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**DTC P0219: Engine Over Speed Condition**

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**TECHNICAL DESCRIPTION**

- The ECM monitors the engine rotational speed. When the engine rotation increases to the speed which has possibility of failure, the ECM stores the diagnostic trouble code.

**Check Condition**

- Ignition switch is "ON" position.

**Judgment Criterion**

- The maximum engine rotational speed stored in the past was more than 8,398 r/min.

**FAIL-SAFE AND BACKUP FUNCTION**

- None

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

- The failure is supposed to be attributed to the excessive engine rotational speed.

**DIAGNOSIS**

1. When this diagnostic trouble code is output, check whether the engine malfunctions or not.

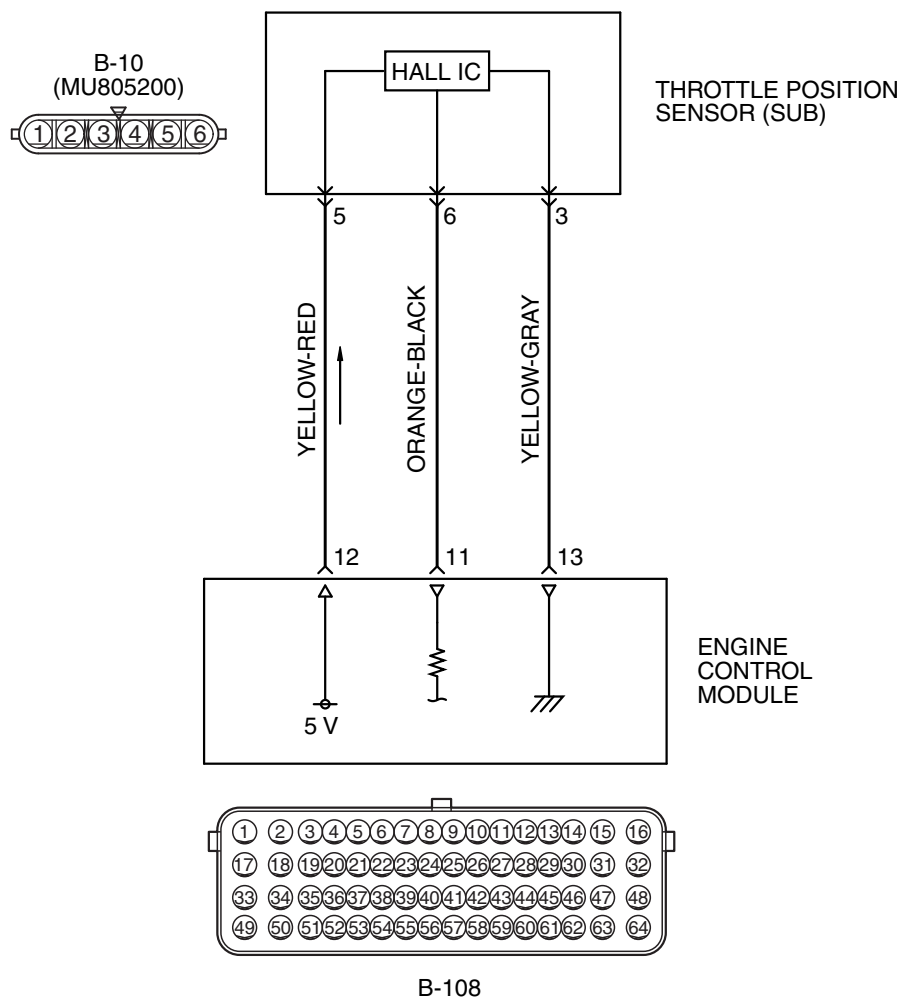
*NOTE: Except for an engine malfunction, there are possible causes attributed to the excessive engine rotational speed. Check whether there is another malfunction except the engine failure.*

2. If there is a malfunction, check and repair it.
3. After the repair, initialize the learning value. (Refer to GROUP 00, Precautions Before Service – Initialization Procedure For Learning Value In MFI Engine [P.00-42](#).) Delete the diagnostic trouble codes.

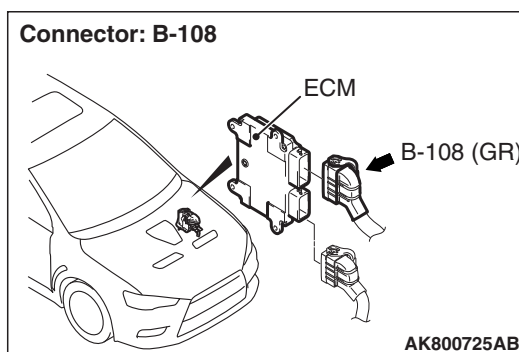
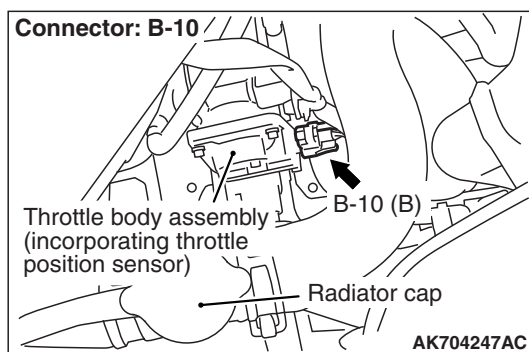
*NOTE: If there is neither malfunction nor repair, it is not necessary to initialize the learning value or delete the diagnostic trouble code.*

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

## THROTTLE POSITION SENSOR (SUB) CIRCUIT



AK604243 AE



## CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 11) from the throttle position sensor (sub) output terminal (terminal No. 6).

- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

### TECHNICAL DESCRIPTION

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

### DESCRIPTIONS OF MONITOR METHODS

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

### MONITOR EXECUTION

Continuous

### MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

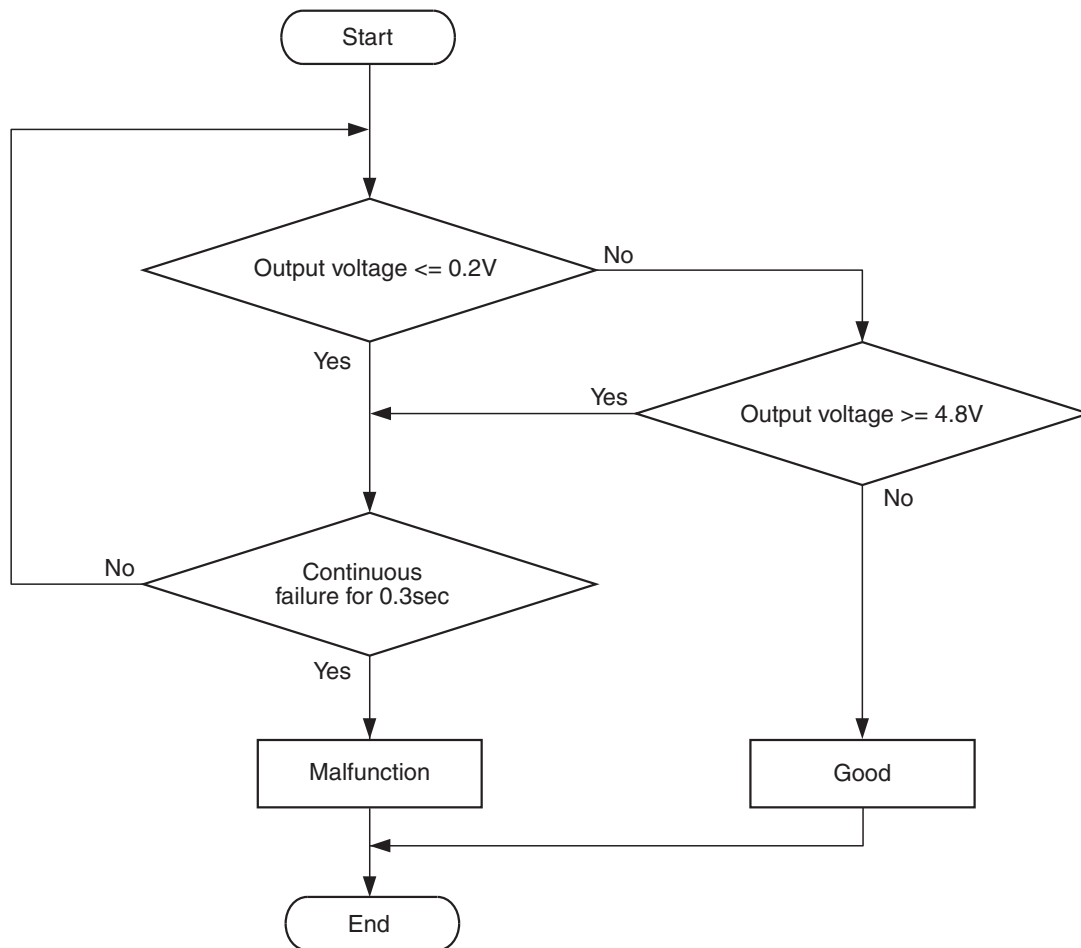
- Not applicable

**Sensor (The sensor below is determined to be normal)**

- Not applicable

### DTC SET CONDITIONS

### Logic Flow Chart



AK604318

### Check Condition

- Ignition switch is "ON" position.

### Judgement Criterion

- Throttle position sensor (sub) output voltage is less than 0.2 volt for 0.3 second.

**FAIL-SAFE AND BACKUP FUNCTION**

- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (main) fails.

**OBD-II DRIVE CYCLE PATTERN**

None.

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

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

**DIAGNOSIS****Required Special Tools:**

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

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

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Detach the intake air hose at the throttle body.
- (4) Disconnect the connector of the throttle position sensor.
- (5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
- (6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
- (7) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

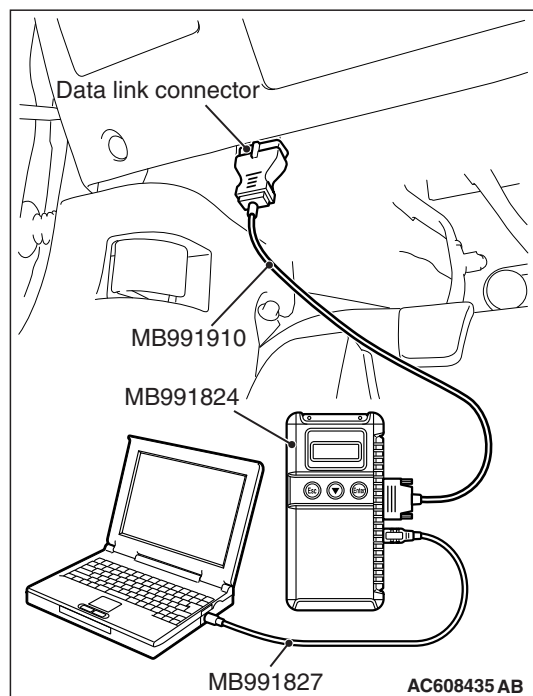
**YES** : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

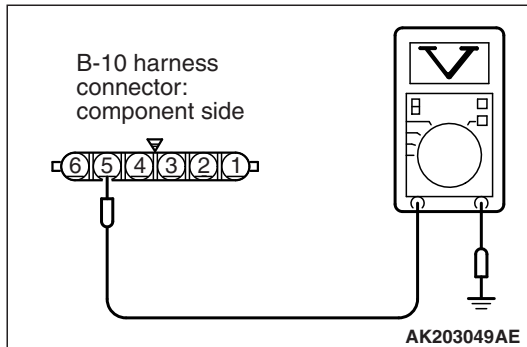
**NO** : Go to Step 2.

**STEP 2. Check harness connector B-10 at throttle position sensor for damage.****Q: Is the harness connector in good condition?**

**YES** : Go to Step 3.

**NO** : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.





**STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-10.**

- (1) Disconnect the connector B-10 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 5 and ground.
  - Voltage should be between 4.9 and 5.1 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 7.

**NO :** Go to Step 4.

**STEP 4. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 5.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 6.

**NO :** Repair it. Then go to Step 11.

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

- (1) Turn the ignition switch to the "ON" position.
- (2) Detach the intake air hose at the throttle body.
- (3) Disconnect the connector of the throttle position sensor.
- (4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
- (5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
- (6) 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 ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 11.

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**STEP 7. Check harness connector B-108 at ECM for damage.****Q: Is the harness connector in good condition?**

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

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**STEP 8. Check for harness damage between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).****Q: Is the harness wire in good condition?**

**YES :** Go to Step 9.

**NO :** Repair it. Then go to Step 11.

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**STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-10 (terminal No. 6) and ECM connector B-108 (terminal No. 11).****Q: Is the harness wire in good condition?**

**YES :** Go to Step 10.

**NO :** Repair it. Then go to Step 11.

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**STEP 10. Replace the throttle body assembly.**

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

**Q: Is DTC P0222 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 11.

**NO :** The inspection is complete.

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

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

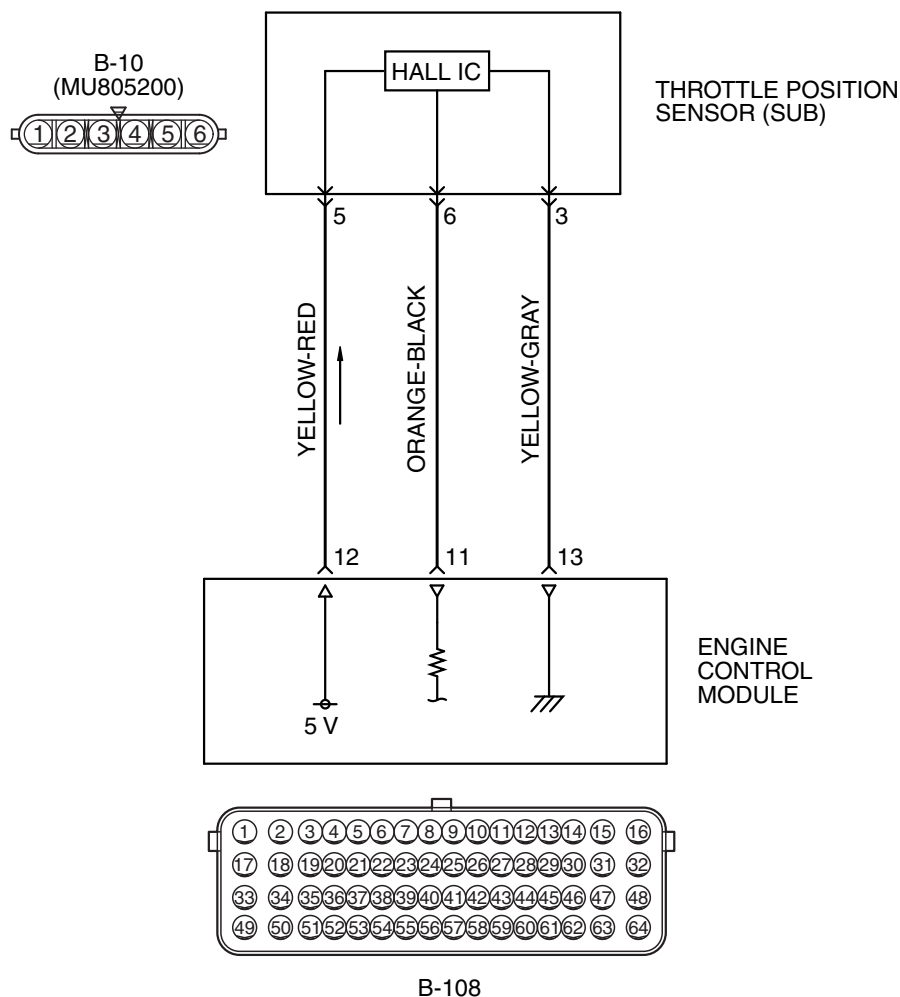
**Q: Is DTC P0222 set?**

**YES :** Retry the troubleshooting.

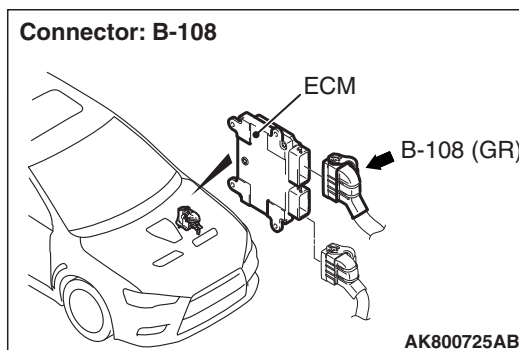
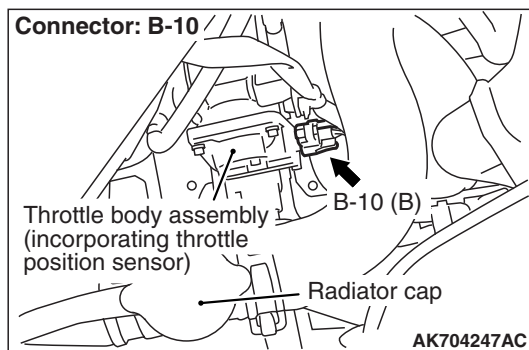
**NO :** The inspection is complete.

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

## THROTTLE POSITION SENSOR (SUB) CIRCUIT



AK604243 AE



## CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 11) from the throttle position sensor (sub) output terminal (terminal No. 6).

- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

### TECHNICAL DESCRIPTION

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

### DESCRIPTIONS OF MONITOR METHODS

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

### MONITOR EXECUTION

Continuous

### MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

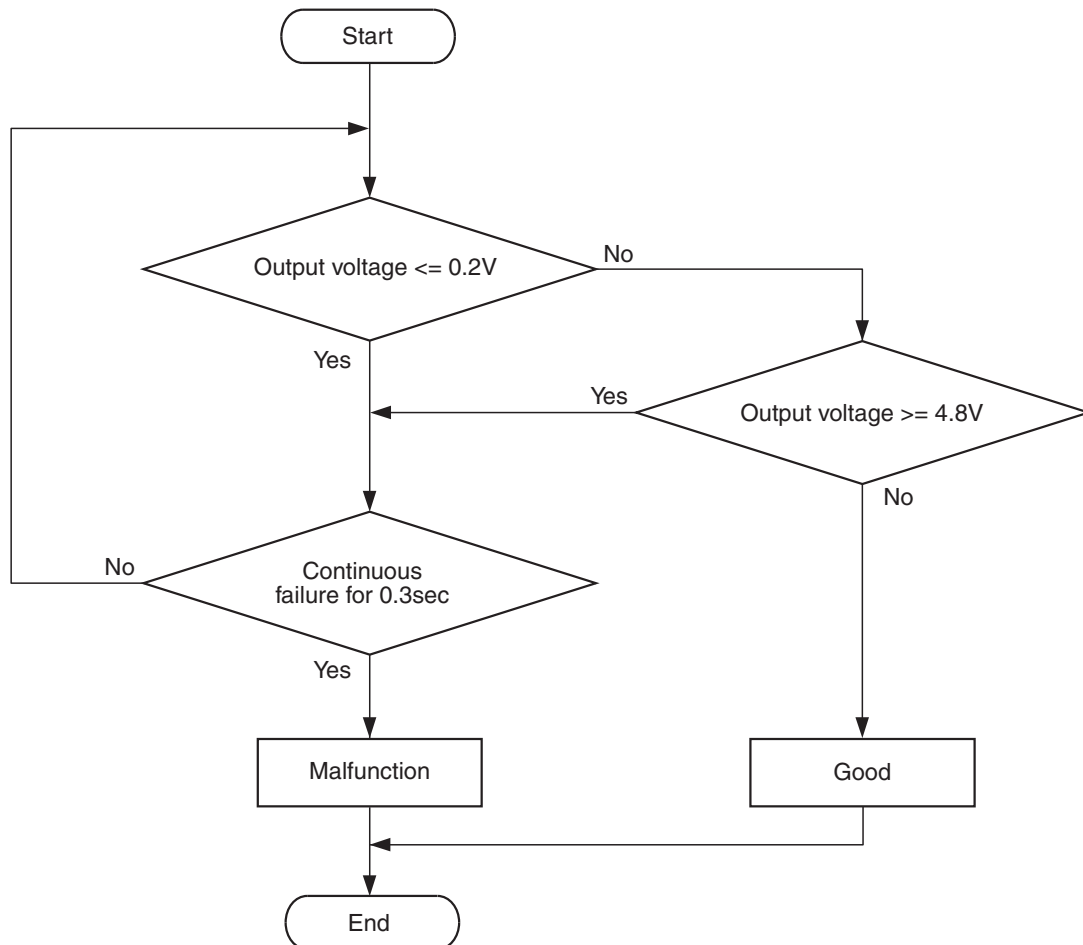
- Not applicable

**Sensor (The sensor below is determined to be normal)**

- Not applicable

### DTC SET CONDITIONS

#### Logic Flow Chart



AK604318

#### Check Condition

- Ignition switch is "ON" position.

#### Judgement Criterion

- Throttle position sensor (sub) output voltage is more than 4.8 volts for 0.3 second.

**FAIL-SAFE AND BACKUP FUNCTION**

- Throttle opening degree is restricted.
- Throttle opening degree position is in default position if throttle position sensor (main) fails.

**OBD-II DRIVE CYCLE PATTERN**

None.

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

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

**DIAGNOSIS****Required Special Tools:**

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

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

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Detach the intake air hose at the throttle body.
- (4) Disconnect the connector of the throttle position sensor.
- (5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
- (6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
- (7) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

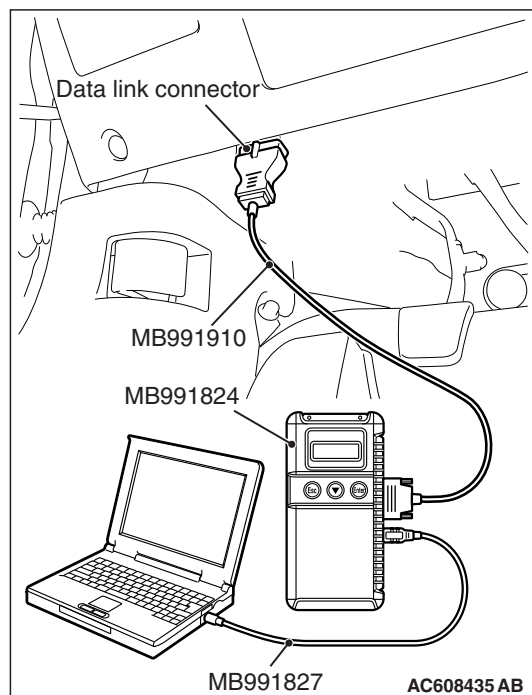
**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

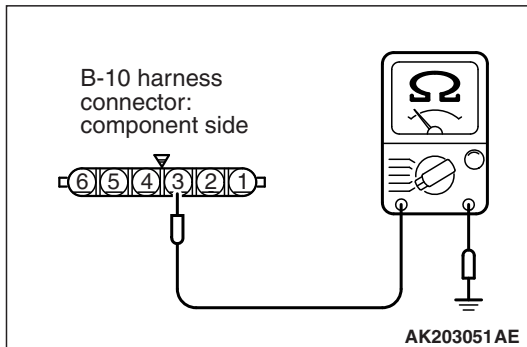
**NO :** Go to Step 2.

**STEP 2. Check harness connector B-10 at throttle position sensor for damage.****Q: Is the harness connector in good condition?**

**YES :** Go to Step 3.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 8.





**STEP 3. Check the continuity at throttle position sensor harness side connector B-10.**

- (1) Disconnect the connector B-10 and measure at the harness side.
- (2) Check for the continuity between terminal No. 3 and ground.
  - Continuity (2 ohms or less)

**Q: Does continuity exist?**

**YES :** Go to Step 7.

**NO :** Go to Step 4.

**STEP 4. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 5.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 8.

**STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-10 (terminal No. 3) and ECM connector B-108 (terminal No. 13).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 6.

**NO :** Repair it. Then go to Step 8.

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

- (1) Turn the ignition switch to the "ON" position.
- (2) Detach the intake air hose at the throttle body.
- (3) Disconnect the connector of the throttle position sensor.
- (4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
- (5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
- (6) 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 ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 8.

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**STEP 7. Replace the throttle body assembly.**

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

**Q: Is DTC P0223 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 8.

**NO :** The inspection is complete.

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

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

**Q: Is DTC P0223 set?**

**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

**DTC P0234: Turbocharger Wastegate System Malfunction**

**TECHNICAL DESCRIPTION**

- The ECM checks that the engine is not overcharged by always monitoring intake air volume.
- The ECM protects the engine by shutting off fuel when an overcharged condition is detected.

**DESCRIPTIONS OF MONITOR METHODS**

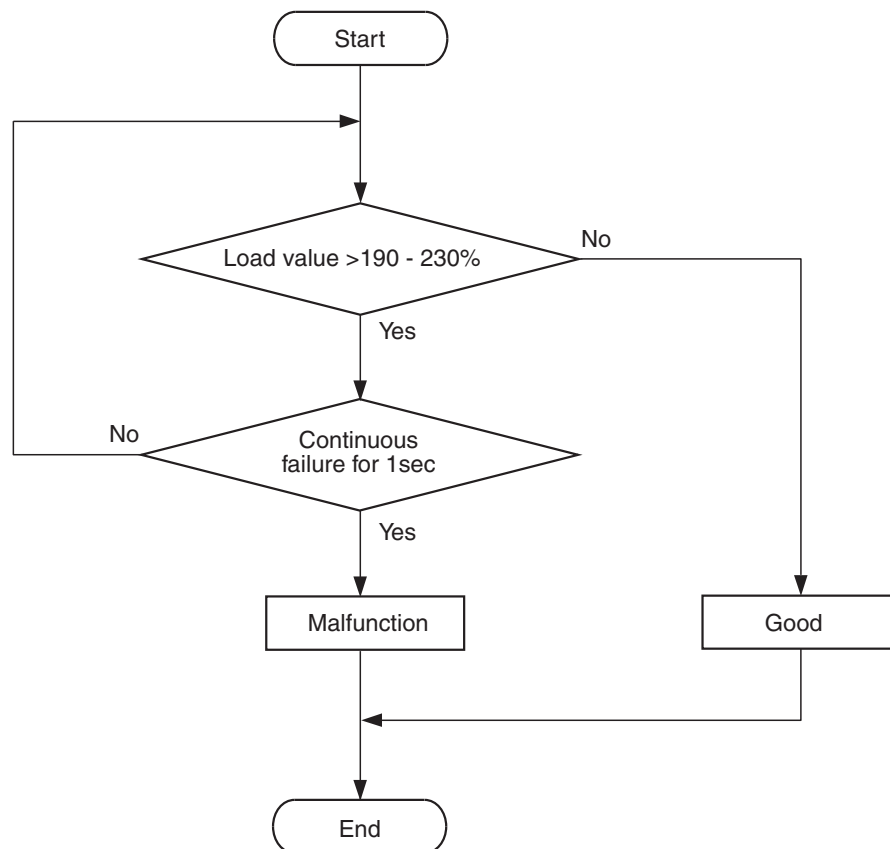
It detects overcharging failure by monitoring intake air volume.

**MONITOR EXECUTION**

Continuous

**DTC SET CONDITIONS**

**Logic Flow Chart**



AK800584

**Check Condition, Judgement Criterion**

- Volumetric efficiency is more than 190 – 230 per-cent for 1 second.

**FAIL-SAFE AND BACKUP FUNCTION**

- Fuel is cut in abnormal engine overboost condition.

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 17.

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

- Intake charge pressure failed.
- Turbocharger wastegate actuator failed.
- Intake charge pressure control system failed.
- ECM failed.

**DIAGNOSIS**

---

**STEP 1. Check the intake charge pressure.**

Refer to GROUP 15, On-vehicle Service – Intake Charge Pressure Check [P.15-6](#).

**Q: Are there any abnormalities?**

**YES** : Repair it. Then go to Step 4.

**NO** : Go to Step 2.

**STEP 2. Check the intake charge pressure control system.**

Refer to GROUP 15, On-vehicle Service – Intake Charge Pressure Control System Check [P.15-7](#).

**Q: Are there any abnormalities?**

**YES** : Repair it. Then go to Step 4.

**NO** : Go to Step 3.

**STEP 3. Check the turbocharger wastegate actuator.**

Refer to GROUP 15, On-vehicle Service – Turbocharger Wastegate Actuator Check [P.15-6](#).

**Q: Are there any abnormalities?**

**YES** : Repair or replace it. Then go to Step 4.

**NO** : Go to Step 4.

**STEP 4. Test the OBD-II drive cycle.**

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 17 [P.13B-10](#).

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

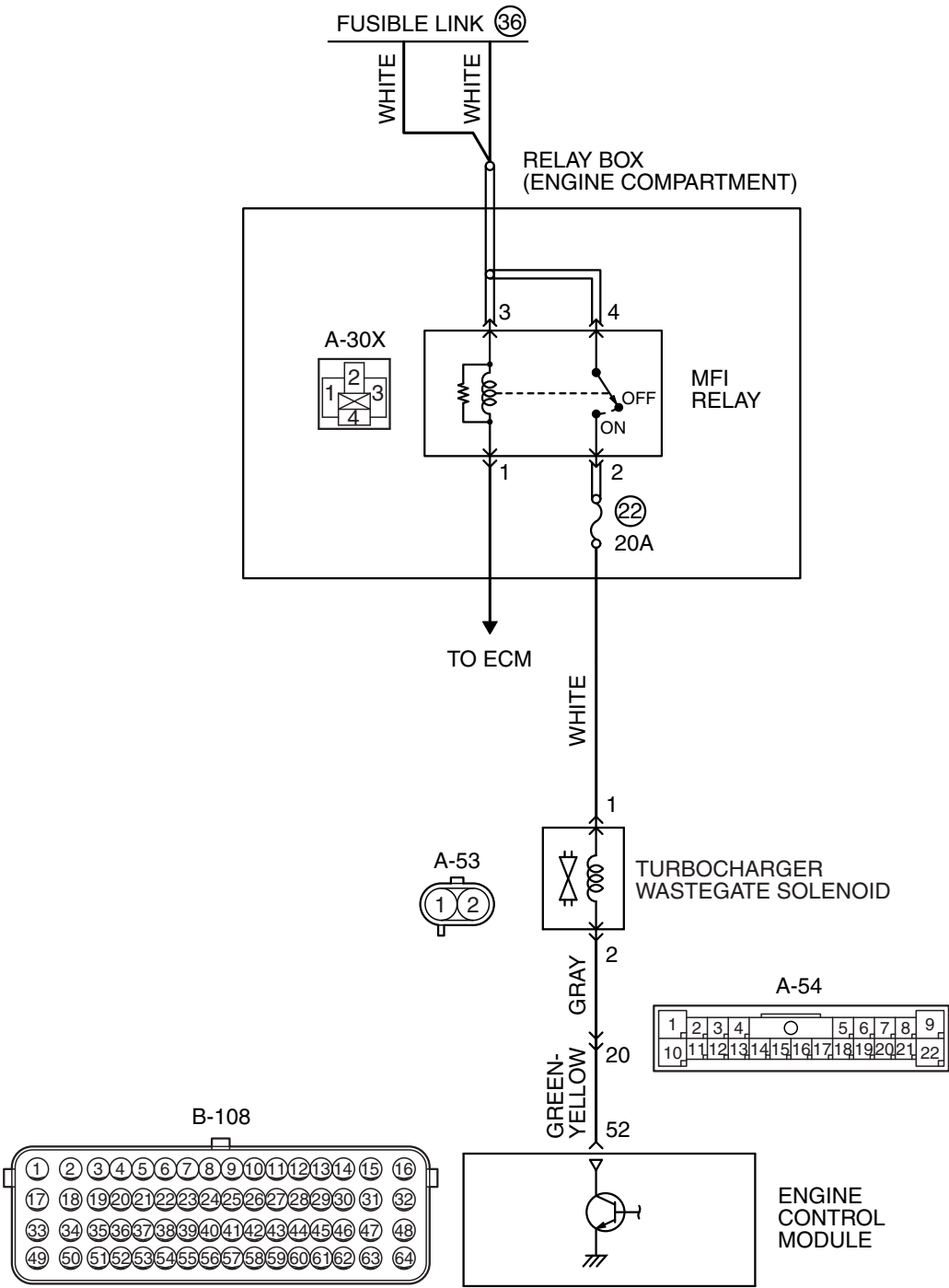
**Q: Is the DTC P0234 set?**

**YES** : Retry the troubleshooting.

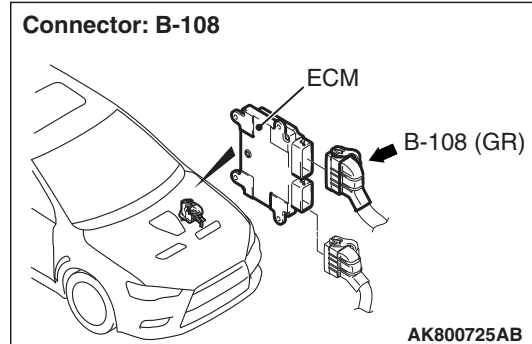
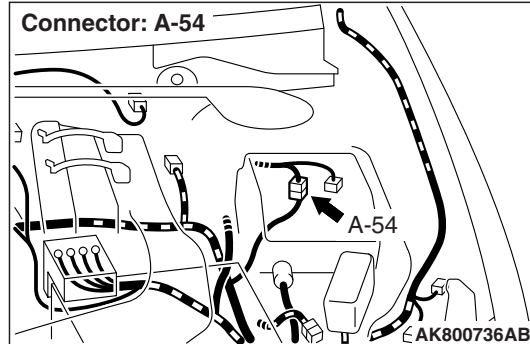
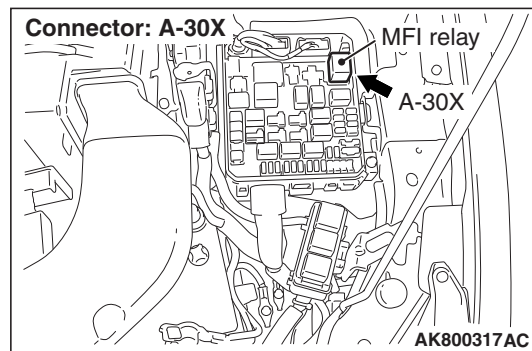
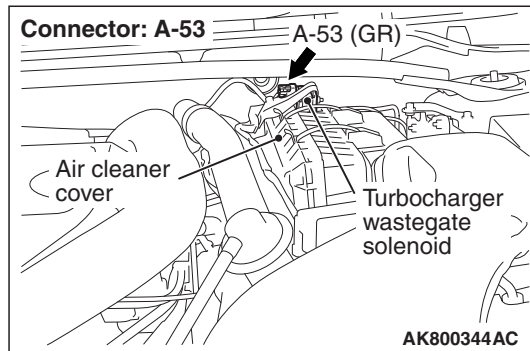
**NO** : The inspection is complete.

DTC P0243: Turbocharger Wastegate Solenoid Circuit

TURBOCHARGER WASTEGATE SOLENOID CIRCUIT



AK704405AC



## CIRCUIT OPERATION

- The turbocharger wastegate solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground the turbocharger wastegate solenoid by turning the power transistor in the ECM "ON" and "OFF".

## TECHNICAL DESCRIPTION

- To judge if there is open circuit in the turbocharger wastegate solenoid drive circuit, the ECM measures the surge voltage of the turbocharger wastegate solenoid coil.
- The ECM drives the turbocharger wastegate solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage of 2 volts or more.

## DESCRIPTIONS OF MONITOR METHODS

If a surge voltage is not generated in the coil after the turbocharger wastegate solenoid has been actuated, an open circuit 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)**

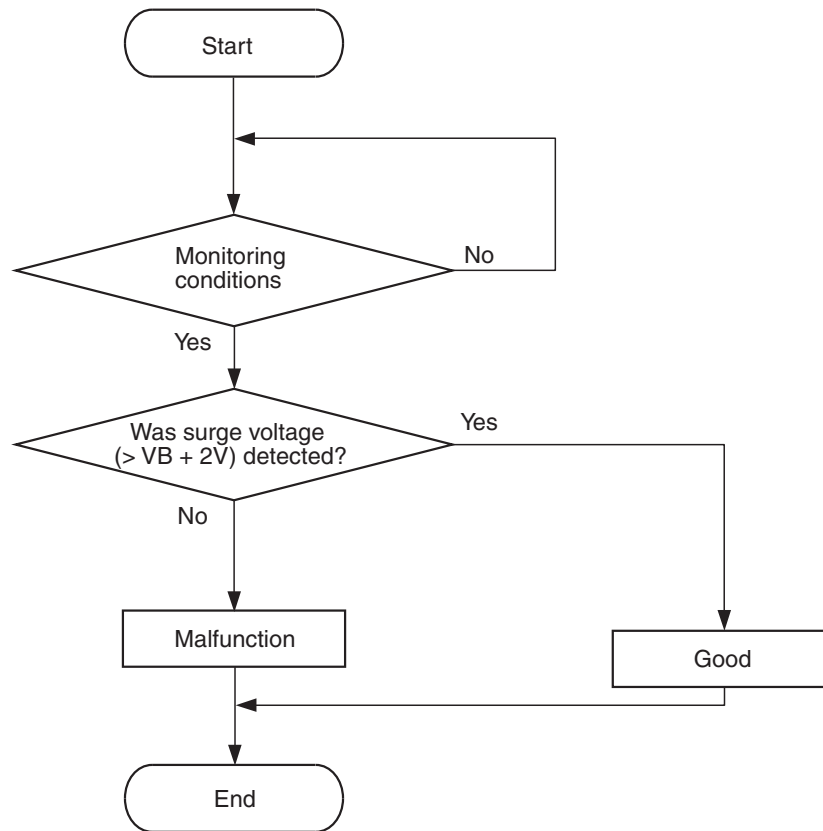
- Not applicable

**Sensor (The sensor below is determined to be normal)**

- Not applicable

## DTC SET CONDITIONS

### Logic Flow Chart



AK604339

#### Check Conditions

- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

#### Judgement Criteria

- The turbocharger wastegate solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM 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 turbocharger wastegate solenoid is between 10 and 90 percent.
- More than 1 second has passed after the above mentioned conditions have been met.

#### Judgement Criterion

- The turbocharger wastegate solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the turbocharger wastegate solenoid is turned off.

## FAIL-SAFE AND BACKUP FUNCTION

- None

## OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Turbocharger wastegate solenoid failed.
- Open or shorted turbocharger wastegate solenoid circuit, harness damage, or connector damage.
- ECM failed.

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

**STEP 1. Using scan tool MB991958, check actuator test item 20: Turbocharger Wastegate Solenoid.**

**⚠ CAUTION**

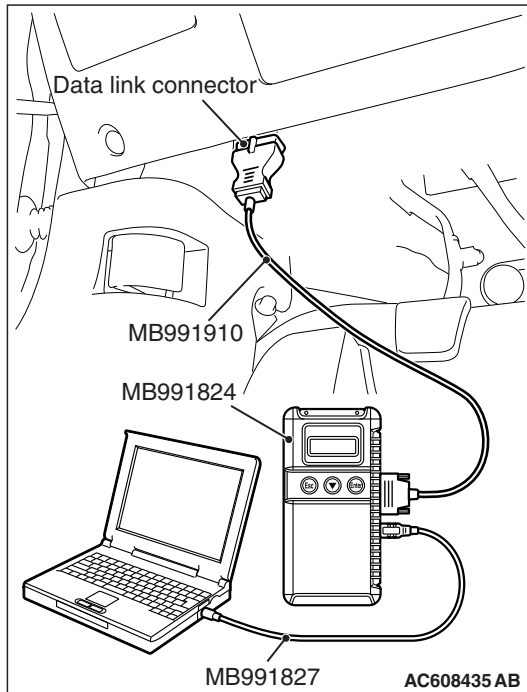
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (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 testing mode for item 20, Turbocharger Wastegate Solenoid.
  - An operation sound should be heard and vibration should be felt when the turbocharger wastegate 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.

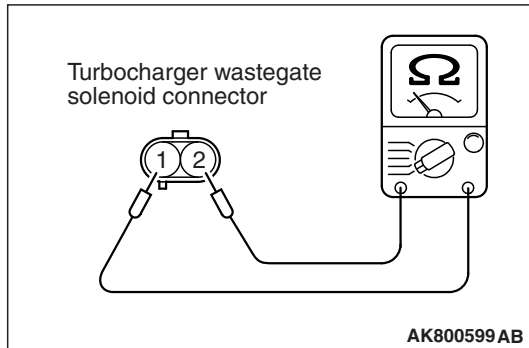


**STEP 2. Check harness connector A-53 at turbocharger wastegate solenoid for damage.**

**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 11.



**STEP 3. Check the turbocharger wastegate solenoid.**

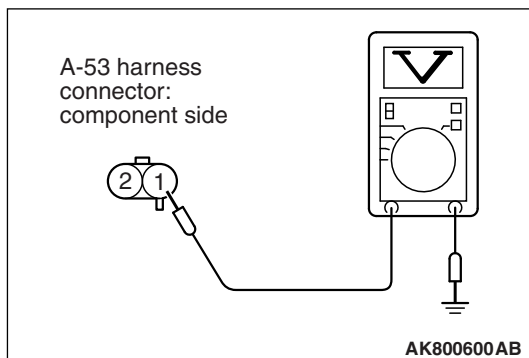
- (1) Disconnect the turbocharger wastegate solenoid connector A-53.
- (2) Measure the resistance between turbocharger wastegate solenoid side connector terminal No. 1 and No. 2.

**Standard value: 29 – 35  $\Omega$  [at 20°C (68°F)]**

**Q: Is the measured resistance between 29 and 35  $\Omega$  [at 20°C (68°F)]?**

**YES :** Go to Step 4.

**NO :** Replace the turbocharger wastegate solenoid. Then go to Step 11.



**STEP 4. Measure the power supply voltage at turbocharger wastegate solenoid harness side connector A-53.**

- (1) Disconnect the connector A-53 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 A-30X at MFI relay for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Repair harness wire between MFI relay connector A-30X (terminal No. 2) and turbocharger wastegate solenoid connector A-53 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 11.

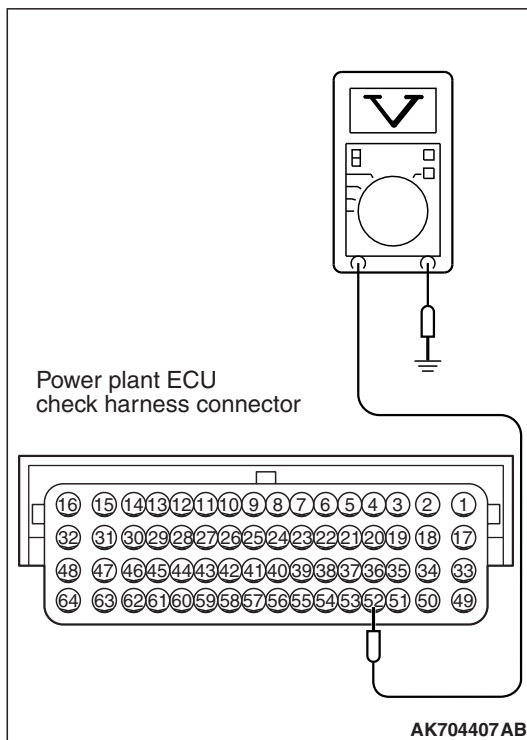
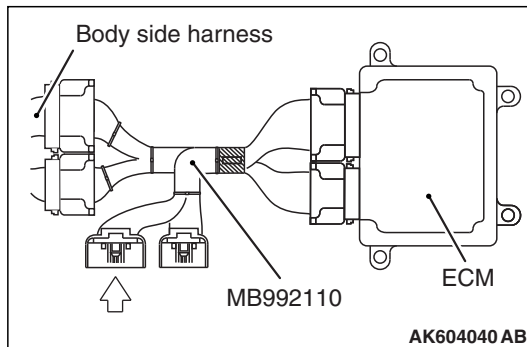
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**STEP 6. Check harness connector B-108 at ECM 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 11.



**STEP 7. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 52 and ground.
  - Voltage should be battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Check harness connector A-54 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between turbocharger wastegate solenoid connector A-53 (terminal No. 2) and ECM connector B-108 (terminal No. 52) because of open circuit or short circuit to ground. Then go to Step 11.

**STEP 8. Check harness connector A-30X at MFI relay 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 11.

**STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and turbocharger wastegate solenoid connector A-53 (terminal No. 1).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 10.

**NO :** Repair it. Then go to Step 11.

**STEP 10. Check for harness damage between turbocharger wastegate solenoid connector A-53 (terminal No. 2) and ECM connector B-108 (terminal No. 52).**

*NOTE: Check harness after checking intermediate connector A-54. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.*

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-11 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-9. Then go to Step 11.

**NO :** Repair it. Then go to Step 11.

**STEP 11. Test the OBD-II drive cycle.**

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13B-10.

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

**Q: Is DTC P0243 set?**

**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

---

## DTC P0300: Random/Multiple Cylinder Misfire Detected

---

### TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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)**

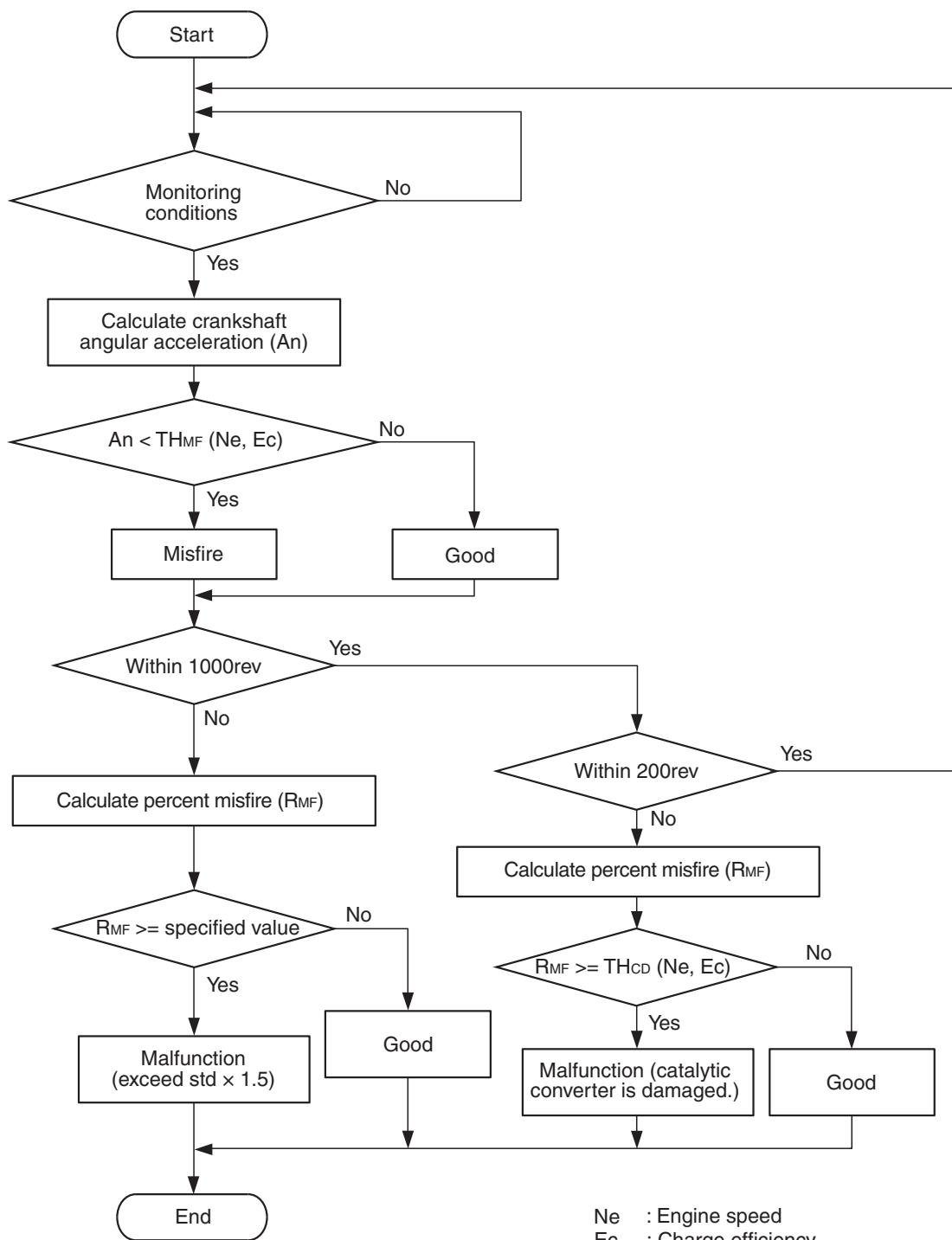
- Not applicable

**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



Ne : Engine speed  
 Ec : Charge efficiency  
 TH<sub>MF</sub> : Threshold value for misfire  
 TH<sub>CD</sub> : Threshold value for catalyst damage

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## Check Conditions

- Engine speed is between 438 and 6,500 r/min.
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Engine coolant temperature is more than -10°C (14°F).

- The engine load is within the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding sudden acceleration/deceleration and fuel shut-off operation.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is more than 1,000°C (1,832°F)].

or

- Misfire has occurred in 2.0 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

**FAIL-SAFE AND BACKUP FUNCTION**

- The supply of fuel to the misfiring cylinder can possibly be cut.

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).

**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 chain teeth.
- ECM failed.

**DIAGNOSIS**

**Required Special Tools:**

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

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

**⚠ CAUTION**

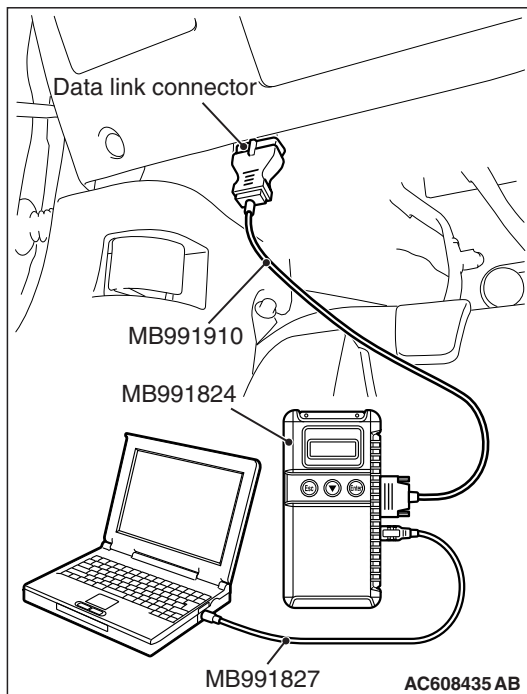
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

**Q: Is the sensor operating properly?**

**YES :** Go to Step 2.

**NO :** Refer to, DTC P0335 – Crankshaft Position Sensor Circuit [P.13B-387](#).



**STEP 2. Using scan tool MB991958, check data list item 26: 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, 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 [P.13B-272](#),  
DTC P0172 – System too Rich [P.13B-278](#).

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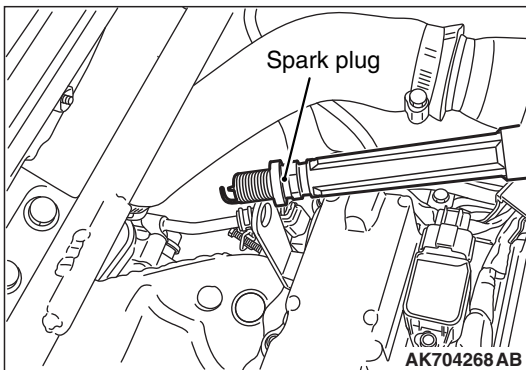
**STEP 3. Using scan tool MB991958, check data list item 28: Short-Term Fuel Trim.**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991958 to the data reading mode for item 28, 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 4.

**NO :** Refer to DTC P0171 – System too Lean [P.13B-272](#),  
DTC P0172 – System too Rich [P.13B-278](#).



---

**STEP 4. Visual check of ignition spark.**

- (1) Remove the spark plug and install it to the ignition coil.
- (2) Connect the ignition coil connector.
- (3) Remove all injector connector.
- (4) At the engine start, check each spark plug produces a spark.

**Q: Did it spark?**

**YES :** Go to Step 6.

**NO :** Go to Step 5.

---

**STEP 5. Check the spark plugs.**

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning [P.16-52](#).

**Q: Is the spark plug normal?**

**YES :** Refer to Symptom Procedures 25 – Ignition Circuit System [P.13B-801](#).

**NO :** Replace the faulty spark plug. Then go to Step 8.

---

**STEP 6. Check the following items.**

- (1) Check the following items, and repair or replace the defective component.
  - a. Check for skipped timing chain teeth.
  - b. Check compression.

**Q: Are there any abnormalities?**

**YES :** Repair or replace it. Then go to Step 8.

**NO :** Go to Step 7.

---

**STEP 7. Check the trouble symptoms.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0300 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 8.

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

---

**STEP 8. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).
- (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**

---

**TECHNICAL DESCRIPTION**

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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)**

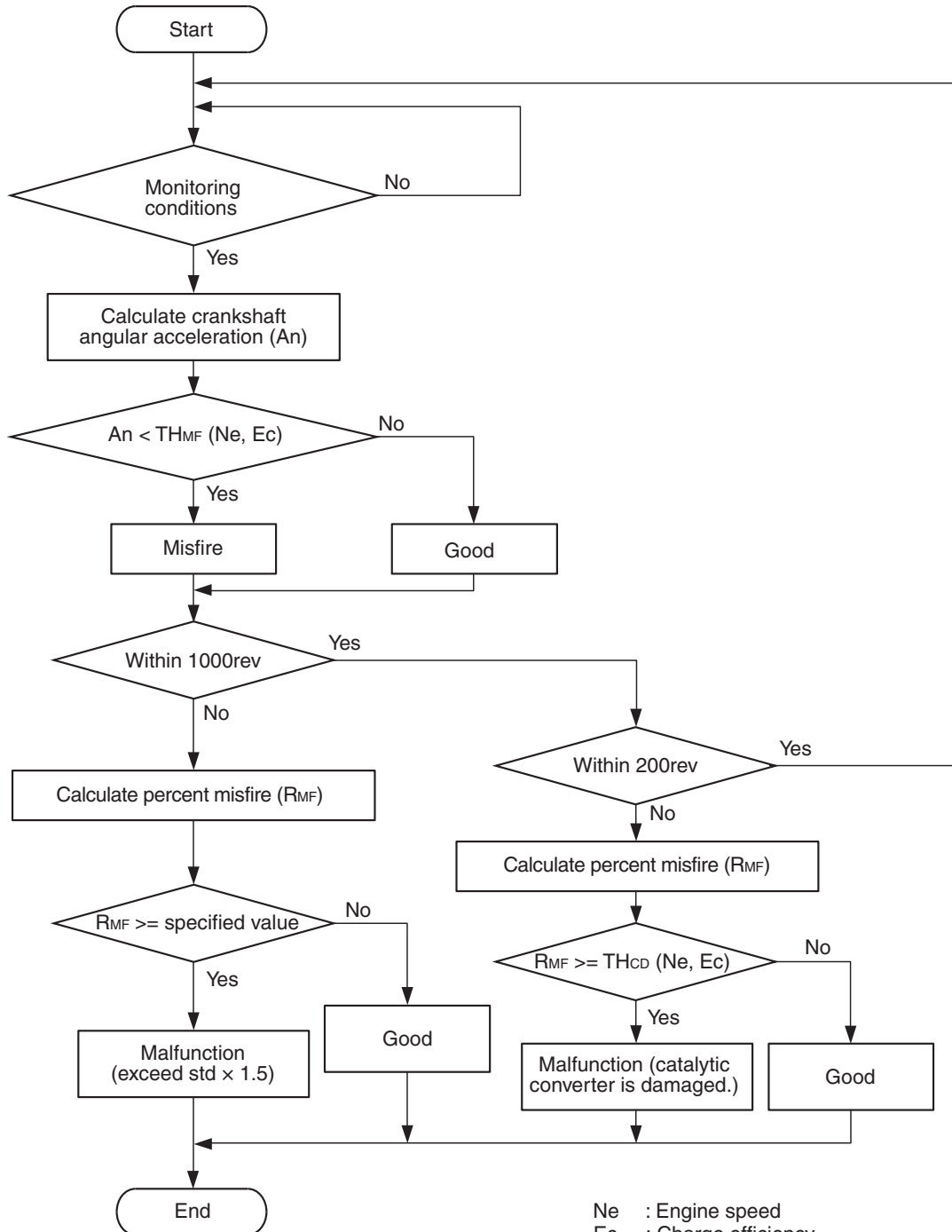
- Not applicable

**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



Ne : Engine speed  
Ec : Charge efficiency  
THMF : Threshold value for misfire  
THCD : Threshold value for catalyst damage

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### Check Conditions

- Engine speed is between 438 and 6,500 r/min.
- Engine coolant temperature is more than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is within the positive torque load.

- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding sudden acceleration/deceleration and fuel shut-off operation.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is more than 1,000°C (1,832°F)].

or

- Misfire has occurred in 2.0 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

## FAIL-SAFE AND BACKUP FUNCTION

- The supply of fuel to the misfiring cylinder can possibly be cut.

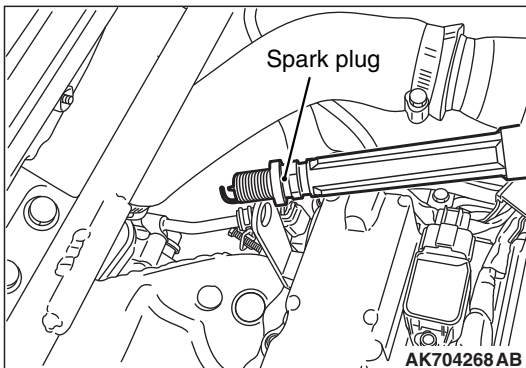
## OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).

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

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

## DIAGNOSIS



### STEP 1. Visual check on ignition spark of No. 1 cylinder.

- (1) Remove the spark plug and install it to the ignition coil.
- (2) Connect the ignition coil connector.
- (3) Remove all injector connector.
- (4) At the engine start, check spark plug produces a spark.

#### Q: Did it spark?

**YES** : Go to Step 3.

**NO** : Go to Step 2.

### STEP 2. Check the No. 1 cylinder spark plug.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning [P.16-52](#).

#### Q: Is the spark plug normal?

**YES** : Refer to, Symptom Procedures 25 – Ignition Circuit System [P.13B-801](#).

**NO** : Replace the No. 1 cylinder spark plug. Then go to Step 5.

### STEP 3. Check the compression.

Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check [P.11C-15](#).

#### 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 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0301 set?**

- YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). 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 14 [P.13B-10](#).
- (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**

---

**TECHNICAL DESCRIPTION**

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

**DESCRIPTIONS OF MONITOR METHODS**

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

**MONITOR EXECUTION**

Continuous

**MONITOR EXECUTION CONDITIONS**  
**(Other monitor and Sensor)**

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

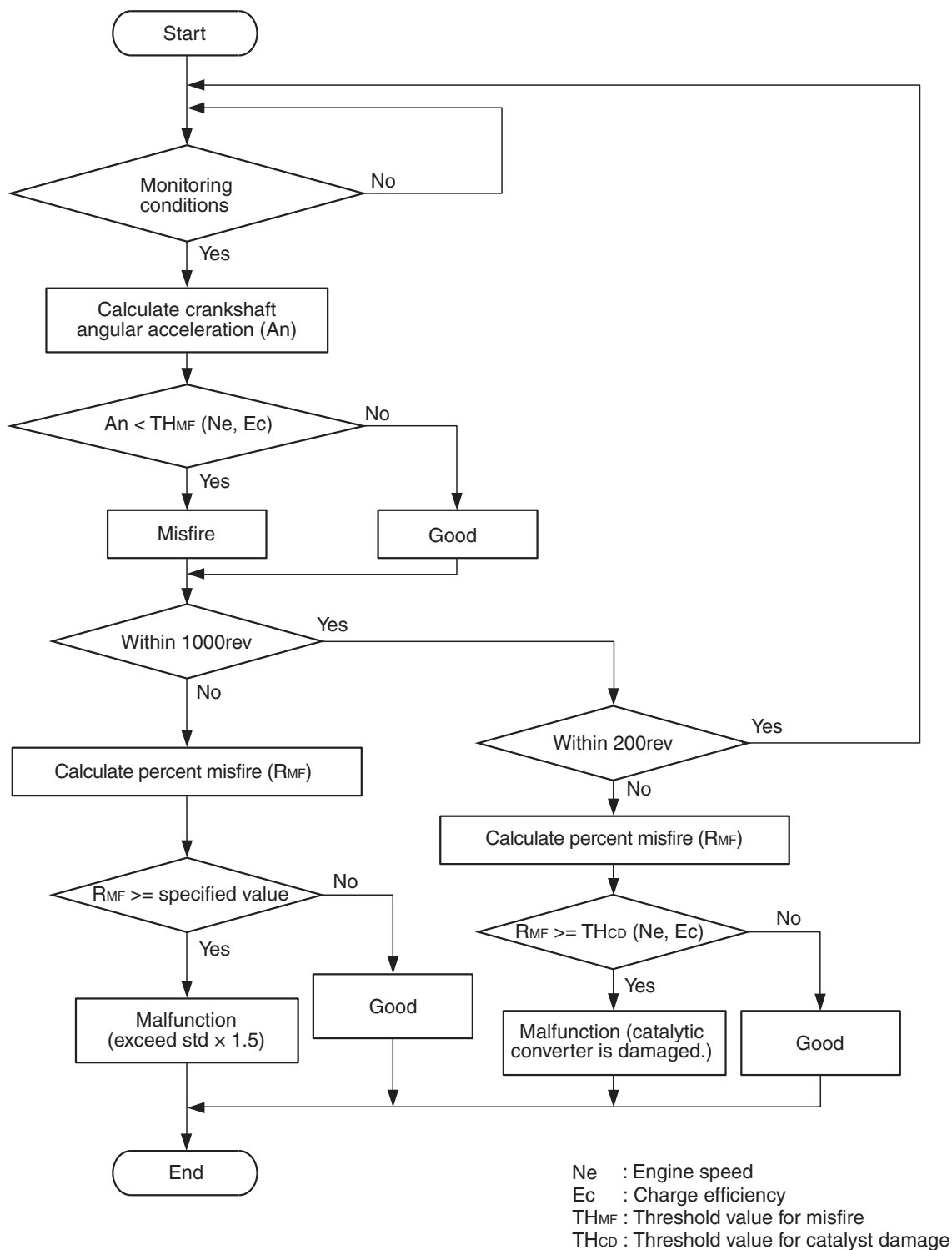
- Not applicable

**Sensor (The sensor below is determined to be normal)**

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

## DTC SET CONDITIONS

## Logic Flow Chart



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## Check Conditions

- Engine speed is between 438 and 6,500 r/min.
- Engine coolant temperature is more than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).

- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is within the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding sudden acceleration/deceleration and fuel shut-off operation.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is more than 1,000°C (1,832°F)].

or

- Misfire has occurred in 2.0 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

**FAIL-SAFE AND BACKUP FUNCTION**

- The supply of fuel to the misfiring cylinder can possibly be cut.

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).

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

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

**DIAGNOSIS**

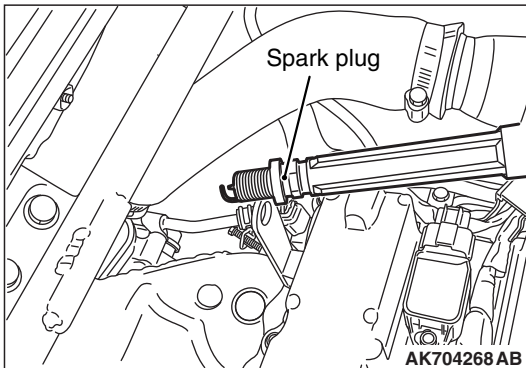
**STEP 1. Visual check on ignition spark of No. 2 cylinder.**

- (1) Remove the spark plug and install it to the ignition coil.
- (2) Connect the ignition coil connector.
- (3) Remove all injector connector.
- (4) At the engine start, check spark plug produces a spark.

**Q: Did it spark?**

**YES** : Go to Step 3.

**NO** : Go to Step 2.



**STEP 2. Check the No. 2 cylinder spark plug.**

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning [P.16-52](#).

**Q: Is the spark plug normal?**

**YES** : Refer to, Symptom Procedures 25 – Ignition Circuit System [P.13B-801](#).

**NO** : Replace the No. 2 cylinder spark plug. Then go to Step 5.

**STEP 3. Check the compression.**

Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check [P.11C-15](#).

**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 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0302 set?**

- YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). 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 14 [P.13B-10](#).
- (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****TECHNICAL DESCRIPTION**

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

**DESCRIPTIONS OF MONITOR METHODS**

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

**MONITOR EXECUTION**

Continuous

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

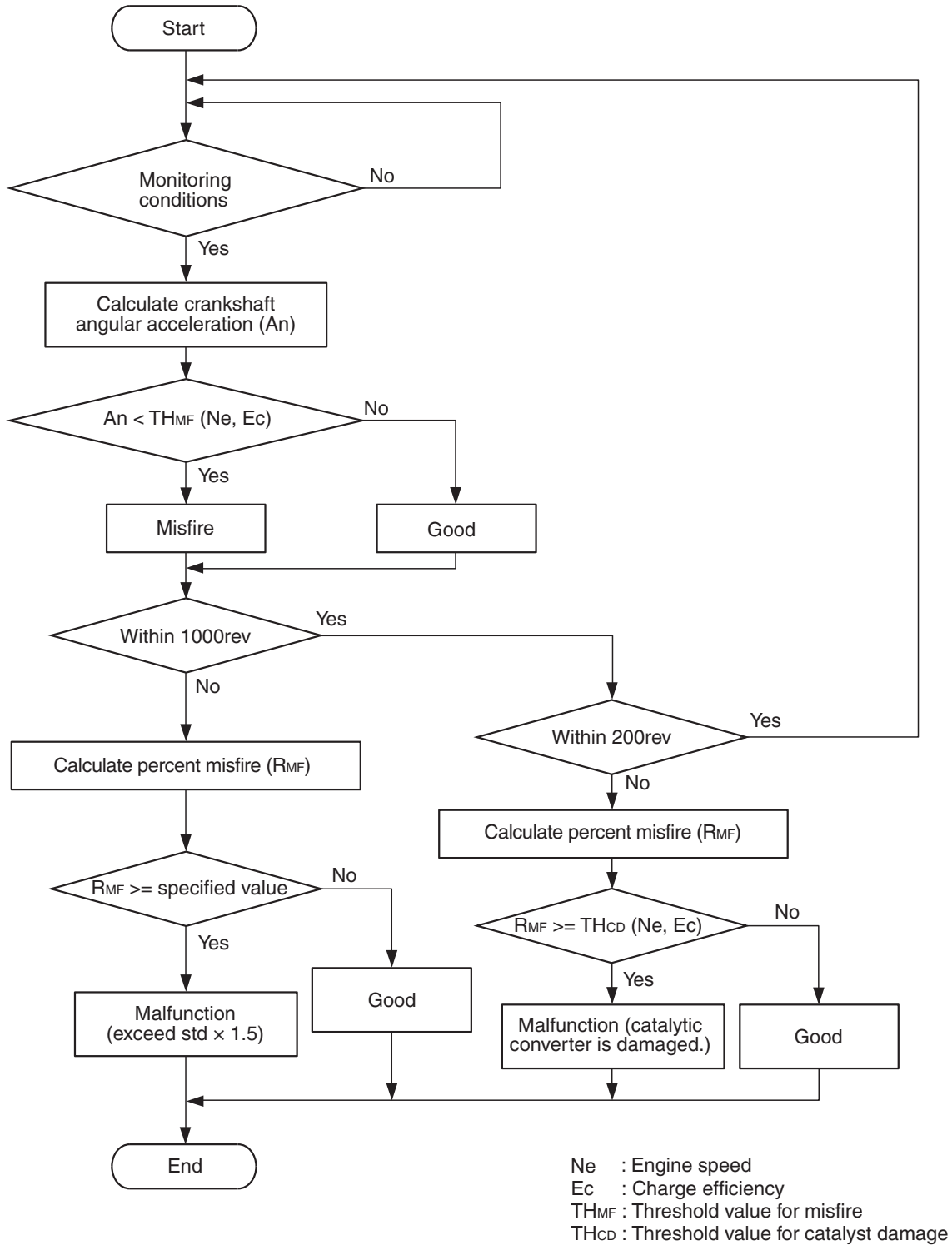
- Not applicable

**Sensor (The sensor below is determined to be normal)**

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

## DTC SET CONDITIONS

### Logic Flow Chart



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### Check Conditions

- Engine speed is between 438 and 6,500 r/min.
- Engine coolant temperature is more than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).

- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is within the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding sudden acceleration/deceleration and fuel shut-off operation.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is more than 1,000°C (1,832°F)].

or

- Misfire has occurred in 2.0 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

**FAIL-SAFE AND BACKUP FUNCTION**

- The supply of fuel to the misfiring cylinder can possibly be cut.

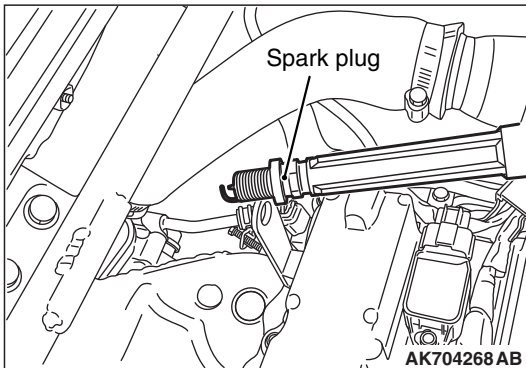
**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).

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

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

**DIAGNOSIS**



**STEP 1. Visual check on ignition spark of No. 3 cylinder.**

- (1) Remove the spark plug and install it to the ignition coil.
- (2) Connect the ignition coil connector.
- (3) Remove all injector connector.
- (4) At the engine start, check spark plug produces a spark.

**Q: Did it spark?**

**YES** : Go to Step 3.

**NO** : Go to Step 2.

**STEP 2. Check the No. 3 cylinder spark plug.**

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning [P.16-52](#).

**Q: Is the spark plug normal?**

**YES** : Refer to, Symptom Procedures 25 – Ignition Circuit System [P.13B-801](#).

**NO** : Replace the No. 3 cylinder spark plug. Then go to Step 5.

**STEP 3. Check the compression.**

Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check [P.11C-15](#).

**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 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0303 set?**

- YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). 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 14 [P.13B-10](#).
- (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**

---

**TECHNICAL DESCRIPTION**

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM 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)**

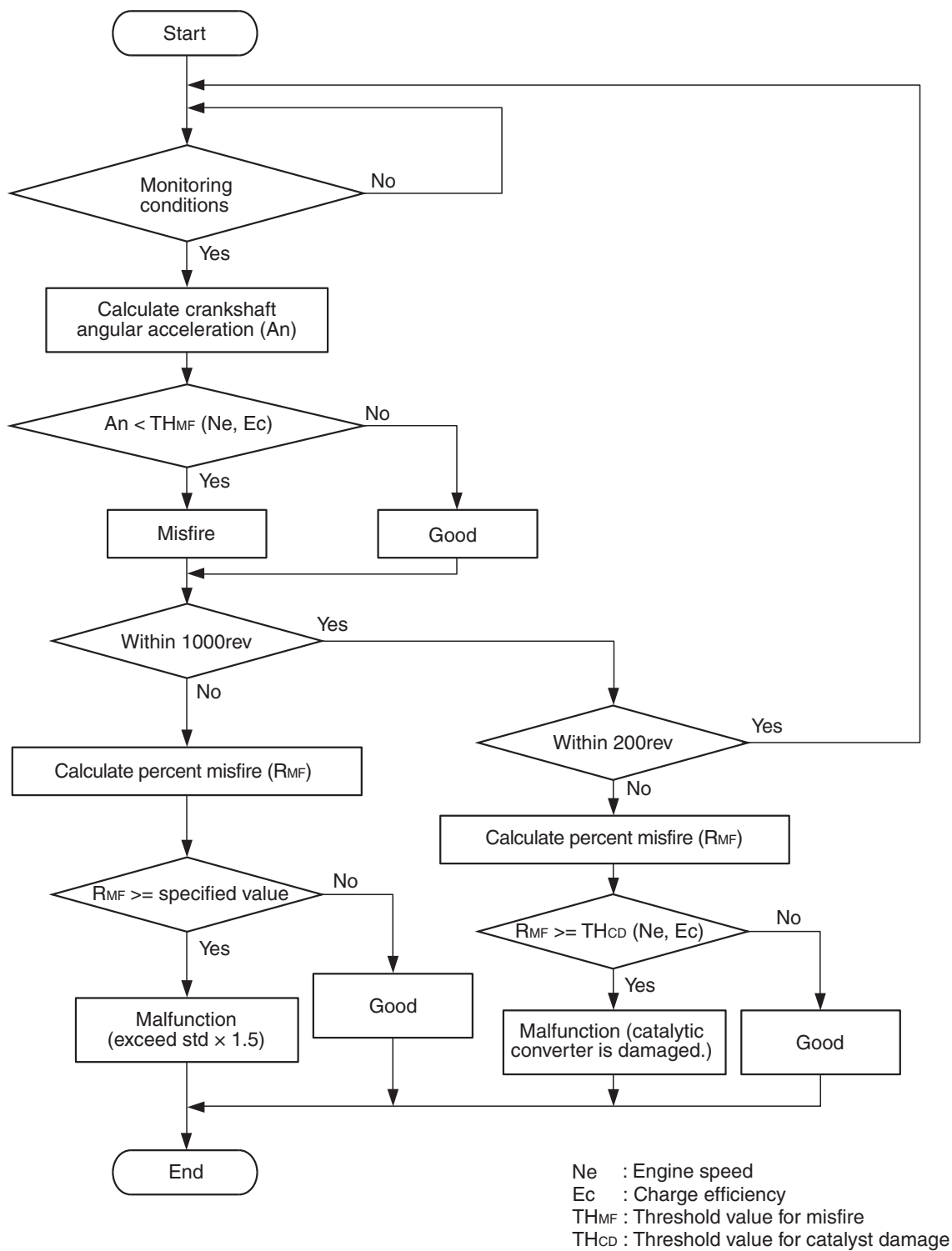
- Not applicable

**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



AK800585

## Check Conditions

- Engine speed is between 438 and 6,500 r/min.
- Engine coolant temperature is more than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).

- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- The engine load is within the positive torque load.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding sudden acceleration/deceleration and fuel shut-off operation.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is more than 1,000°C (1,832°F)].

or

- Misfire has occurred in 2.0 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

**FAIL-SAFE AND BACKUP FUNCTION**

- The supply of fuel to the misfiring cylinder can possibly be cut.

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 [P.13B-10](#).

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

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

**DIAGNOSIS**

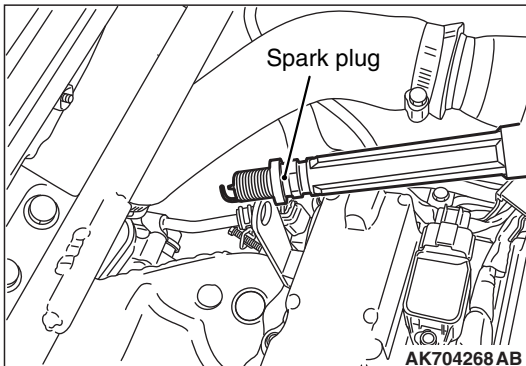
**STEP 1. Visual check on ignition spark of No. 4 cylinder.**

- (1) Remove the spark plug and install it to the ignition coil.
- (2) Connect the ignition coil connector.
- (3) Remove all injector connector.
- (4) At the engine start, check spark plug produces spark.

**Q: Did it spark?**

**YES** : Go to Step 3.

**NO** : Go to Step 2.



**STEP 2. Check the No. 4 cylinder spark plug.**

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning [P.16-52](#).

**Q: Is the spark plug normal?**

**YES** : Refer to, Symptom Procedures 25 – Ignition Circuit System [P.13B-801](#).

**NO** : Replace the No. 4 cylinder spark plug. Then go to Step 5.

**STEP 3. Check the compression.**

Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check [P.11C-15](#).

**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 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0304 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). 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 14 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

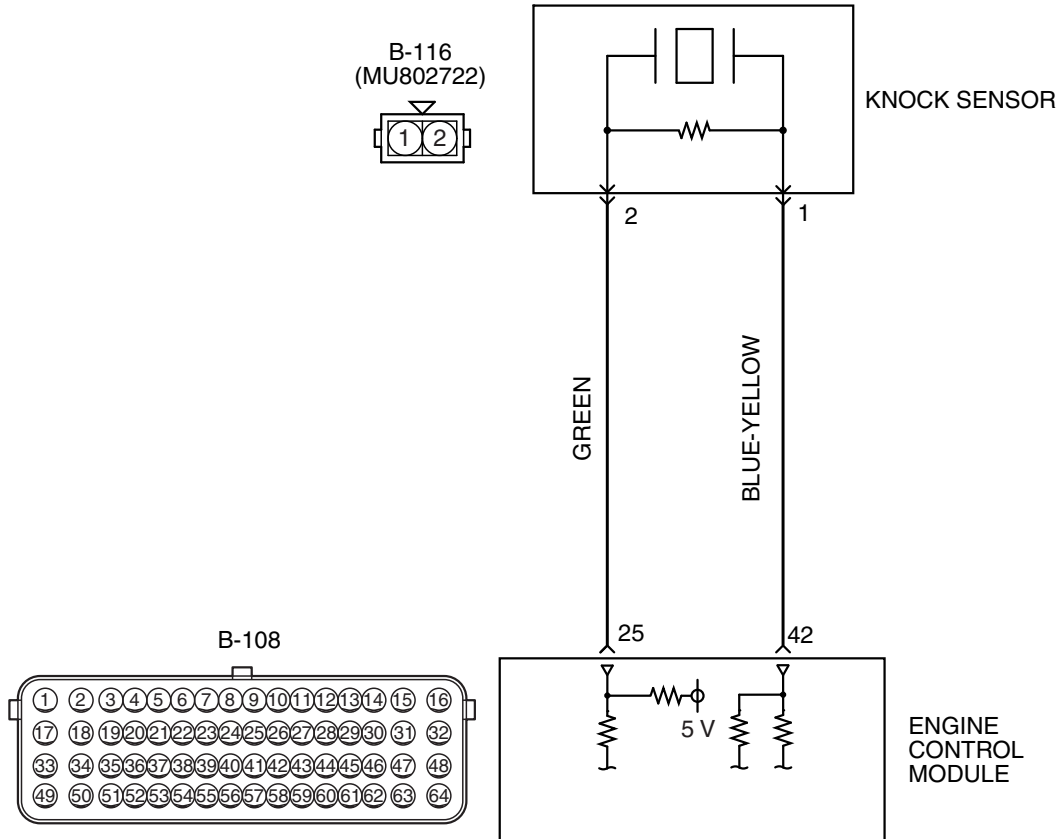
**Q: Is DTC P0304 set?**

**YES :** Retry the troubleshooting.

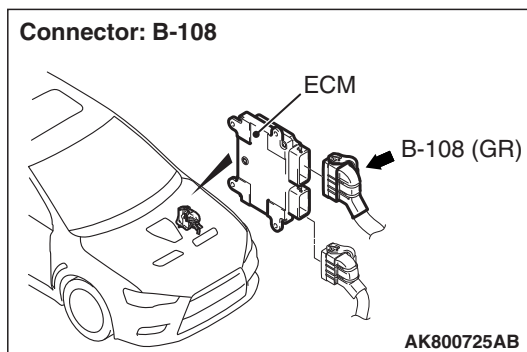
**NO :** The inspection is complete.

DTC P0327: Knock Sensor Circuit Low

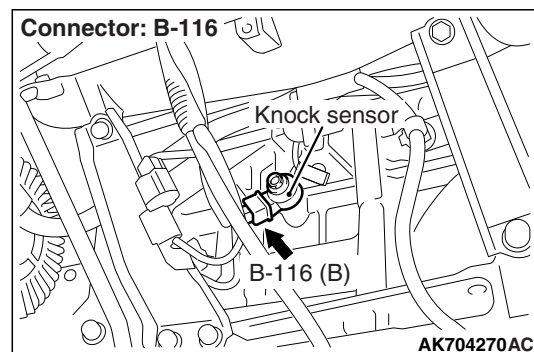
KNOCK SENSOR CIRCUIT



AK704757 AC



AK800725AB



AK704270AC

CIRCUIT OPERATION

- The knock sensor (terminal No. 2) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 1) is grounded with ECM (terminal No. 42).

- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Knock sensor output voltage is out of specified range.

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.

MONITOR EXECUTION

Continuous

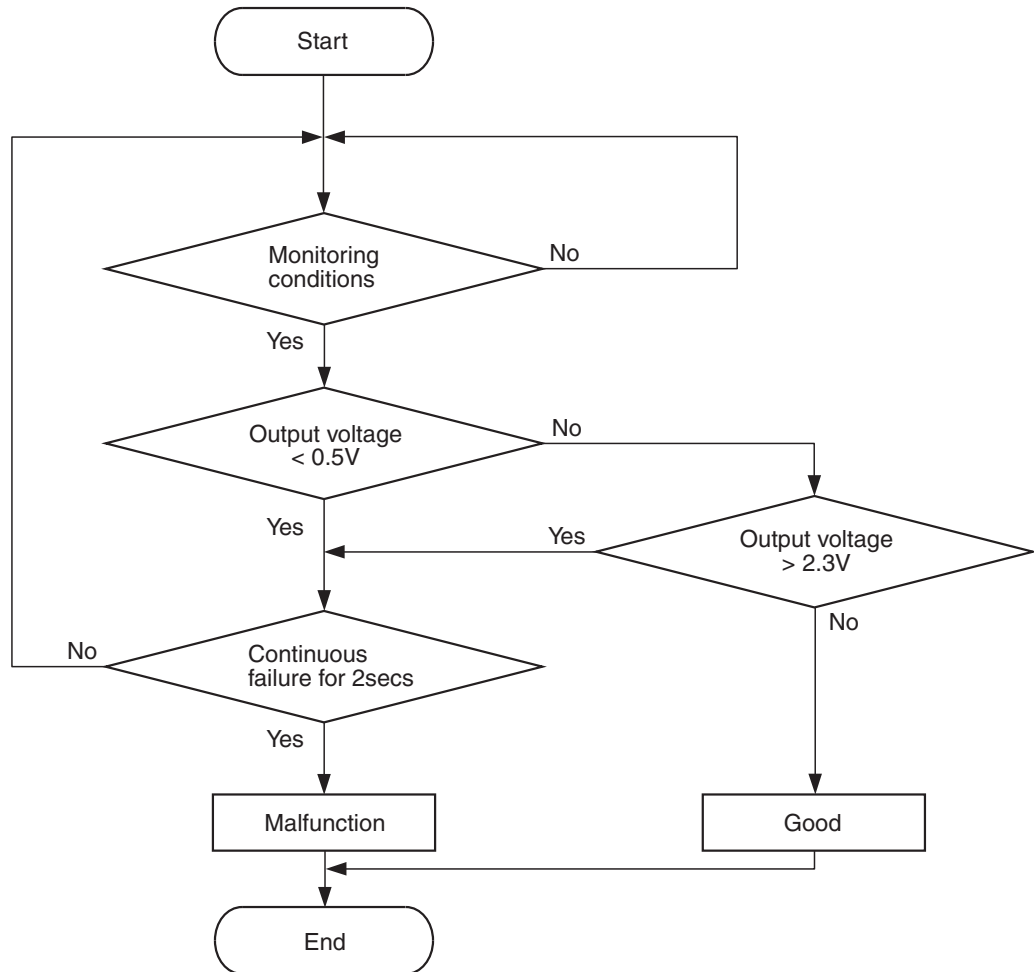
**MONITOR EXECUTION CONDITIONS**  
(Other monitor and Sensor)

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**

AK704271

**Check Condition**

- More than 2 seconds have passed since the engine starting sequence was completed.

**Judgement Criterion**

- Knock sensor output voltage is less than 0.5 volt for 2 seconds.

**FAIL-SAFE AND BACKUP FUNCTION**

- Fix the ignition timing with an allowance against knock.

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Knock sensor failed.
- Open or shorted knock sensor circuit or connector damage.
- ECM failed.

## DIAGNOSIS

---

**STEP 1. Check harness connector B-116 at knock sensor and harness connector B-108 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Go to Step 2.

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

---

**STEP 2. Check for open circuit between knock sensor connector B-116 (terminal No. 1) and ECM connector B-108 (terminal No. 42).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 3.

**NO :** Repair it. Then go to Step 5.

---

**STEP 3. Check for open circuit and short circuit to ground between knock sensor connector B-116 (terminal No. 2) and ECM connector B-108 (terminal No. 25).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 4.

**NO :** Repair it. Then go to Step 5.

---

**STEP 4. Replace the knock sensor.**

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

**Q: Is DTC P0327 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 5.

**NO :** The inspection is complete.

---

**STEP 5. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

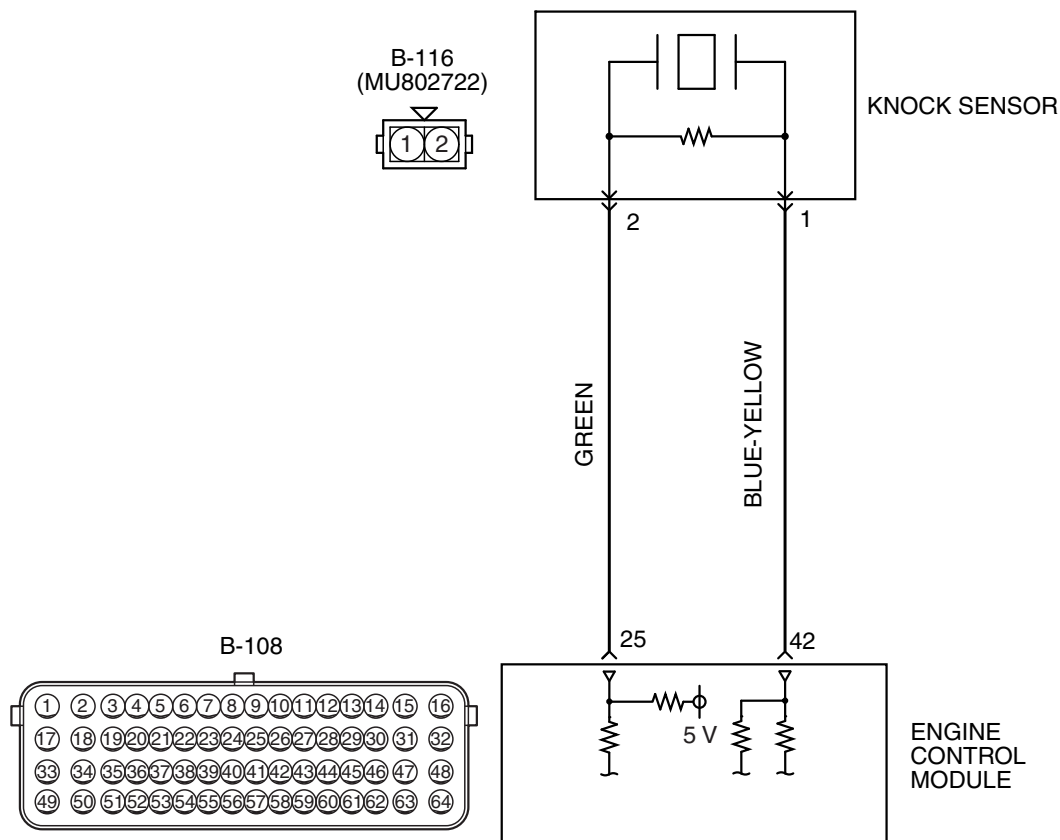
**Q: Is DTC P0327 set?**

**YES :** Retry the troubleshooting.

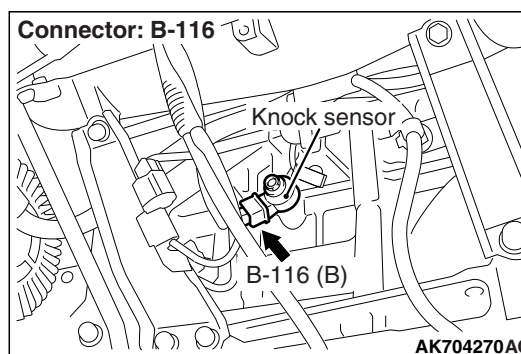
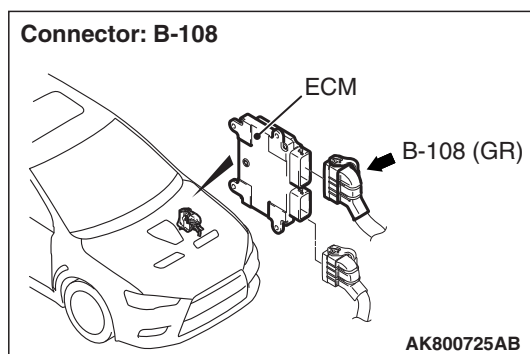
**NO :** The inspection is complete.

## DTC P0328: Knock Sensor Circuit High

## KNOCK SENSOR CIRCUIT



AK704757 AC



## CIRCUIT OPERATION

- The knock sensor (terminal No. 2) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 1) is grounded with ECM (terminal No. 42).

## TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.

- The ECM checks whether the voltage is within a specified range.

## DESCRIPTIONS OF MONITOR METHODS

Knock sensor output voltage is out of specified range.

## MONITOR EXECUTION

Continuous

## MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

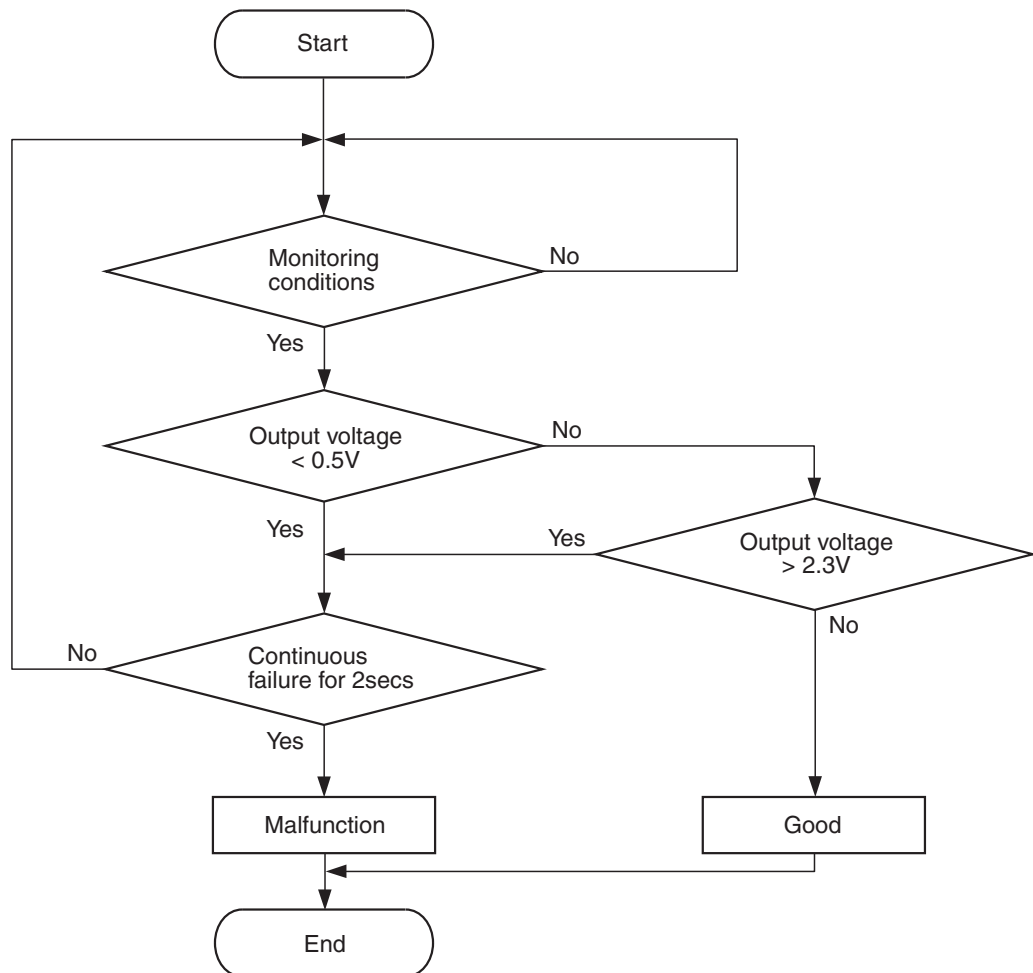
- Not applicable

Sensor (The sensor below is determined to be  
normal)

- Not applicable

## DTC SET CONDITIONS

### Logic Flow Chart



AK704271

### Check Condition

- More than 2 seconds have passed since the engine starting sequence was completed.

### Judgement Criterion

- Knock sensor output voltage is more than 2.3 volts for 2 seconds.

## FAIL-SAFE AND BACKUP FUNCTION

- Fix the ignition timing with an allowance against knock.

## OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Shorted knock sensor circuit or connector damage.

- ECM failed.

**DIAGNOSIS**

---

**STEP 1. Check harness connector B-116 at knock sensor and harness connector B-108 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Go to Step 2.

**NO :** Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 3.

---

**STEP 2. Check for short circuit to power supply between knock sensor connector B-116 (terminal No. 2) and ECM connector B-108 (terminal No. 25).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 3.

**NO :** Repair it. Then go to Step 3.

---

**STEP 3. Test the OBD-II drive cycle.**

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

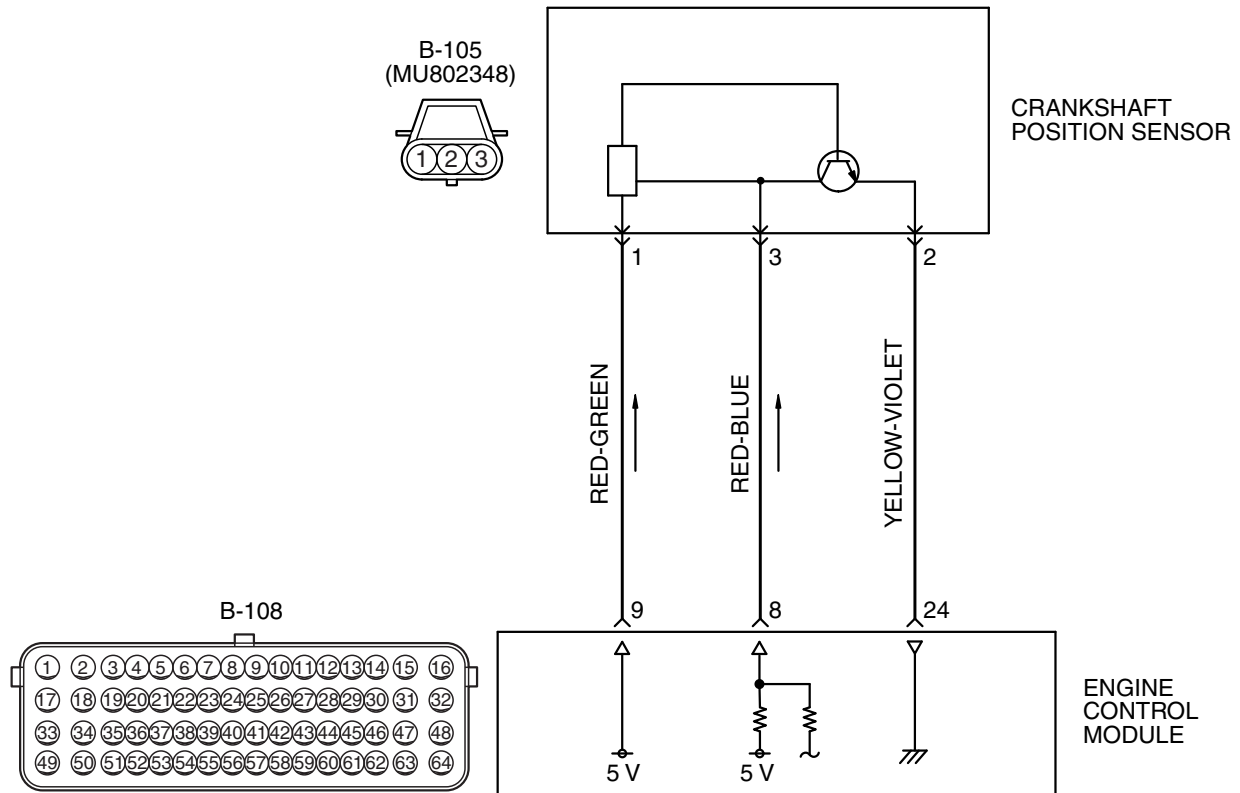
**Q: Is DTC P0328 set?**

**YES :** Retry the troubleshooting.

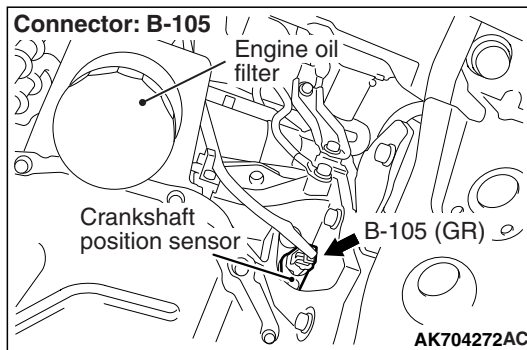
**NO :** The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit

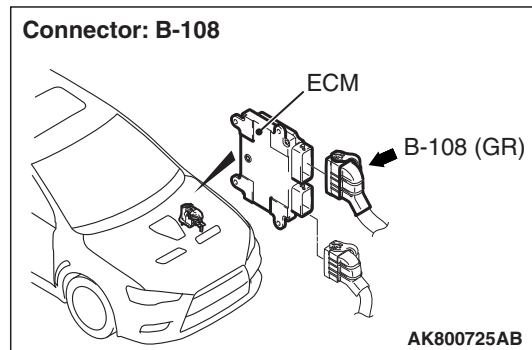
CRANKSHAFT POSITION SENSOR CIRCUIT



AK604245 AE



AK704272AC



AK800725AB

CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the crankshaft position sensor is grounded with ECM (terminal No. 24).

- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 8). 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.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM 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

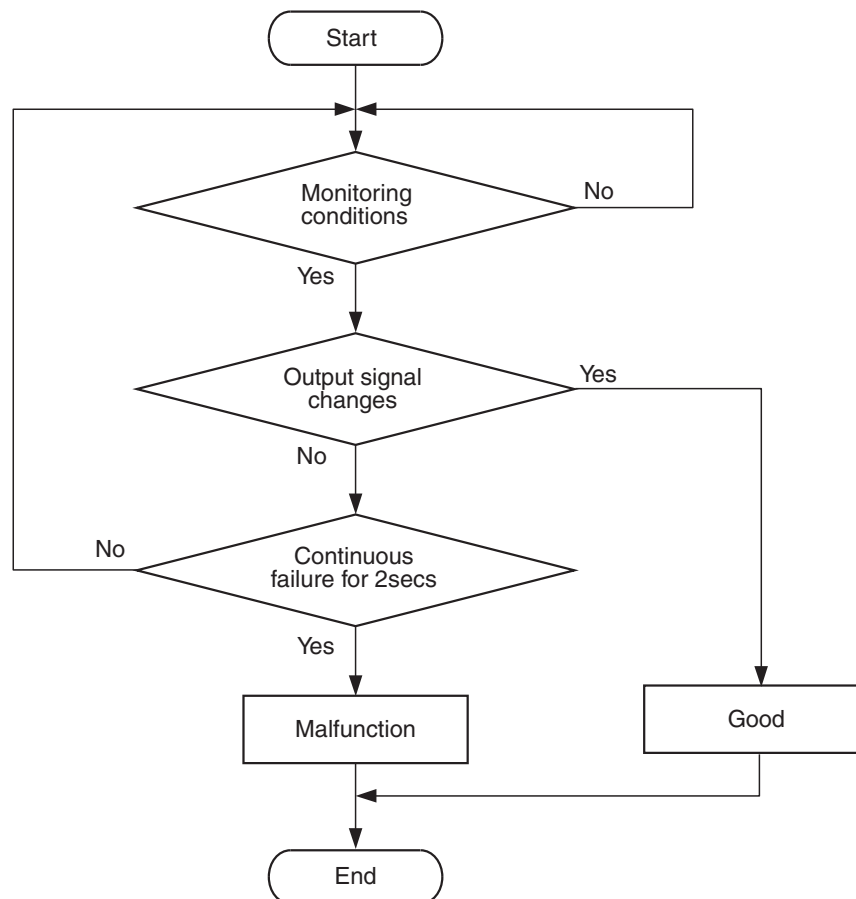
**MONITOR EXECUTION CONDITIONS  
(Other monitor and Sensor)**

**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**

AK604334

**Check Condition**

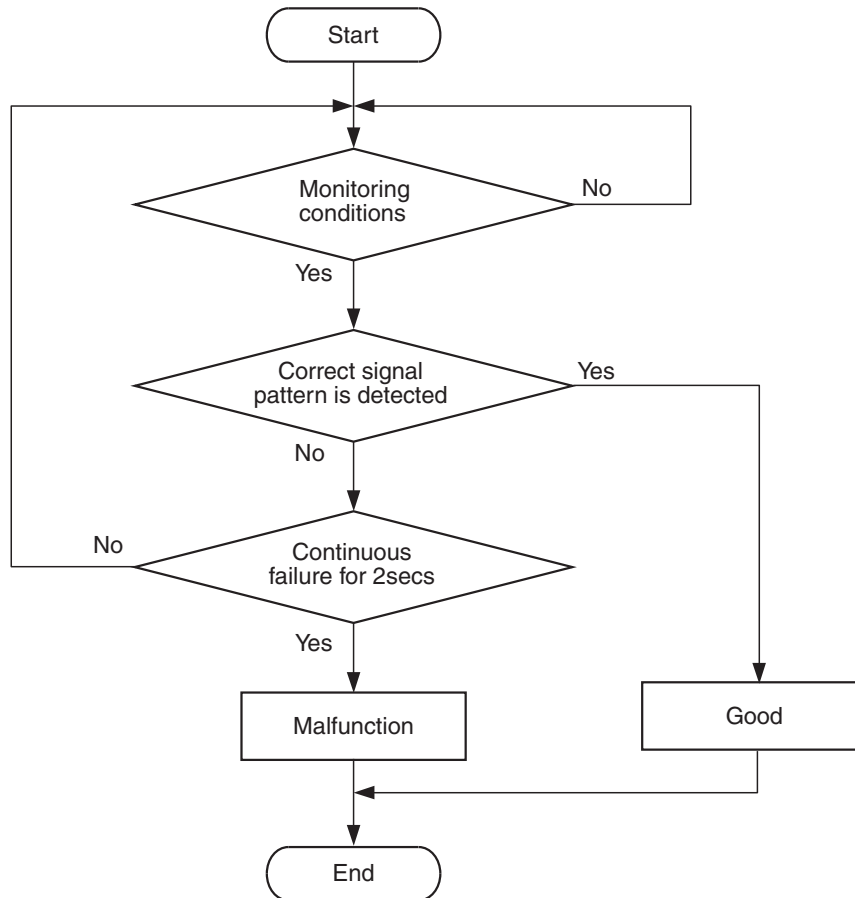
- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

**Judgement Criterion**

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

## DTC SET CONDITIONS <Range/Performance problem – alignment>

### Logic Flow Chart



AK705067

#### Check Condition

- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

#### Judgement Criterion

- Normal signal pattern is not inputted for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

#### FAIL-SAFE AND BACKUP FUNCTION

- None

#### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

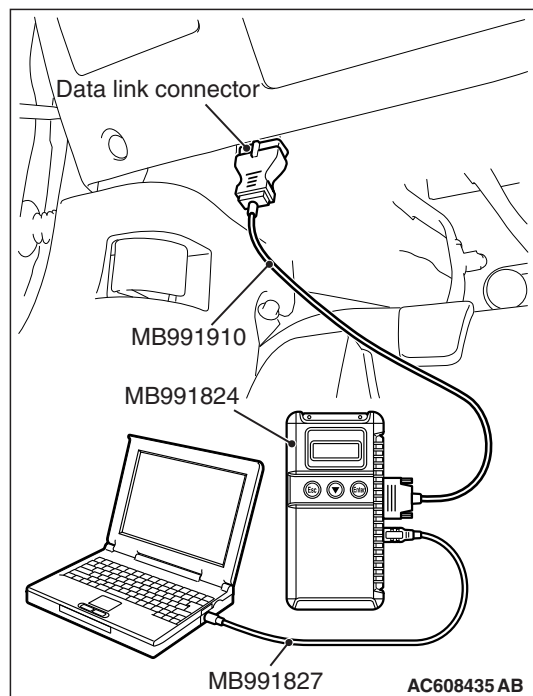
#### TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or harness damage, or connector damage.
- Crankshaft position sensing ring failed
- ECM failed.

### DIAGNOSIS

#### Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness



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

**⚠ CAUTION**

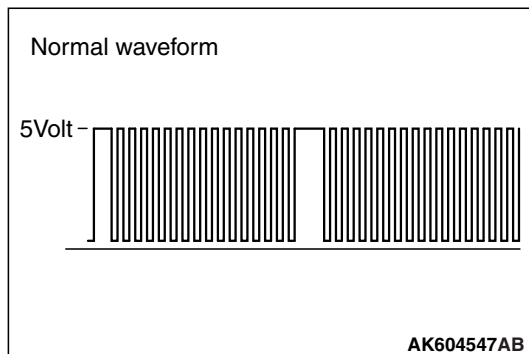
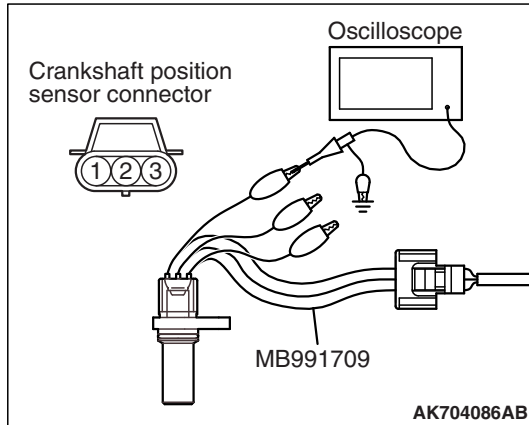
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

**Q: Is the sensor operating properly?**

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

**NO :** Go to Step 2.



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

- (1) Disconnect the crankshaft position sensor connector B-105 and connect the test harness special tool (MB991709) between the separated connectors (All terminals should be connected).

- (2) Connect the oscilloscope probe to terminal No. 3 of the crankshaft position sensor connector.

*NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 8.*

- (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-105 at crankshaft position sensor and harness connector B-108 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Go to Step 4.

**NO :** Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 20.

**STEP 4. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.**

- (1) Start the engine and run at idle.
- (2) 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.
- (3) 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 ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 20.

**STEP 5. Check harness connector B-105 at crankshaft position sensor for damage.****Q: Is the harness connector in good condition?**

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 20.

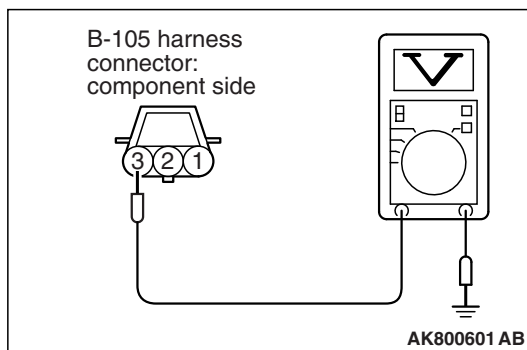
**STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-105.**

- (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. 3 and ground.
  - Voltage should be between 4.9 and 5.1 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

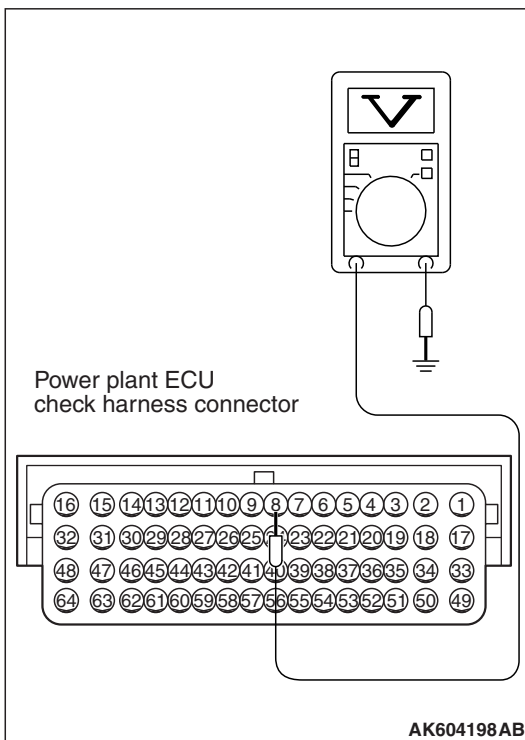
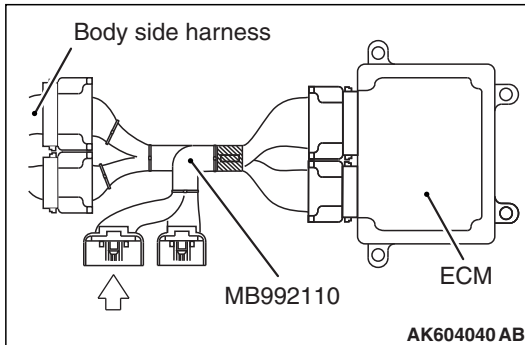
**YES :** Go to Step 10.

**NO :** Go to Step 7.

**STEP 7. Check harness connector B-108 at ECM 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 20.



**STEP 8. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Disconnect the crankshaft position sensor connector B-105.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 8 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 :** Repair harness wire between crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8) because of open circuit. Then go to Step 20.

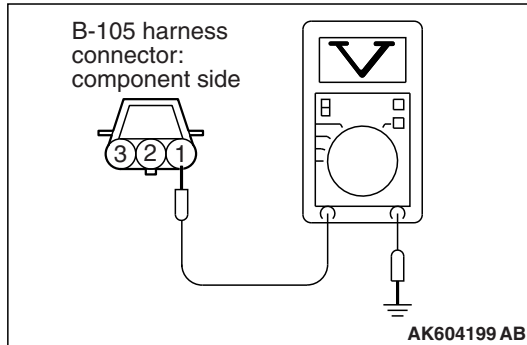
**NO :** Go to Step 9.

**STEP 9. Check for short circuit to ground between crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 20.

**NO :** Repair it. Then go to Step 20.

**STEP 10. Measure the sensor supply voltage at crankshaft position sensor 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. 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 13.

**NO :** Go to Step 11.

**STEP 11. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 12.

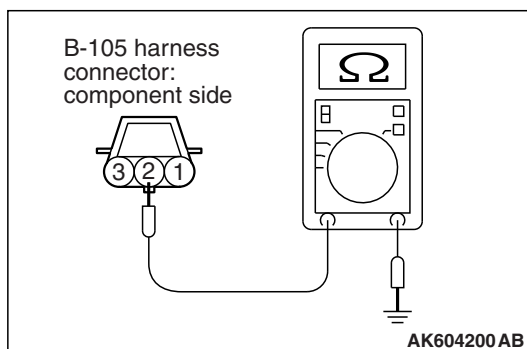
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 20.

**STEP 12. Check for open circuit and short circuit to ground between crankshaft position sensor connector B-105 (terminal No. 1) and ECM connector B-108 (terminal No. 9).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 20.

**NO :** Repair it. Then go to Step 20.

**STEP 13. Check the continuity at crankshaft position sensor harness side connector B-105.**

- (1) Disconnect the connector B-105 and measure at the harness side.
- (2) Check for the continuity between terminal No. 2 and ground.
  - Continuity (2 ohms or less)

**Q: Does continuity exist?**

**YES :** Go to Step 16.

**NO :** Go to Step 14.

---

**STEP 14. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 15.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 20.

---

**STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-105 (terminal No. 2) and ECM connector B-108 (terminal No. 24).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 20.

**NO :** Repair it. Then go to Step 20.

---

**STEP 16. Check harness connector B-108 at ECM 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 ECM connector B-108 (terminal No. 9) and crankshaft position sensor connector B-105 (terminal No. 1).**

**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 crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 19.

**NO :** Repair it. Then go to Step 20.

---

**STEP 19. Check the crankshaft position sensing ring.**

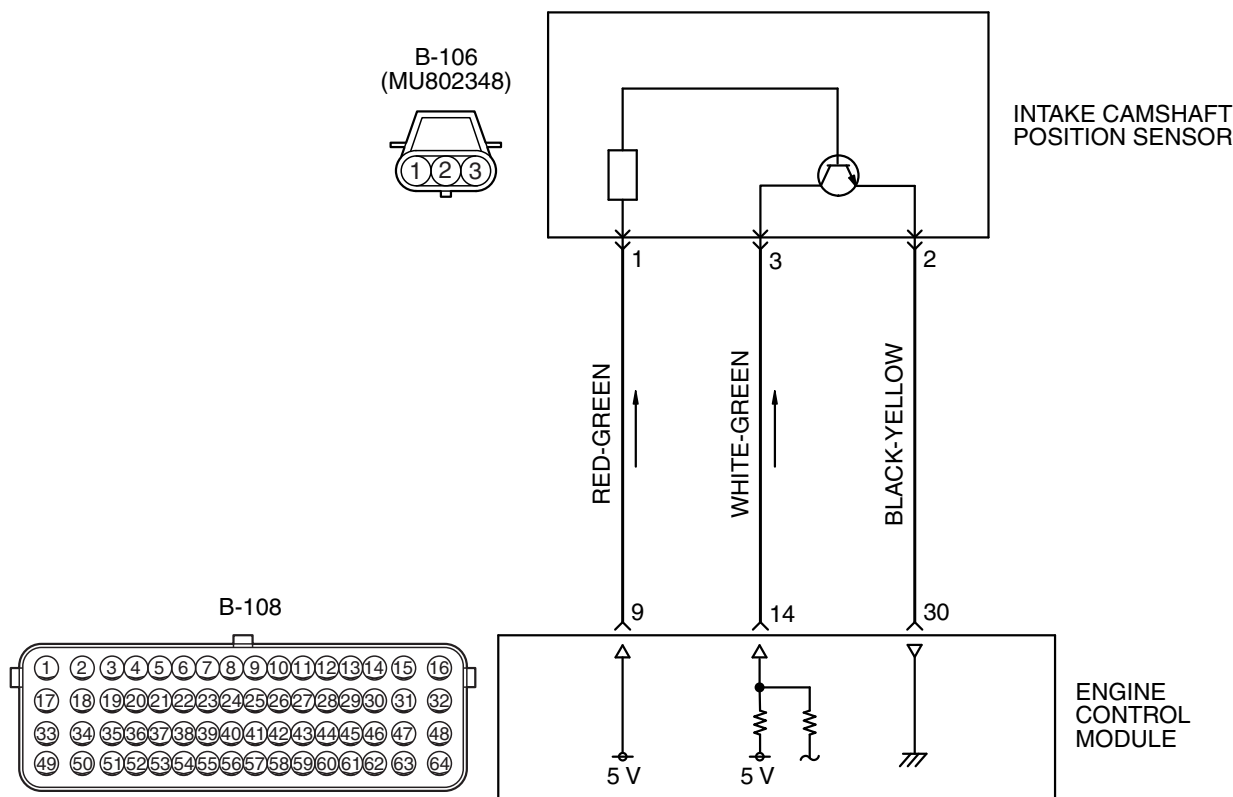
**Q: Is the crankshaft position sensing ring in good condition?**

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

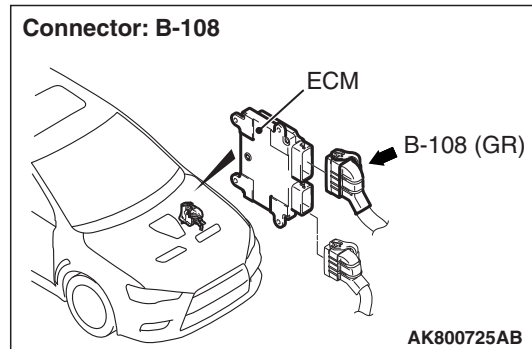
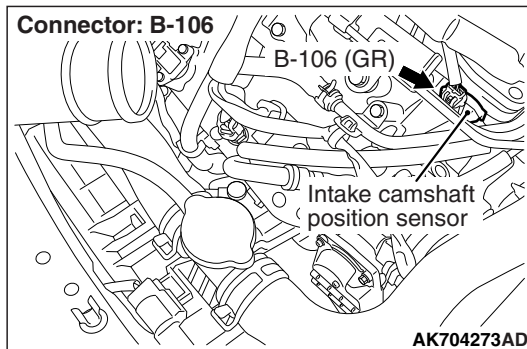
**NO :** Replace the crankshaft sensing ring. Then go to Step 20.

**STEP 20. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0335 set?****YES** : Retry the troubleshooting.**NO** : The inspection is complete.**DTC P0340: Intake Camshaft Position Sensor Circuit****INTAKE CAMSHAFT POSITION SENSOR CIRCUIT**

AK604246AE



## CIRCUIT OPERATION

- The intake camshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the intake camshaft position sensor is grounded with ECM (terminal No. 30).
- A 5-volt voltage is applied on the intake camshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 14). The intake camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

## TECHNICAL DESCRIPTION

- The intake 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.
- When the engine is running, the intake camshaft position sensor outputs a pulse signal.
- The ECM checks whether pulse signal is input while the engine is cranking.

## DESCRIPTIONS OF MONITOR METHODS

- Intake camshaft position sensor signal does not change.
- Intake 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)**

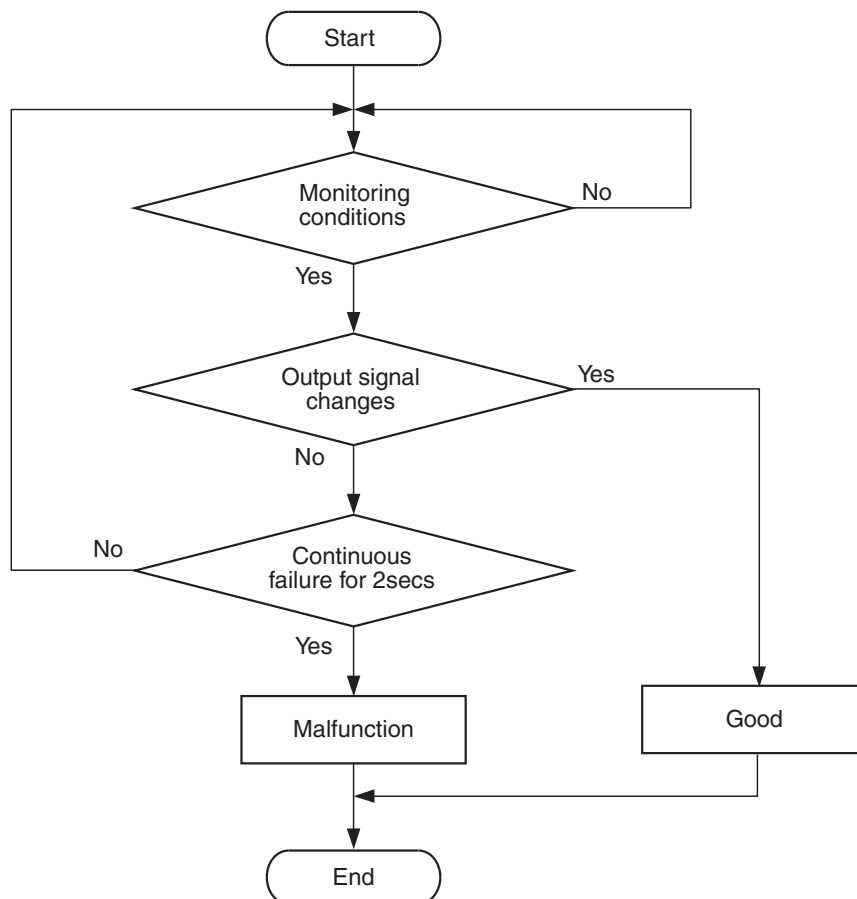
- Not applicable

**Sensor (The sensor below is determined to be normal)**

- Not applicable

## DTC SET CONDITIONS &lt;Circuit continuity&gt;

## Logic Flow Chart



AK604334

**Check Condition**

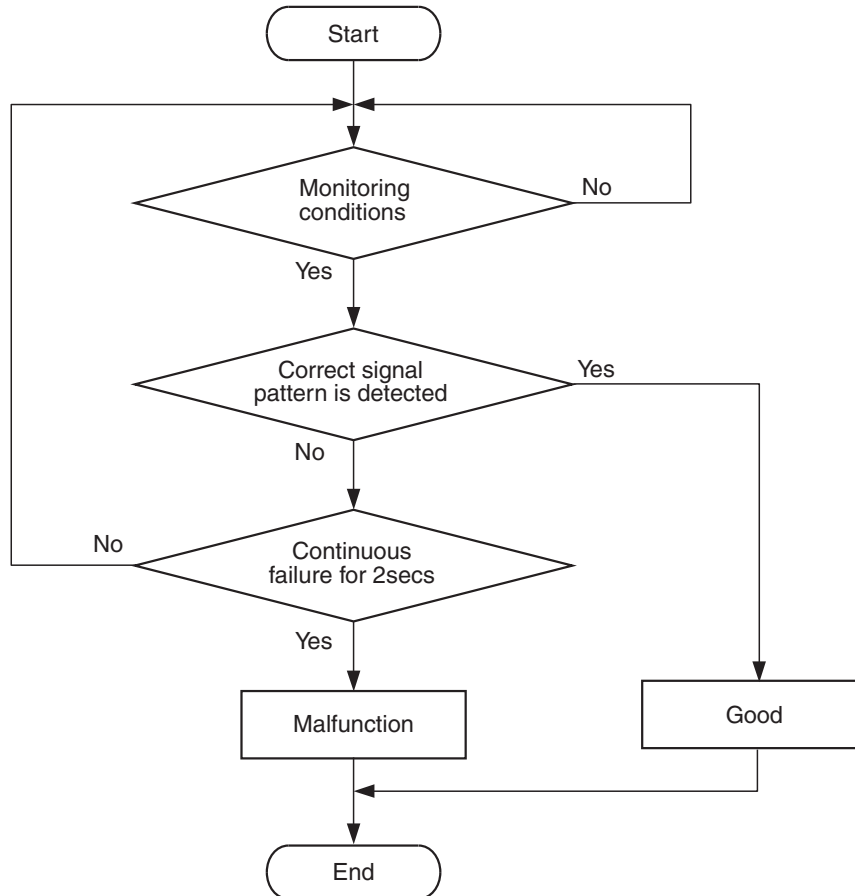
- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

**Judgement Criterion**

- Intake camshaft position sensor output voltage does not change (no pulse signal is input) for 2 seconds.

**DTC SET CONDITIONS <Range/Performance problem – alignment>**

**Logic Flow Chart**



AK705067

**Check Condition**

- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

**Judgement Criterion**

- Normal signal pattern is not inputted for cylinder identification from the crankshaft position sensor signal and intake camshaft position sensor signal for 2 seconds.

**FAIL-SAFE AND BACKUP FUNCTION**

- Engine runs in learned pattern until engine stops.
- Does not control variable valve timing (V.V.T.).

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

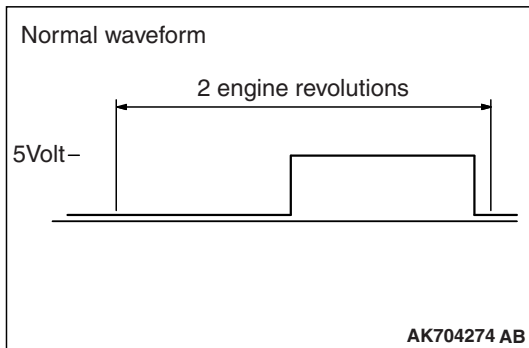
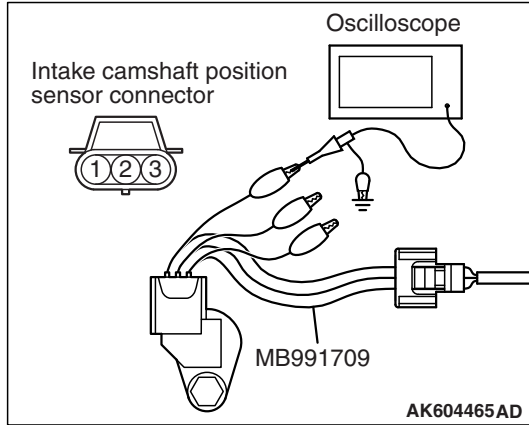
**TROUBLESHOOTING HINTS (The most likely causes for this code to be set are: )**

- Intake camshaft position sensor failed.
- Open or shorted intake camshaft position sensor circuit, or harness damage, or connector damage.
- Intake camshaft failed.
- ECM failed.

**DIAGNOSIS**

**Required Special Tools:**

- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

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

- (1) Disconnect the intake camshaft position sensor connector B-106, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)
- (2) Connect the oscilloscope probe to the intake camshaft position sensor side connector terminal No. 3.  
*NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 14.*
- (3) Start the engine and run at idle.

- (4) Check the waveform.
  - The waveform should show a pattern similar to the illustration.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the waveform normal?**

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

**STEP 2. Check harness connector B-106 at intake camshaft position sensor and harness connector B-108 at ECM for damage.****Q: Are the harness connectors 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 19.

---

**STEP 3. Check the trouble symptoms.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0340 set?**

- YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.
- 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-106 at intake 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 19.

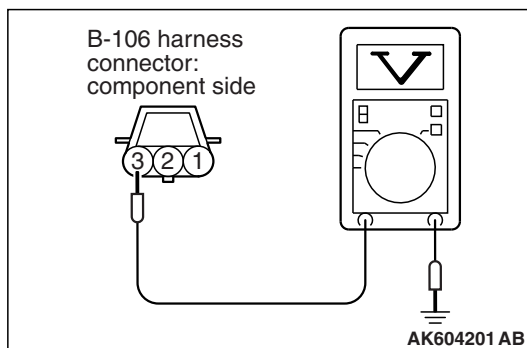
---

**STEP 5. Measure the sensor supply voltage at intake camshaft position sensor harness side connector B-106.**

- (1) Disconnect the connector B-106 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should be 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 9.
- NO :** Go to Step 6.

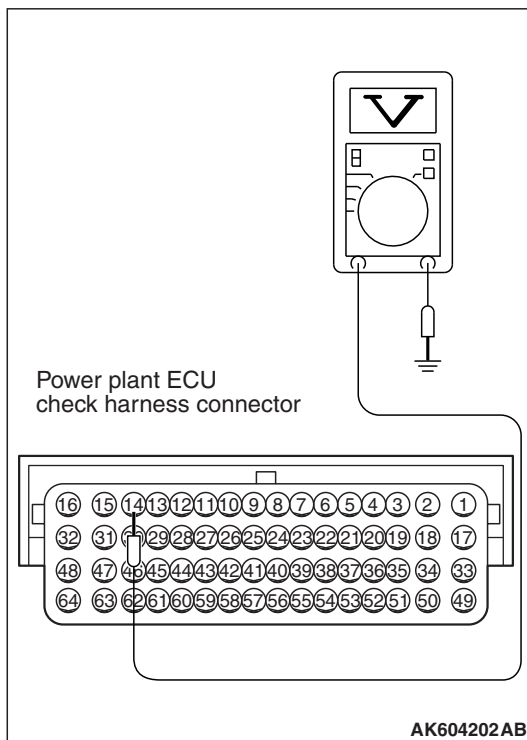
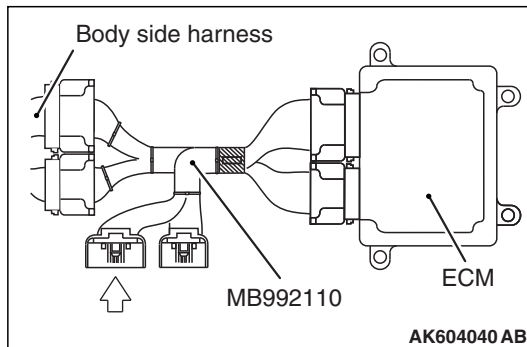


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**STEP 6. Check harness connector B-108 at ECM for damage.**

**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 19.



**STEP 7. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Disconnect the intake camshaft position sensor connector B-106.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 14 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 :** Repair harness wire between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14) because of open circuit. Then go to Step 19.

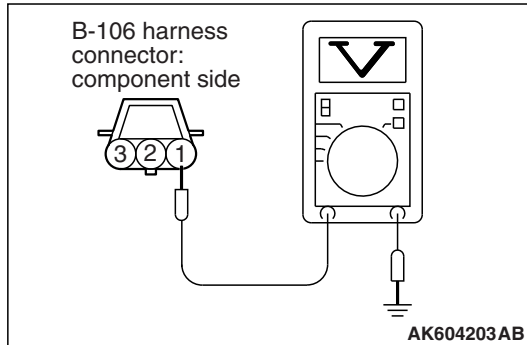
**NO :** Go to Step 8.

**STEP 8. Check for short circuit to ground between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-11 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-9. Then go to Step 19.

**NO :** Repair it. Then go to Step 19.



**STEP 9. Measure the sensor supply voltage at intake camshaft position sensor harness side connector B-106.**

- (1) Disconnect the connector B-106 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 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 12.

**NO :** Go to Step 10.

**STEP 10. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 19.

**STEP 11. Check for open circuit and short circuit to ground between intake camshaft position sensor connector B-106 (terminal No. 1) and ECM connector B-108 (terminal No. 9).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.

**NO :** Repair it. Then go to Step 19.

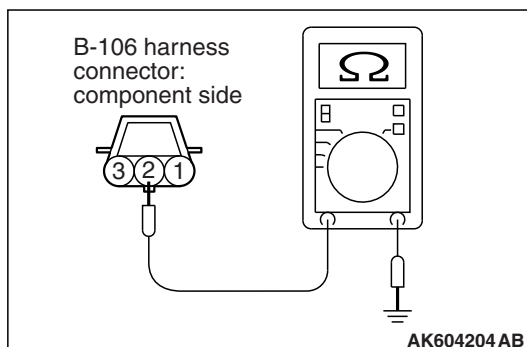
**STEP 12. Check the continuity at intake camshaft position sensor harness side connector B-106.**

- (1) Disconnect the connector B-106 and measure at the harness side.
- (2) Check for the continuity between terminal No. 2 and ground.
  - Continuity (2 ohms or less).

**Q: Does continuity exist?**

**YES :** Go to Step 15.

**NO :** Go to Step 13.



---

**STEP 13. Check harness connector B-108 at ECM 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 19.

---

**STEP 14. Check for open circuit and harness damage between intake camshaft position sensor connector B-106 (terminal No. 2) and ECM connector B-108 (terminal No. 30).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.

**NO :** Repair it. Then go to Step 19.

---

**STEP 15. Check harness connector B-108 at ECM 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 19.

---

**STEP 16. Check for harness damage between ECM connector B-108 (terminal No. 9) and intake camshaft position sensor connector B-106 (terminal No. 1).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 17.

**NO :** Repair it. Then go to Step 19.

---

**STEP 17. Check for harness damage between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 18.

**NO :** Repair it. Then go to Step 19.

---

**STEP 18. Check the intake camshaft position sensing portion.**

**Q: Is the intake camshaft position sensing portion in good condition?**

**YES :** Replace the intake camshaft position sensor. Then go to Step 19.

**NO :** Replace the intake camshaft. Then go to Step 19.

**STEP 19. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

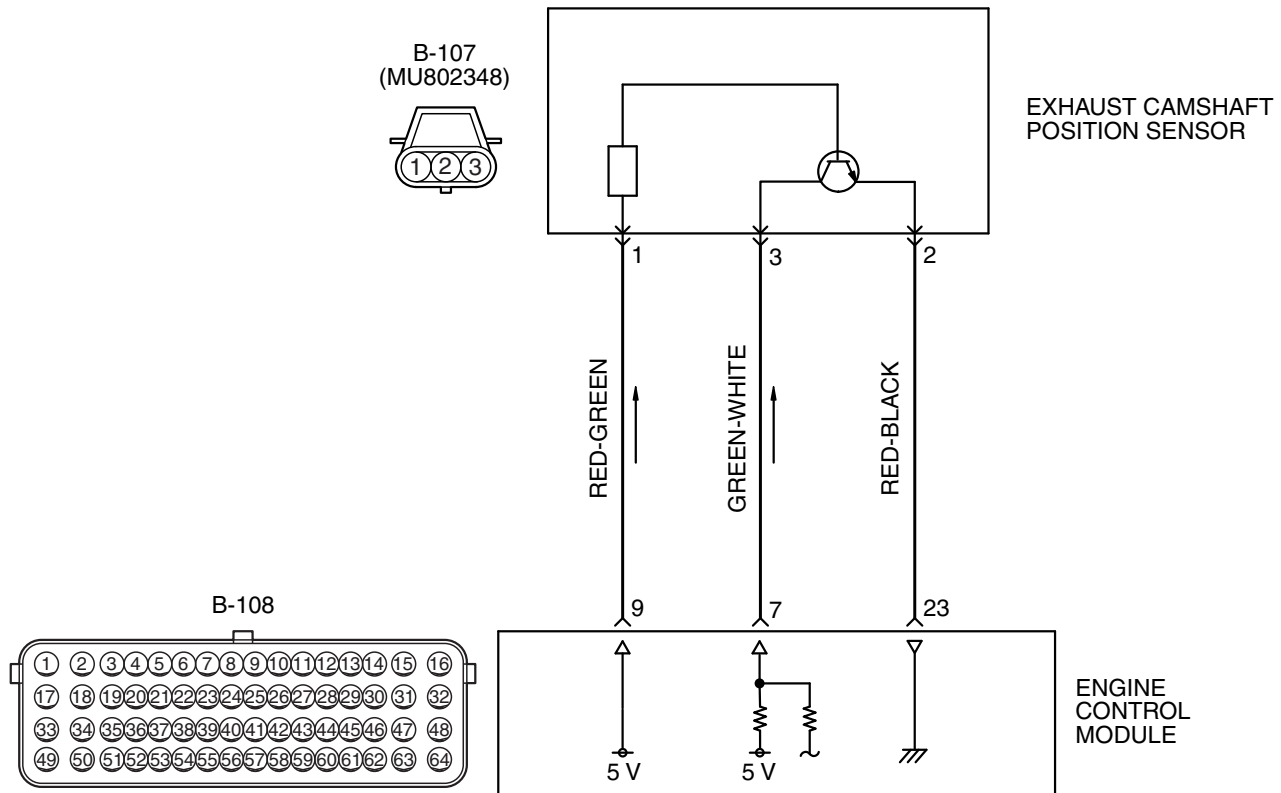
**Q: Is DTC P0340 set?**

**YES :** Retry the troubleshooting.

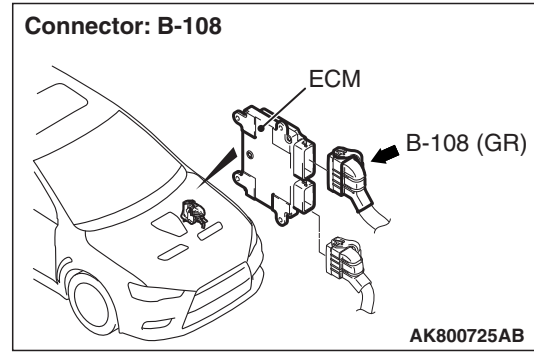
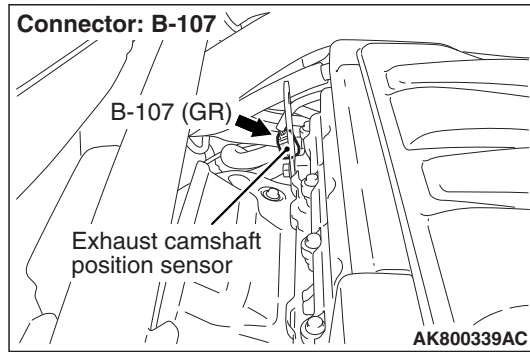
**NO :** The inspection is complete.

**DTC P0365: Exhaust Camshaft Position Sensor Circuit**

**EXHAUST CAMSHAFT POSITION SENSOR CIRCUIT**



AK604247AE



## CIRCUIT OPERATION

- The exhaust camshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the exhaust camshaft position sensor is grounded with ECM (terminal No. 23).
- A 5-volt voltage is applied on the exhaust camshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 7). The exhaust camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

## TECHNICAL DESCRIPTION

- The exhaust 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.
- When the engine is running, the exhaust camshaft position sensor outputs a pulse signal.
- The ECM checks whether pulse signal is input while the engine is cranking.

## DESCRIPTIONS OF MONITOR METHODS

- Exhaust camshaft position sensor signal does not change.
- Exhaust 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)**

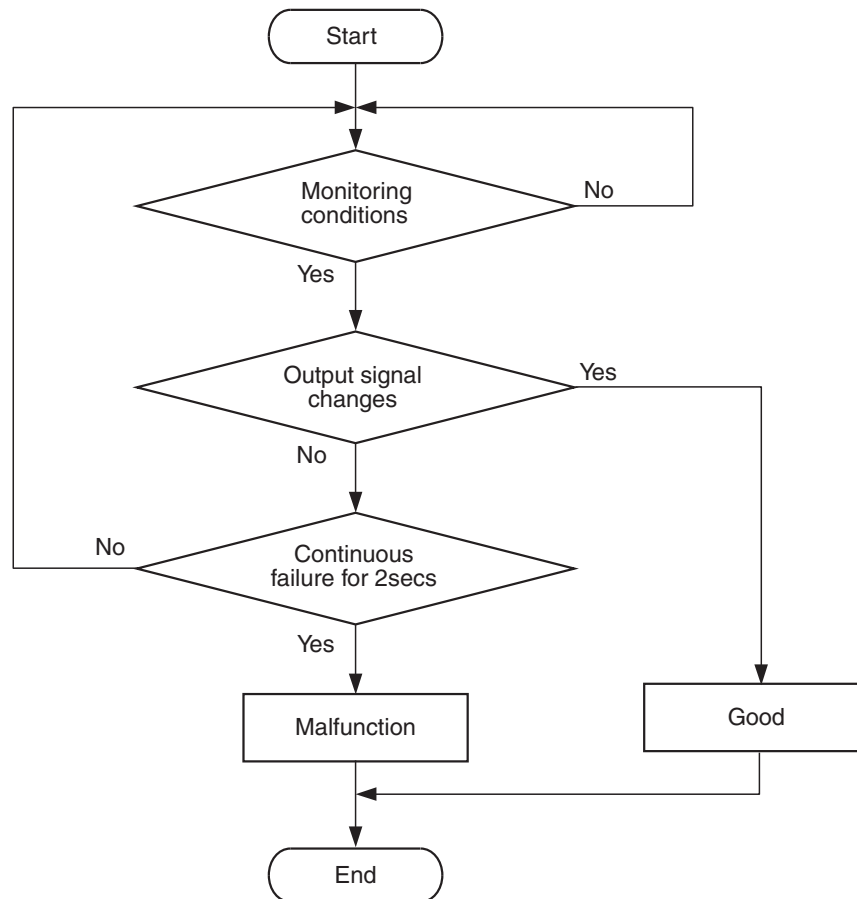
- Not applicable

**Sensor (The sensor below is determined to be normal)**

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



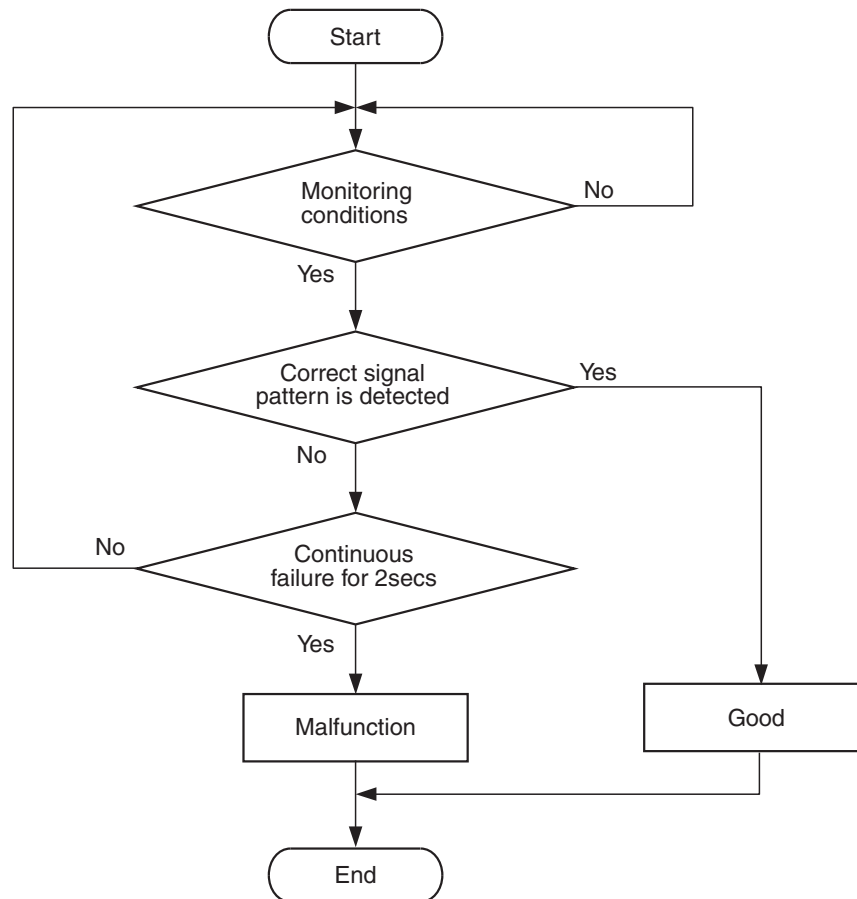
AK604334

**Check Condition**

- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

**Judgement Criterion**

- Exhaust camshaft position sensor output voltage does not change (no pulse signal is input) for 2 seconds.

**DTC SET CONDITIONS <Range/Performance problem – alignment>****Logic Flow Chart**

AK705067

**Check Condition**

- Engine is being cranked.
- or
- Engine speed is more than 500 r/min excluding during cranking.

**Judgement Criterion**

- Normal signal pattern is not inputted from the crankshaft position sensor signal and exhaust camshaft position sensor signal for 2 seconds.

**FAIL-SAFE AND BACKUP FUNCTION**

- Does not control variable valve timing (V.V.T.).

**OBD-II DRIVE CYCLE PATTERN**

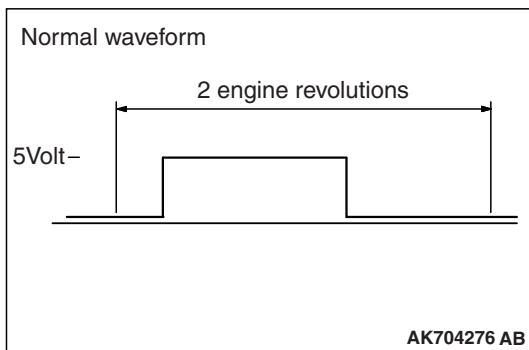
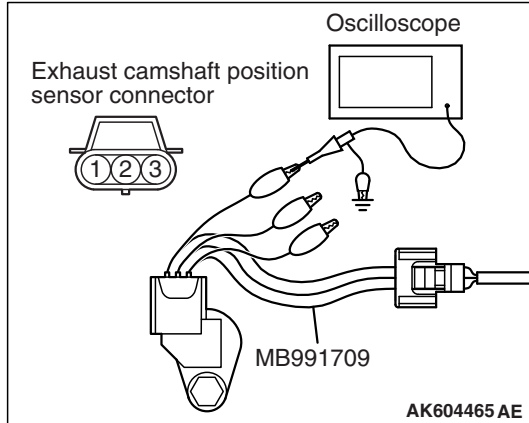
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Exhaust camshaft position sensor failed.
- Open or shorted exhaust camshaft position sensor circuit, or harness damage, or connector damage.
- Exhaust camshaft failed.
- ECM failed.

**DIAGNOSIS****Required Special Tools:**

- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness



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

(1) Disconnect the exhaust camshaft position sensor connector B-107, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the exhaust camshaft position sensor side connector terminal No. 3.

*NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 7.*

(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-107 at exhaust camshaft position sensor and harness connector B-108 at ECM for damage.**

**Q: Are the harness connectors 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 19.

**STEP 3. Check the trouble symptoms.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0365 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.

**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-107 at exhaust 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 19.

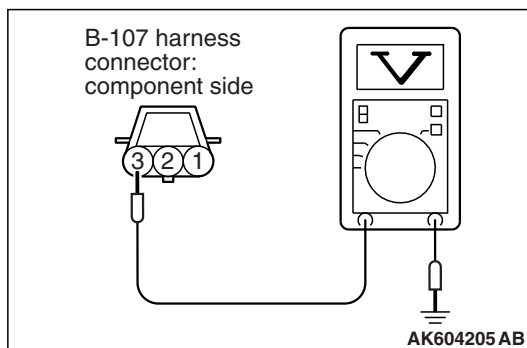
**STEP 5. Measure the sensor supply voltage at exhaust camshaft position sensor harness side connector B-107.**

- (1) Disconnect the connector B-107 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should be between 4.9 and 5.1 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

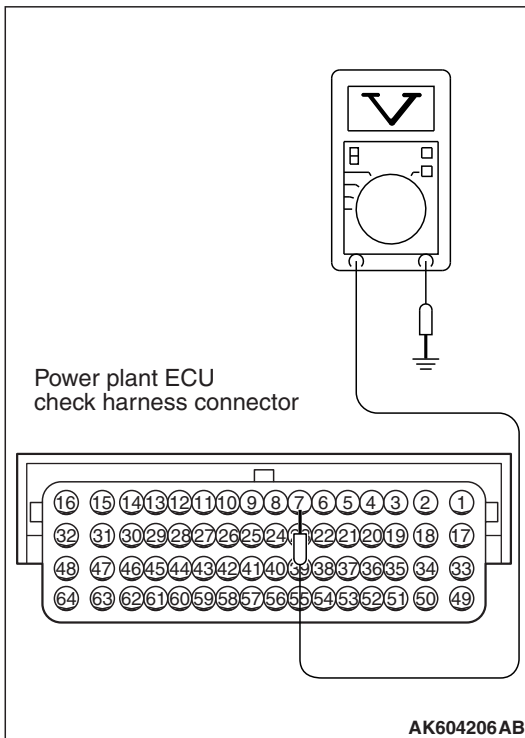
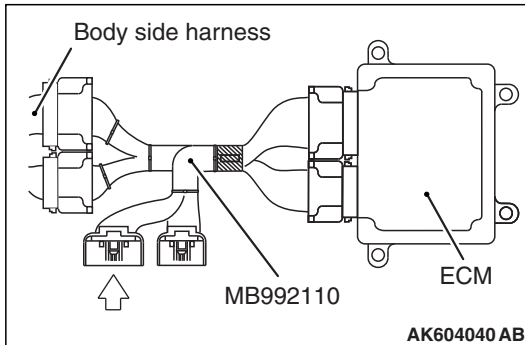
**YES :** Go to Step 9.

**NO :** Go to Step 6.

**STEP 6. Check harness connector B-108 at ECM 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 19.



**STEP 7. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Disconnect the exhaust camshaft position sensor connector B-107.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 7 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 :** Repair harness wire between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7) because of open circuit. Then go to Step 19.

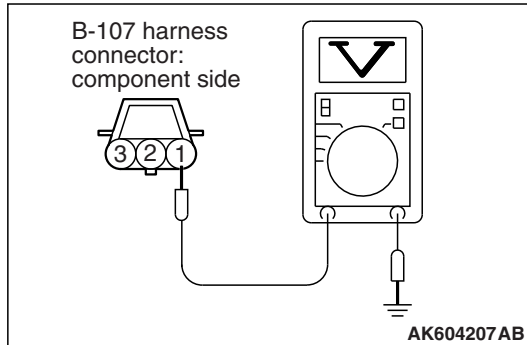
**NO :** Go to Step 8.

**STEP 8. Check for short circuit to ground between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-11 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-9. Then go to Step 19.

**NO :** Repair it. Then go to Step 19.


**STEP 9. Measure the sensor supply voltage at exhaust camshaft position sensor harness side connector B-107.**

- (1) Disconnect the connector B-107 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 12.

**NO :** Go to Step 10.

**STEP 10. Check harness connector B-108 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 11.

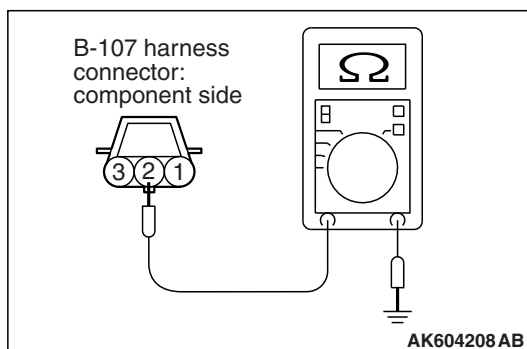
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 19.

**STEP 11. Check for open circuit and short circuit to ground between exhaust camshaft position sensor connector B-107 (terminal No. 1) and ECM connector B-108 (terminal No. 9).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.

**NO :** Repair it. Then go to Step 19.


**STEP 12. Check the continuity at exhaust camshaft position sensor harness side connector B-107.**

- (1) Disconnect the connector B-107 and measure at the harness side.
- (2) Check for the continuity between terminal No. 2 and ground.
  - Continuity (2 ohms or less).

**Q: Does continuity exist?**

**YES :** Go to Step 15.

**NO :** Go to Step 13.

---

**STEP 13. Check harness connector B-108 at ECM 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 19.

---

**STEP 14. Check for open circuit and harness damage between exhaust camshaft position sensor connector B-107 (terminal No. 2) and ECM connector B-108 (terminal No. 23).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 19.

**NO :** Repair it. Then go to Step 19.

---

**STEP 15. Check harness connector B-108 at ECM 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 19.

---

**STEP 16. Check for harness damage between ECM connector B-108 (terminal No. 9) and exhaust camshaft position sensor connector B-107 (terminal No. 1).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 17.

**NO :** Repair it. Then go to Step 19.

---

**STEP 17. Check for harness damage between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7).**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 18.

**NO :** Repair it. Then go to Step 19.

---

**STEP 18. Check the exhaust camshaft position sensing portion.**

**Q: Is the exhaust camshaft position sensing portion in good condition?**

**YES :** Replace the exhaust camshaft position sensor. Then go to Step 19.

**NO :** Replace the exhaust camshaft. Then go to Step 19.

**STEP 19. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0365 set?****YES** : Retry the troubleshooting.**NO** : The inspection is complete.

---

**DTC P0420: Warm Up Catalyst Efficiency Below Threshold**

---

**TECHNICAL DESCRIPTION**

- The signal from the heated oxygen sensor (rear) differs from the heated oxygen sensor (front), because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the heated oxygen sensor (front) becomes similar to the heated oxygen sensor (rear).
- The ECM compares the output of the heated oxygen sensor (front and rear) signals.

**DESCRIPTIONS OF MONITOR METHODS**

Heated oxygen sensor (front and rear) 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

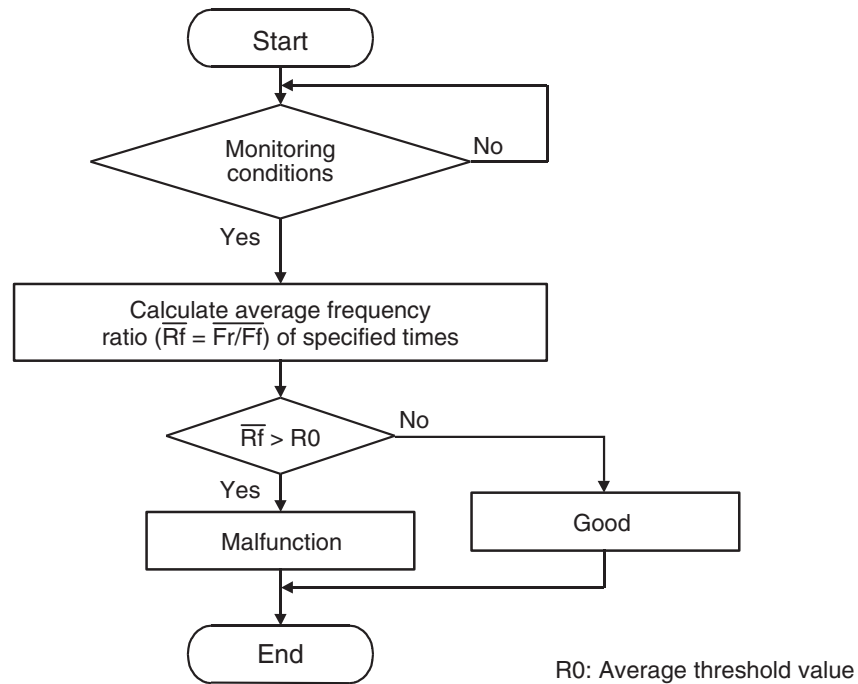
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor (front) heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor (front) inactive monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- Heated oxygen sensor (rear) feedback control 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



AK604337

#### Check Conditions

- Engine speed is less than 3,500 r/min.
- Accelerator pedal is depressed.
- Mass airflow rate is between 13 and 45 g/sec.
- More than 3.5 seconds have passed after the above-mentioned three conditions have been met.
- Intake air temperature is more than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is more than 1.5 km/h (1.0 mph).
- The ECM monitors the maximum 5 times per drive cycle under these conditions.
- Short-term fuel trim is between  $-20$  percent and  $+17$  percent.
- The cumulative mass airflow is more than 1,638 g.

#### Judgement Criterion

- When the monitoring for 10 seconds is carried out 5 times, the frequency ratio of rear and front signals is more than the specified value.

*NOTE: The specified value varies depending on the average air flow rate.*

#### FAIL-SAFE AND BACKUP FUNCTION

- None

#### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 [P.13B-10](#).

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

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

#### DIAGNOSIS

##### Required Special Tools:

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

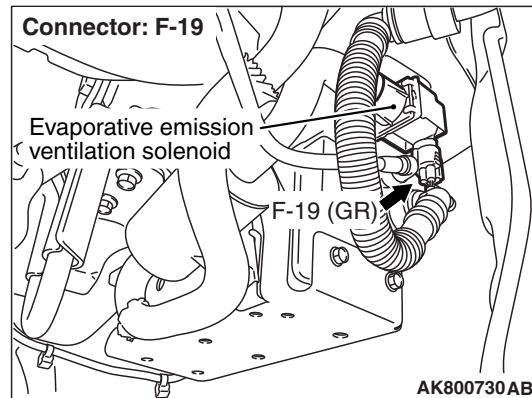
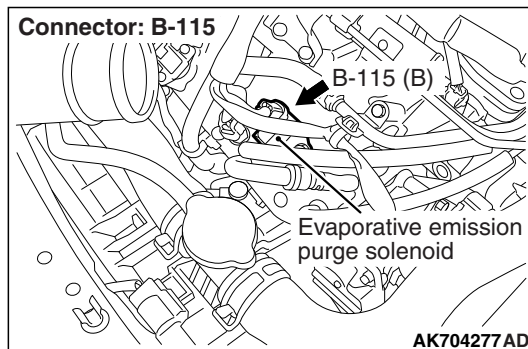
**STEP 1. Replace the catalytic converter.**

- (1) Replace the catalytic converter.
- (2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 [P.13B-10](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0420 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#).

**NO :** The inspection is complete.

**DTC P0441: Evaporative Emission Control System Incorrect Purge Flow****TECHNICAL DESCRIPTION**

- ECM 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)**

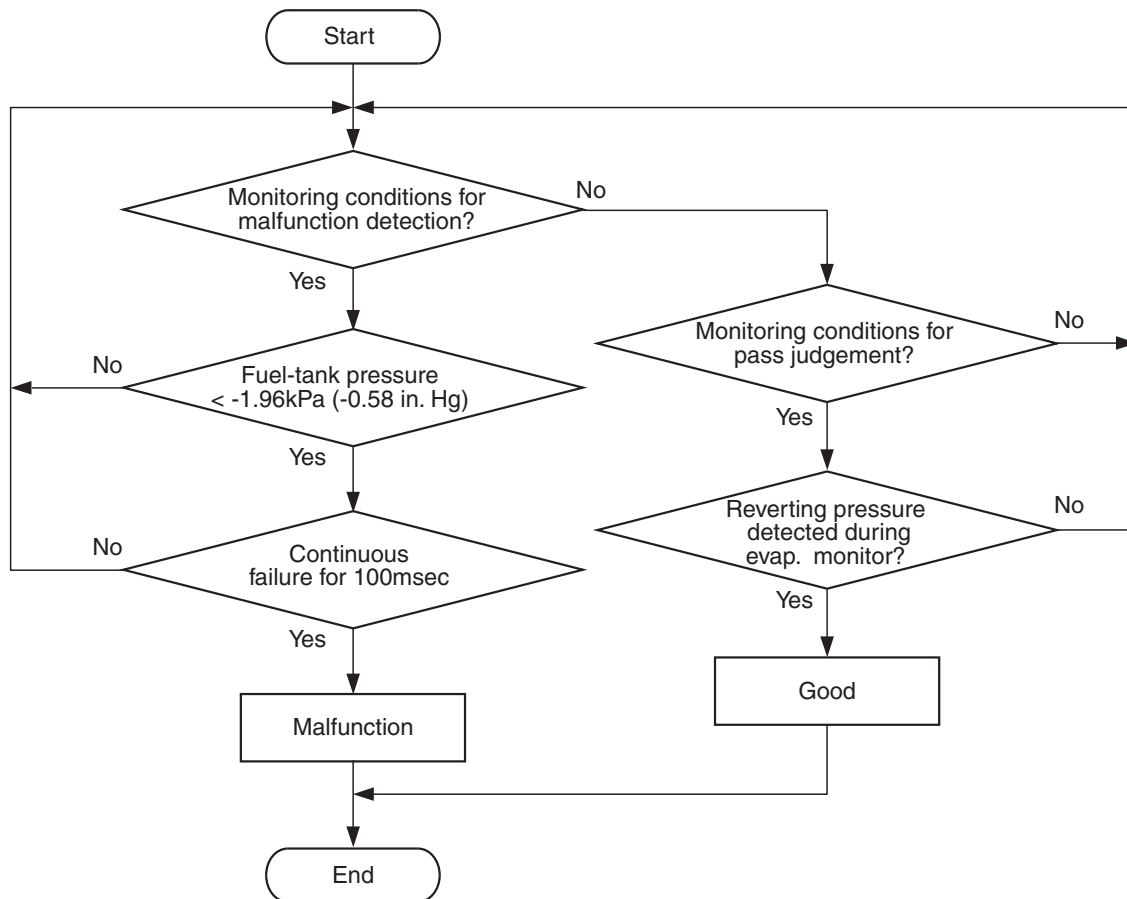
- Fuel tank differential pressure sensor monitor

**Sensor (The sensor below is determined to be normal)**

- Not applicable

## DTC SET CONDITIONS

### Logic Flow Chart



AK604338

#### Check Conditions

- Engine is running.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have passed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

#### Judgement Criterion

- The pressure in the fuel tank is less than -1.96 kPa (-0.58 in.Hg) for 0.1 second.

#### FAIL-SAFE AND BACKUP FUNCTION

- None

#### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).

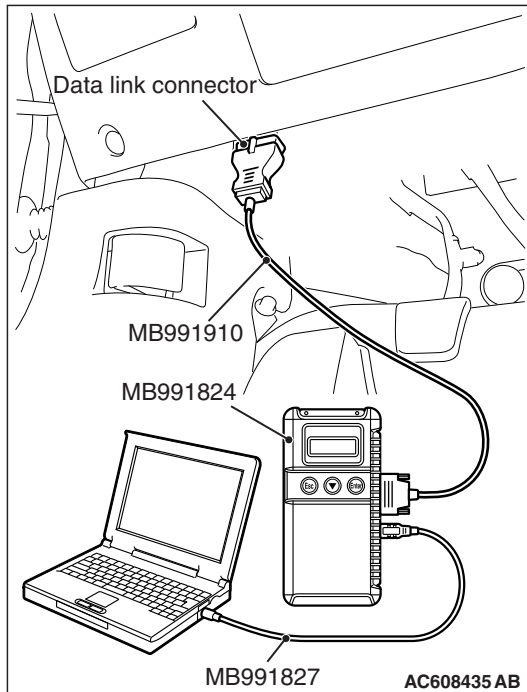
#### TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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 (M.U.T.-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 – Fuel Tank Differential Pressure Circuit Range/Performance Problem [P.13B-456](#).

**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 1,500 and 3,500 millivolts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the fuel tank pressure between 1,500 and 3,500 millivolts?**

**YES :** Go to Step 3.

**NO :** Refer to DTC P0451 – Fuel Tank Differential Pressure Circuit Range/Performance Problem [P.13B-456](#).

---

**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.

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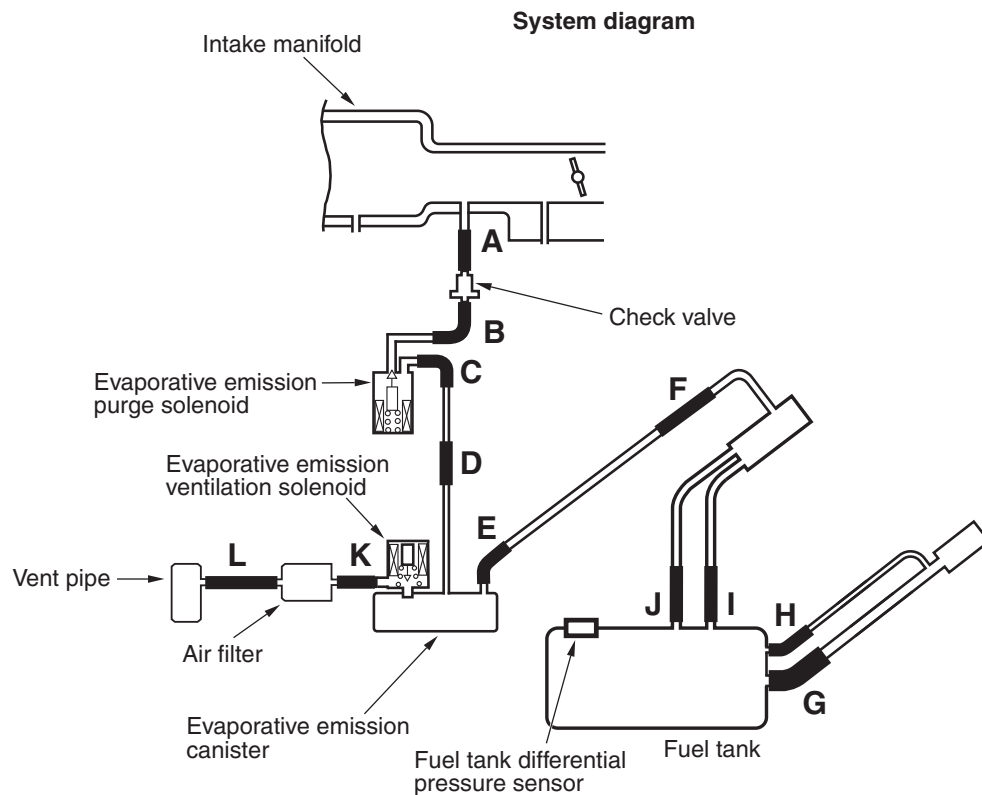
**STEP 5. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).
- (2) Read the diagnostic trouble code (DTC).

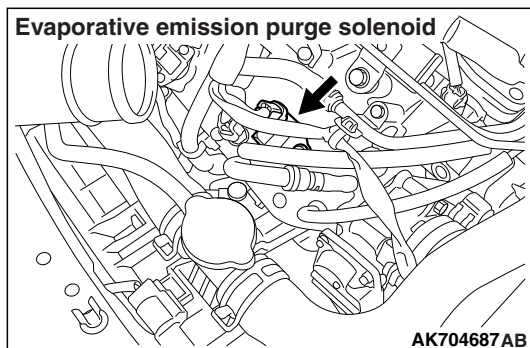
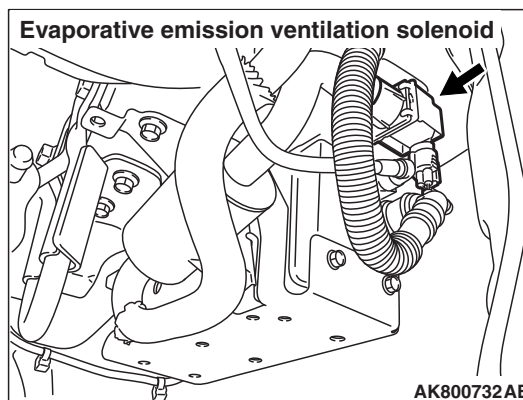
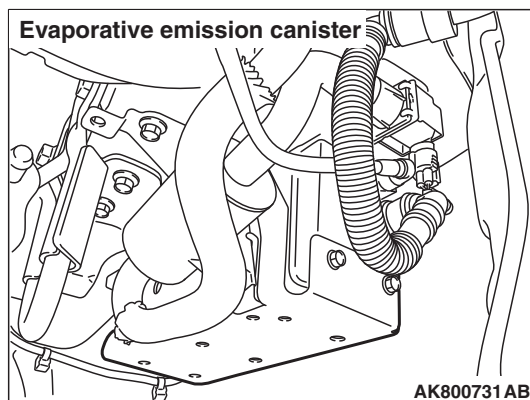
**Q: Is DTC P0441 set?**

**YES** : Retry the troubleshooting.

**NO** : The inspection is complete.

**DTC P0442: Evaporative Emission Control System Leak Detected (small leak)**

AK704684 AB



## TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM 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 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)**

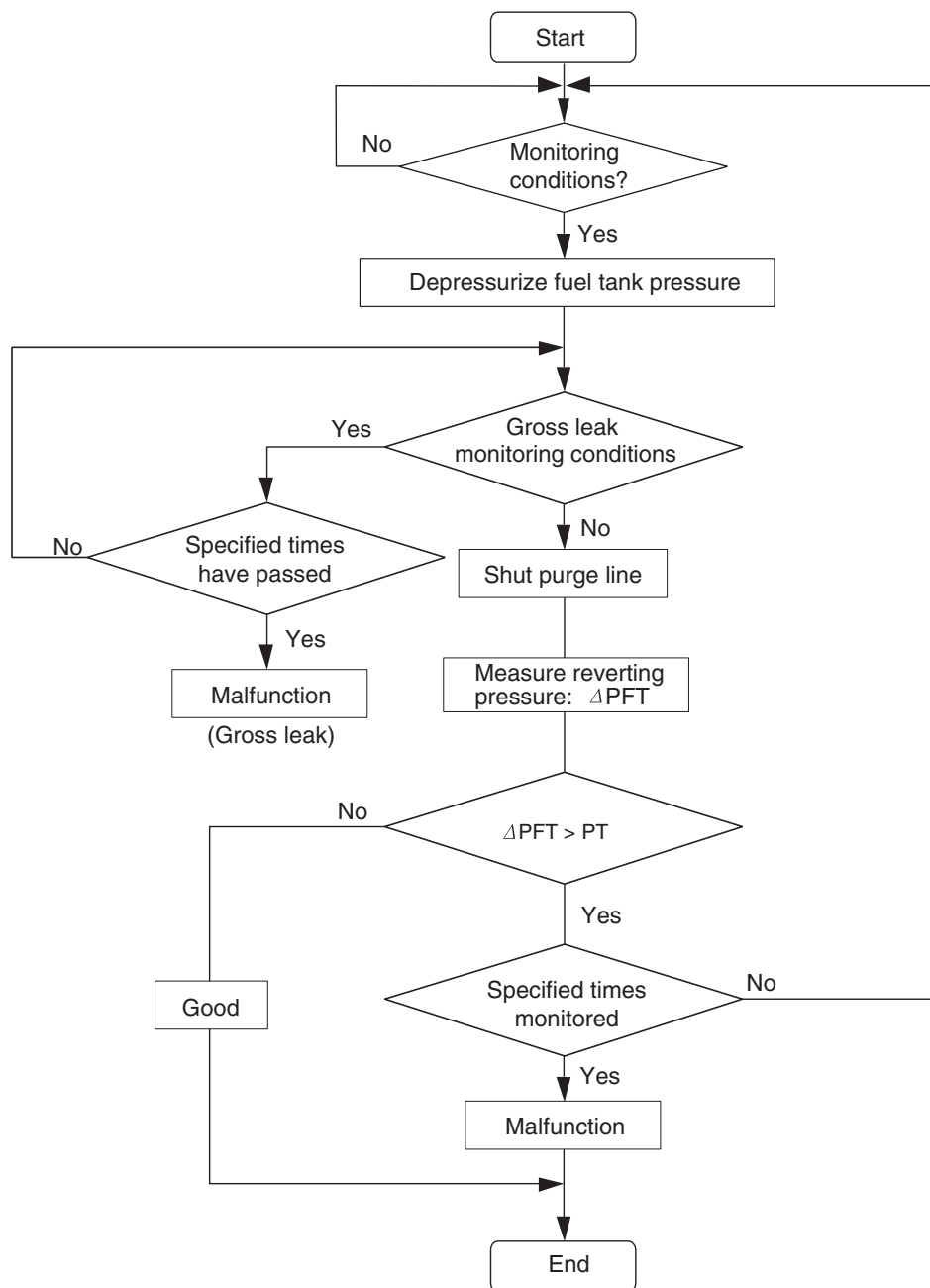
- Evaporative emission purge system monitor
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel tank differential pressure sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

## Logic Flow Chart (Monitor Sequence)



AK604523AB

## Check Conditions

- Amount of remaining fuel is 15 – 40 percent of capacity when the engine is started.
- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 60°C (140°F).
- Intake air temperature is more than –10°C (14°F).
- Fuel temperature is less than 36°C (97°F).
- Power steering pressure switch: "OFF"
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 451 Pa (0.13 in.Hg).
- The pressure fluctuation is less than 647 Pa (0.19 in.Hg).

- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Vehicle speed is more than 20 km/h (12 mph).
- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 75 – 125 seconds

#### Judgement Criterion

- Internal pressure of the fuel tank has changed more than 1,010 Pa (0.29 in.Hg) in 20 seconds after the tank and vapor lines 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.*

#### Check Conditions

- Amount of remaining fuel is 40 – 85 percent of capacity when the engine is started.
- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 20°C (68°F).
- Intake air temperature is more than –10°C (14°F).
- Fuel temperature is less than 36°C (97°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Barometric pressure is more than 76 kPa (22.4 in.Hg).

- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 10 – 14 minutes

#### Judgement Criterion

- Internal pressure of the fuel tank has changed more than 1,922 Pa (0.56 in.Hg) in 88 seconds after the tank and vapor lines 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.*

#### FAIL-SAFE AND BACKUP FUNCTION

- None

#### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).

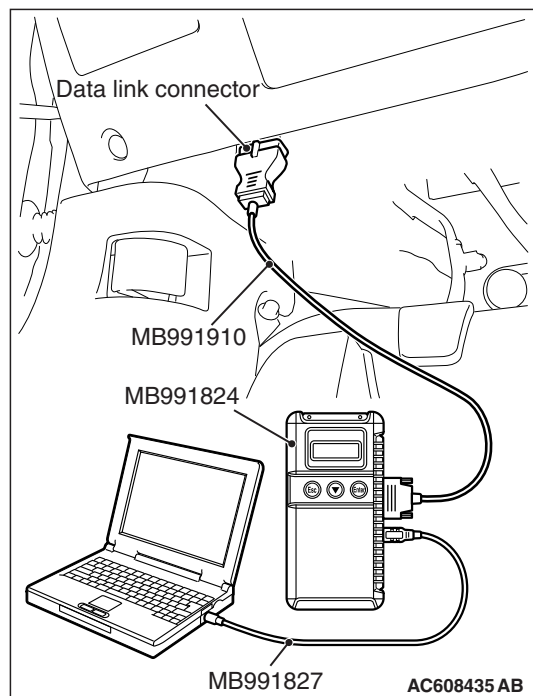
#### TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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 will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

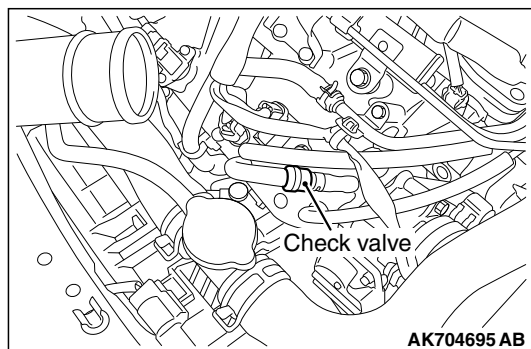
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991958.
- (4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (5) Start the engine.
- (6) Select "Special Function"
- (7) Select "Evap Leak Monitor"
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

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

**YES :** A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13B-51](#). If no other DTC's have been set, go to Step 2 .

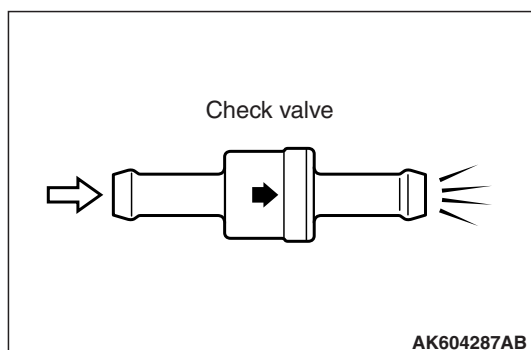
**NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> :** The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

**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.



**STEP 2. Test check valve.**

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

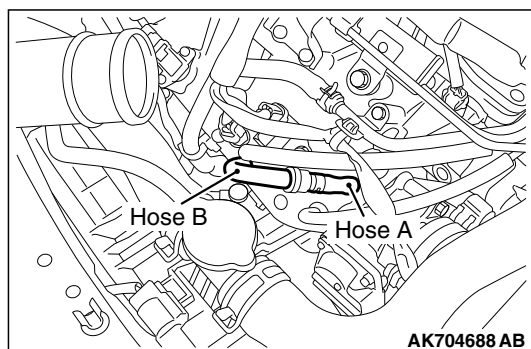


(2) Check valve should allow air to flow in only one direction.

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

**YES :** Go to Step 3 .

**NO :** Replace check valve. Then go to Step 14 .



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

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

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 4 .

**NO :** Replace any damaged hose. Then go to Step 14 .

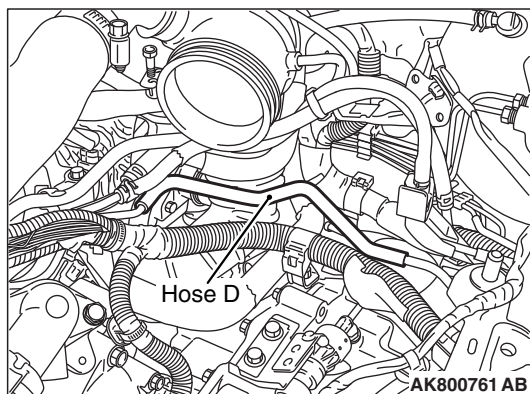
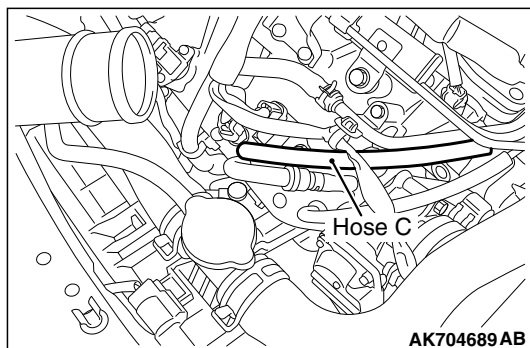
**STEP 4. Check the evaporative emission purge solenoid for leaks.**

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-104](#).

**Q: Is the evaporative emission purge solenoid operating properly?**

**YES :** Go to Step 5 .

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 14 .

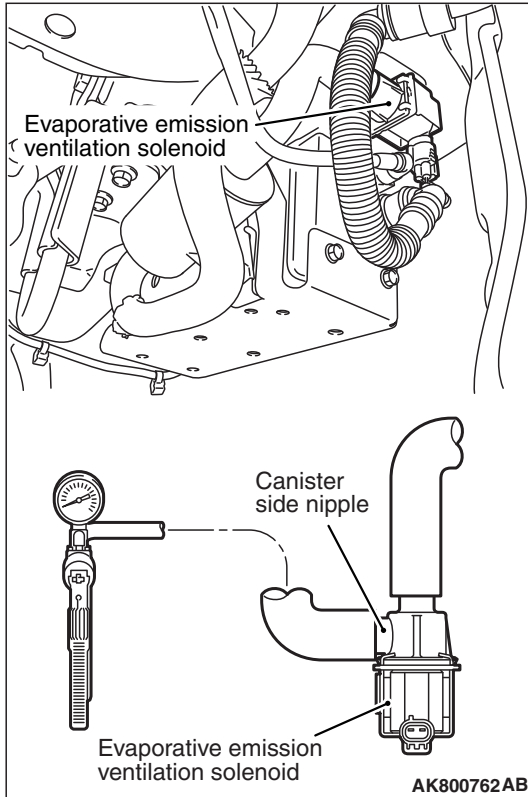
**STEP 5. Check for leaks in evaporative emission hoses C and D.**

Use a hand vacuum pump to test each hose C and D.

**Q: Do the hoses hold vacuum?**

**YES** : Go to Step 6 .

**NO** : Replace any damaged hose. Then go to Step 14 .



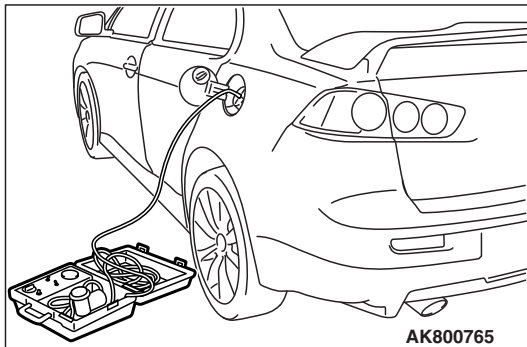
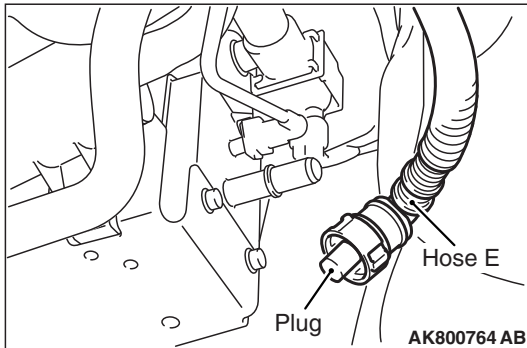
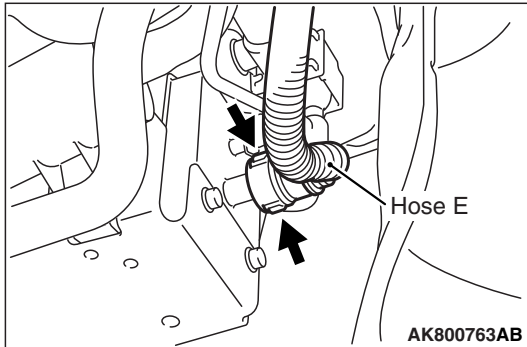
**STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.**

- (1) Remove the canister cover.
- (2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
- (3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
- (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.
- (7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
- (8) Reinstall the canister cover.

**Q: Did the evaporative emission ventilation solenoid hold vacuum?**

**YES :** Go to Step 7 .

**NO :** Replace the evaporative emission ventilation solenoid. Then go to Step 14 .

**STEP 7. Perform the pressure test on the evaporative emission system.**

- (1) Disconnect hose E from the canister while holding the release buttons indicated in the illustration pressed by fingers.
- (2) Plug the disconnected end of hose E.
- (3) 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.
- (4) Remove the fuel cap.
- (5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
- (6) 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.*
- (7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
- (8) Connect hose E to the evaporative emission canister.

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

**YES :** Go to Step 12 .

**NO :** Go to Step 8 .

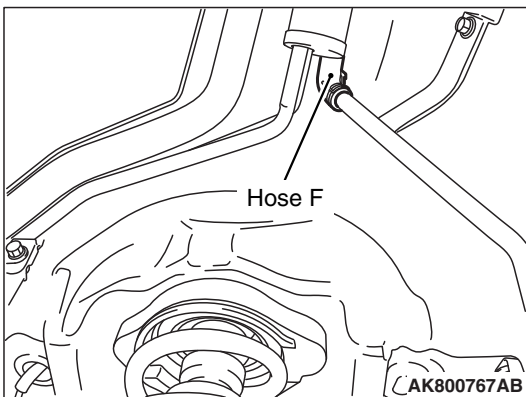
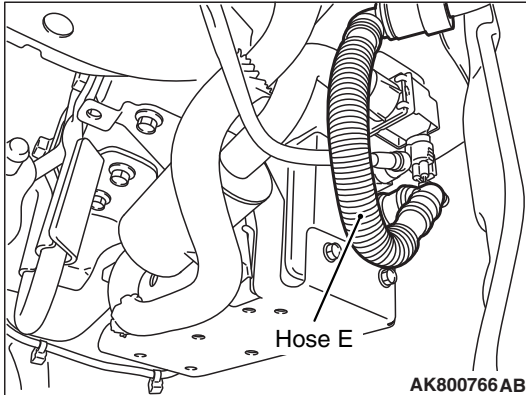
**STEP 8. Check for leaks in evaporative emission hoses E and F.**

Use a hand vacuum pump to test each hose E and F.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 9 .

**NO :** Replace any damaged hose. Then go to Step 14 .



**STEP 9. Check for leaks in evaporative emission hoses G and H.**

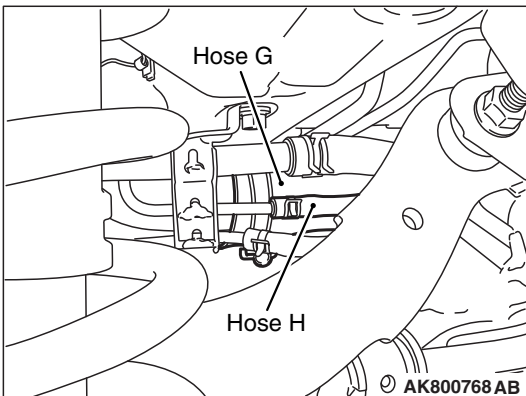
(1) Remove the fuel tank assembly.

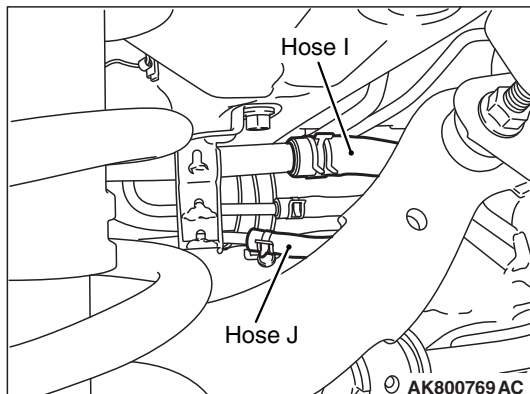
(2) Use a hand vacuum pump to test each hose G and H.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 10.

**NO :** Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .



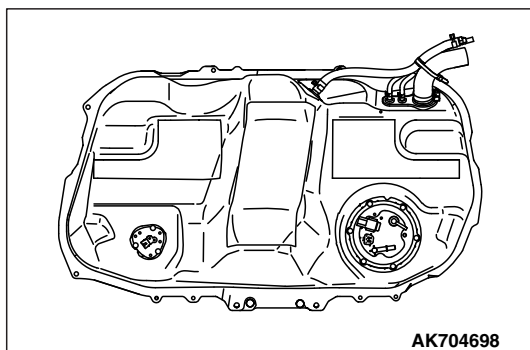
**STEP 10. Check for leaks in evaporative emission hoses I and J.**

- (1) Remove the fuel tank assembly.
- (2) Use a hand vacuum pump to test each hose I and J.

**Q: Do the hoses hold vacuum?**

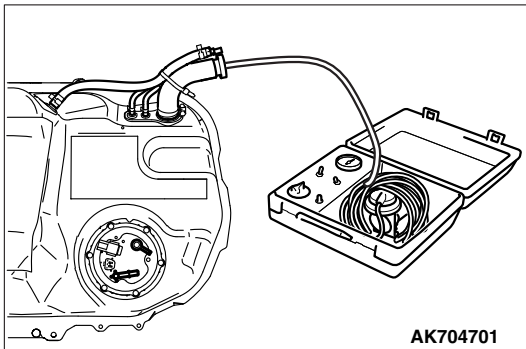
**YES :** Go to Step 11 .

**NO :** Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .

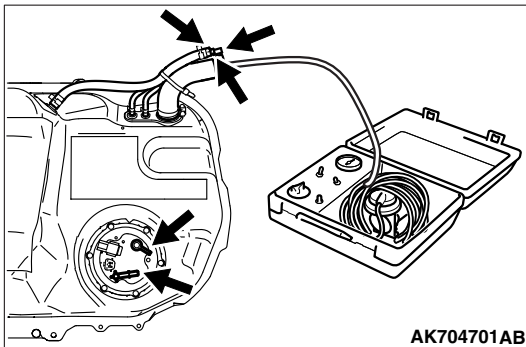
**STEP 11. Check for leaks in the fuel tank.**

- (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.

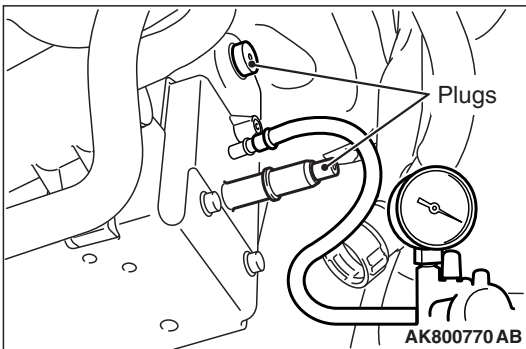
**Q: Are any leaks found?**

**YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> :**

Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 14 .

**YES <When there is a leak from the fuel tank.> :** Replace the fuel tank. Then go to Step 14 .

**NO :** When there is no leak, reinstall the fuel tank. Then go to Step 13 .



**STEP 12. Check the evaporative emission canister for vacuum leaks.**

- (1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump and remove the plugs.

**Q: Is the evaporative emission canister in good condition?**

**YES :** Go to Step 13 .

**NO :** Replace the evaporative emission canister. Then go to Step 14 .

---

**STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTCs using scan tool MB991958.
- (3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (4) Start the engine.
- (5) Select "Special Function"
- (6) Select "Evap Leak Monitor"
- (7) During the test, keep the accelerator pedal at the idle position.
- (8) 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".
- (9) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-11 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-9. Then go to Step 14 .

**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 14 .

**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.

---

**STEP 14. Test the OBD-II drive cycle.**

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

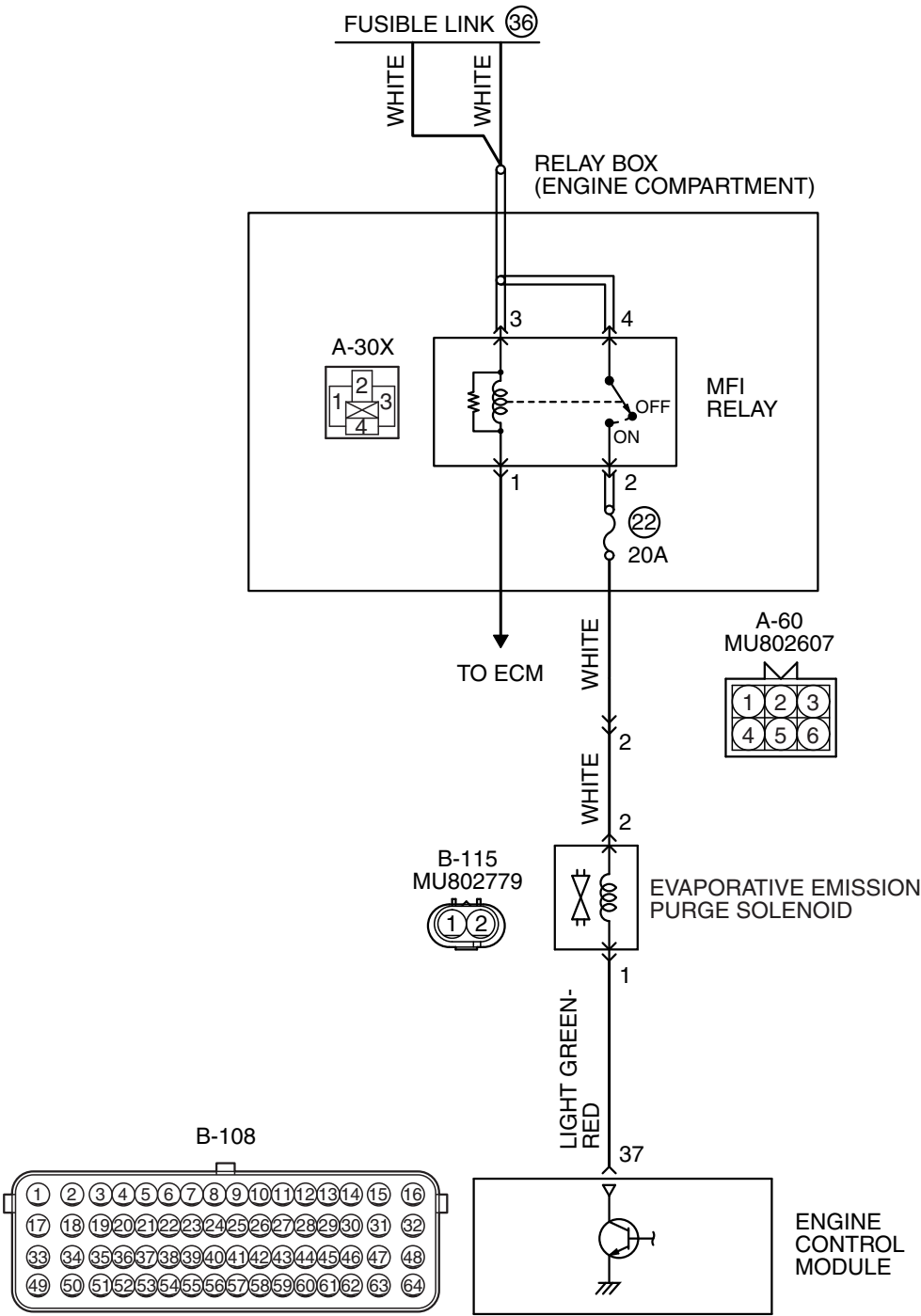
**Q: Is DTC P0442 set?**

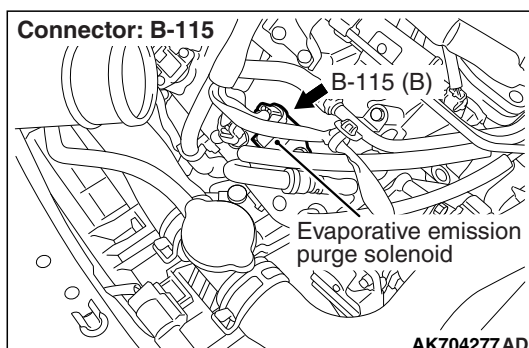
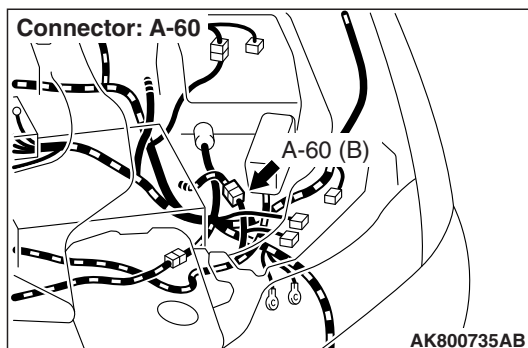
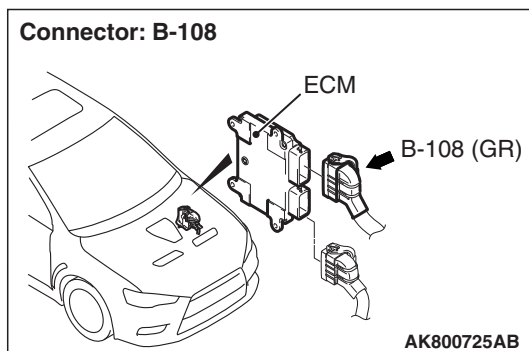
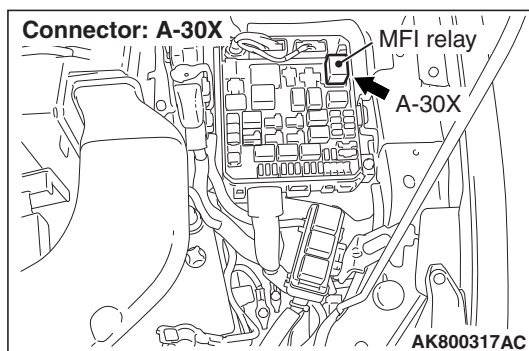
**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

EVAPORATIVE EMISSION PURGE SOLENOID CIRCUIT





## CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

## TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the ECM 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)

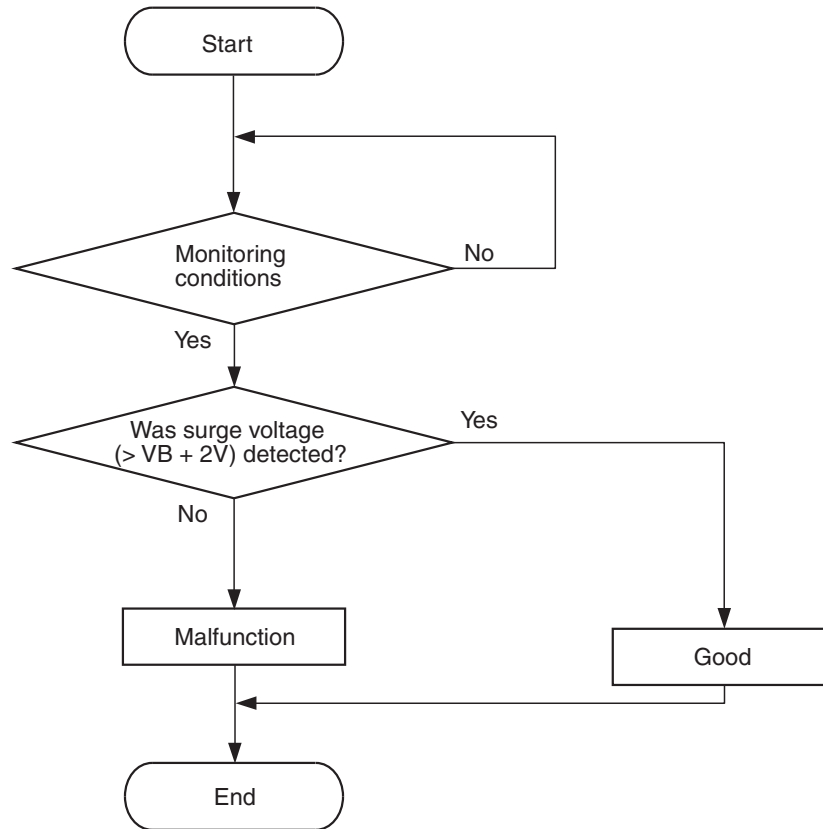
- Not applicable

**Sensor** (The sensor below is determined to be normal)

- Not applicable

## DTC SET CONDITIONS

### Logic Flow Chart



AK604339

#### 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 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 passed 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.

### FAIL-SAFE AND BACKUP FUNCTION

- None

### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

### 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.

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

**STEP 1. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.**

**⚠ CAUTION**

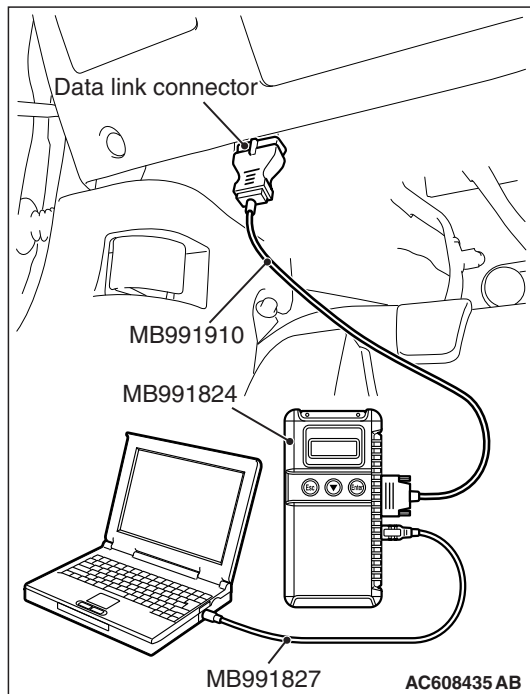
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (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.

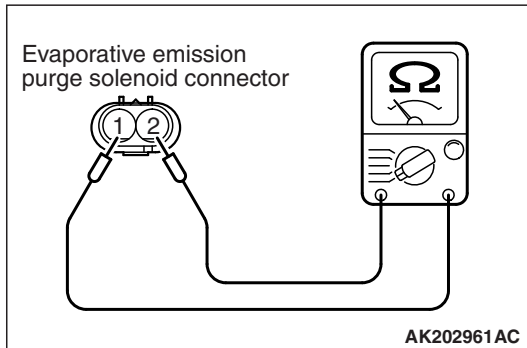


**STEP 2. Check harness connector B-115 at evaporative emission purge solenoid for damage.**

**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 11.



**STEP 3. Check the evaporative emission purge solenoid.**

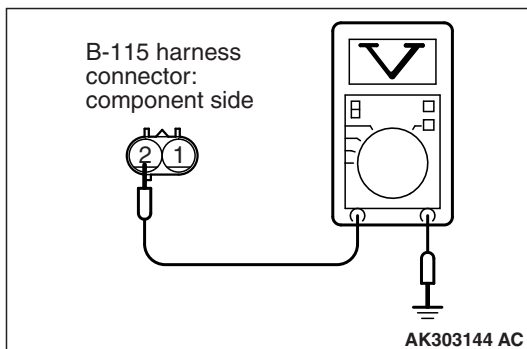
- (1) Disconnect the evaporative emission purge solenoid connector B-115.
- (2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

**Standard value: 22 – 26  $\Omega$  [at 20°C (68°F)]**

**Q: Is the measured resistance between 22 and 26  $\Omega$  [at 20°C (68°F)]?**

**YES :** Go to Step 4.

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 11.



**STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-115.**

- (1) Disconnect the connector B-115 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 A-30X at MFI relay for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Check harness connector A-60 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and evaporative emission purge solenoid connector B-115 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 11.

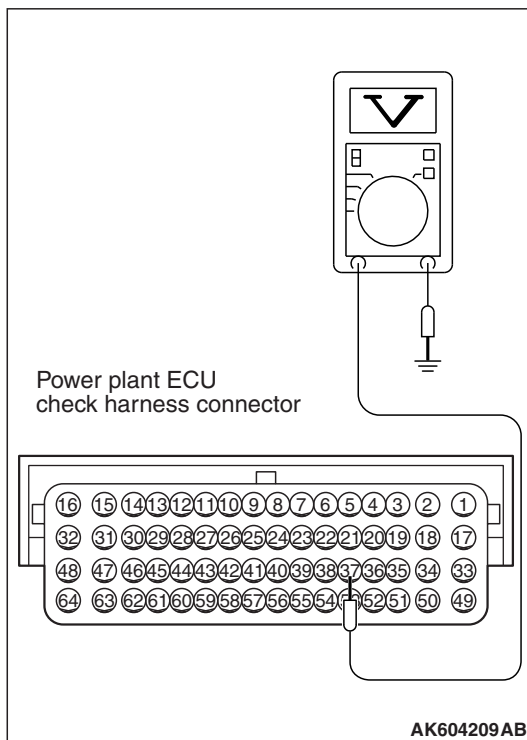
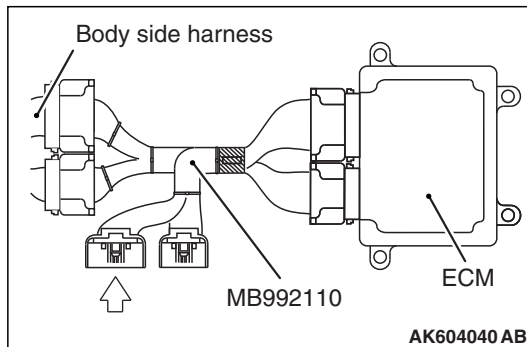
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**STEP 6. Check harness connector B-108 at ECM 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 11.



**STEP 7. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.**

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

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

(3) Measure the voltage between terminal No. 37 and ground.

- Voltage should be battery positive voltage.

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

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

**YES :** Go to Step 8.

**NO :** Repair harness wire between evaporative emission purge solenoid connector B-115 (terminal No. 1) and ECM connector B-108 (terminal No. 37) because of open circuit or short circuit to ground. Then go to Step 11.

**STEP 8. Check harness connector A-30X at MFI relay 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 11.

---

**STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and evaporative emission purge solenoid connector B-115 (terminal No. 2).**

*NOTE: Check harness after checking intermediate connector A-60. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.*

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 10.

**NO :** Repair it. Then go to Step 11.

---

**STEP 10. Check for harness damage between evaporative emission purge solenoid connector B-115 (terminal No. 1) and ECM connector B-108 (terminal No. 37).**

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 11.

**NO :** Repair it. Then go to Step 11.

---

**STEP 11. Test the OBD-II drive cycle.**

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

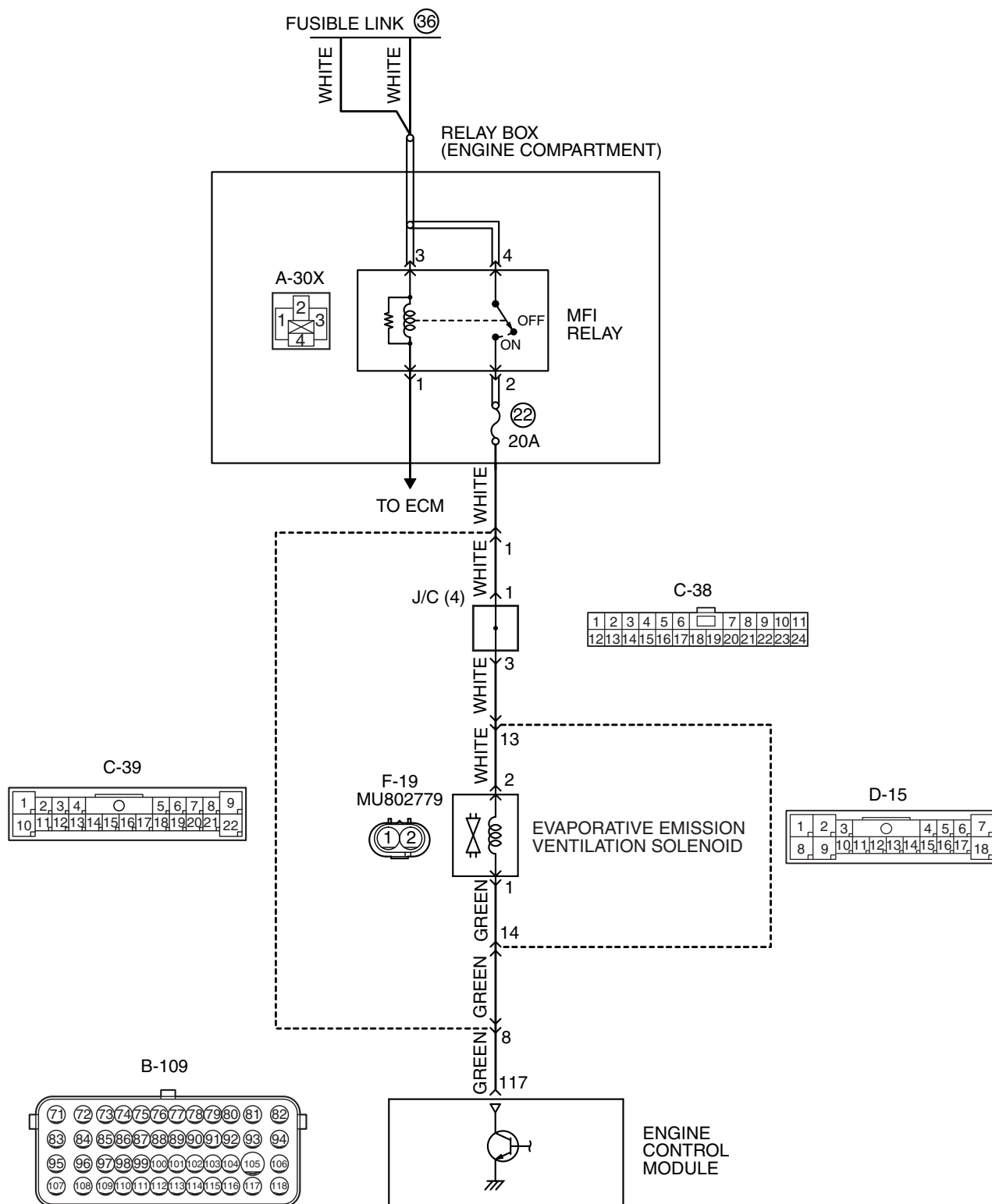
**Q: Is DTC P0443 set?**

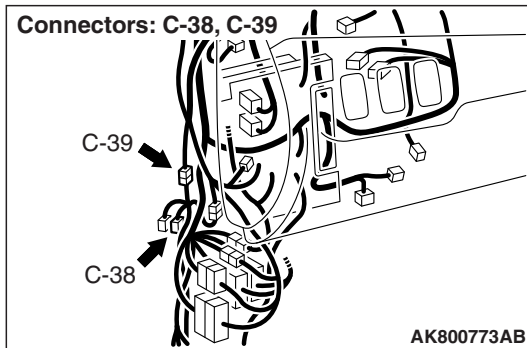
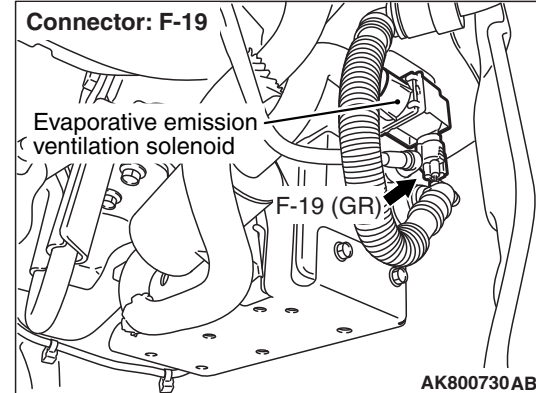
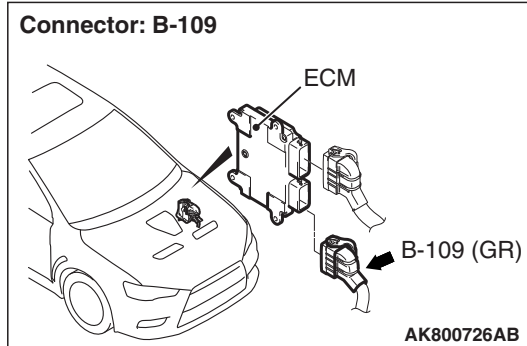
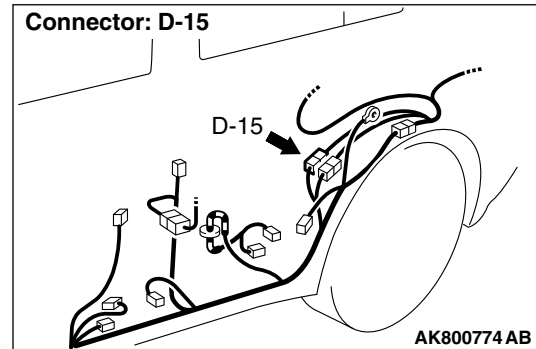
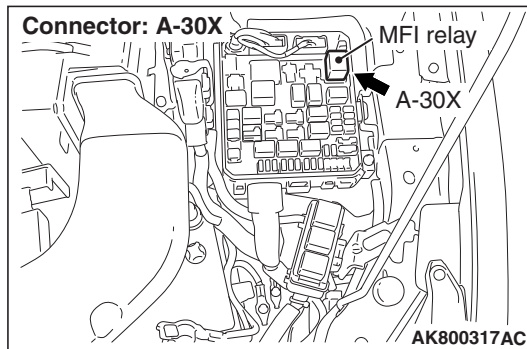
**YES :** Retry the troubleshooting.

**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. 2).
- The ECM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM ON and OFF.

## TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM 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)

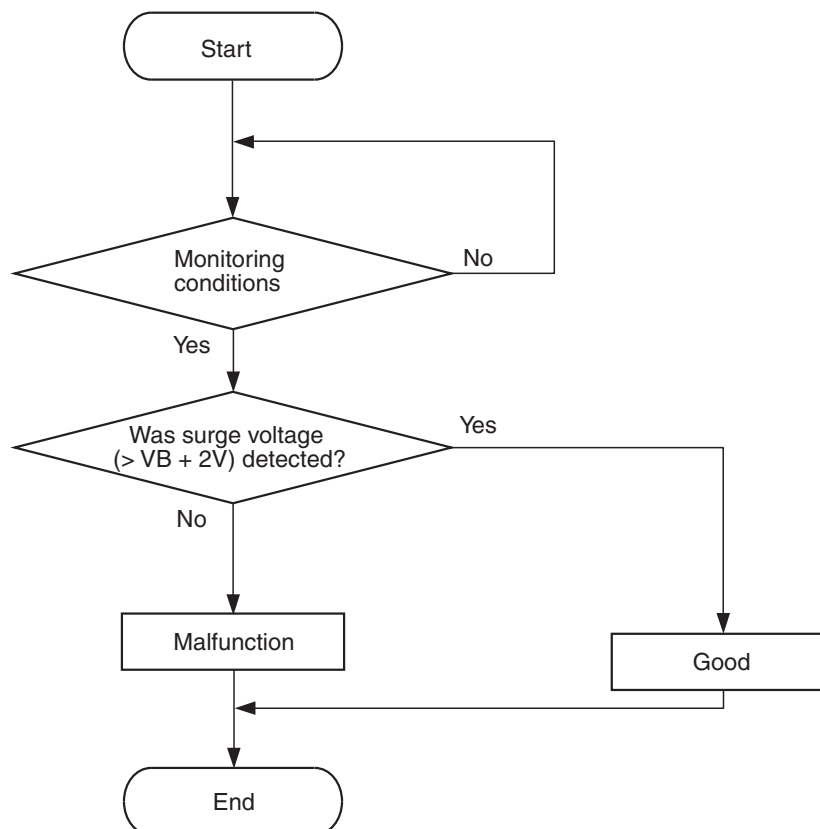
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

## DTC SET CONDITIONS

## Logic Flow Chart



AK604339

**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 monitors for this condition once during the drive cycle.

**Check Conditions**

- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has passed 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.

**FAIL-SAFE AND BACKUP FUNCTION**

- None

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

**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.

## DIAGNOSIS

### Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

**STEP 1. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.**

### **⚠ CAUTION**

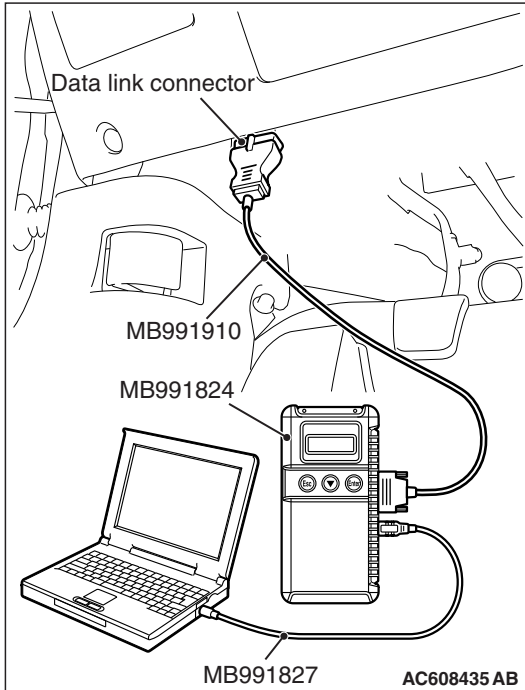
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (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.

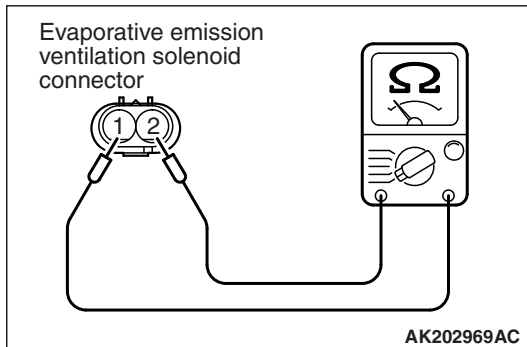


**STEP 2. Check harness connector F-19 at evaporative emission ventilation solenoid for damage.**

### **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 11.

**STEP 3. Check the evaporative emission ventilation solenoid.**

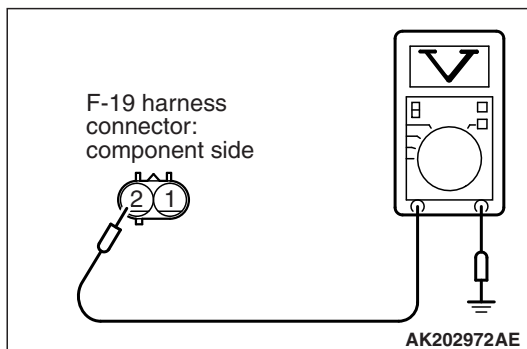
- (1) Disconnect the evaporative emission ventilation solenoid connector F-19.
- (2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

**Standard value: 17 – 21  $\Omega$  [at 20°C (68°F)]**

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

**YES :** Go to Step 4.

**NO :** Replace the evaporative emission ventilation solenoid. Then go to Step 11.

**STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-19.**

- (1) Disconnect the connector F-19 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 A-30X at MFI relay for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Check harness connectors C-38, C-39 and D-15 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 A-30X (terminal No. 2) and evaporative emission ventilation solenoid connector F-19 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**STEP 6. Check harness connector B-109 at ECM for damage.**

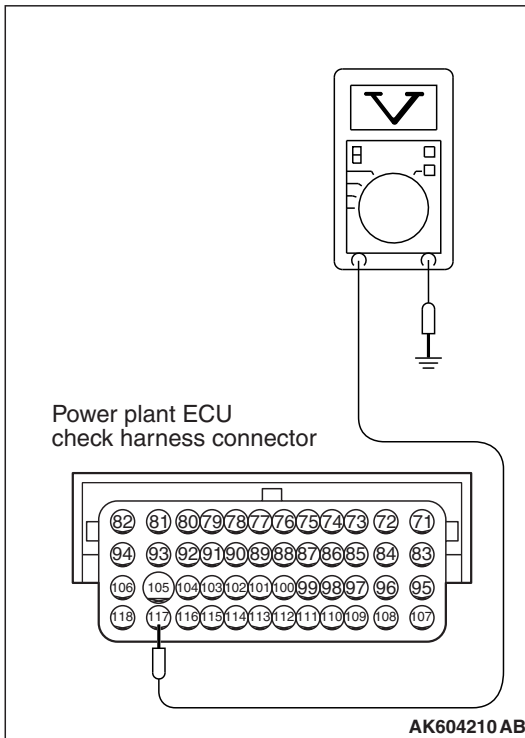
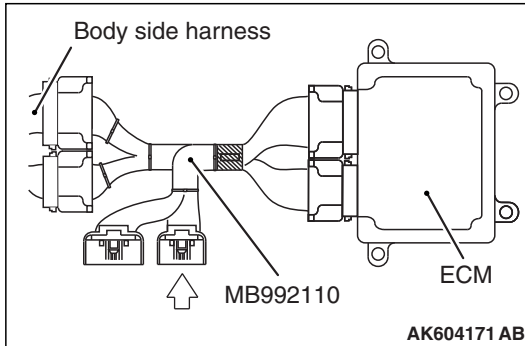
**Q: Is the harness connector in good condition?**

**YES :** Go to Step 7.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**STEP 7. Measure the power supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal No. 117 and ground.
  - Voltage should be battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Check harness connectors C-39 and D-15 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 evaporative emission ventilation solenoid connector F-19 (terminal No. 1) and ECM connector B-109 (terminal No. 117) because of open circuit or short circuit to ground. Then go to Step 11.

**STEP 8. Check harness connector A-30X at MFI relay 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 11.

---

**STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and evaporative emission ventilation solenoid connector F-19 (terminal No. 2).**

*NOTE: Check harness after checking intermediate connectors C-38, C-39 and D-15. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.*

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 10.

**NO :** Repair it. Then go to Step 11.

---

**STEP 10. Check for harness damage between evaporative emission ventilation solenoid connector F-19 (terminal No. 1) and ECM connector B-109 (terminal No. 117).**

*NOTE: Check harness after checking intermediate connectors C-39 and D-15. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.*

**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 11.

**NO :** Repair it. Then go to Step 11.

---

**STEP 11. Test the OBD-II drive cycle.**

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

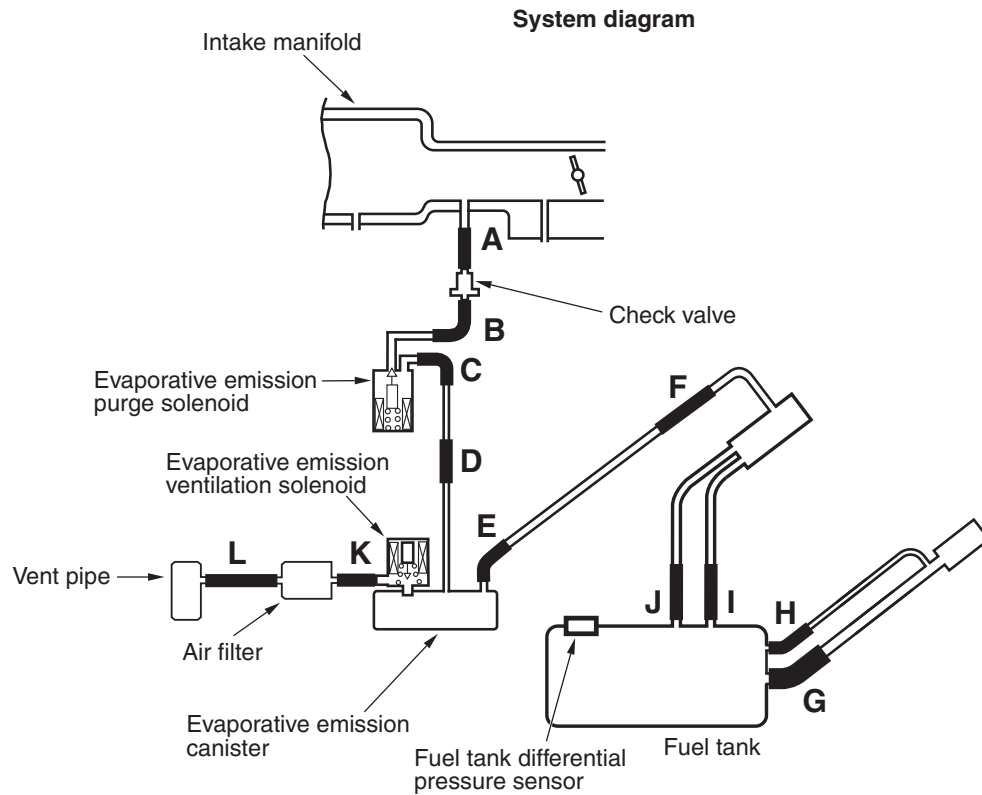
(2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0446 set?**

**YES :** Retry the troubleshooting.

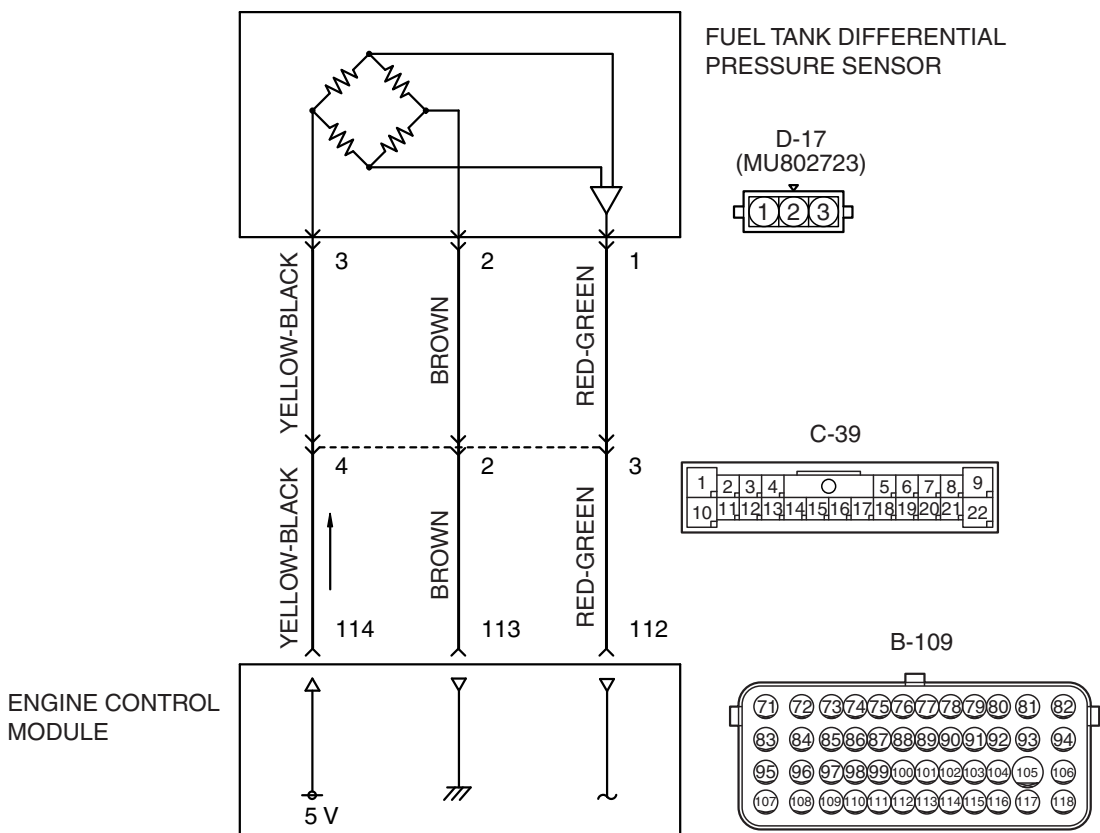
**NO :** The inspection is complete.

DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction



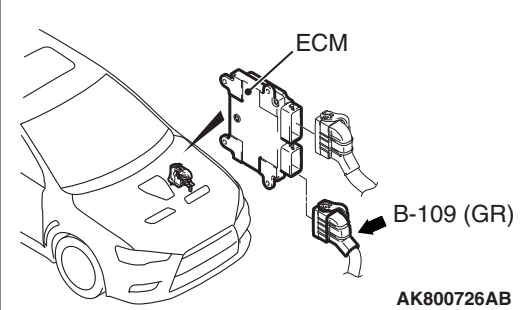
AK704684 AB

**FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT**

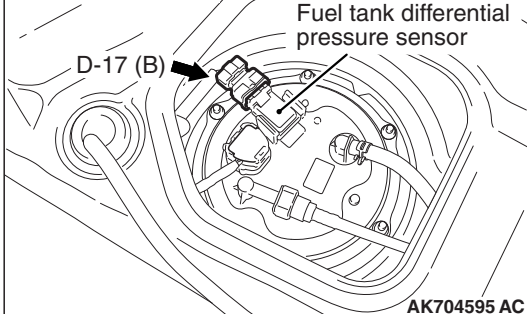


AK604513 AB

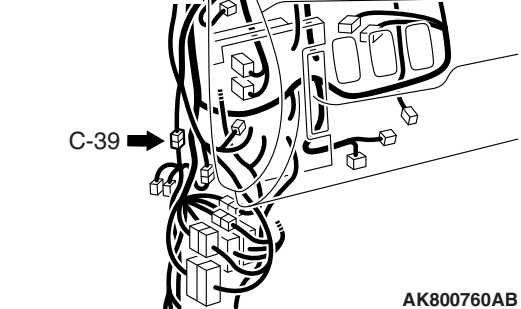
Connector: B-109



Connector: D-17



Connector: C-39



## CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

## TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

## DESCRIPTIONS OF MONITOR METHODS

Compare evaporative emission 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)**

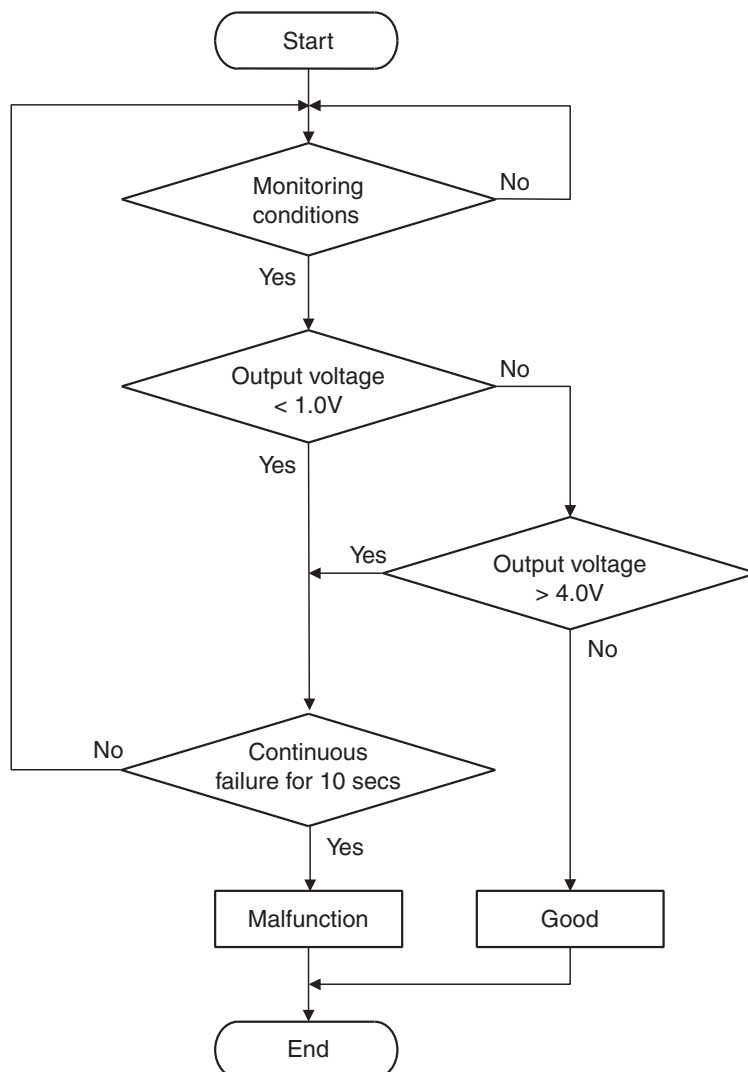
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

## Logic Flow Chart (Monitor Sequence)



AK704950

**Check Conditions**

- Intake air temperature is more than 5°C (41°F).
- Engine speed is more than 1,594 r/min.
- Volumetric efficiency is between 20 and 50 percent.

**Judgement Criterion**

- When the evaporative emission purge solenoid is off, the fuel tank differential pressure sensor output voltage is less than 1.0 volt for 10 seconds.

**Check Conditions**

- Intake air temperature is between 5°C (41°F) and 45°C (113°F).
- Engine speed is more than 1,594 r/min.

- Volumetric efficiency is between 20 and 50 percent.

**Judgement Criterion**

- When the evaporative emission purge solenoid is fully operational (100 percent ratio), the fuel tank differential pressure sensor output voltage is more than 4.0 volts for 10 seconds.

**FAIL-SAFE AND BACKUP FUNCTION**

- None

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).

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

- Fuel tank differential pressure sensor failed.
- Fuel tank differential pressure sensor circuit harness damage, or connector damage.
- ECM failed.

**DIAGNOSIS**

**Required Special Tools:**

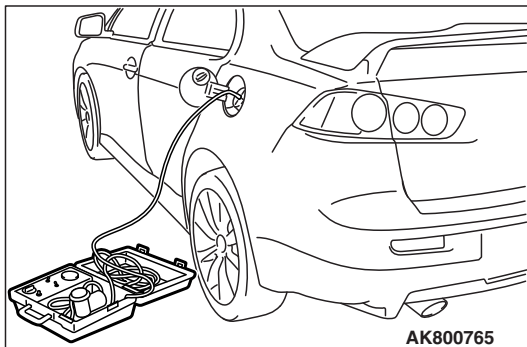
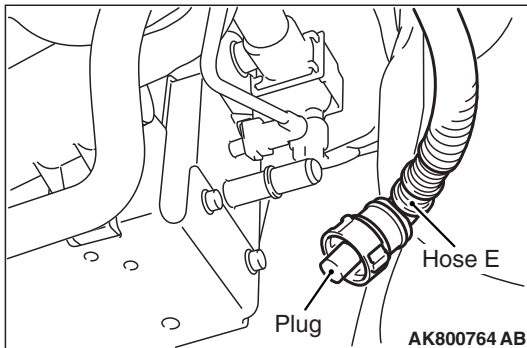
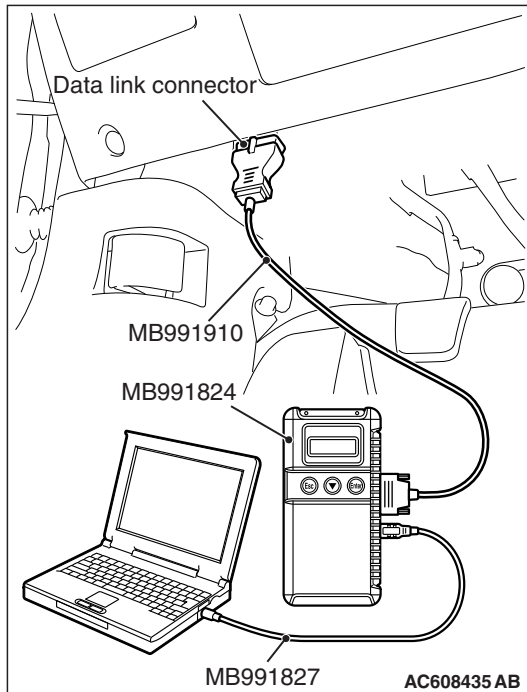
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, check data list item 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) Plug the disconnected end of hose E.
- (3) Turn the ignition switch to the "ON" position.
- (4) Remove the fuel cap.
- (5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
  - Output voltage should be between 1,500 and 3,500 millivolts.
- (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 E to the evaporative emission canister.

**Q: Is the sensor operating properly?**

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

**NO :** Go to Step 2 .

**STEP 2. Check harness connector D-17 at fuel tank differential pressure sensor for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 3 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

**STEP 3. Measure the sensor supply voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

(1) Do not disconnect the connector D-17.

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

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

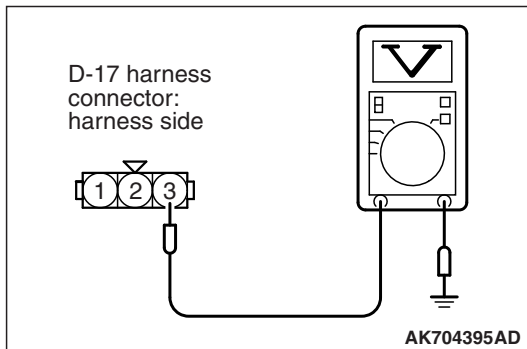
- Voltage should be between 4.9 and 5.1 volts.

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

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

**YES :** Go to Step 6 .

**NO :** Go to Step 4 .



**STEP 4. Check harness connector B-109 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to step 5 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

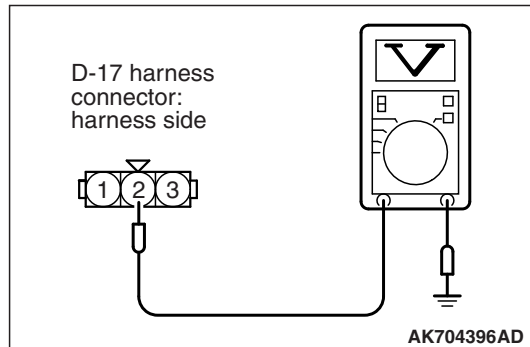
**STEP 5. Check for harness damage between fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .

**STEP 6. Measure the ground voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

- (1) Do not disconnect the connector D-17.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 2 and ground by backprobing.
  - Voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage 0.5 volt or less?****YES :** Go to Step 9 .**NO :** Go to Step 7 .**STEP 7. Check harness connector B-109 at ECM 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 harness damage between fuel tank differential pressure sensor connector D-17 (terminal No. 2) and ECM connector B-109 (terminal No. 113).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .**NO :** Repair it. Then go to Step 12 .**STEP 9. Check harness connector B-109 at ECM 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 fuel tank differential pressure sensor connector D-17 (terminal No. 1) and ECM connector B-109 (terminal No. 112).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .

---

**STEP 11. Replace the fuel tank differential pressure sensor.**

- (1) Replace the fuel tank differential pressure sensor.
- (2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0450 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 12 .

**NO :** The inspection is complete.

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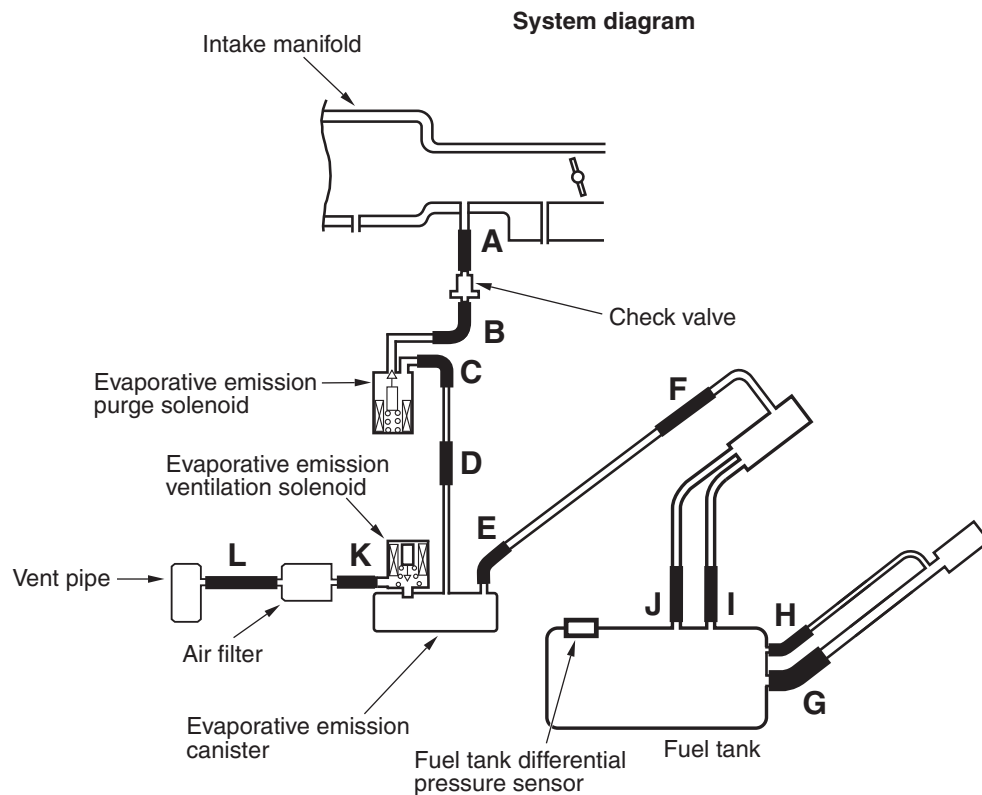
**STEP 12. Test the OBD-II drive cycle.**

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

**Q: Is DTC P0450 set?**

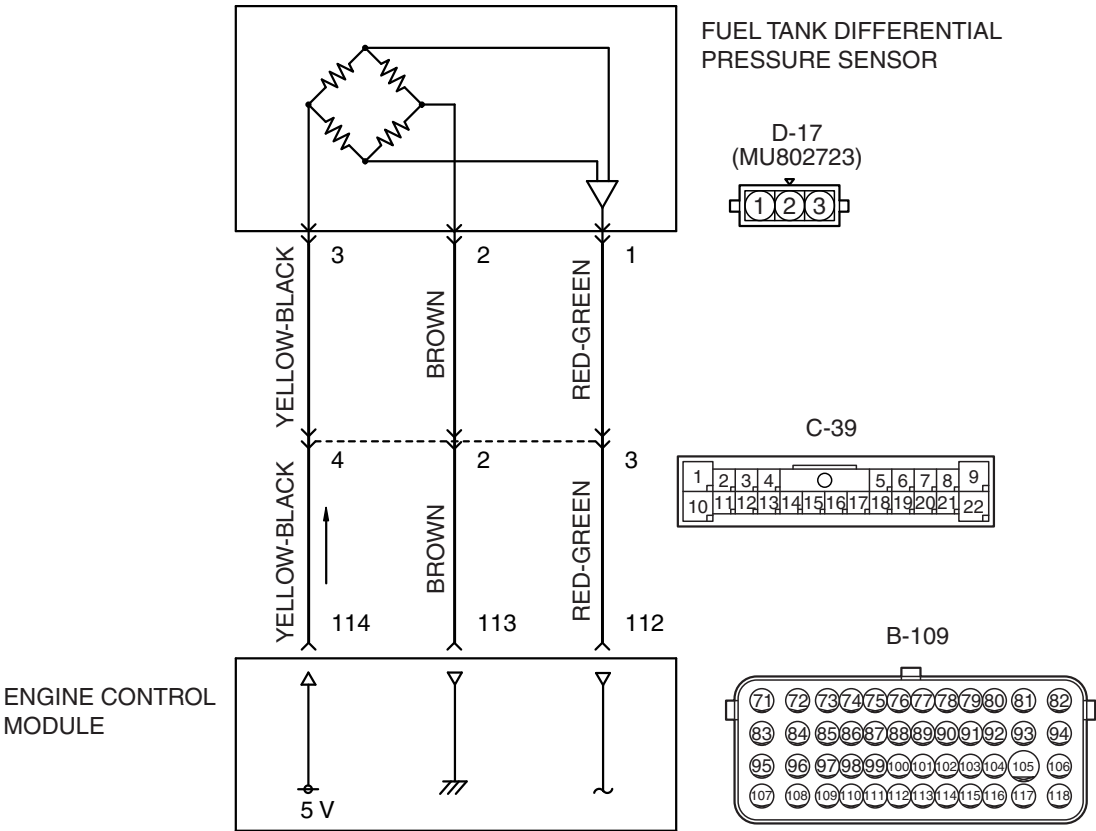
**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

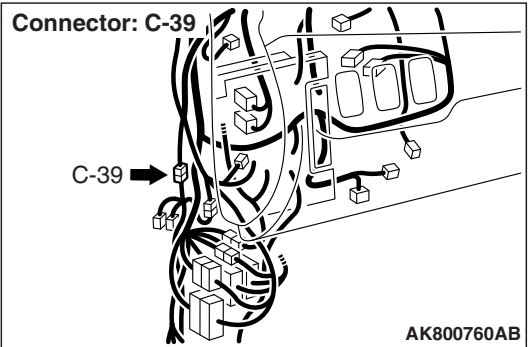
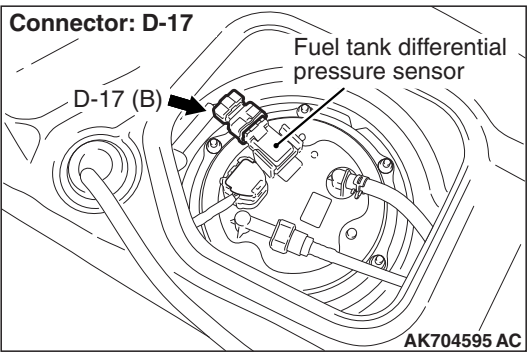
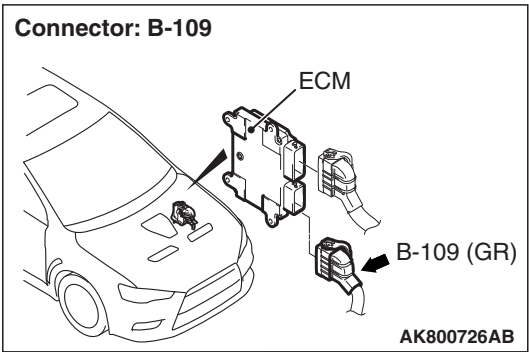
**DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance**

AK704684 AB

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



AK604513 AB



**CIRCUIT OPERATION**

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

**TECHNICAL DESCRIPTION**

- The ECM monitors the fuel tank differential pressure sensor signal voltage.
- The ECM 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)**

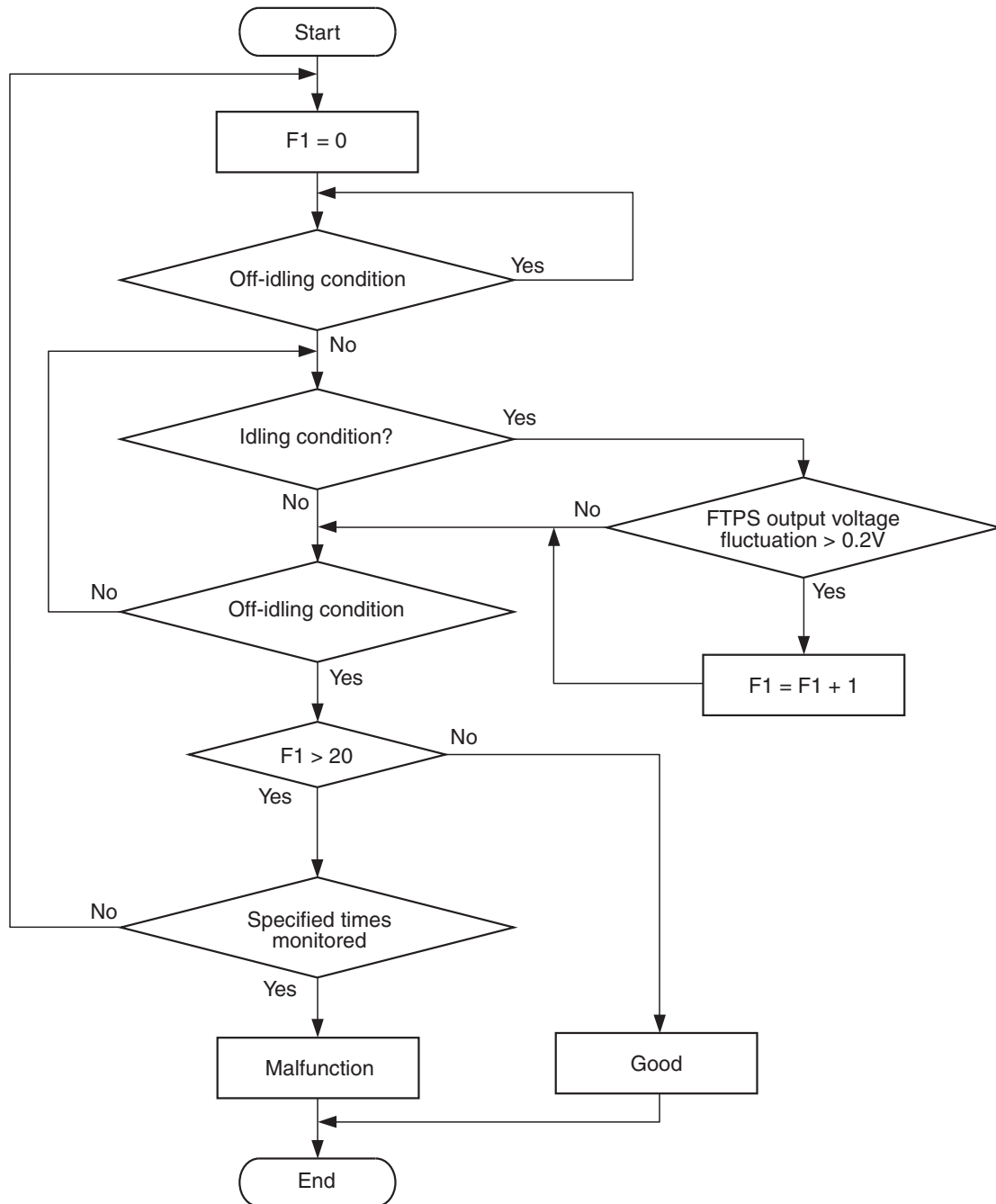
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

### Logic Flow Chart (Monitor Sequence)



AK705072

#### Check Conditions

- Accelerator pedal is not depressed.
- Vehicle speed is less than 1.5 km/h (1 mph).

*NOTE: The conditions for deviating from idling operation are as follows:*

- Vehicle speed is more than 50 km/h (31 mph).

#### Judgement Criteria

- The drastic pressure fluctuation is detected 20 times or more per engine idling, which is that the fuel tank differential pressure sensor output voltage is 0.2 volt or more.

- The condition described above is consecutively detected 4 times under the normal driving conditions.

*NOTE: If the number of sudden pressure fluctuations does not reach 20 times during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to 0.*

## FAIL-SAFE AND BACKUP FUNCTION

- None

## OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 [P.13B-10](#).

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

- Fuel tank differential pressure sensor failed.
- Fuel tank differential pressure sensor circuit harness damage, or connector damage.
- ECM failed.

## DIAGNOSIS

### Required Special Tools:

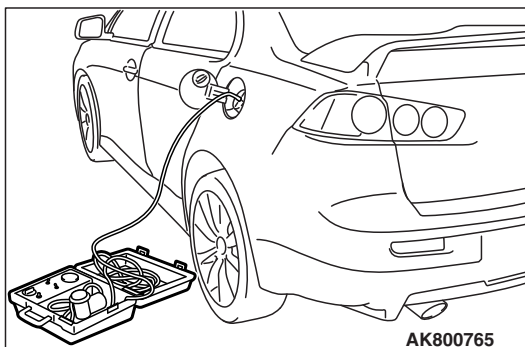
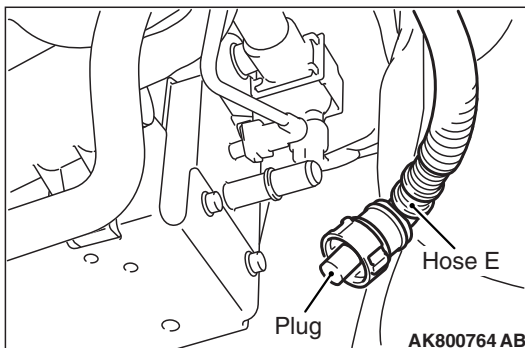
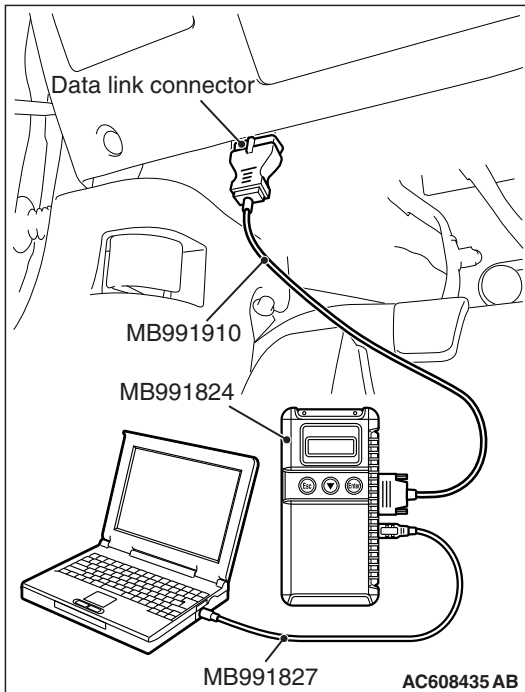
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, check data list item 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) Plug the disconnected end of hose E.
- (3) Turn the ignition switch to the "ON" position.
- (4) Remove the fuel cap.
- (5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
  - Output voltage should be between 1,500 and 3,500 millivolts.
- (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 E to the evaporative emission canister.

**Q: Is the sensor operating properly?**

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

**NO :** Go to Step 2 .

---

**STEP 2. Check harness connector D-17 at fuel tank differential pressure sensor for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 3 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

---

**STEP 3. Measure the sensor supply voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

(1) Do not disconnect the connector D-17.

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

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

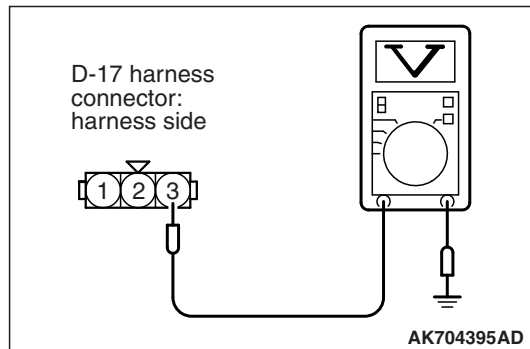
- Voltage should be between 4.9 and 5.1 volts.

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

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

**YES :** Go to Step 6 .

**NO :** Go to Step 4 .



---

**STEP 4. Check harness connector B-109 at ECM for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to step 5 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

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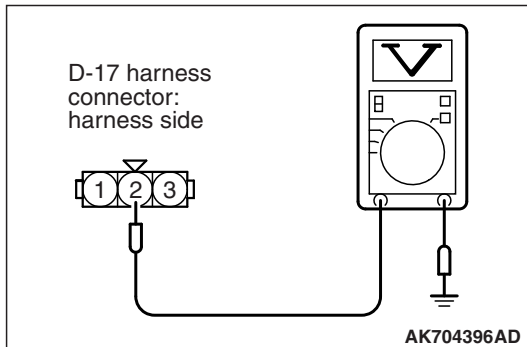
**STEP 5. Check for harness damage between fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .



**STEP 6. Measure the ground voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

- (1) Do not disconnect the connector D-17.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 2 and ground by backprobing.
  - Voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage 0.5 volt or less?**

**YES :** Go to Step 9 .

**NO :** Go to Step 7 .

**STEP 7. Check harness connector B-109 at ECM 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 harness damage between fuel tank differential pressure sensor connector D-17 (terminal No. 2) and ECM connector B-109 (terminal No. 113).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .

**STEP 9. Check harness connector B-109 at ECM 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 fuel tank differential pressure sensor connector D-17 (terminal No. 1) and ECM connector B-109 (terminal No. 112).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .

---

**STEP 11. Replace the fuel tank differential pressure sensor.**

- (1) Replace the fuel tank differential pressure sensor.
- (2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 [P.13B-10](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0451 set?**

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 12 .

**NO :** The inspection is complete.

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**STEP 12. Test the OBD-II drive cycle.**

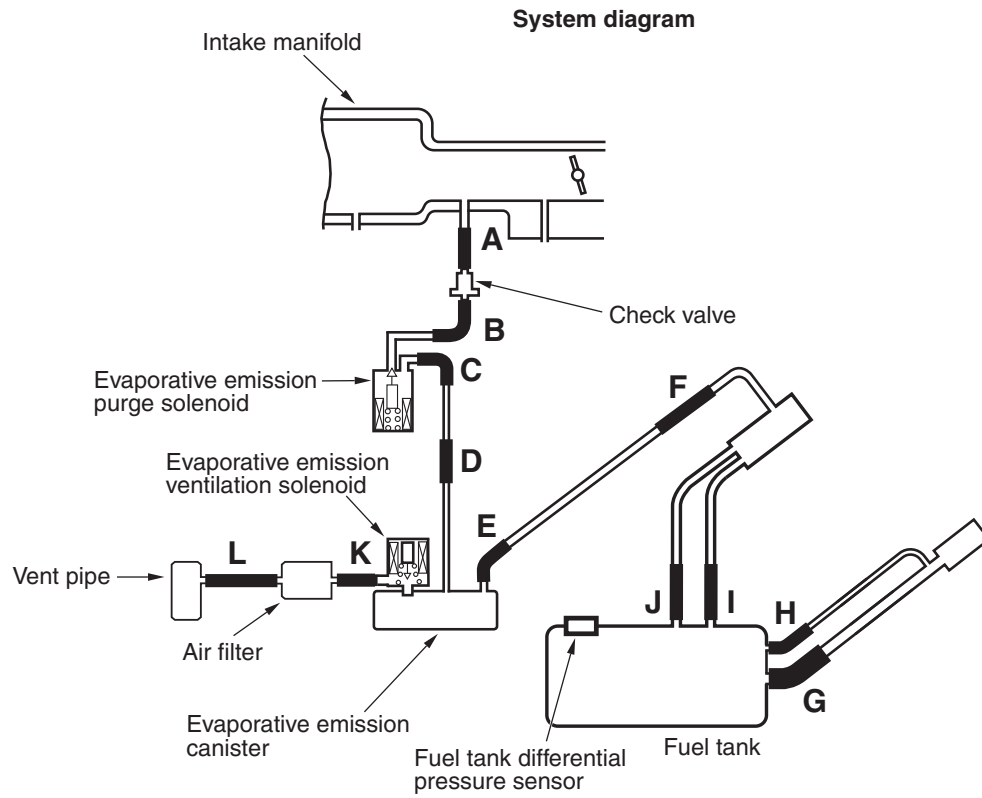
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0451 set?**

**YES :** Retry the troubleshooting.

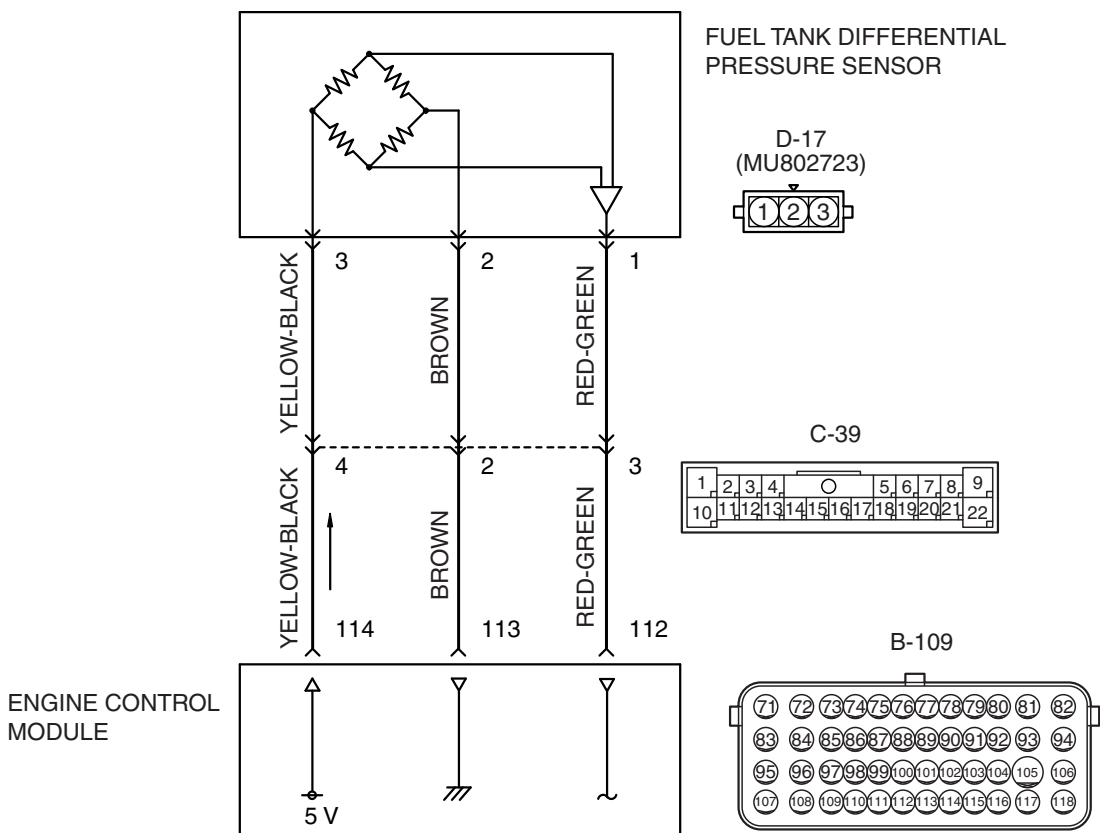
**NO :** The inspection is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input



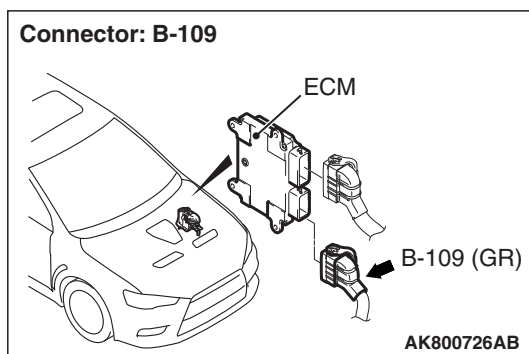
AK704684 AB

**FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT**

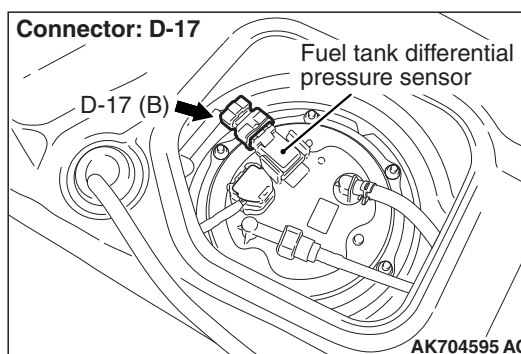


AK604513 AB

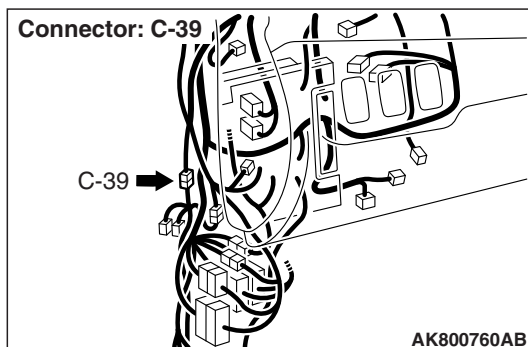
Connector: B-109



Connector: D-17



Connector: C-39



## CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

## TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

## DESCRIPTIONS OF MONITOR METHODS

Fuel tank differential pressure sensor output voltage is out of specified range.

## MONITOR EXECUTION

Continuous

## MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

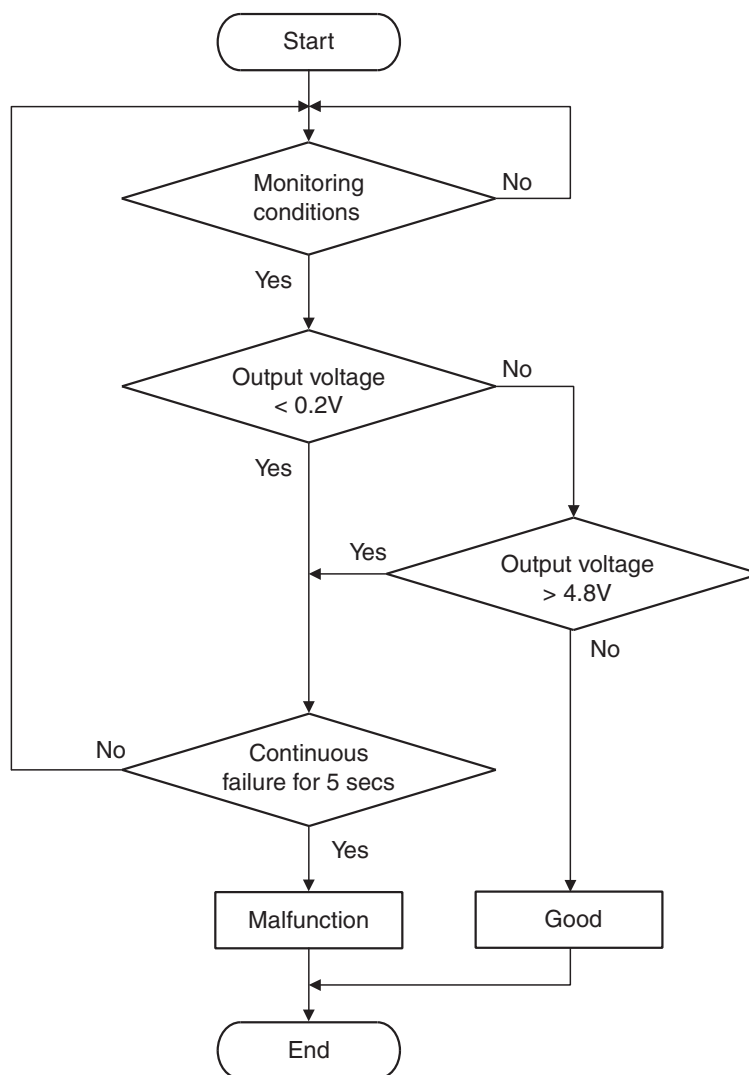
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

## Logic Flow Chart (Monitor Sequence)



AK704952

**Check Condition**

- More than 2 seconds have passed since the engine starting sequence was completed.

**Judgement Criterion**

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

**FAIL-SAFE AND BACKUP FUNCTION**

- None

**OBD-II DRIVE CYCLE PATTERN**

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, connector damage.
- ECM failed.

## DIAGNOSIS

### Required Special Tools:

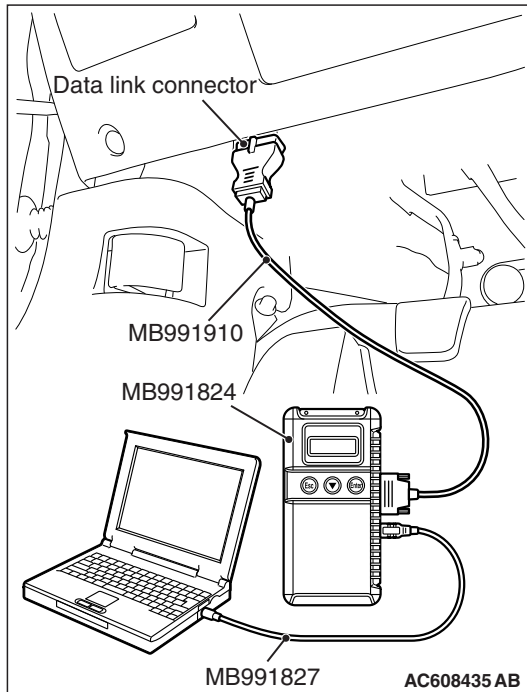
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

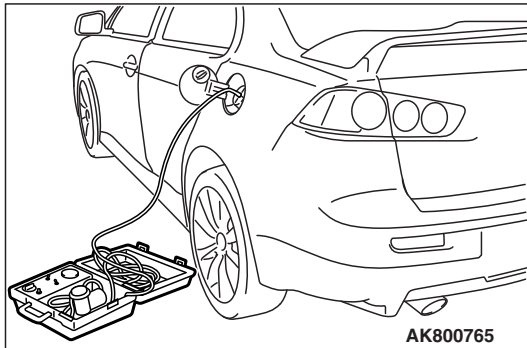
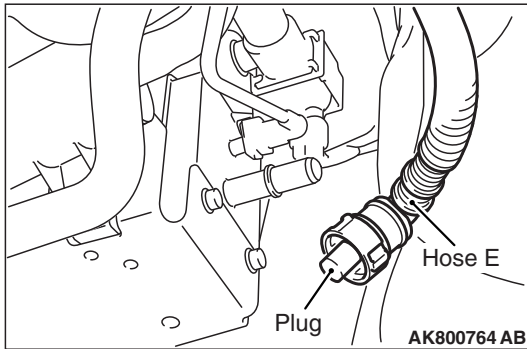
**STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.**

### **⚠ 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 E 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 for item 52, Fuel Tank Differential Pressure Sensor.
  - Output voltage should be between 1,500 and 3,500 millivolts.
- (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 E to the evaporative emission canister.

**Q: Is the sensor operating properly?**

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

**NO :** Go to Step 2 .

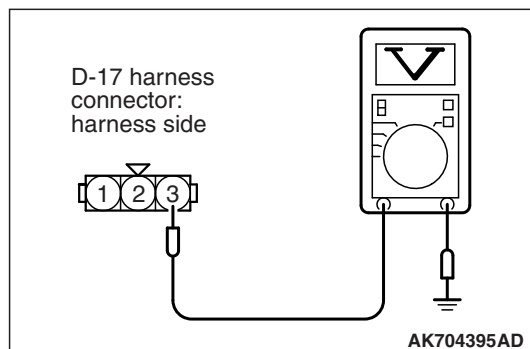
**STEP 2. Measure the sensor supply voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

- (1) Do not disconnect the connector D-17.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 3 and ground by backprobing.
  - 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 8 .

**NO :** Go to Step 3 .

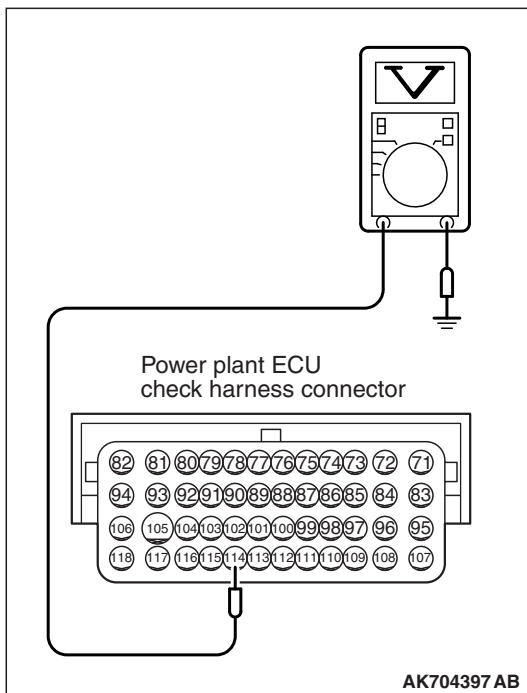
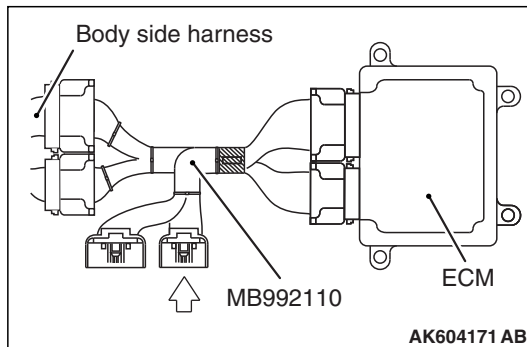


**STEP 3. Check harness connector B-109 at ECM for damage.**

**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 12 .



**STEP 4. Measure the sensor supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.**

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

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

(3) Measure the voltage between terminal No. 114 and ground.

- Voltage should be between 4.9 and 5.1 volts.

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

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

**YES :** Go to Step 7 .

**NO :** Go to Step 5 .

**STEP 5. Check harness connector D-17 at fuel tank differential pressure sensor for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Go to Step 6 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

**STEP 6. Check for short circuit to ground between fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114).**

*NOTE: Check harness after checking intermediate connector C-39. 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 :** Go to Step 11 .

**NO :** Repair it. Then go to Step 12 .

---

**STEP 7. Check harness connector D-17 at fuel tank differential pressure sensor for damage.**

**Q: Is the harness connector in good condition?**

**YES :** Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114) because of open circuit. Then go to Step 12 .

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .

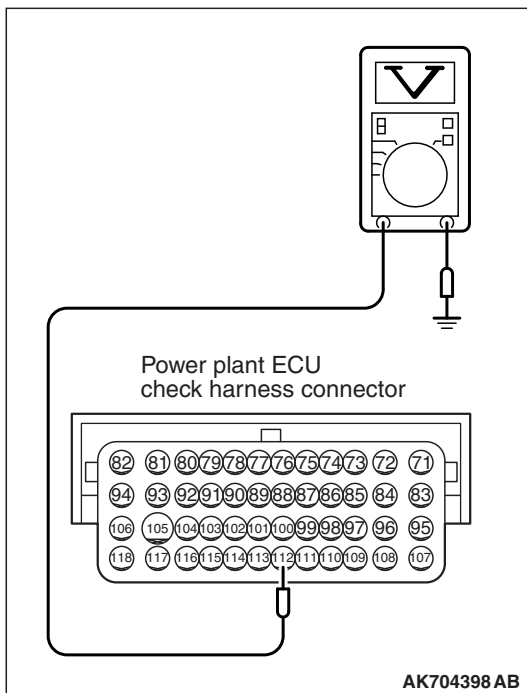
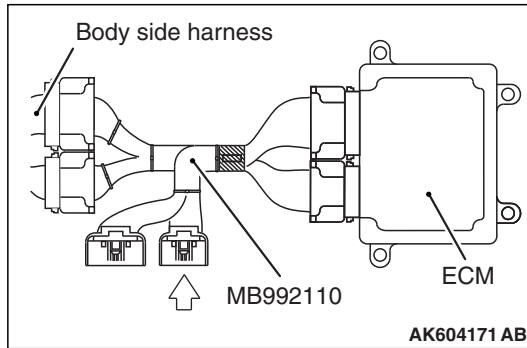
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**STEP 8. Check harness connector D-17 at fuel tank differential pressure sensor and harness connector B-109 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Go to Step 9 .

**NO :** Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12 .



**STEP 9. Measure the sensor output voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.**

- (1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
- (2) Turn the ignition switch to the "ON" position.
- (3) Remove the fuel cap.

- (4) Measure the voltage between terminal No. 112 and ground.
  - Voltage should be between 1.5 and 3.5 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage normal?**

**YES :** Go to Step 11 .

**NO :** Go to Step 10 .

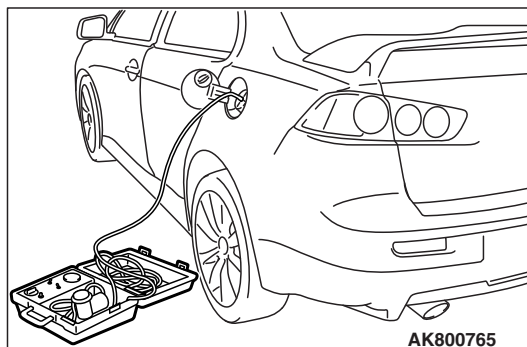
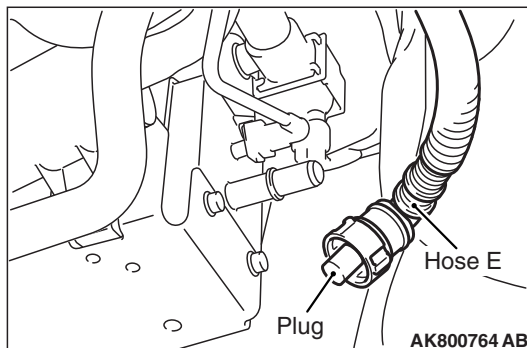
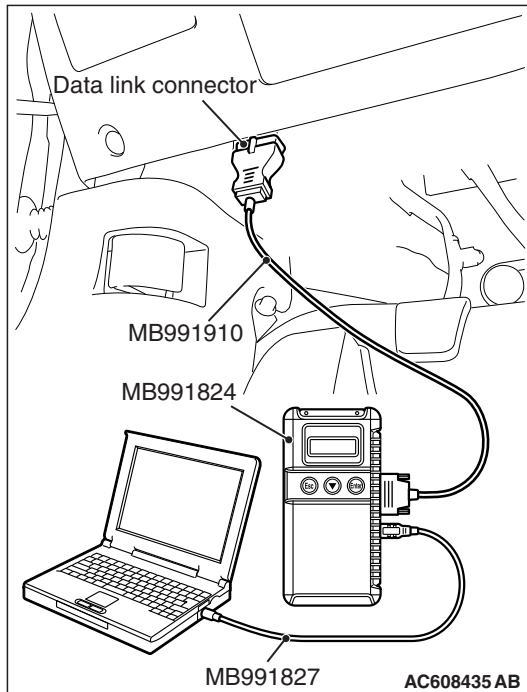
**STEP 10. Check for open circuit and short circuit to ground between fuel tank differential pressure sensor connector D-17 (terminal No. 1) and ECM connector B-109 (terminal No. 112).**

*NOTE: Check harness after checking intermediate connector C-39. 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 fuel tank differential pressure sensor.  
Then go to Step 12 .

**NO :** Repair it. Then go to Step 12 .



**STEP 11. 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 E 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 for item 52, Fuel Tank Differential Pressure Sensor.
  - Output voltage should be between 1,500 and 3,500 millivolts.

- (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 E to the evaporative emission canister.

**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 ID code. Refer to GROUP 42B, Diagnosis

– ID Code Registration Necessity Judgment Table  
<Vehicles with KOS> [P.42B-11](#) or GROUP 42C,  
Diagnosis – ID Codes Registration Judgment Table  
<Vehicles with WCM> [P.42C-9](#). Then go to Step 12 .

**STEP 12. Test the OBD-II drive cycle.**

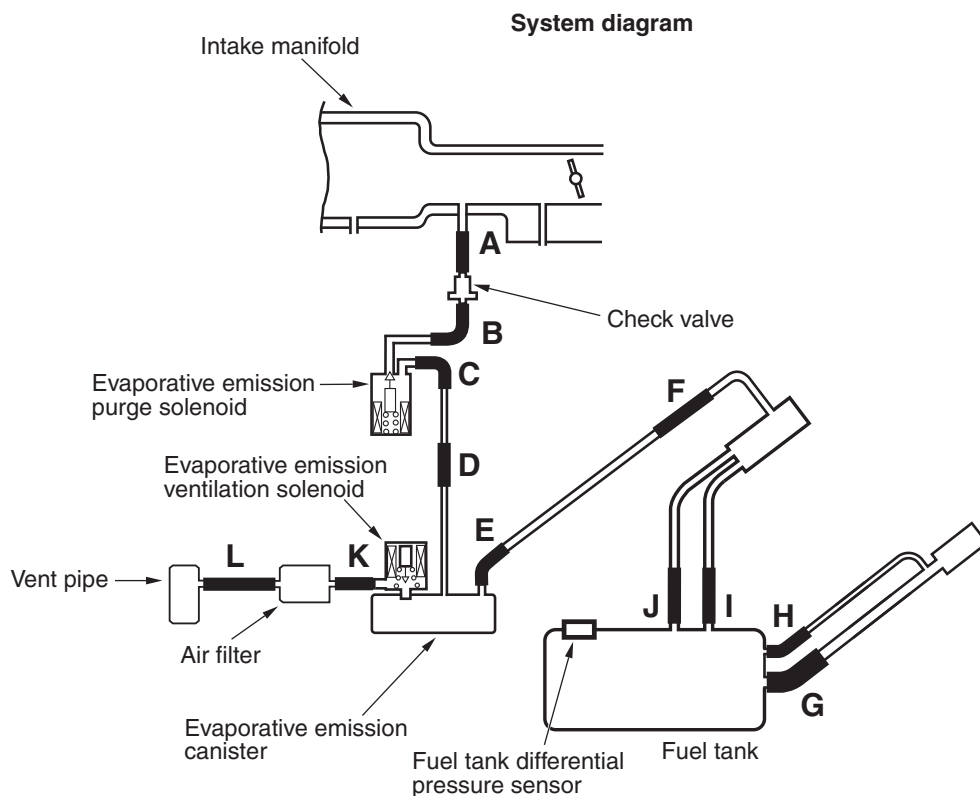
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0452 set?**

**YES** : Retry the troubleshooting.

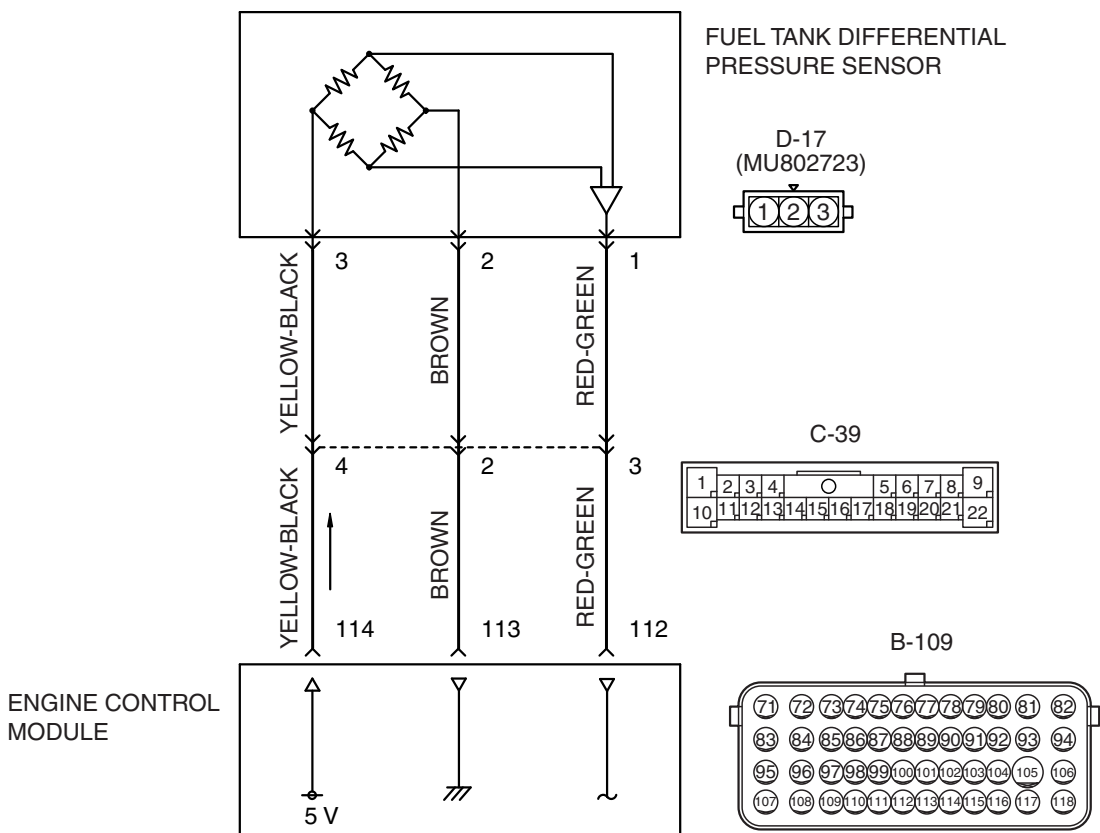
**NO** : The inspection is complete.

**DTC P0453: Evaporative Emission Control System Pressure Sensor High Input**

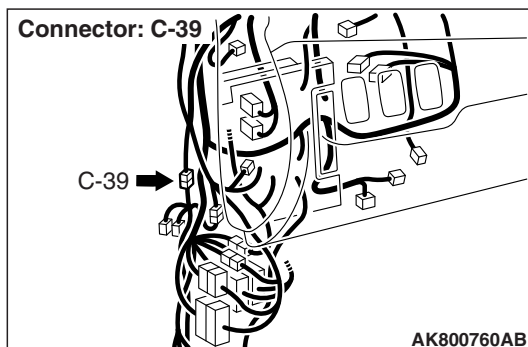
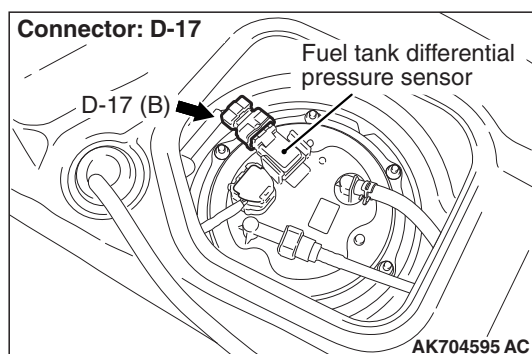
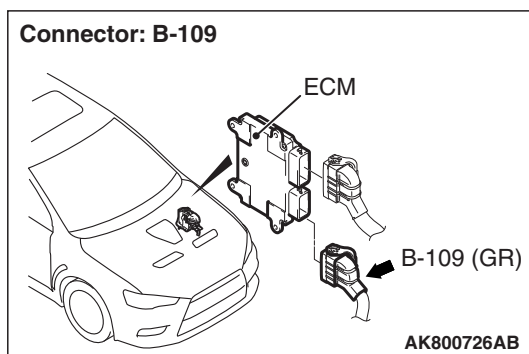


AK704684AB

**FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT**



AK604513 AB



## CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference voltage to the fuel tank differential pressure sensor (terminal No. 3). The ECM (terminal No. 113) supplies a ground to the fuel tank differential pressure sensor (terminal No. 2).
- The ECM (terminal No. 112) receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal No. 1).

## TECHNICAL DESCRIPTION

- To determine whether the fuel tank differential pressure sensor is defective, the ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM 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

Fuel tank differential pressure sensor output voltage is out of specified range.

## MONITOR EXECUTION

Continuous

## MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

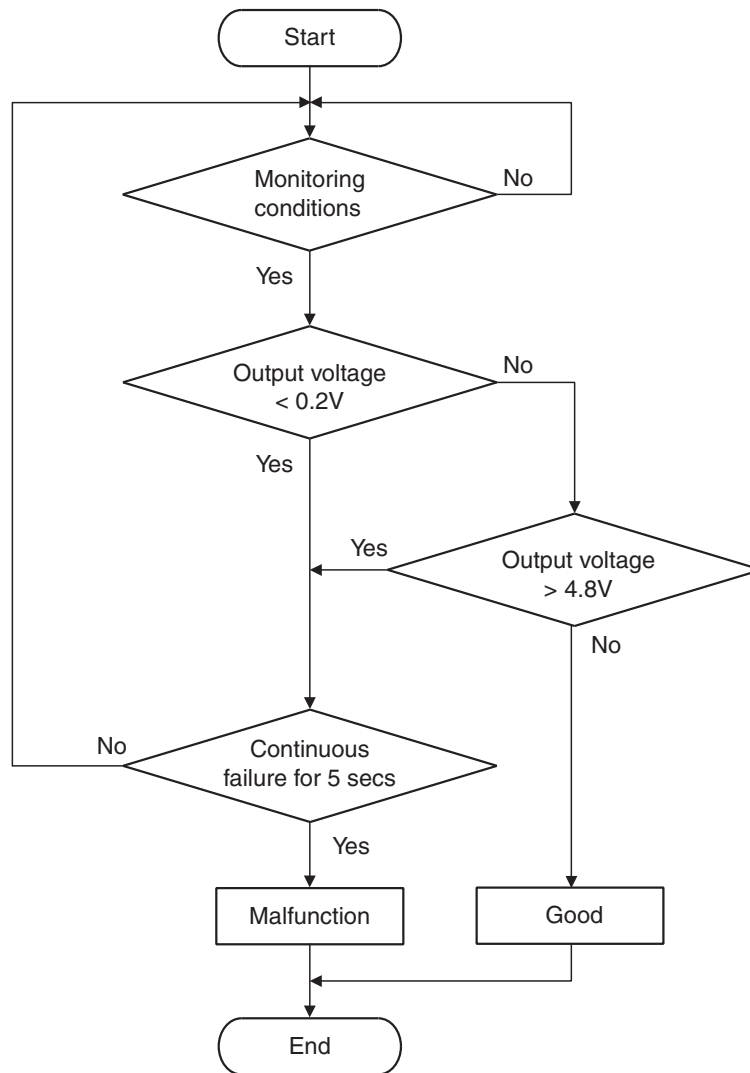
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

## Logic Flow Chart (Monitor Sequence)



AK704952

## Check Conditions

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

## Judgement Criterion

- The fuel tank differential pressure sensor output voltage is more than 4.8 volts for 5 seconds.

## FAIL-SAFE AND BACKUP FUNCTION

- None

## OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 [P.13B-10](#).

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

- Fuel tank differential pressure sensor failed.
- Open fuel tank differential pressure sensor circuit, or connector damage.
- ECM failed.

## DIAGNOSIS

### Required Special Tools:

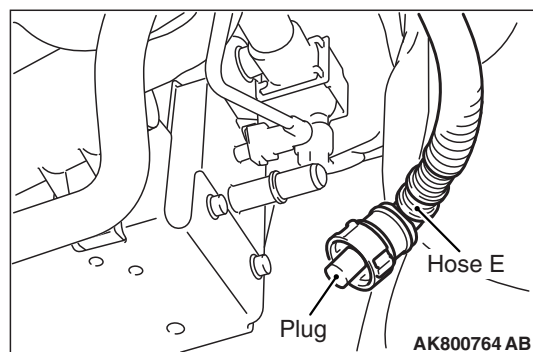
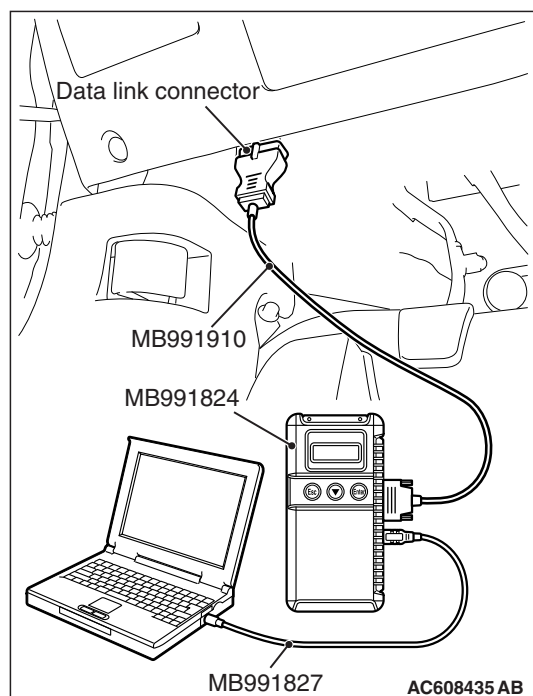
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, check data list item 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.



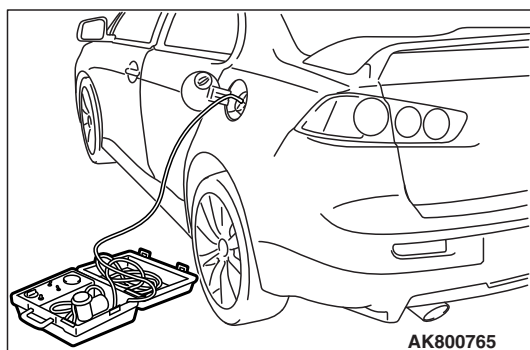
(2) Disconnect hose E from the evaporative emission canister, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.

- Output voltage should be between 1,500 and 3,500 millivolts.



- (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 E to the evaporative emission canister.

**Q: Is the sensor operating properly?**

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

**NO :** Go to Step 2 .

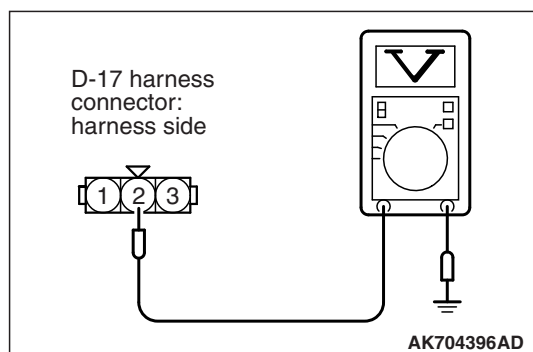
**STEP 2. Measure the ground voltage at fuel tank differential pressure sensor connector D-17 by backprobing.**

- (1) Do not disconnect the connector D-17.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 2 and ground by backprobing.
  - Voltage should be 0.5 volt or less.
- (4) 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 3 .



**STEP 3. Check harness connector D-17 at fuel tank differential pressure sensor and harness connector B-109 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Go to Step 4 .

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

**STEP 4. Check for open circuit between fuel tank differential pressure sensor connector D-17 (terminal No. 2) and ECM connector B-109 (terminal No. 113).**

*NOTE: Check harness after checking intermediate connector C-39. 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 5 .

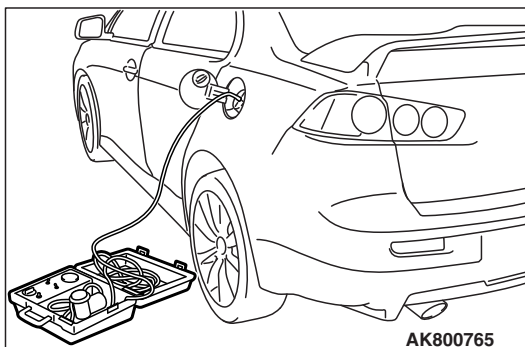
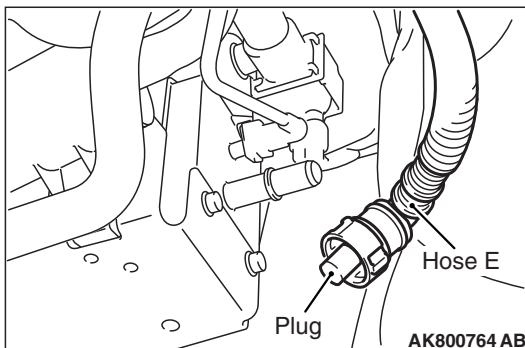
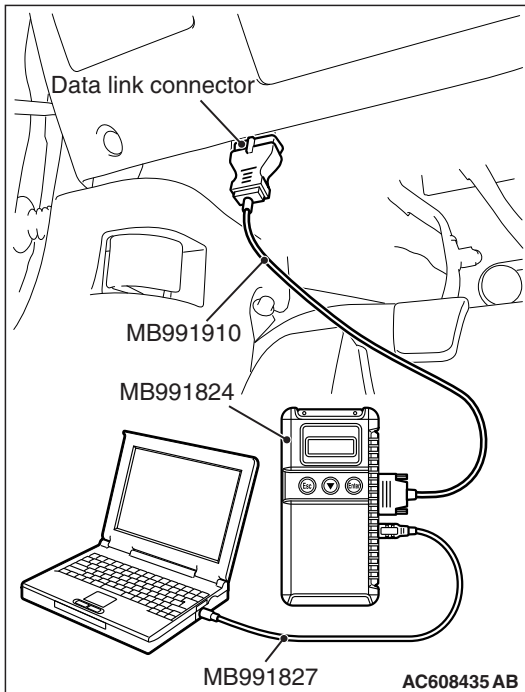
**NO :** Repair it. Then go to Step 7 .

**STEP 5. 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 E 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 for item 52, Fuel Tank Differential Pressure Sensor.

- Output voltage should be between 1,500 and 3,500 millivolts.

(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 E to the evaporative emission canister.

**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 ID code. Refer to GROUP 42B, Diagnosis

– ID Code Registration Necessity Judgment Table  
<Vehicles with KOS> [P.42B-11](#) or GROUP 42C,  
Diagnosis – ID Codes Registration Judgment Table  
<Vehicles with WCM> [P.42C-9](#). Then go to Step 7 .

**STEP 6. Check harness connector D-17 at fuel tank differential pressure sensor and harness connector B-109 at ECM for damage.**

**Q: Are the harness connectors in good condition?**

**YES :** Replace the fuel tank differential pressure sensor.  
Then go to Step 7 .

**NO :** Repair or replace them. Refer to GROUP 00E,  
Harness Connector Inspection [P.00E-2](#). 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 23  
[P.13B-10](#).

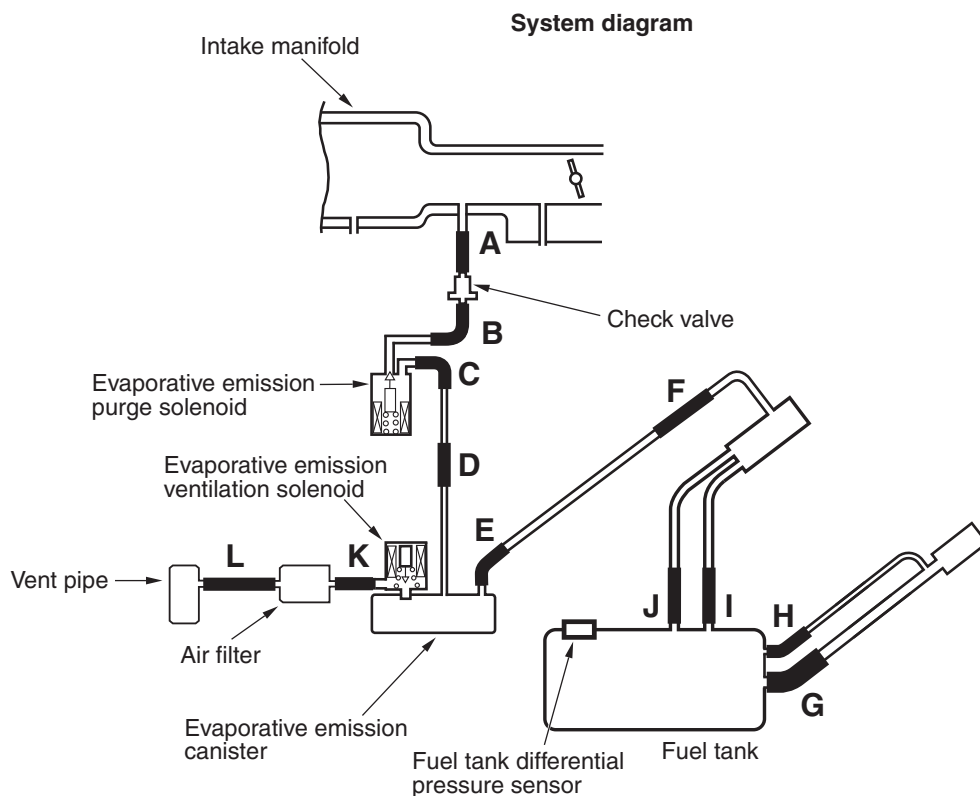
(2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0453 set?**

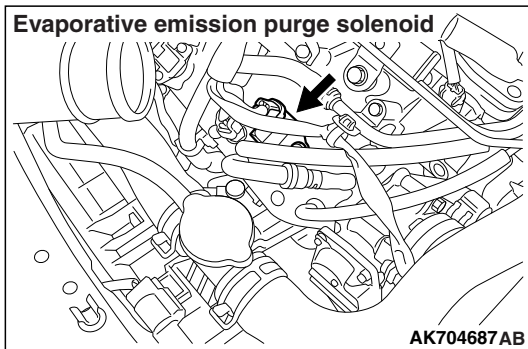
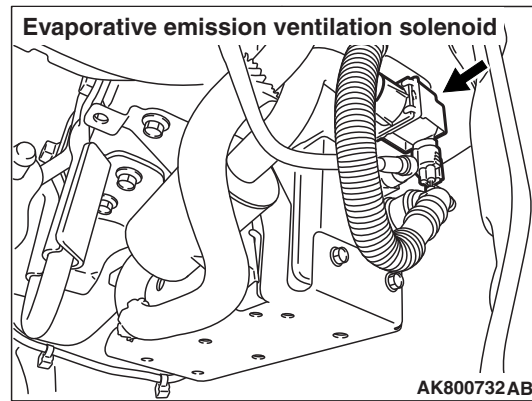
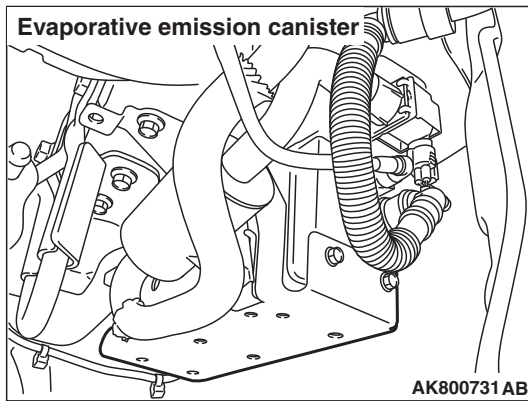
**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

**DTC P0455: Evaporative Emission Control System Leak Detected (gross leak)**



AK704684AB



## 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 monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the ECM will set DTC P0455.
- The ECM 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 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

Continuous

## MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

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

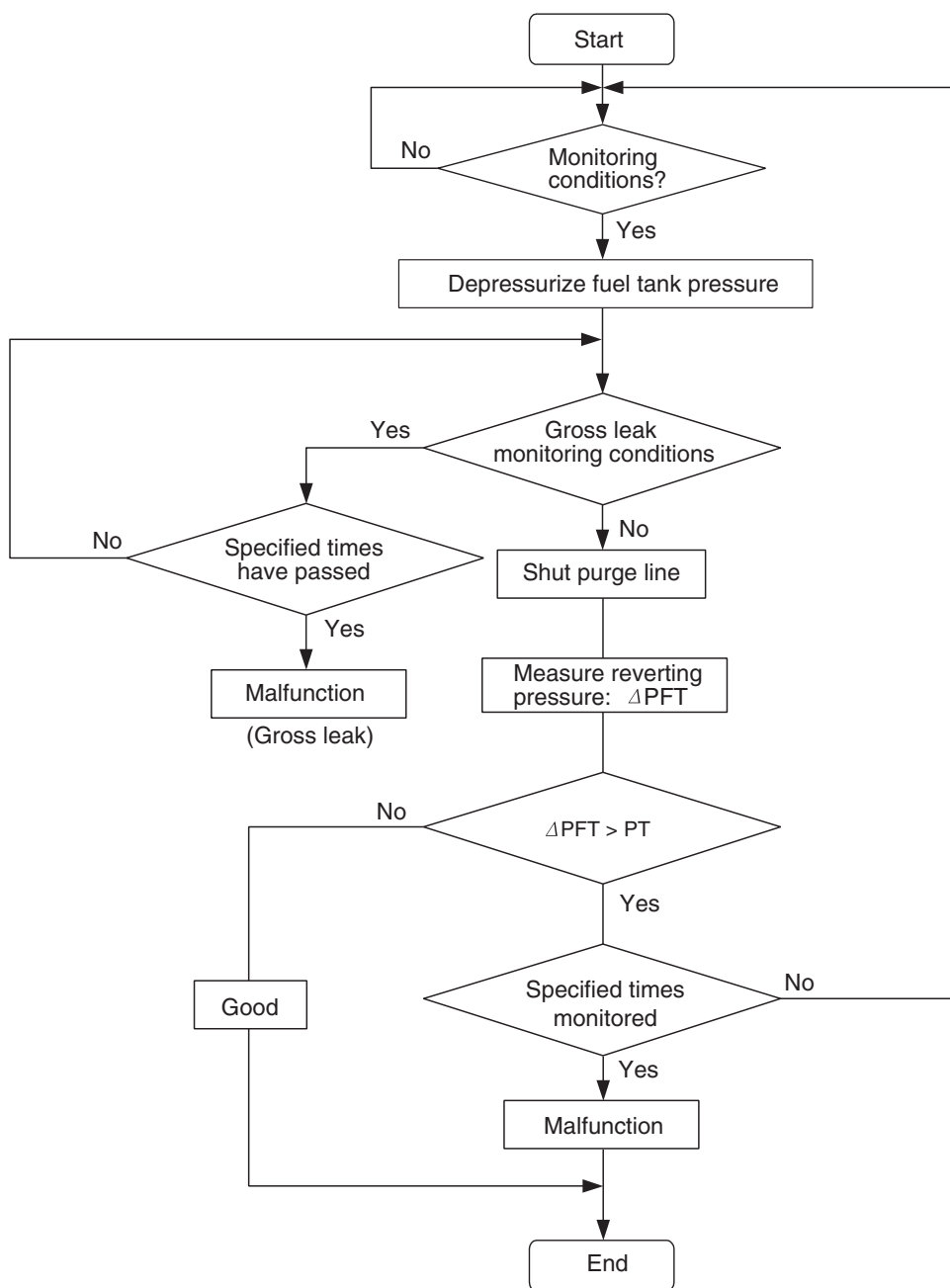
- Not applicable

**Sensor (The sensors below are determined to be normal)**

- Not applicable

## DTC SET CONDITIONS

## Logic Flow Chart (Monitor Sequence)



AK704743

## Check Conditions

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 60°C (140°F). <Amount of remaining fuel is 15 – 40 percent of capacity when the engine is started>
- Engine coolant temperature is more than 20°C (68°F). <Amount of remaining fuel is 40 – 85 percent of capacity when the engine is started>
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Volumetric efficiency is between 20 and 50 percent.
- Engine speed is more than 1,594 r/min.

- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 451 Pa (0.13 in.Hg). <Amount of remaining fuel is 15 – 40 percent of capacity when the engine is started>
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg). <Amount of remaining fuel is 40 – 85 percent of capacity when the engine is started>
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Intake air temperature is more than 5°C (41°F).
- Fuel temperature is less than 36°C (97°F).
- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 150 seconds

#### Judgment Criterion

- The fuel tank internal pressure is more than –1961 Pa (–0.58 in.Hg) after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed.

#### FAIL-SAFE AND BACKUP FUNCTION

- None

#### OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).

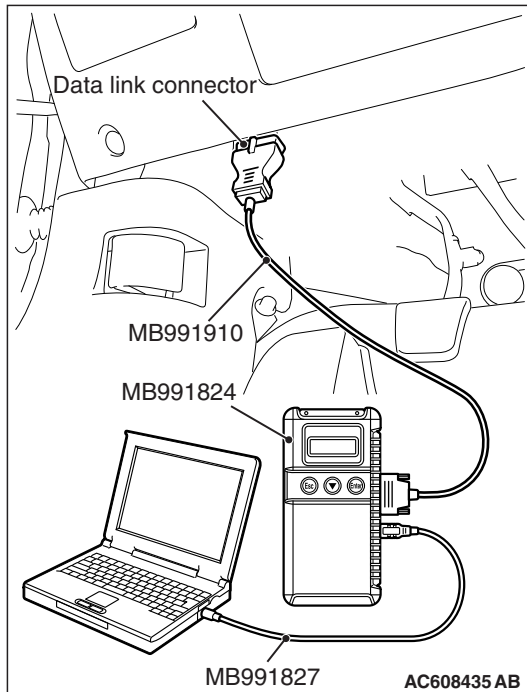
#### TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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 will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

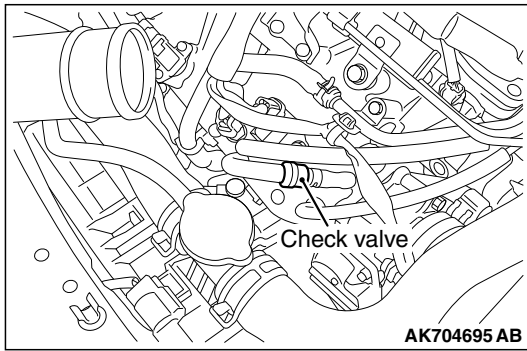
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991958.
- (4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (5) Start the engine.
- (6) Select "Special Function"
- (7) Select "Evap Leak Monitor"
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

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

**YES :** A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13B-51](#). If no other DTC's have been set, go to Step 2 .

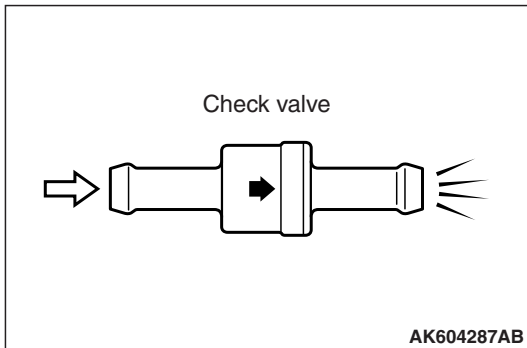
**NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> :** The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

**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.



**STEP 2. Test check valve.**

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

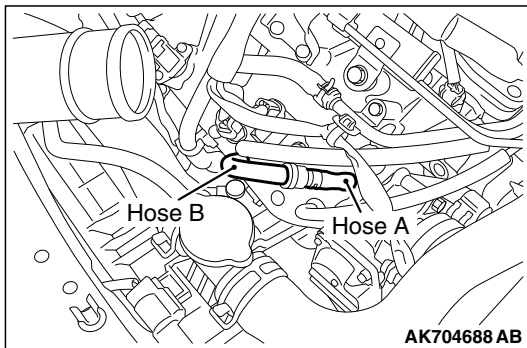


(2) Check valve should allow air to flow in only one direction.

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

**YES :** Go to Step 3 .

**NO :** Replace check valve. Then go to Step 14 .



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

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

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 4 .

**NO :** Replace any damaged hose. Then go to Step 14 .

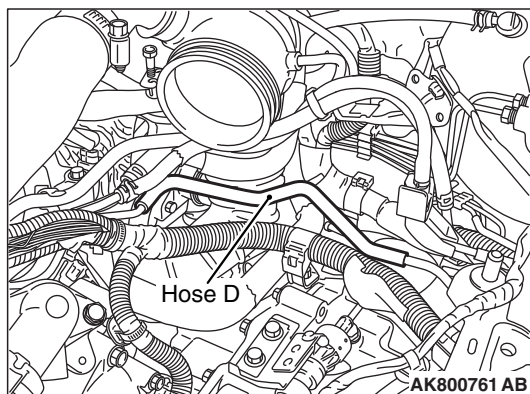
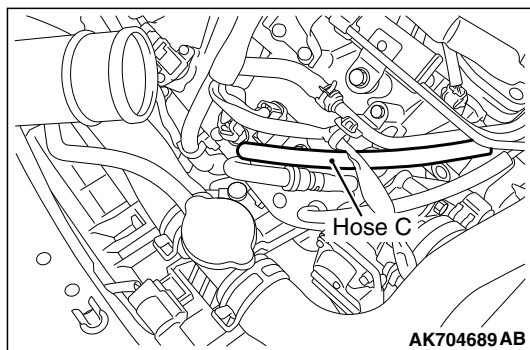
**STEP 4. Check the evaporative emission purge solenoid for leaks.**

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-104](#).

**Q: Is the evaporative emission purge solenoid operating properly?**

**YES :** Go to Step 5 .

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 14 .

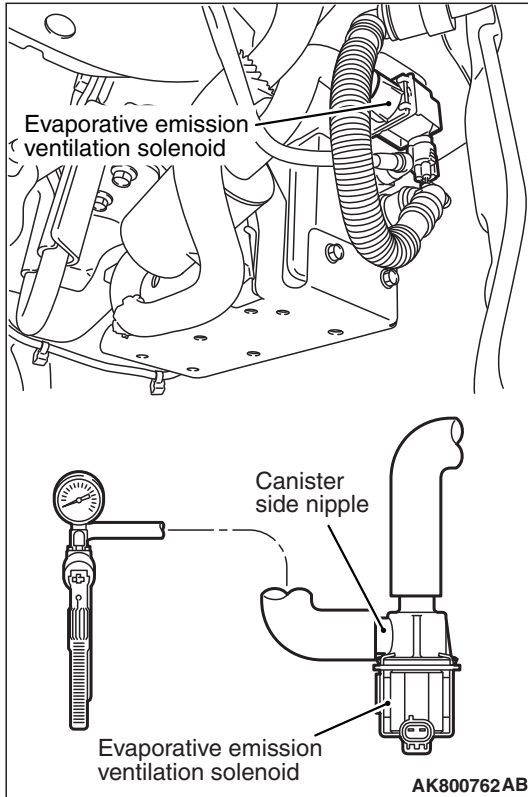
**STEP 5. Check for leaks in evaporative emission hoses C and D.**

Use a hand vacuum pump to test each hose C and D.

**Q: Do the hoses hold vacuum?**

**YES** : Go to Step 6 .

**NO** : Replace any damaged hose. Then go to Step 14 .



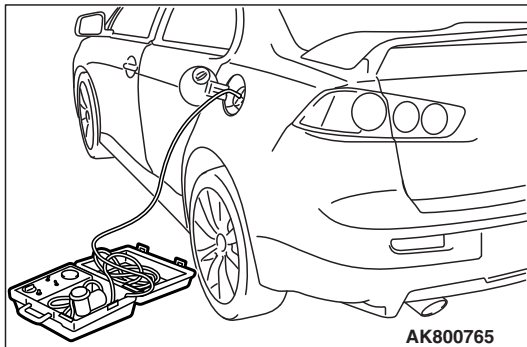
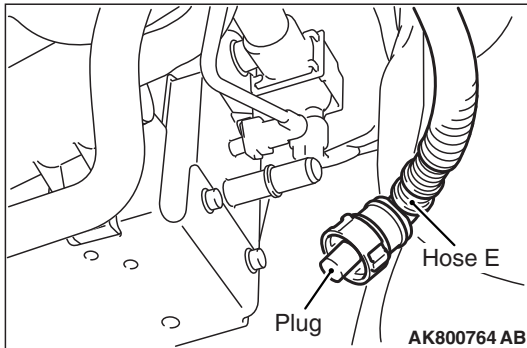
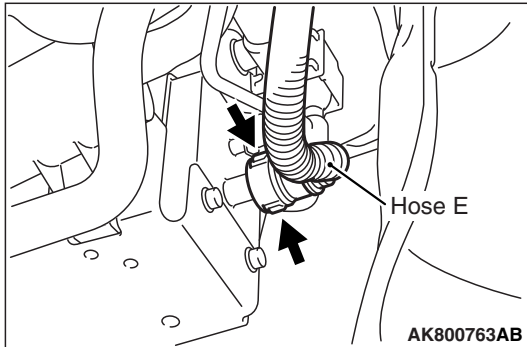
**STEP 6. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.**

- (1) Remove the canister cover.
- (2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
- (3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
- (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.
- (7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
- (8) Reinstall the canister cover.

**Q: Did the evaporative emission ventilation solenoid hold vacuum?**

**YES :** Go to Step 7 .

**NO :** Replace the evaporative emission ventilation solenoid. Then go to Step 14 .

**STEP 7. Perform the pressure test on the evaporative emission system.**

- (1) Disconnect hose E from the canister while holding the release buttons indicated in the illustration pressed by fingers.
- (2) Plug the disconnected end of hose E.
- (3) 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.
- (4) Remove the fuel cap.
- (5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
- (6) 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.*
- (7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
- (8) Connect hose E to the evaporative emission canister.

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

**YES :** Go to Step 12 .

**NO :** Go to Step 8 .

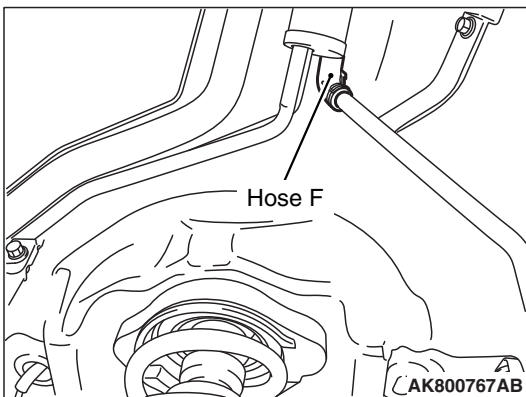
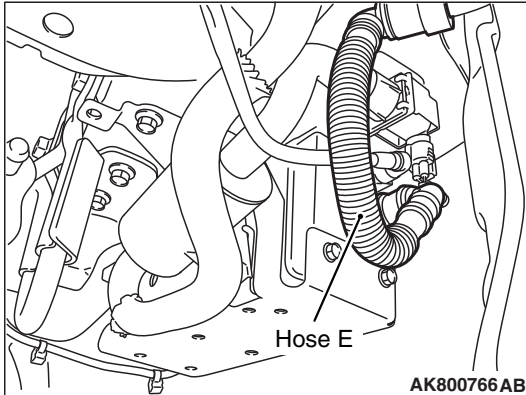
**STEP 8. Check for leaks in evaporative emission hoses E and F.**

Use a hand vacuum pump to test each hose E and F.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 9 .

**NO :** Replace any damaged hose. Then go to Step 14 .



**STEP 9. Check for leaks in evaporative emission hoses G and H.**

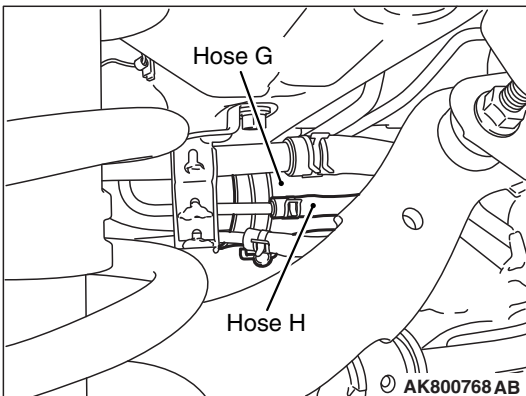
(1) Remove the fuel tank assembly.

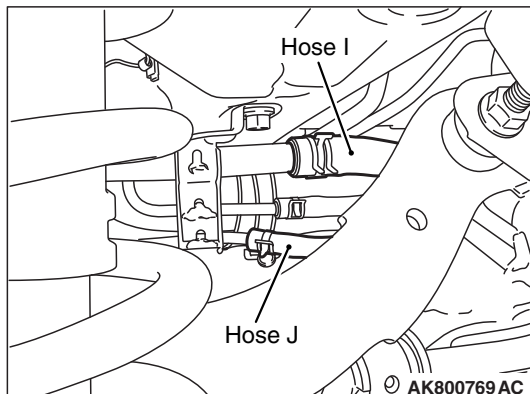
(2) Use a hand vacuum pump to test each hose G and H.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 10.

**NO :** Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .



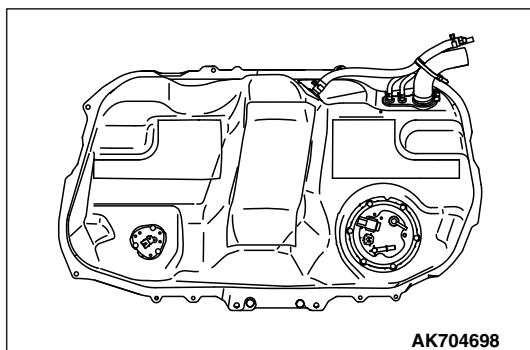
**STEP 10. Check for leaks in evaporative emission hoses I and J.**

- (1) Remove the fuel tank assembly.
- (2) Use a hand vacuum pump to test each hose I and J.

**Q: Do the hoses hold vacuum?**

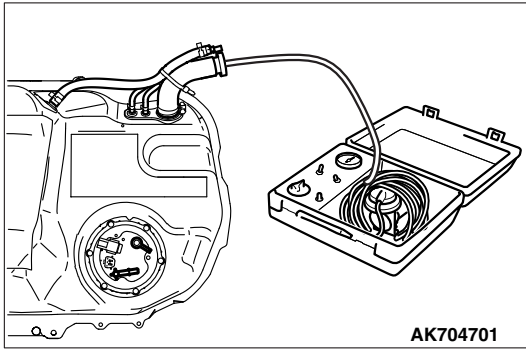
**YES :** Go to Step 11 .

**NO :** Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .

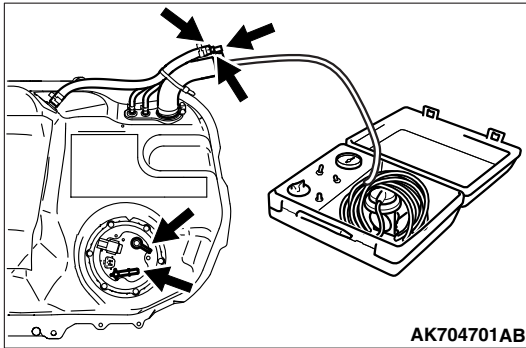
**STEP 11. Check for leaks in the fuel tank.**

- (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 or leveling valve.> :**

Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 14 .

**YES <When there is a leak from the fuel tank.> :** Replace the fuel tank. Then go to Step 14 .

**NO :** When there is no leak, reinstall the fuel tank. Then go to Step 13 .

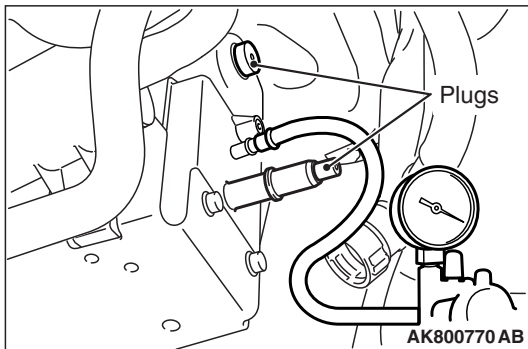
**STEP 12. Check the evaporative emission canister for vacuum leaks.**

- (1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump and remove the plugs.

**Q: Is the evaporative emission canister in good condition?**

**YES :** Go to Step 13 .

**NO :** Replace the evaporative emission canister. Then go to Step 14 .



**STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTCs using scan tool MB991958.
- (3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (4) Start the engine.
- (5) Select "Special Function"
- (6) Select "Evap Leak Monitor"
- (7) During the test, keep the accelerator pedal at the idle position.
- (8) 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".
- (9) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 14 .

**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 14 .

**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.

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**STEP 14. Test the OBD-II drive cycle.**

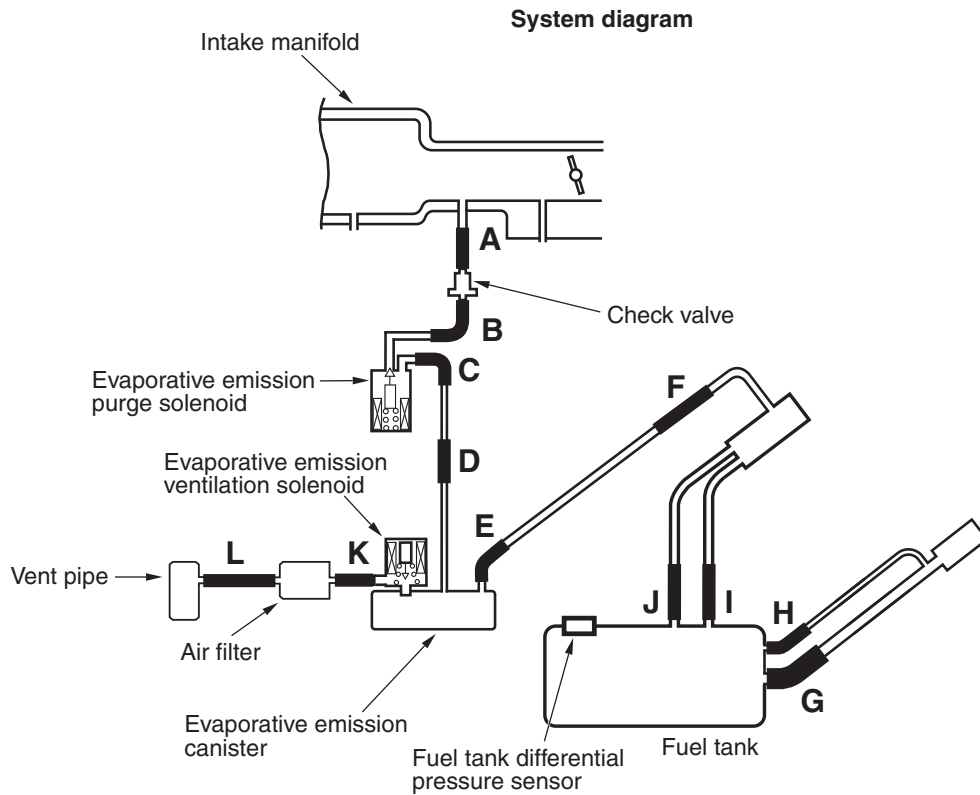
- (1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 [P.13B-10](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0455 set?**

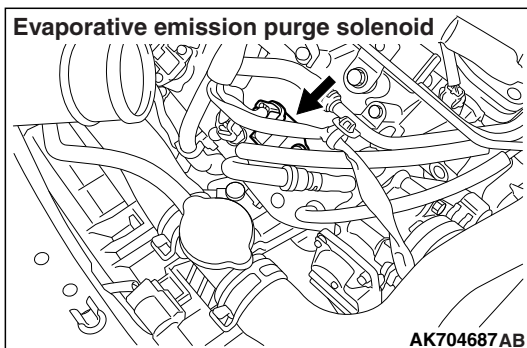
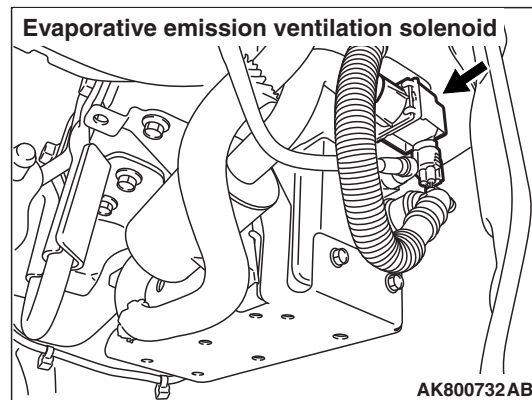
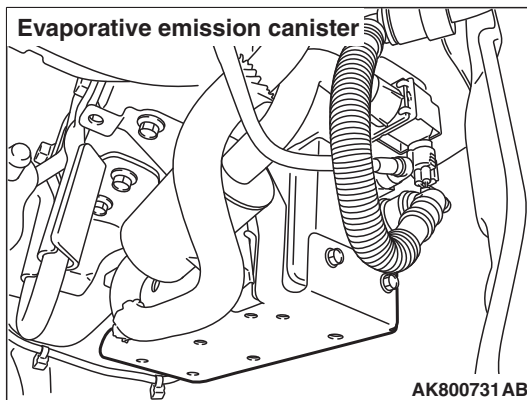
**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.

DTC P0456: Evaporative Emission Control System Leak Detected (very small leak)



AK704684 AB



**TECHNICAL DESCRIPTION**

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM 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 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)**

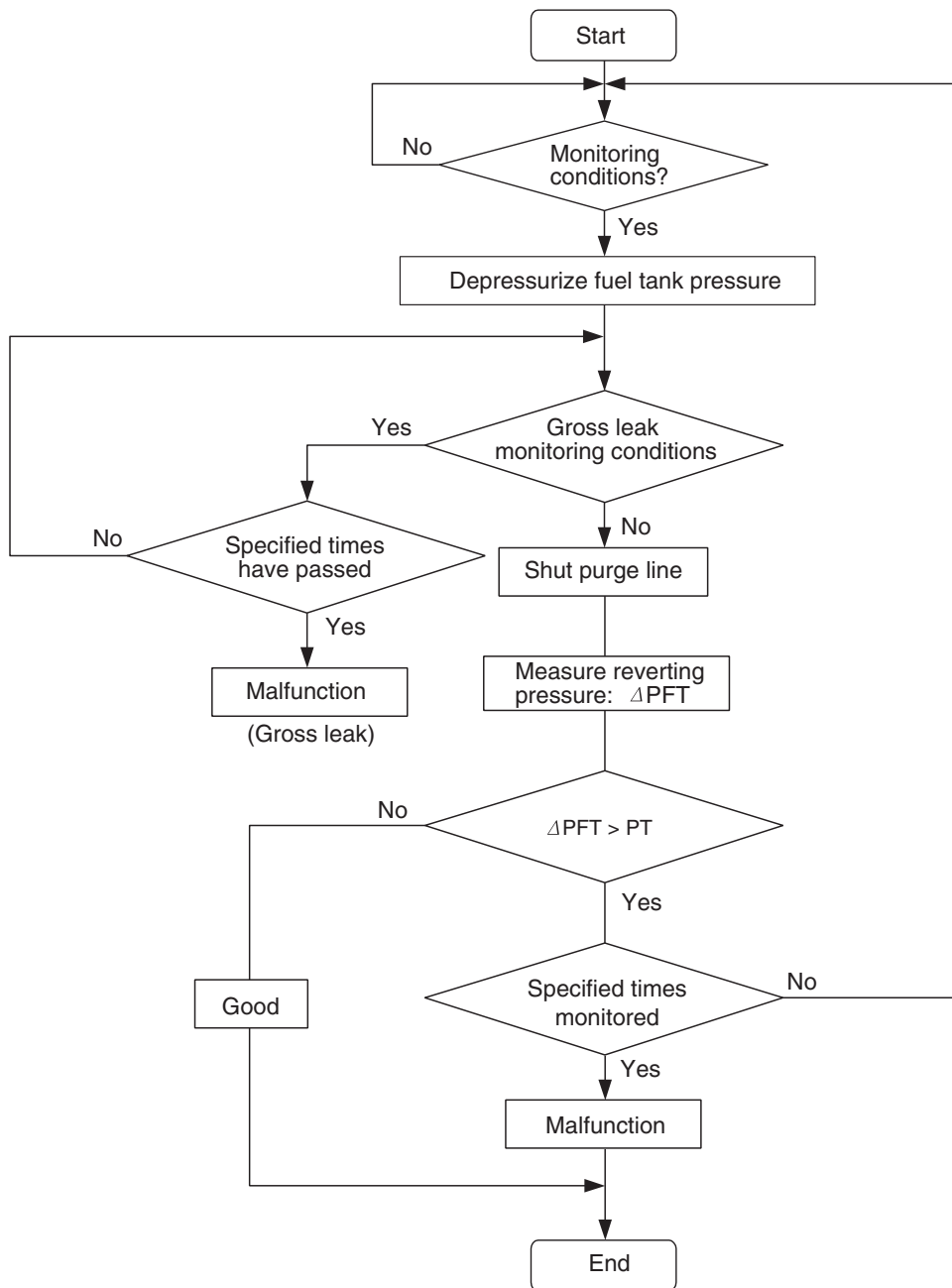
- Evaporative emission purge system monitor
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel tank temperature sensor monitor
- Fuel tank differential pressure sensor monitor
- Fuel level sensor monitor

**Sensor (The sensors below are determined to be normal)**

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

## DTC SET CONDITIONS

### Logic Flow Chart (Monitor Sequence)



AK704743

#### Check Conditions

- Engine coolant temperature is less than 36°C (97°F) when the engine is started.
- Intake air temperature is less than 36°C (97°F) when the engine is started.
- Engine coolant temperature is more than 20°C (68°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the change of the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Amount of remaining fuel is 40 – 85 percent of capacity when the engine is started.
- Barometric pressure is more than 76 kPa (22.4 in.Hg).
- Intake air temperature is more than –10°C (14°F).
- Fuel temperature is less than 33°C (91°F).

- Fuel tank differential pressure sensor output voltage is between 1.0 and 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.
- Monitoring time: 10 – 14 minutes

**Judgement Criterion**

- In case the amount of change in the pressure that is monitored for a given length of time inside the tank is beyond the specified value after sealing off the fuel tank and the vapor line.

*NOTE: The specified value varies depending on the fuel temperature and fuel level.*

**FAIL-SAFE AND BACKUP FUNCTION**

- None

**OBD-II DRIVE CYCLE PATTERN**

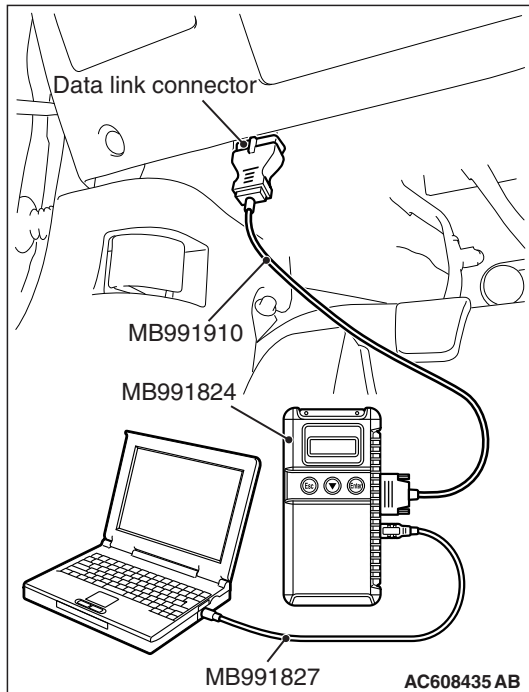
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 [P.13B-10](#).

**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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: 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 will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

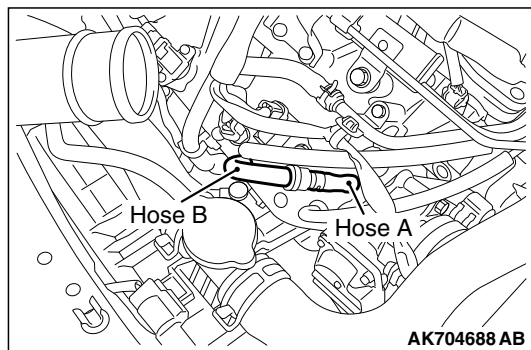
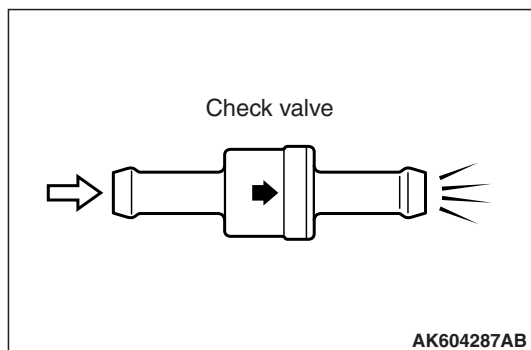
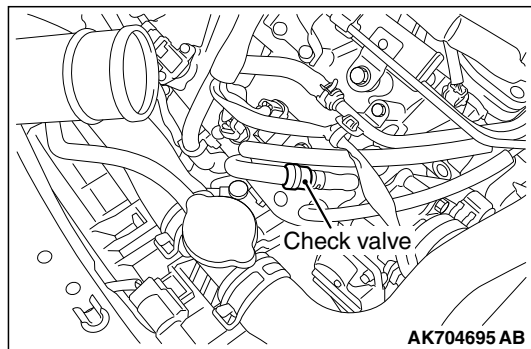
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991958.
- (4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (5) Start the engine.
- (6) Select "Special Function"
- (7) Select "Evap Leak Monitor"
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

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

**YES :** A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13B-51](#). 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.

**STEP 2. 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 3 .

**NO :** Replace check valve. Then go to Step 14 .

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

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

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 4 .

**NO :** Replace any damaged hose. Then go to Step 14 .

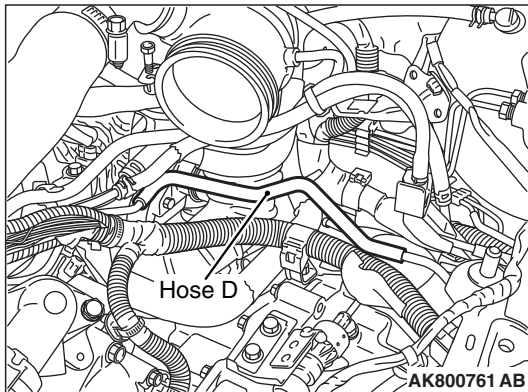
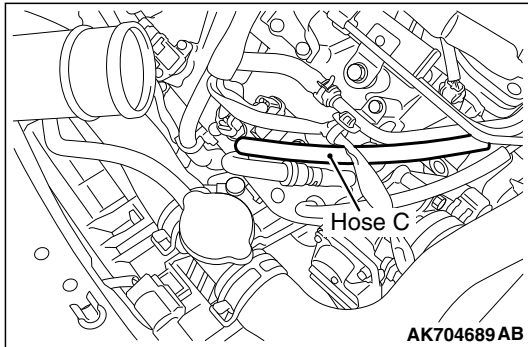
**STEP 4. Check the evaporative emission purge solenoid for leaks.**

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-104](#).

**Q: Is the evaporative emission purge solenoid operating properly?**

**YES :** Go to Step 5 .

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 14 .



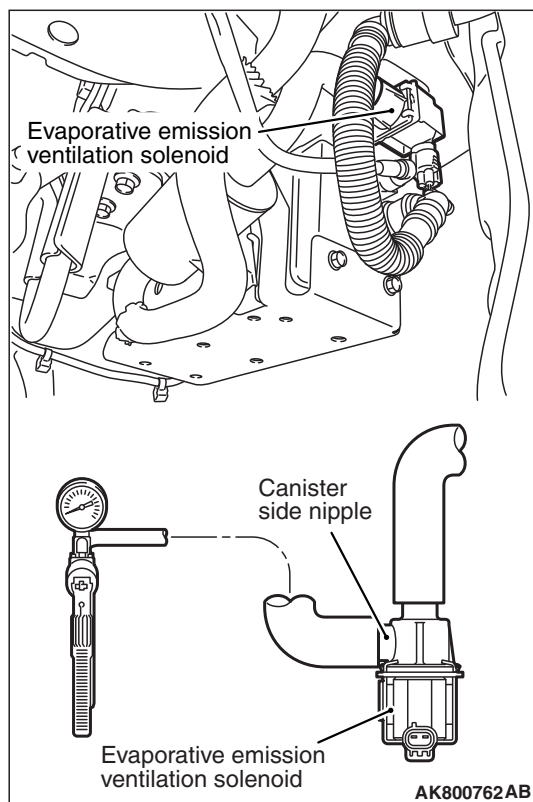
**STEP 5. Check for leaks in evaporative emission hoses C and D.**

Use a hand vacuum pump to test each hose C and D.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 6 .

**NO :** Replace any damaged hose. Then go to Step 14 .

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

- (1) Remove the canister cover.
- (2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
- (3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
- (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.
- (7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
- (8) Reinstall the canister cover.

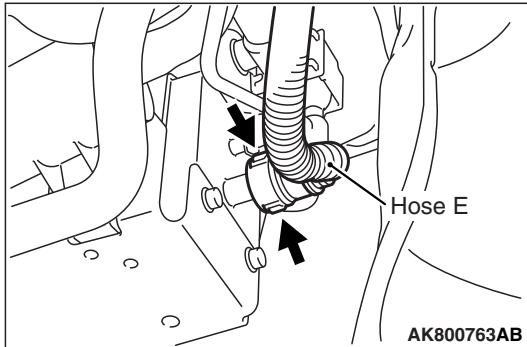
**Q: Did the evaporative emission ventilation solenoid hold vacuum?**

**YES :** Go to Step 7 .

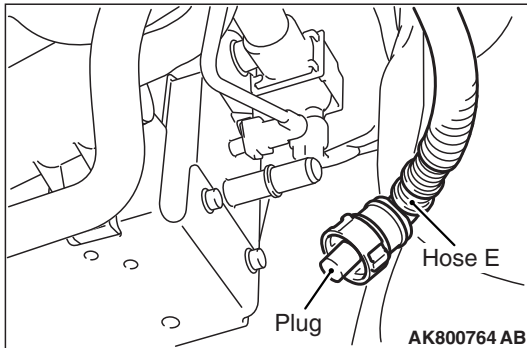
**NO :** Replace the evaporative emission ventilation solenoid. Then go to Step 14 .

**STEP 7. Perform the pressure test on the evaporative emission system.**

- (1) Disconnect hose E from the canister while holding the release buttons indicated in the illustration pressed by fingers.



- (2) Plug the disconnected end of hose E.  
(3) 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.  
(4) Remove the fuel cap.



- (5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).  
(6) Pressure test the system to determine whether any leaks are present.

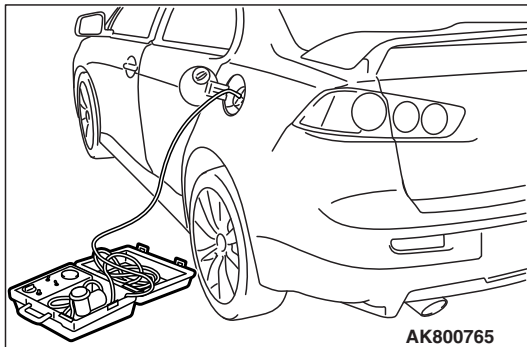
*NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.*

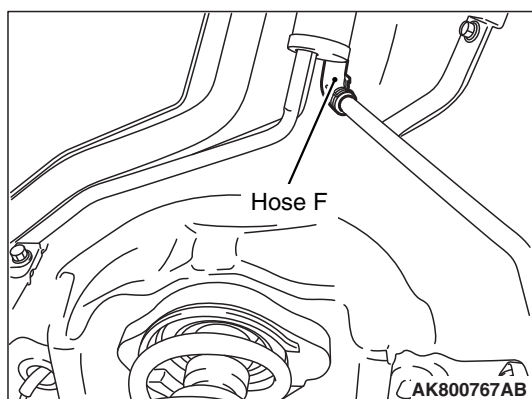
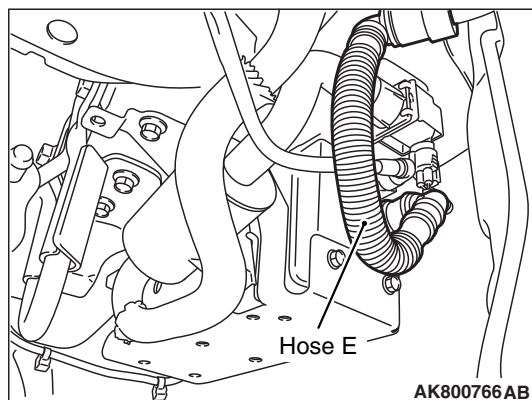
- (7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.  
(8) Connect hose E to the evaporative emission canister.

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

**YES :** Go to Step 12 .

**NO :** Go to Step 8 .



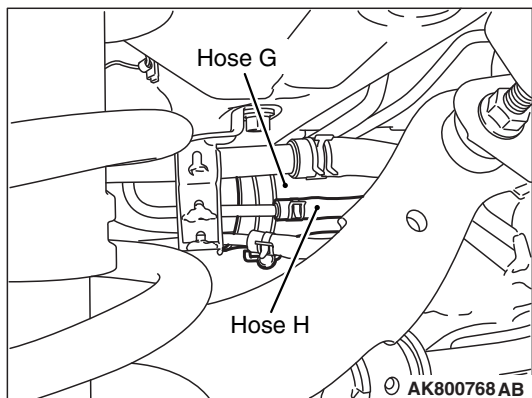
**STEP 8. Check for leaks in evaporative emission hoses E and F.**

Use a hand vacuum pump to test each hose E and F.

**Q: Do the hoses hold vacuum?**

**YES** : Go to Step 9 .

**NO** : Replace any damaged hose. Then go to Step 14 .

**STEP 9. Check for leaks in evaporative emission hoses G and H.**

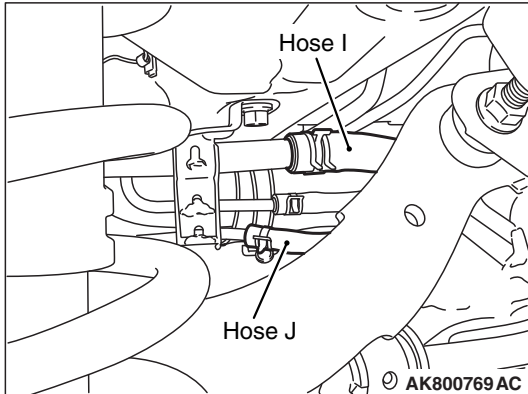
(1) Remove the fuel tank assembly.

(2) Use a hand vacuum pump to test each hose G and H.

**Q: Do the hoses hold vacuum?**

**YES** : Go to Step 10.

**NO** : Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .



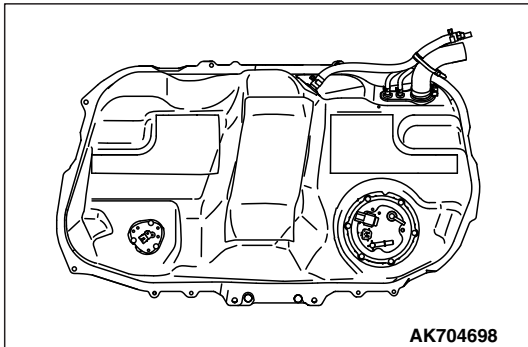
**STEP 10. Check for leaks in evaporative emission hoses I and J.**

- (1) Remove the fuel tank assembly.
- (2) Use a hand vacuum pump to test each hose I and J.

**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 11 .

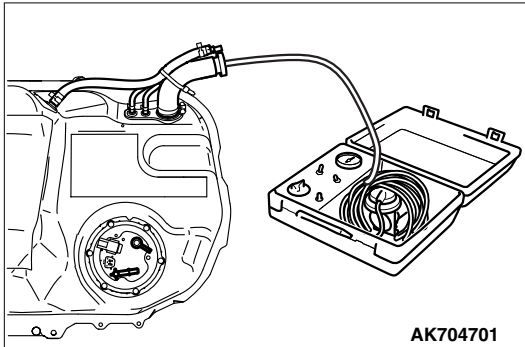
**NO :** Replace any damaged hose and reinstall the fuel tank assembly. Then go to Step 14 .



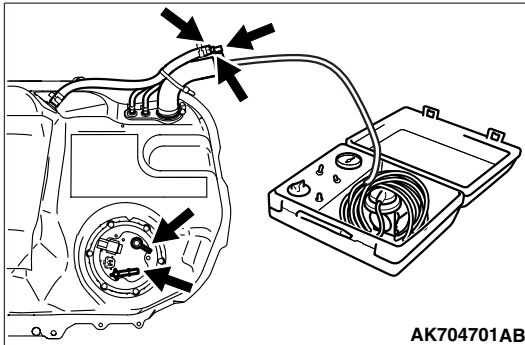
**STEP 11. Check for leaks in the fuel tank.**

- (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.

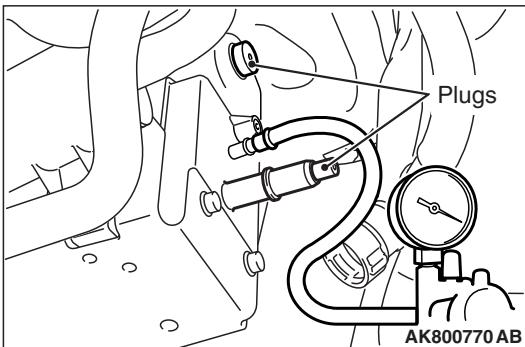
**Q: Are any leaks found?**

**YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> :**

Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 14 .

**YES <When there is a leak from the fuel tank.> :** Replace the fuel tank. Then go to Step 14 .

**NO :** When there is no leak, reinstall the fuel tank. Then go to Step 13 .



**STEP 12. Check the evaporative emission canister for vacuum leaks.**

- (1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump and remove the plugs.

**Q: Is the evaporative emission canister in good condition?**

**YES :** Go to Step 13 .

**NO :** Replace the evaporative emission canister. Then go to Step 14 .

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**STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.

- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTCs using scan tool MB991958.
- (3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
- (4) Start the engine.
- (5) Select "Special Function"
- (6) Select "Evap Leak Monitor"
- (7) During the test, keep the accelerator pedal at the idle position.
- (8) 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".
- (9) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Necessity Judgment Table <Vehicles with KOS> [P.42B-11](#) or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> [P.42C-9](#). Then go to Step 14 .

**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 14 .

**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.

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**STEP 14. Test the OBD-II drive cycle.**

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

**Q: Is DTC P0456 set?**

**YES :** Retry the troubleshooting.

**NO :** The inspection is complete.