2.



STEP 2. Measure the power supply voltage at power steering pressure switch connector B-30 by backprobing.

(1) Do not disconnect the connector B-30.
(2) Start the engine and run at idle.

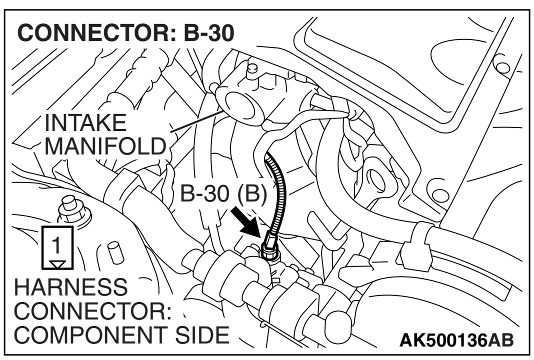


(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When steering wheel is not turned, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

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

Q: Is the measured voltage within the specified range?

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

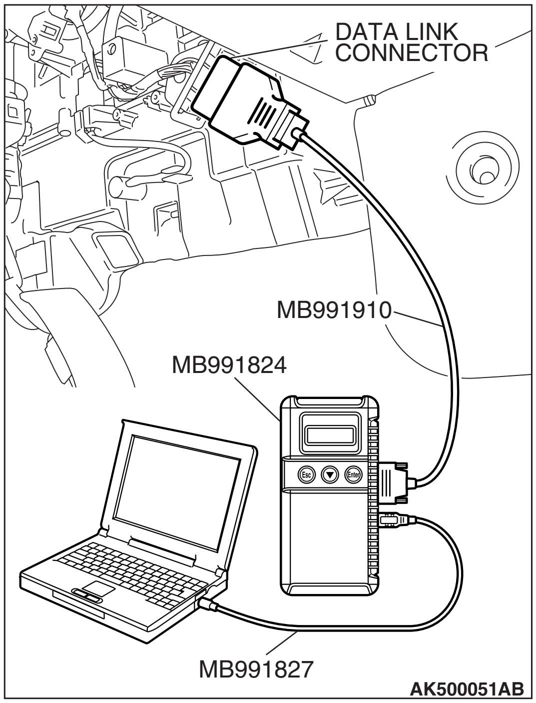


STEP 3. Check harness connector B-30 at power steering pressure switch for damage.

Q: Is the harness connector in good condition?

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

STEP 4. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.



⚠ **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 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

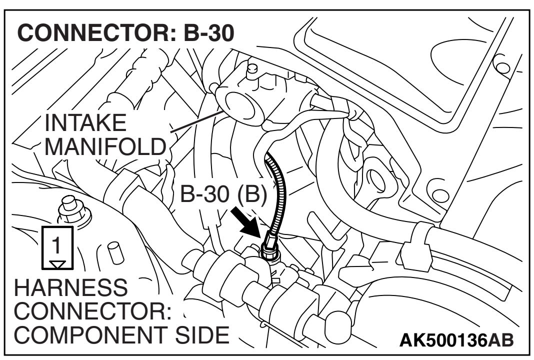
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

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

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

STEP 5. Check harness connector B-30 at power steering pressure switch for damage.

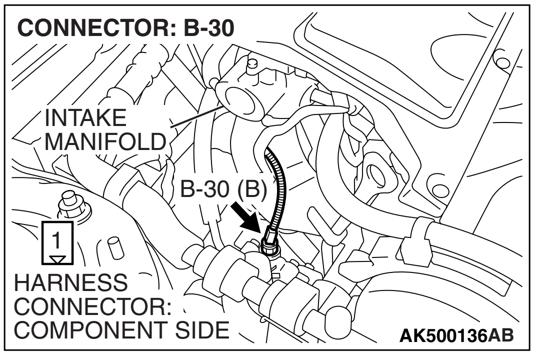


Q: Is the harness connector in good condition?

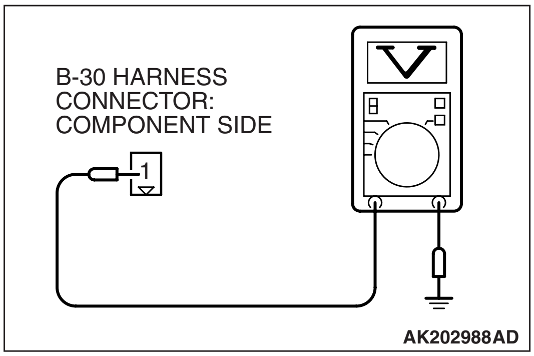
YES : Go to Step 6.

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

STEP 6. Measure the power supply voltage at power steering pressure switch harness side connector B-30.



(1) Disconnect the connector B-30 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



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

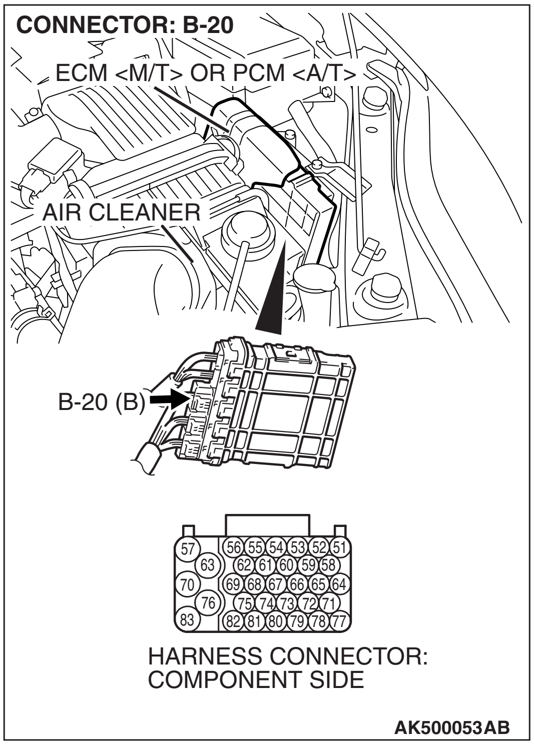
(4) Turn the ignition switch to the "LOCK" (OFF) position.

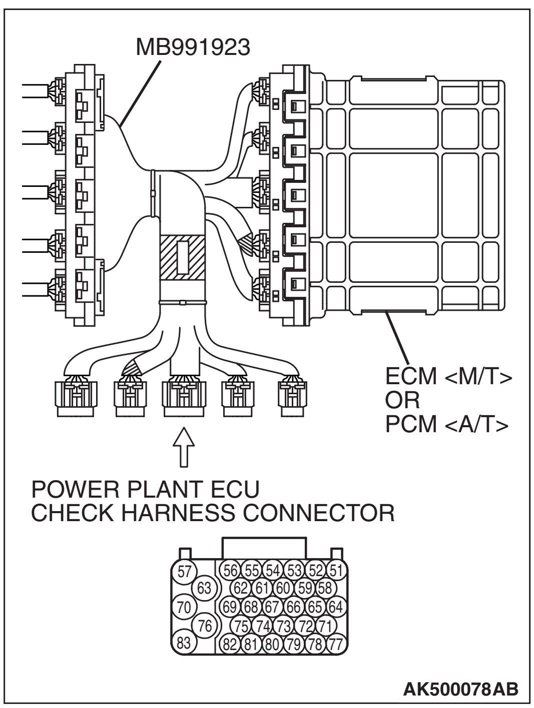
Q: Is battery positive voltage (approximately 12 volts) present?

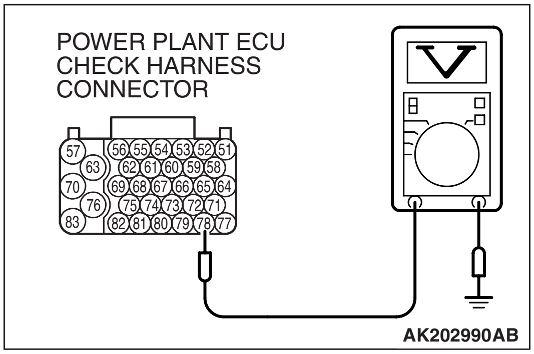
YES : Go to Step 11.
NO : Go to Step 7.

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

(1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the power plant ECU check harness special tool MB991923 between the separated connectors.
(2) Disconnect the power steering pressure switch connector B-30.
(3) Turn the ignition switch to the "ON" position.





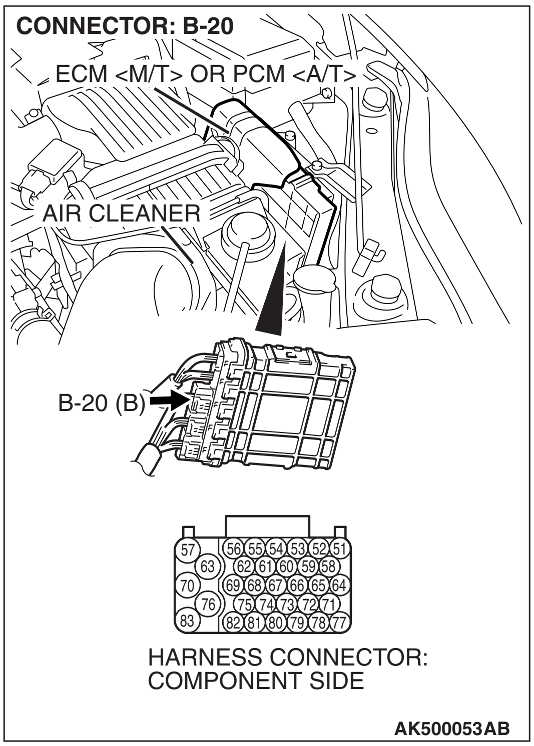


(4) Measure the voltage between terminal No. 78 and ground.
- Voltage should be between battery positive voltage.

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

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

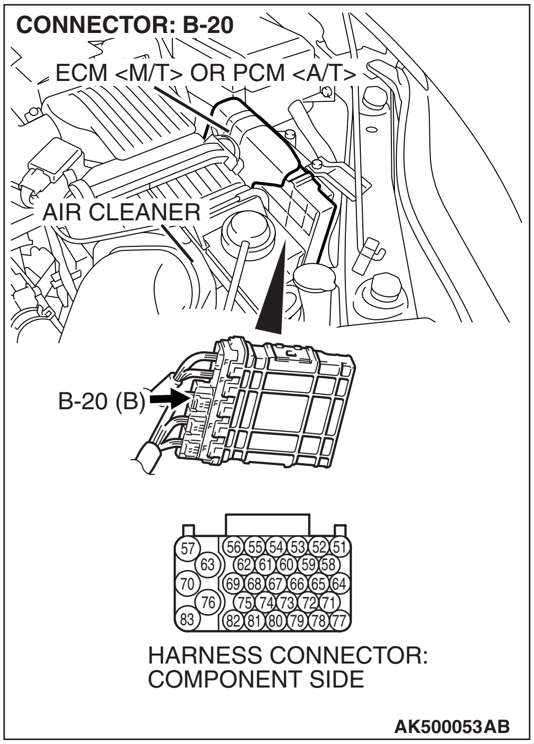
YES : Go to Step 8.
NO : Go to Step 9.



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

Q: Is the harness connector in good condition?

YES : Repair harness wire between power steering pressure switch connector B-30 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 78) because of open circuit. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

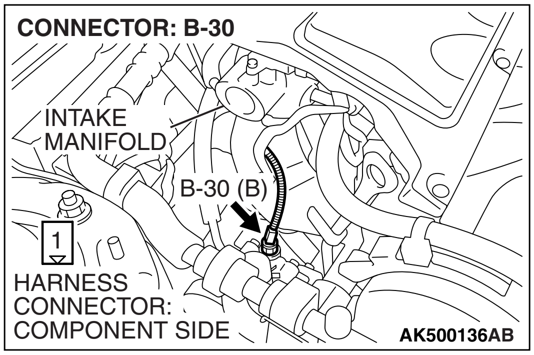


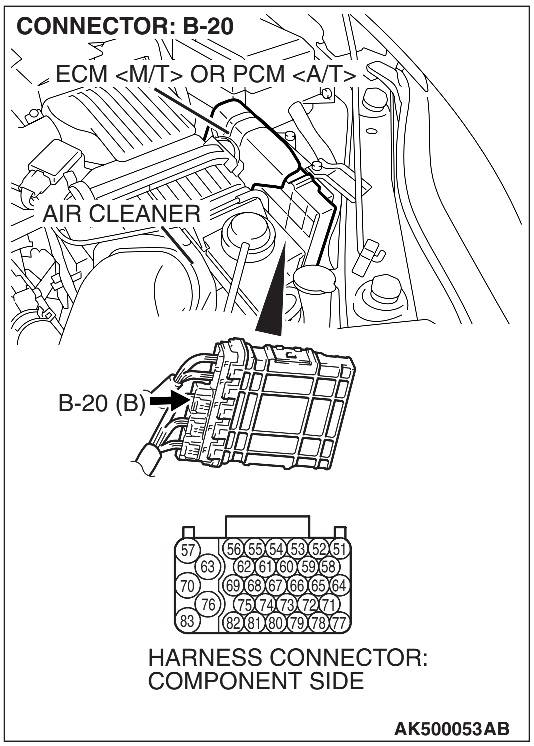
STEP 9. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

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



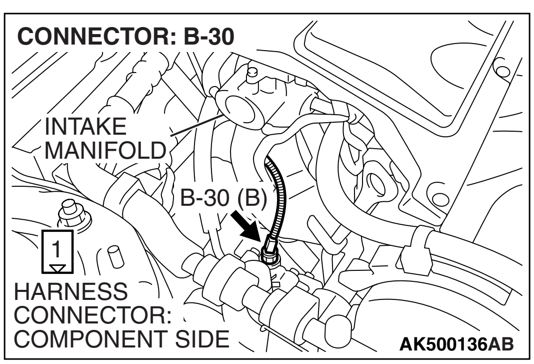


STEP 10. Check for short circuit to ground between power steering pressure switch connector B-30 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 78).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 14.



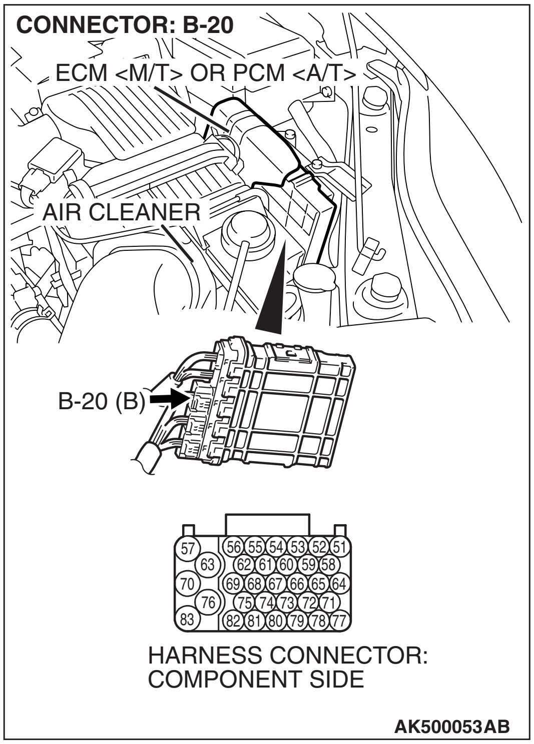
STEP 11. Replace the power steering pressure switch.

(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0551 set?

YES : Go to Step 12.

NO : Go to Step 14.

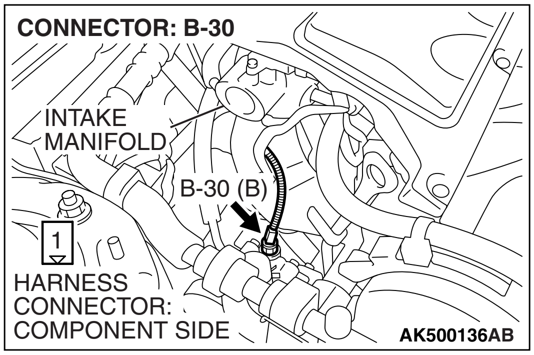


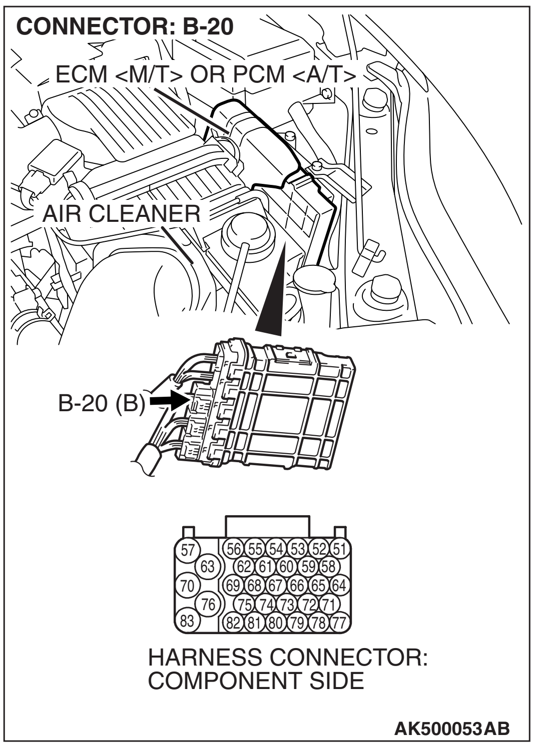
STEP 12. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

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



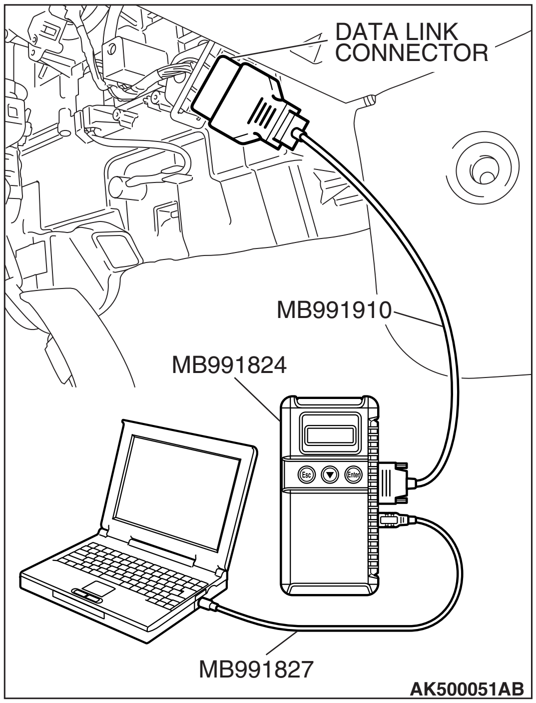


STEP 13. Check for harness damage between power steering pressure switch connector B-30 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 78).

Q: Is the harness wire in good condition?

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

NO : Repair it. Then go to Step 14.



STEP 14. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ 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 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

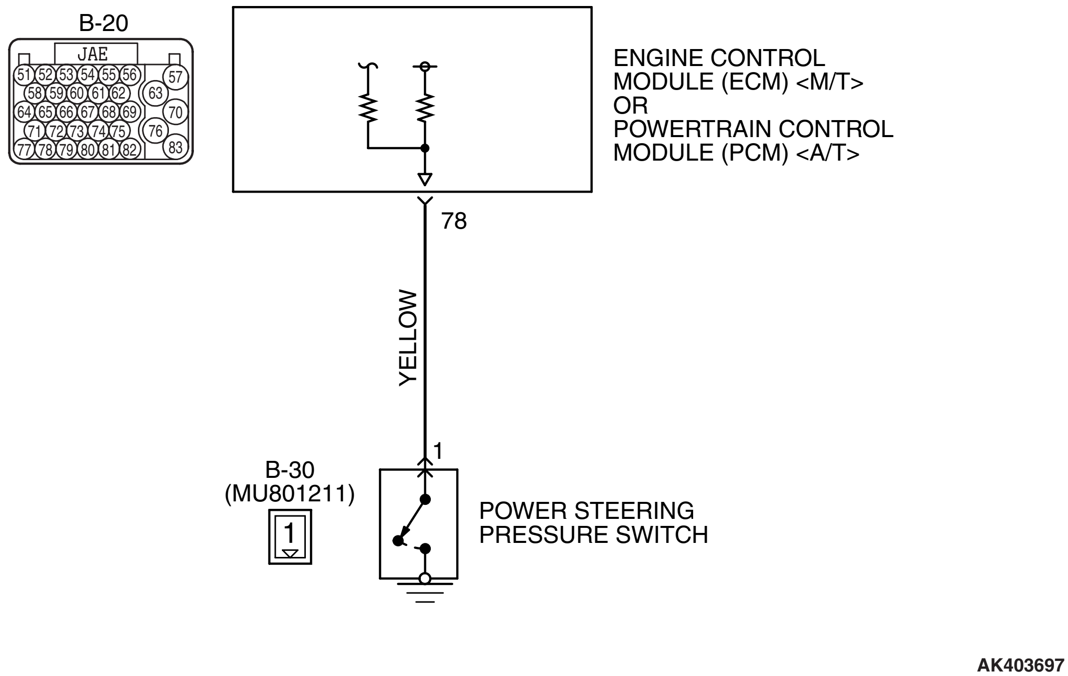
(4) Turn the ignition switch to the "LOCK" (OFF) position.

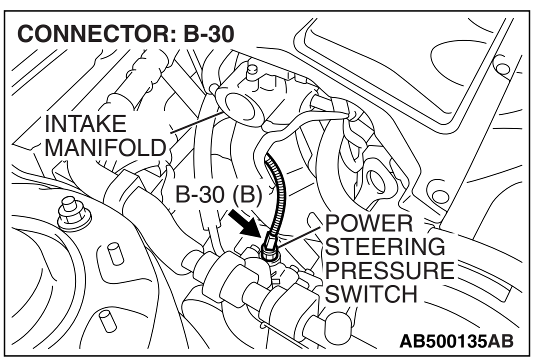
Q: Is the switch operating properly?

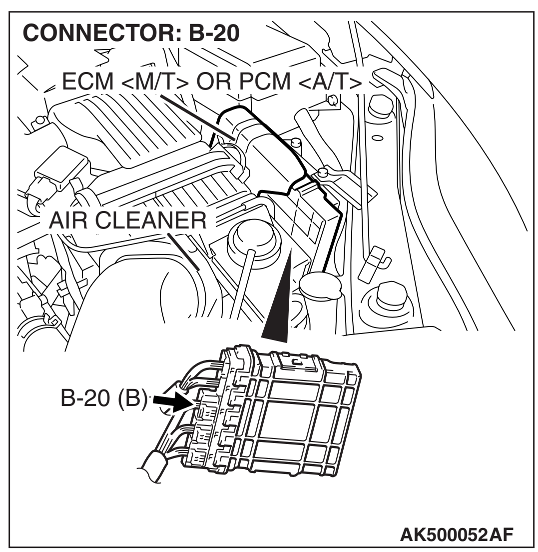
YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0554: Power Steering Pressure Switch Circuit Intermittent

Power Steering Pressure Switch Circuit







CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM <M/T> or the PCM <A/T> (terminal No. 78) via the resistor in the ECM <M/T> or the PCM <A/T>.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or the PCM <A/T>.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM <M/T> or the PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch changes from off to on more than 10 times for 1 second.

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)

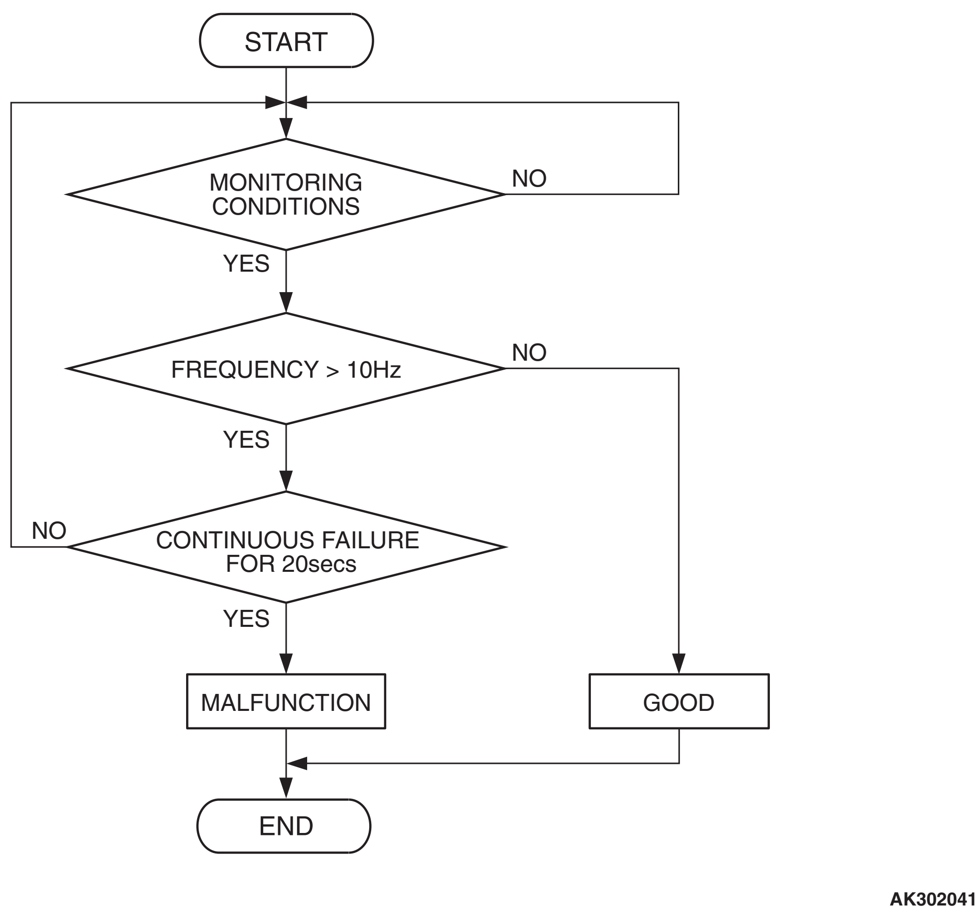
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions
- Engine coolant temperature is higher than 20° C (68° F).
- Vehicle speed is higher than 50 km/h (31 mph).

Judgement Criterion
- The ON/OFF frequency of a power steering pressure switch is 10 Hz or more for 20 seconds.

OBD-II DRIVE CYCLE PATTERN

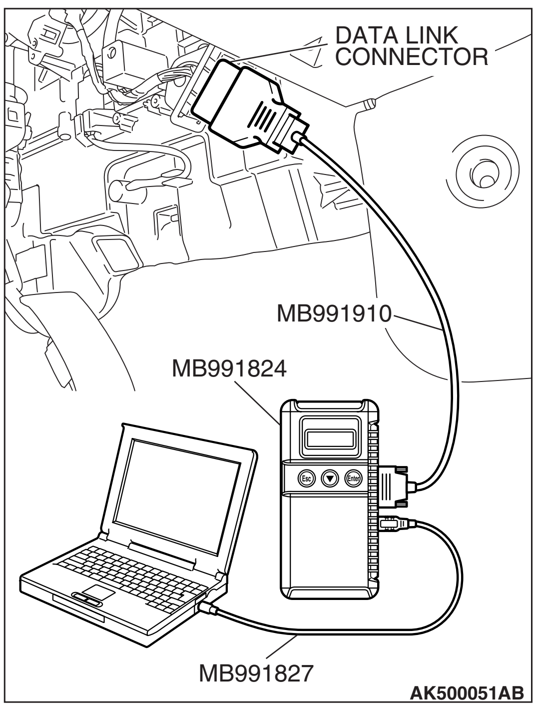
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 17 P.13A-6

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

- Power steering pressure switch failed.
- Incorrect power steering fluid level.
- Incorrect oil pump pressure.
- Harness damage in power steering pressure switch 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 83: Power Steering Pressure Switch.

⚠ 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 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

(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 power steering fluid level.

Refer to GROUP 37, On-Vehicle Service –Fluid Level Check P.37-21.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the power steering pressure switch.
Refer to GROUP 37, On-Vehicle Service –Power Steering Pressure Switch CheckP.37-24.

Q: Are there any abnormalities?

YES : Replace the power steering pressure switch. Then go to Step 7.
NO : Go to Step 4.

STEP 4. Check the oil pump pressure.
Refer to GROUP 37, On-Vehicle Service –Oil Pump Pressure Test P.37-23.

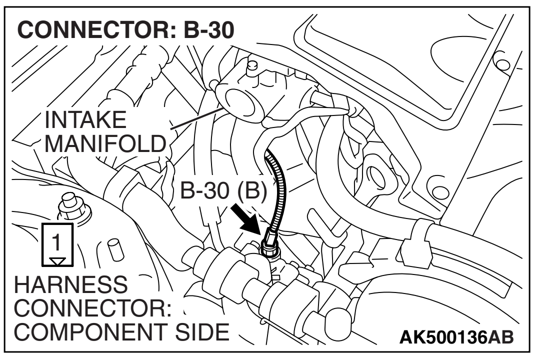
Q: Are there any abnormalities?

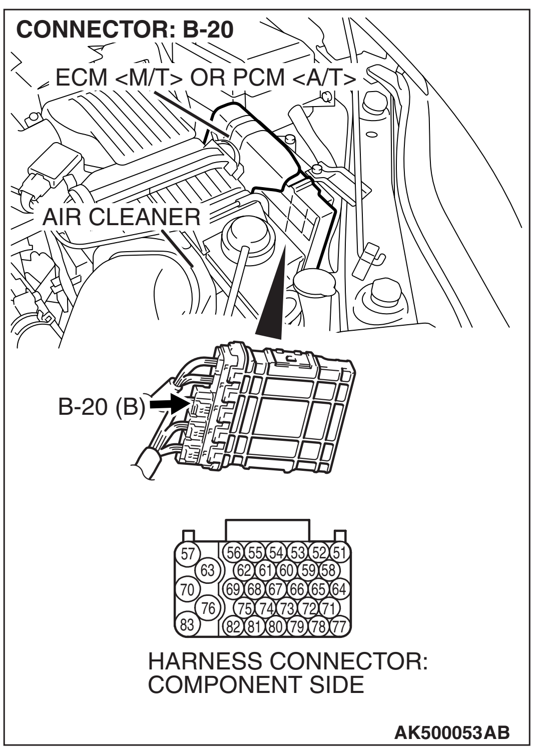
YES : Repair it. Then go to Step 7.
NO : Go to Step 5.

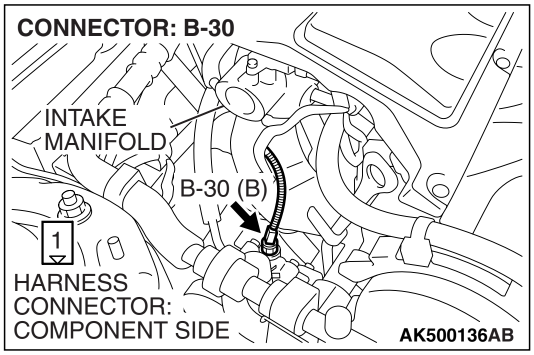
STEP 5. Check harness connector B-30 at the power steering pressure switch and harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

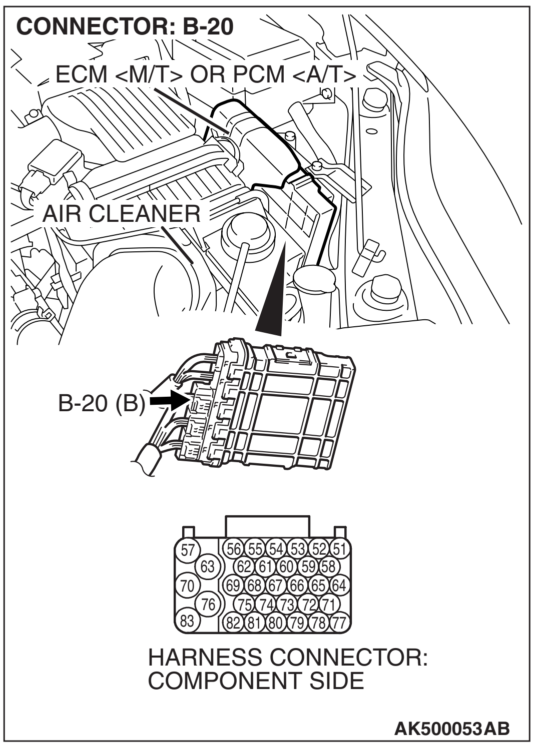
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.









STEP 6. Check for harness damage between power steering pressure switch connector B-30 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 78).

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 7.

NO : Repair it. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 17 P.13A-6.

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

Q: Is DTC P0554 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

NEXT>>