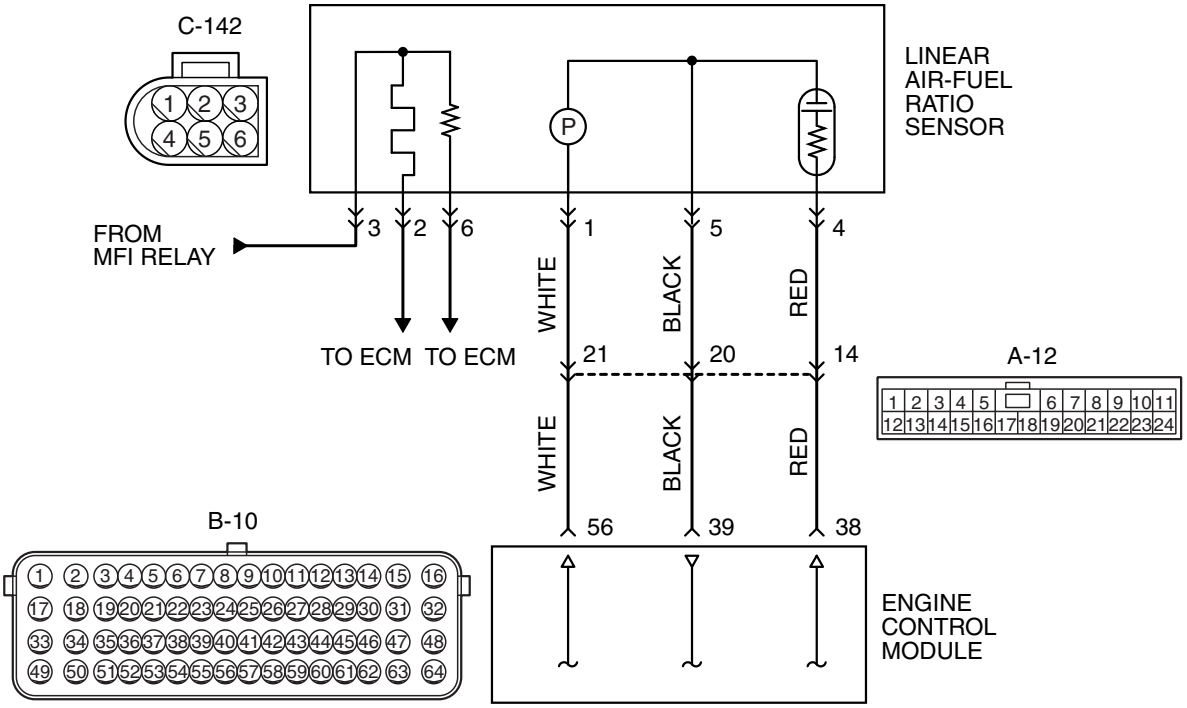
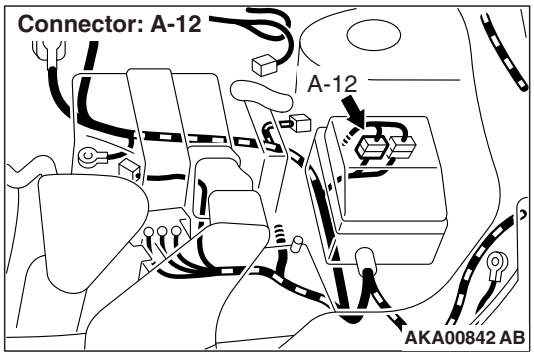
DTC P0132: Linear Air-Fuel Ratio Sensor Circuit High Voltage

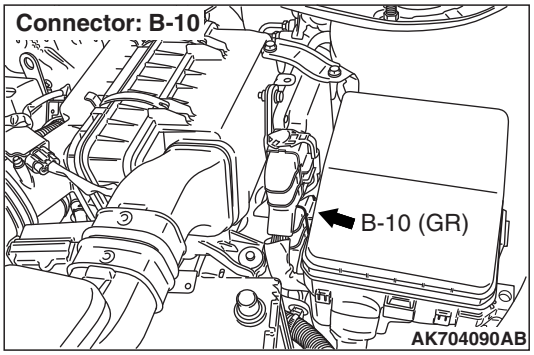
<< Previous

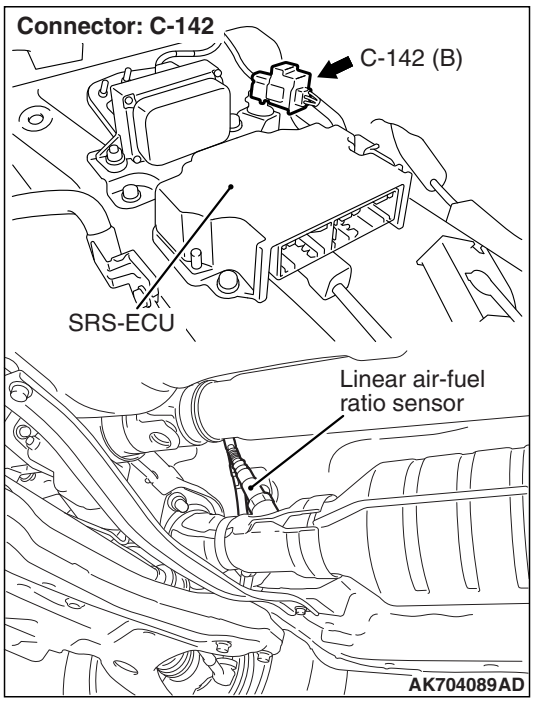
LINEAR AIR-FUEL RATIO SENSOR CIRCUIT



AKA00449 AC







TSB Revision

CIRCUIT OPERATION

The linear air-fuel ratio sensor and the ECM are connected by the following three lines to detect the air-fuel ratio.

- The line between the linear air-fuel ratio sensor (terminal No. 1) and the ECM (terminal No. 56) detects the air-fuel ratio.
- The auxiliary line between the linear air-fuel ratio sensor (terminal No. 4) and the ECM (terminal No. 38) detects the air-fuel ratio.
- The line between the linear air-fuel ratio sensor (terminal No. 5) and the ECM (terminal No. 39) is connected to ground.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If one of the three line voltages is excessively high or if all the three line voltages are excessively high, the DTC is stored as a malfunction.

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)

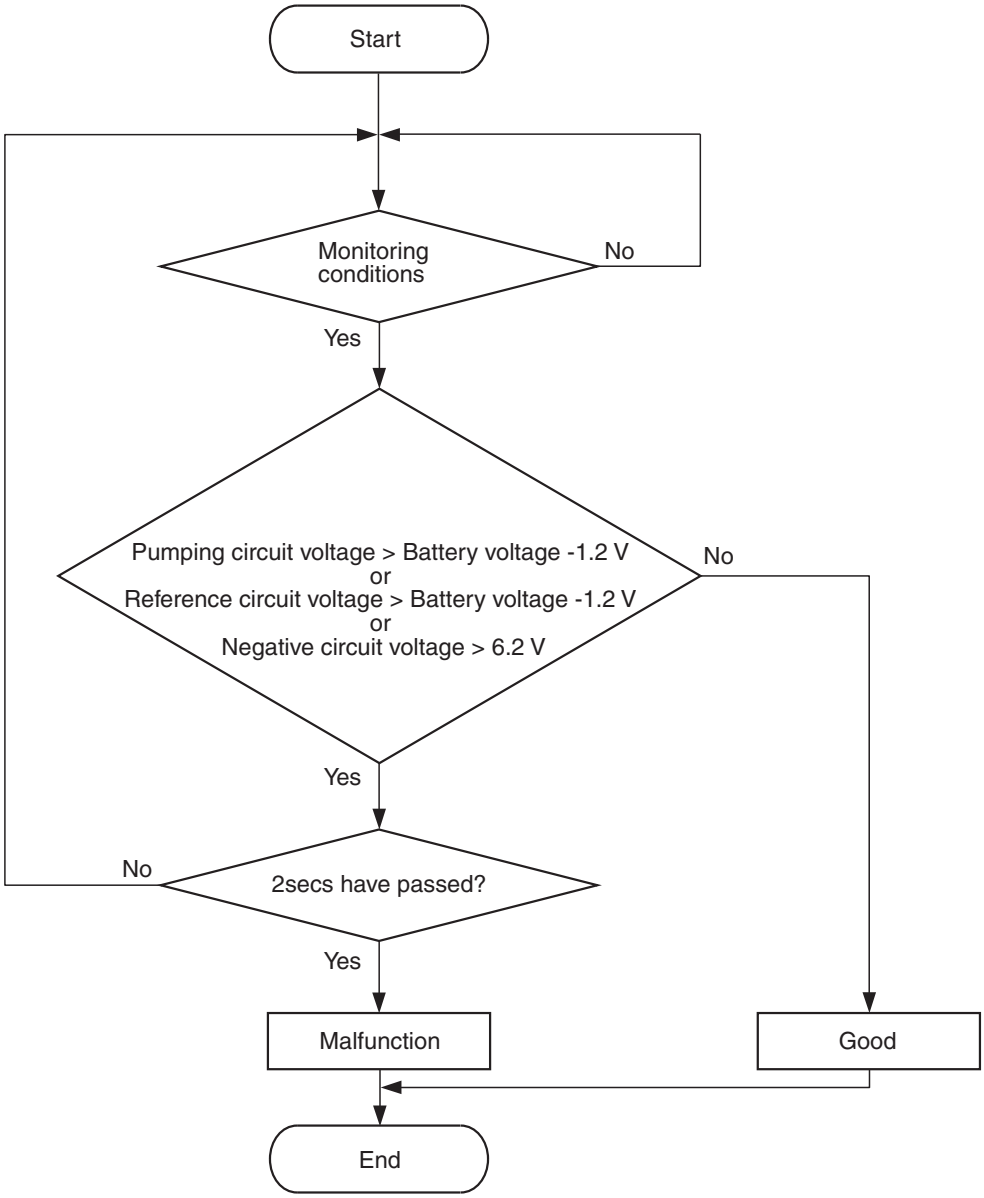
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900358

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 40 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- The pumping circuit voltage is higher than the battery positive voltage from which you subtract 1.2 volt for 2 seconds.

or

- The reference circuit voltage is higher than battery positive voltage from which you subtract 1.2 volt for 2 seconds.

or

- The negative circuit voltage is be higher than 6.2 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.

TSB Revision

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

- Linear air-fuel ratio sensor failed.
- Shorted linear air-fuel ratio 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. Check harness connector C-142 at linear air-fuel ratio sensor and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

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

STEP 2. Check for short circuit to power supply between linear air-fuel ratio sensor connector C-142 (terminal No. 4) and ECM connector B-10 (terminal No. 38).

NOTE: Check harness after checking intermediate connector A-12. 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 3.
NO : Repair it. Then go to Step 7.

STEP 3. Check for short circuit to power supply between linear air-fuel ratio sensor connector C-142 (terminal No. 1) and ECM connector B-10 (terminal No. 56).

NOTE: Check harness after checking intermediate connector A-12. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

Q: Is the harness wire in good condition?

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

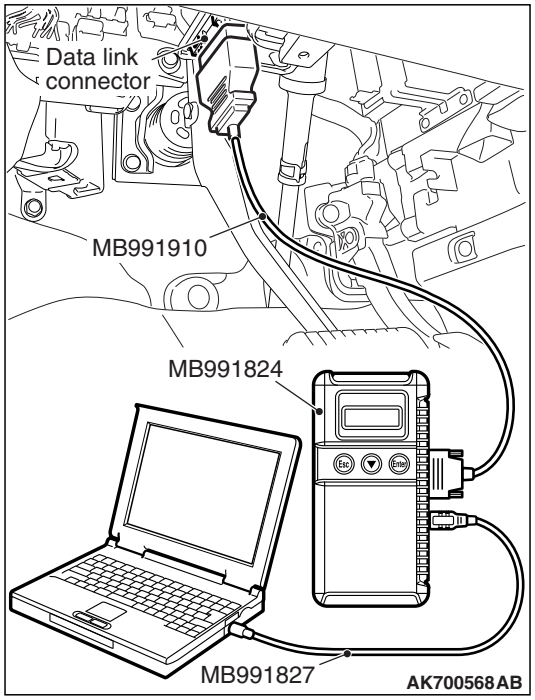
STEP 4. Check for short circuit to power supply between linear air-fuel ratio sensor connector C-142 (terminal No. 5) and ECM connector B-10 (terminal No. 39).

NOTE: Check harness after checking intermediate connector A-12. 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.

TSB Revision



STEP 5. Test the OBD-II drive cycle.

⚠ 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 and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0132 set?

YES : Then go to Step 6.
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.00-15.

STEP 6. Replace the linear air-fuel ratio sensor.

(1) Replace the linear air-fuel ratio sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0132 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 7.
NO : The inspection is complete.

STEP 7. Test the OBD-II drive cycle.

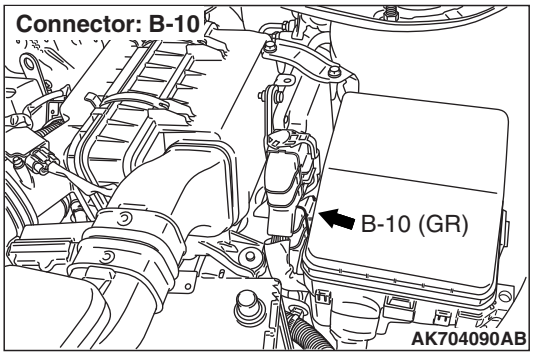
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

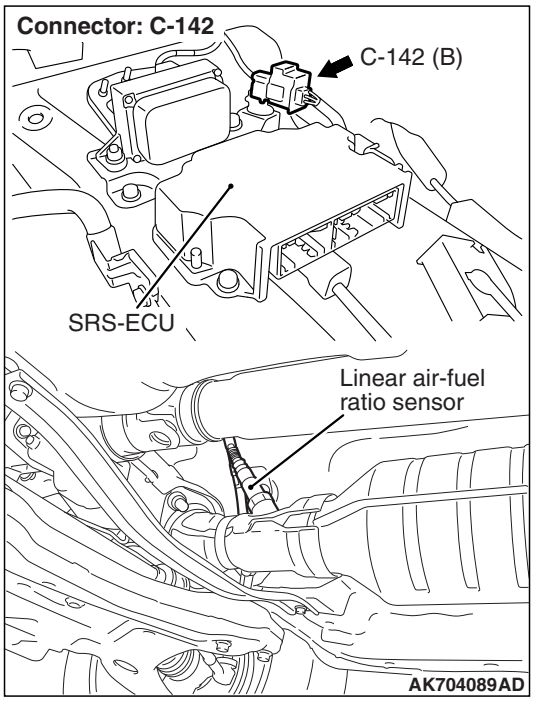
Q: Is DTC P0132 set?

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

TSB Revision

DTC P0133: Linear Air-Fuel Ratio Sensor Circuit Slow Response





TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- If the response speed of the linear air-fuel ratio sensor to the change in the air-fuel ratio is too slow, the DTC is stored as the linear air-fuel ratio sensor deterioration.

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)

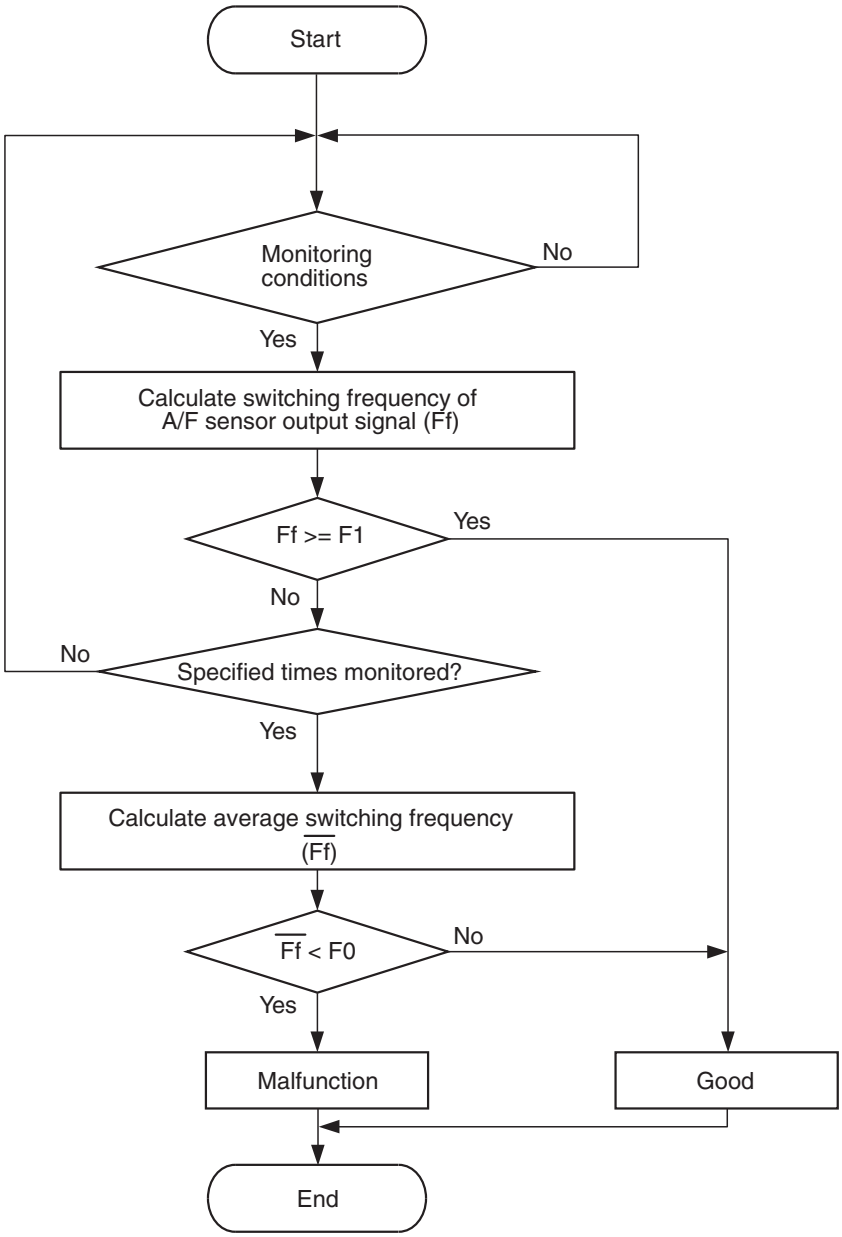
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



F0, F1: Threshold valve

AK900412

Check Conditions

- Engine speed is between 1,219 and 3,000 r/min.
- Volumetric efficiency is between 27.5 and 70 percent.
- Engine coolant temperature is more than 60°C (140°F).
- Under the closed loop air/fuel control.
- The accelerator pedal is depressed.
- Short-term fuel trim is between –25 and +25 percent.
- More than 3 seconds have passed after the above mentioned conditions have been met.
- During the drive cycle, the ECM performs monitoring with the accumulated total time of 10 seconds, 5 times.

TSB Revision

Judgement Criteria

- The average frequency is less than 8 times.
- The frequency is less than 13 times.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 1 P.13A-11.

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

- Linear air-fuel ratio sensor failed.
- Connector damage.

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. Check harness connector C-142 at linear air-fuel ratio sensor and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

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

STEP 2. Test the OBD-II drive cycle.

⚠ CAUTION

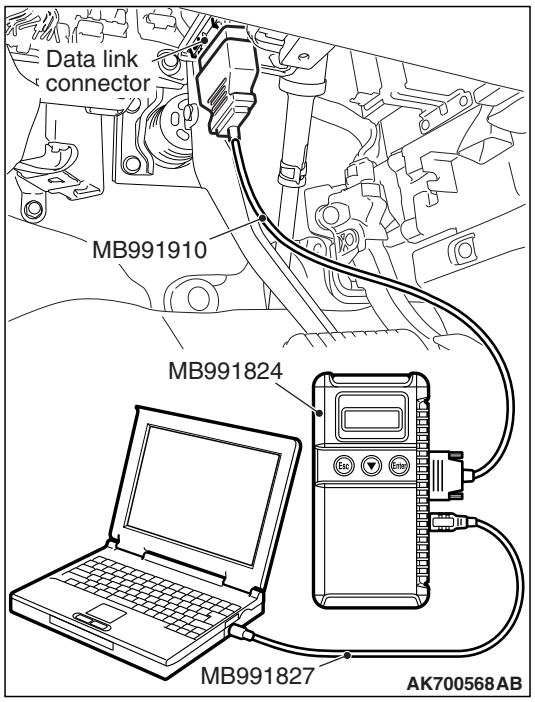
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 1 P.13A-11.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0133 set?

YES : Replace the linear air-fuel ratio sensor. Then go to Step 3.

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.00-15.



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 1 P.13A-11.

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

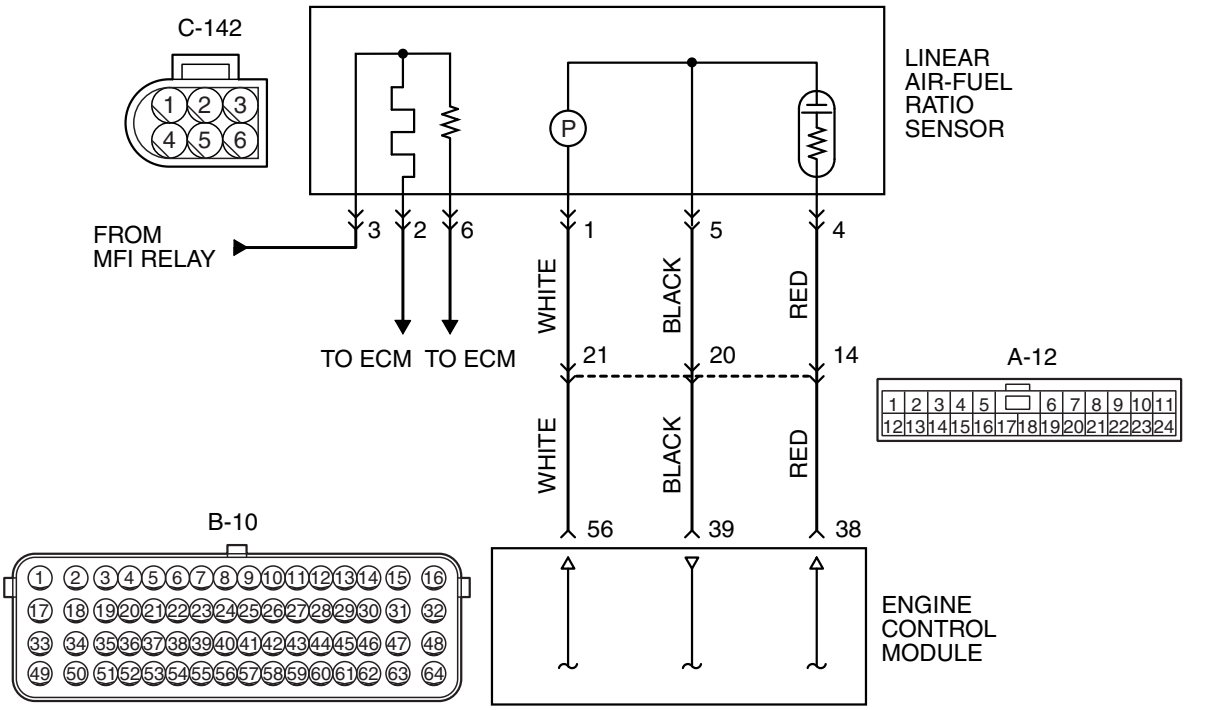
Q: Is DTC P0133 set?

YES : Retry the troubleshooting.

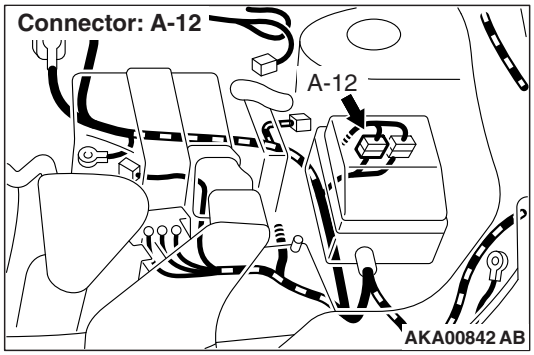
NO : The inspection is complete.

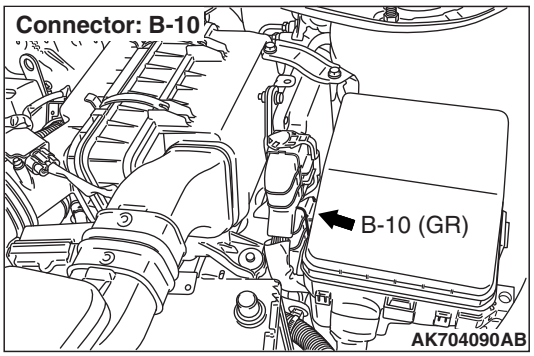
DTC P0134: Linear Air-Fuel Ratio Sensor Circuit No Activity Detected

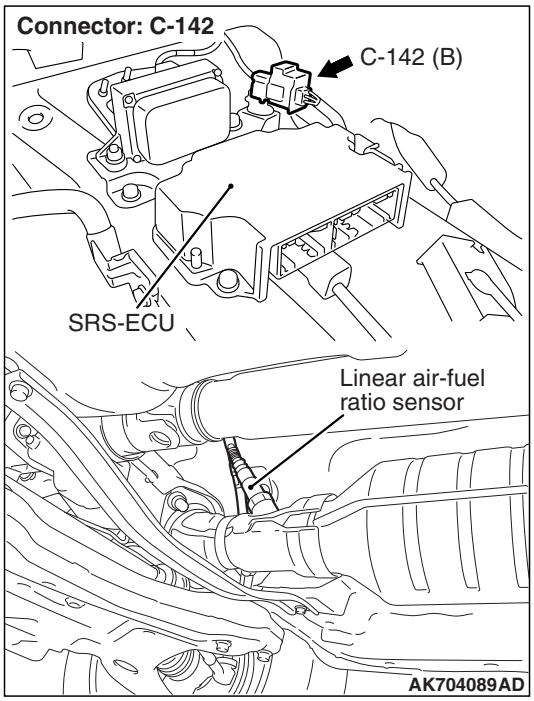
LINEAR AIR-FUEL RATIO SENSOR CIRCUIT



AKA00449 AC







CIRCUIT OPERATION

The linear air-fuel ratio sensor and the ECM are connected by the following three lines to detect the air-fuel ratio.

- The line between the linear air-fuel ratio sensor (terminal No. 1) and the ECM (terminal No. 56) detects the air-fuel ratio.
- The auxiliary line between the linear air-fuel ratio sensor (terminal No. 4) and the ECM (terminal No. 38) detects the air-fuel ratio.
- The line between the linear air-fuel ratio sensor (terminal No. 5) and the ECM (terminal No. 39) is connected to ground.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the linear air-fuel ratio sensor.
- If the linear air-fuel ratio sensor has deteriorated, corrections will be made by the heated oxygen sensor (rear).

DESCRIPTIONS OF MONITOR METHODS

- The linear air-fuel ratio sensor is heated by the linear air-fuel ratio sensor heater or the exhaust gas. If the linear air-fuel ratio sensor remains not activated although being under the conditions where it can sufficiently be activated, the DTC is stored as a malfunction.

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)

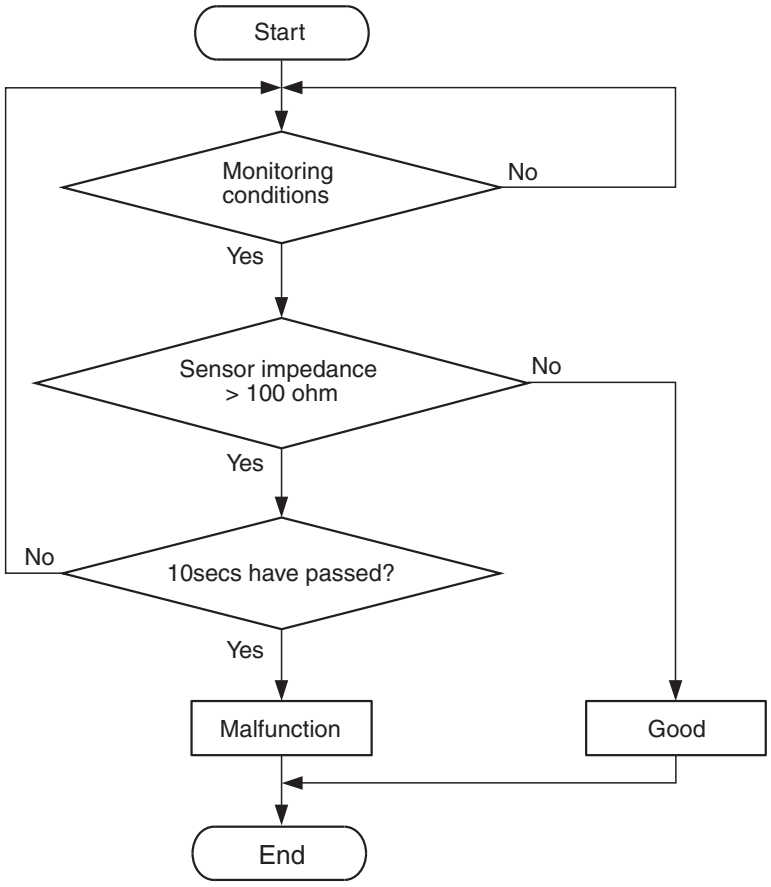
- Linear air-fuel ratio sensor heater monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK900361

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.
- More than 220 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- The sensor impedance is be higher than 100 ohms for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.

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

- Linear air-fuel ratio sensor failed.
- Open linear air-fuel ratio sensor circuit, harness damage or connector damage.

DIAGNOSIS

Required Special Tools:

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

TSB Revision

STEP 1. Check harness connector C-142 at linear air-fuel ratio sensor and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

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

STEP 2. Check for open circuit and harness damage between linear air-fuel ratio sensor connector C-142 (terminal No. 4) and ECM connector B-10 (terminal No. 38).

NOTE: Check harness after checking intermediate connector A-12. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

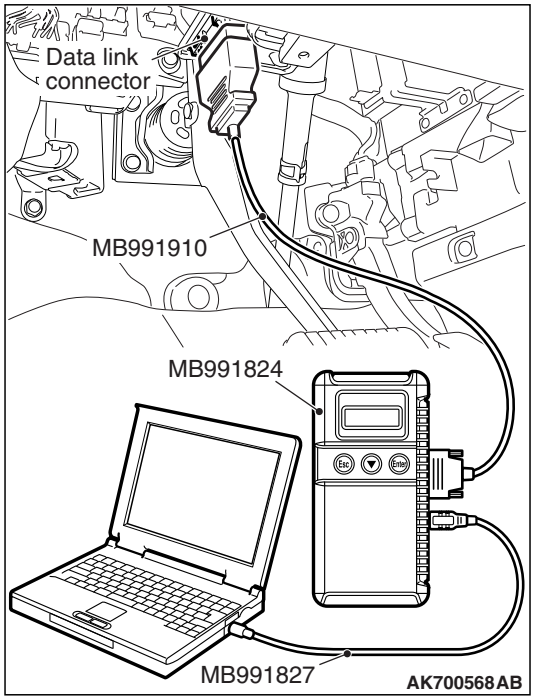
YES : Go to Step 3.
NO : Repair it. Then go to Step 5.

STEP 3. Check for open circuit and harness damage between linear air-fuel ratio sensor connector C-142 (terminal No. 5) and ECM connector B-10 (terminal No. 39).

NOTE: Check harness after checking intermediate connector A-12. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

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



STEP 4. Test the OBD-II drive cycle.

⚠ 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 and delete the DTC.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Replace the linear air-fuel ratio sensor. 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.00-15.

STEP 5. Test the OBD-II drive cycle.

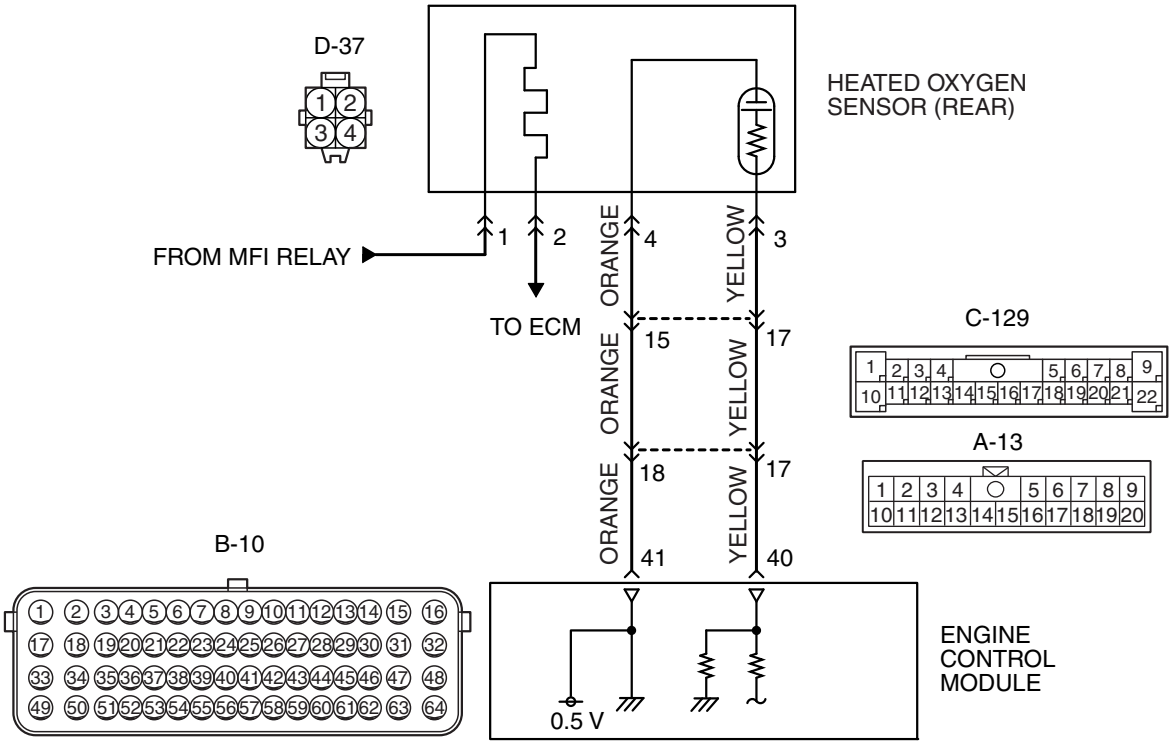
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

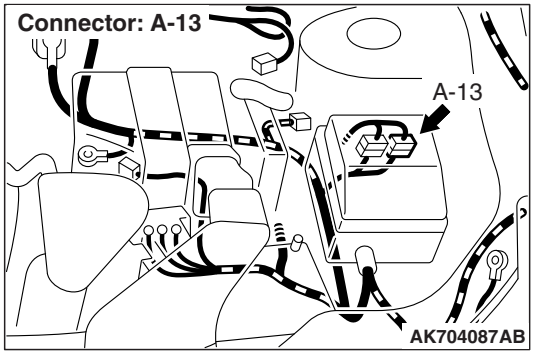
YES : Retry the troubleshooting.
NO : The inspection is complete.

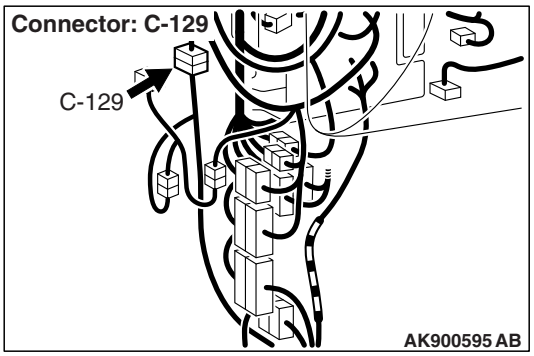
DTC P0137: Heated Oxygen Sensor (rear) Circuit Low Voltage

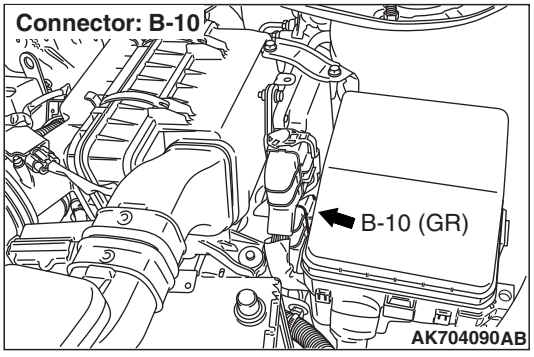
HEATED OXYGEN SENSOR (REAR) CIRCUIT



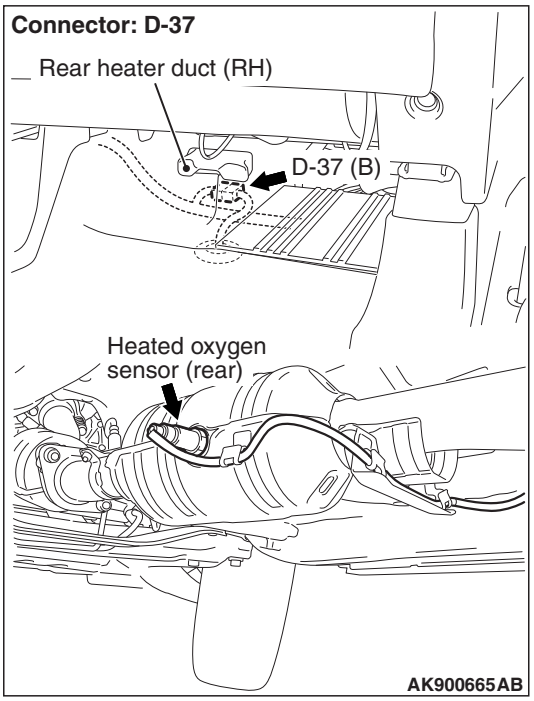
AK900383 AD







TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is under the 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)

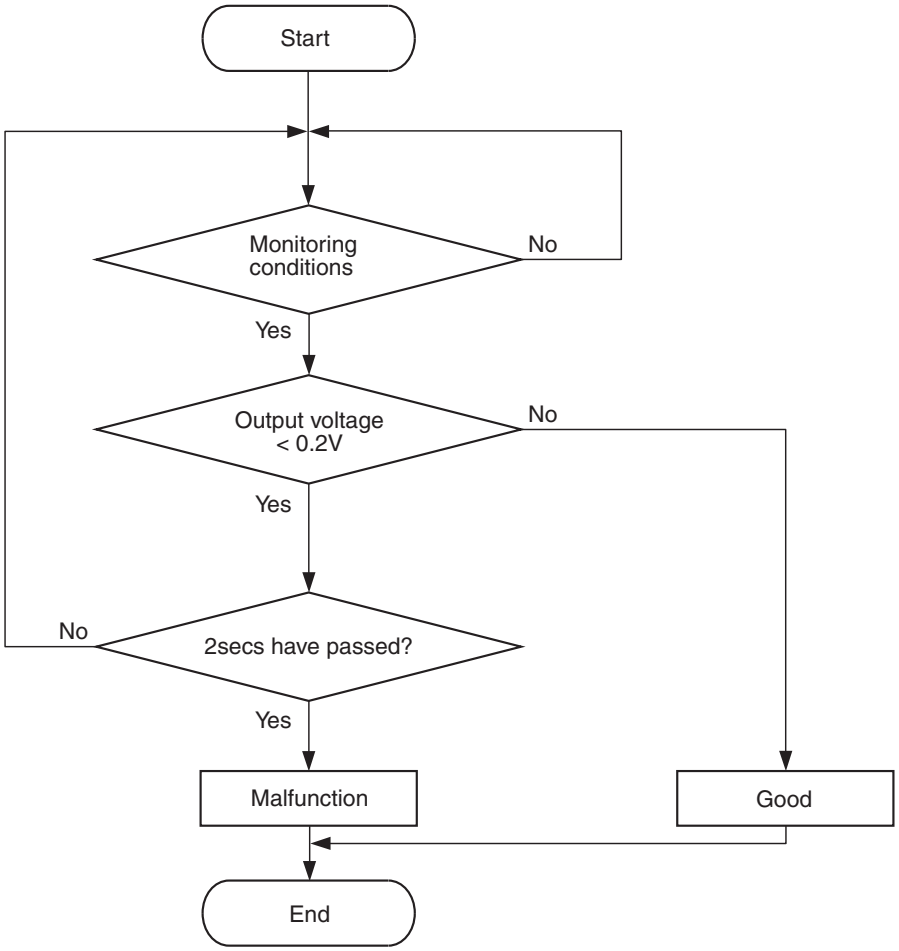
- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor offset voltage monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



AK604321

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.

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

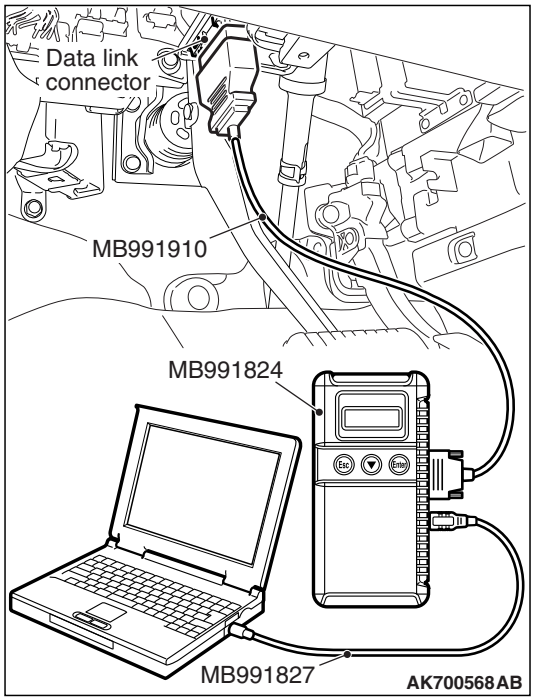
- Heated oxygen sensor (rear) failed.
- Open or shorted heated oxygen sensor (rear) circuit, harness damage or connector damage.
- ECM failed.

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
- MB992110: Power Plant ECU Check Harness

TSB Revision



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

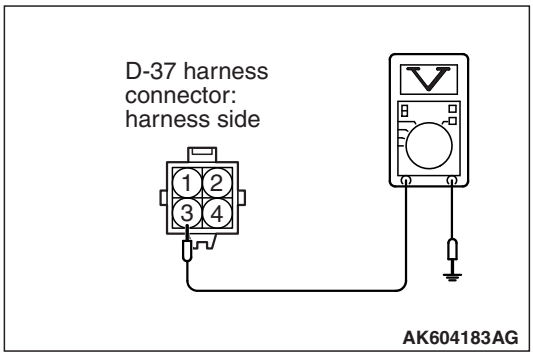
⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : 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.00-15.
NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at heated oxygen sensor (rear) connector D-37 by backprobing

(1) Do not disconnect the connector D-37.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 3 and ground by backprobing under the following driving.
  a. Transaxle: 2nd
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

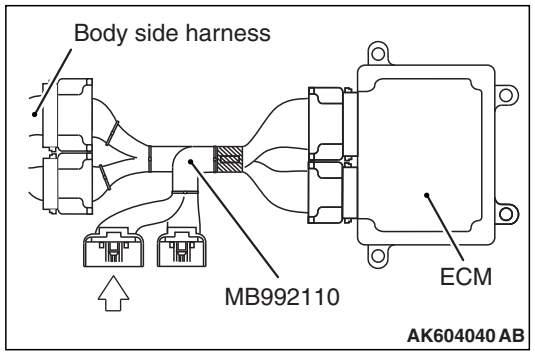
YES : Go to Step 3.
NO : Go to Step 7.

STEP 3. Check harness connector B-10 at ECM for damage.

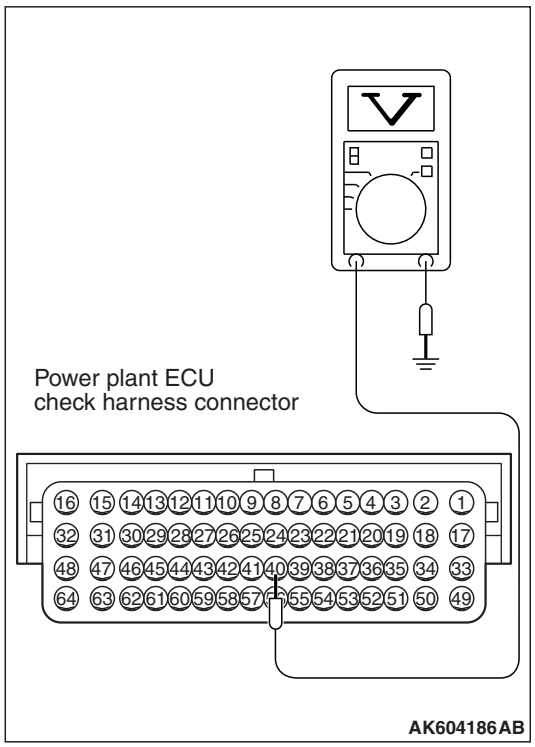
Q: Is the harness connector in good condition?

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 output voltage at ECM connector B-10 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) Start the engine and run at idle.



(3) Measure the voltage between terminal No. 40 and ground by backprobing under the following driving.
   a. Transaxle: 2nd
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

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

STEP 5. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
   a. Transaxle: 2nd
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 0.6 and 1.0 volt.
(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.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 12.

STEP 6. Check harness connector D-37 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-13 and C-129 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 heated oxygen sensor (rear) connector D-37 (terminal No. 3) and ECM connector B-10 (terminal No. 40) because of open circuit or harness damage. Then go to Step 12.

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

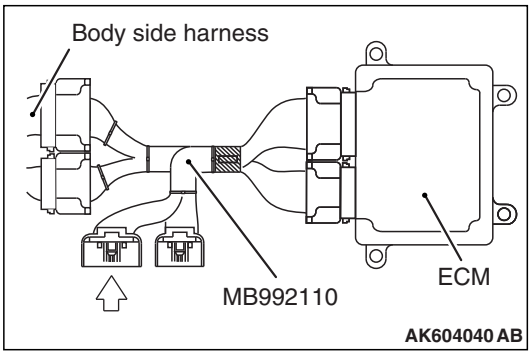
STEP 7. Check harness connector D-37 at heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

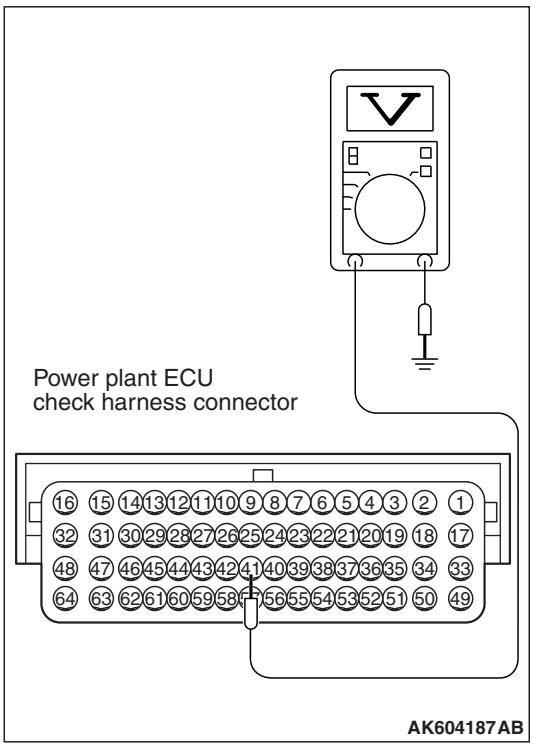
YES : Go to Step 8.

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

STEP 8. Measure the sensor offset voltage at ECM connector B-10 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. 41 and ground.
- Voltage should be between 0.4 and 0.6 volt.

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

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 9.

NO : Check harness connector A-13 and C-129 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 headed oxygen sensor (rear) connector D-37 (terminal No. 4) and ECM connector B-10 (terminal No. 41) because of short circuit to ground. Then go to Step 12.

STEP 9. Check for open circuit and harness damage between heated oxygen sensor (rear) connector D-37 (terminal No. 4) and ECM connector B-10 (terminal No. 41).

NOTE: Check harness after checking intermediate connector A-13 and C-129. 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 10.

NO : Repair it. Then go to Step 12.

STEP 10. Check for short circuit to ground between heated oxygen sensor (rear) connector D-37 (terminal No. 3) and ECM connector B-10 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-13 and C-129. 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?

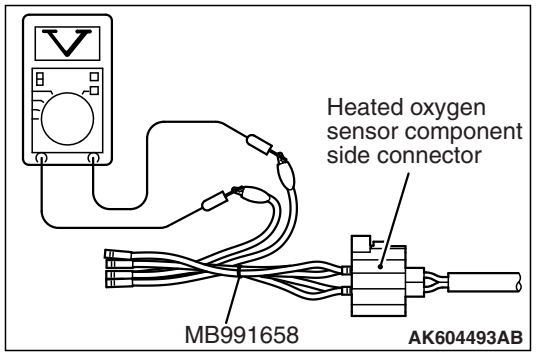
YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector D-37 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 – 1.0 V



NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio.

NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 12.

NO : Replace the heated oxygen sensor (rear). Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13A-11.

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

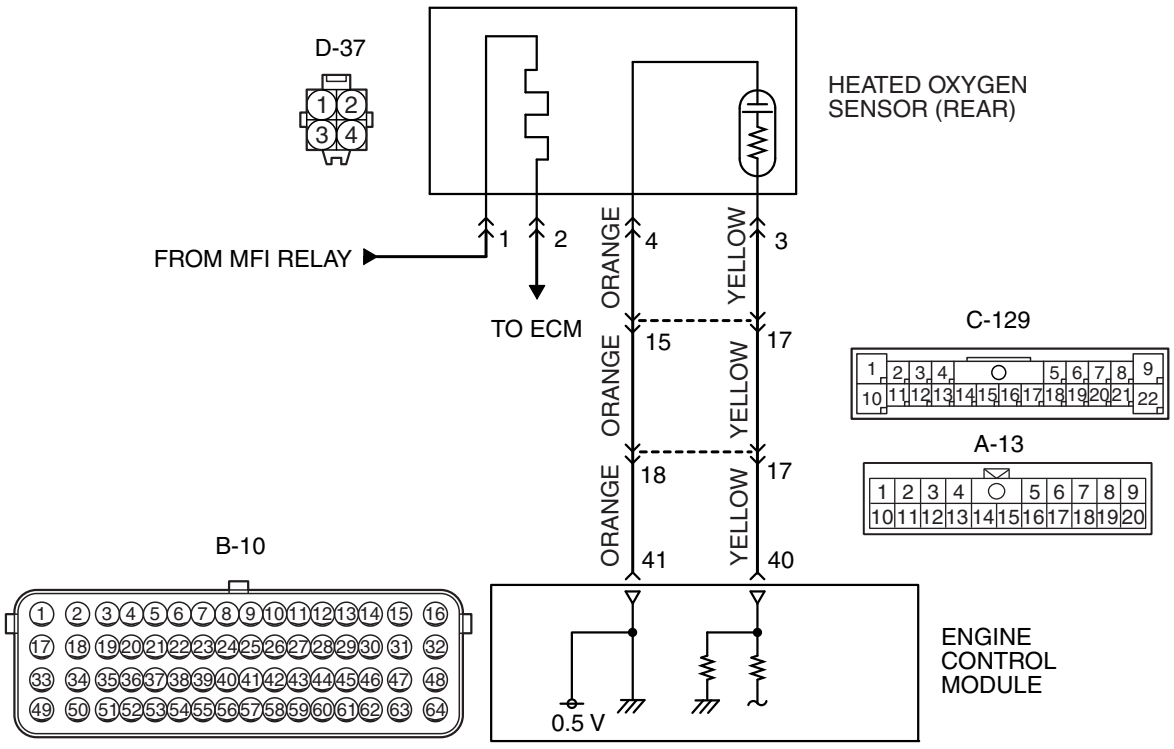
Q: Is DTC P0137 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0138: Heated Oxygen Sensor (rear) Circuit High Voltage

HEATED OXYGEN SENSOR (REAR) CIRCUIT



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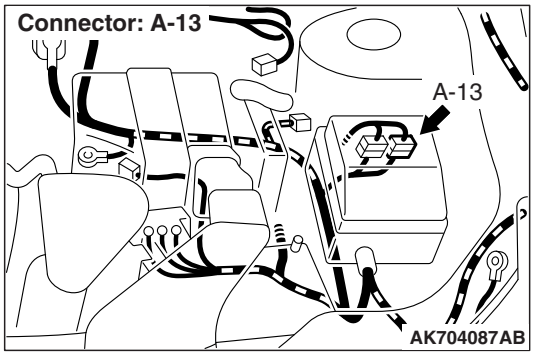
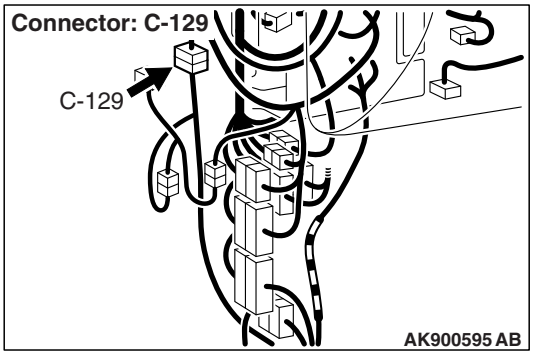
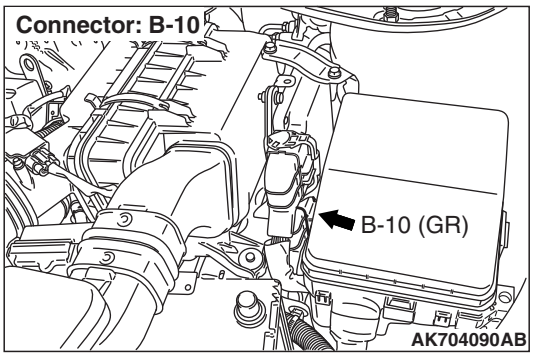
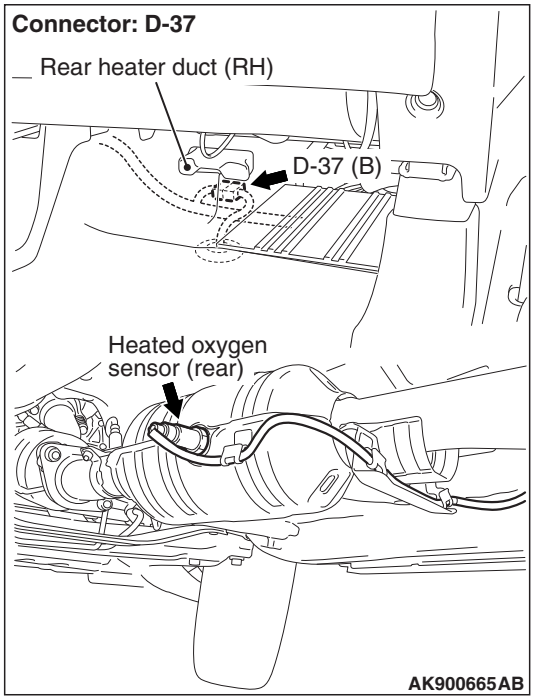








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is over 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)

- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor offset voltage monitor

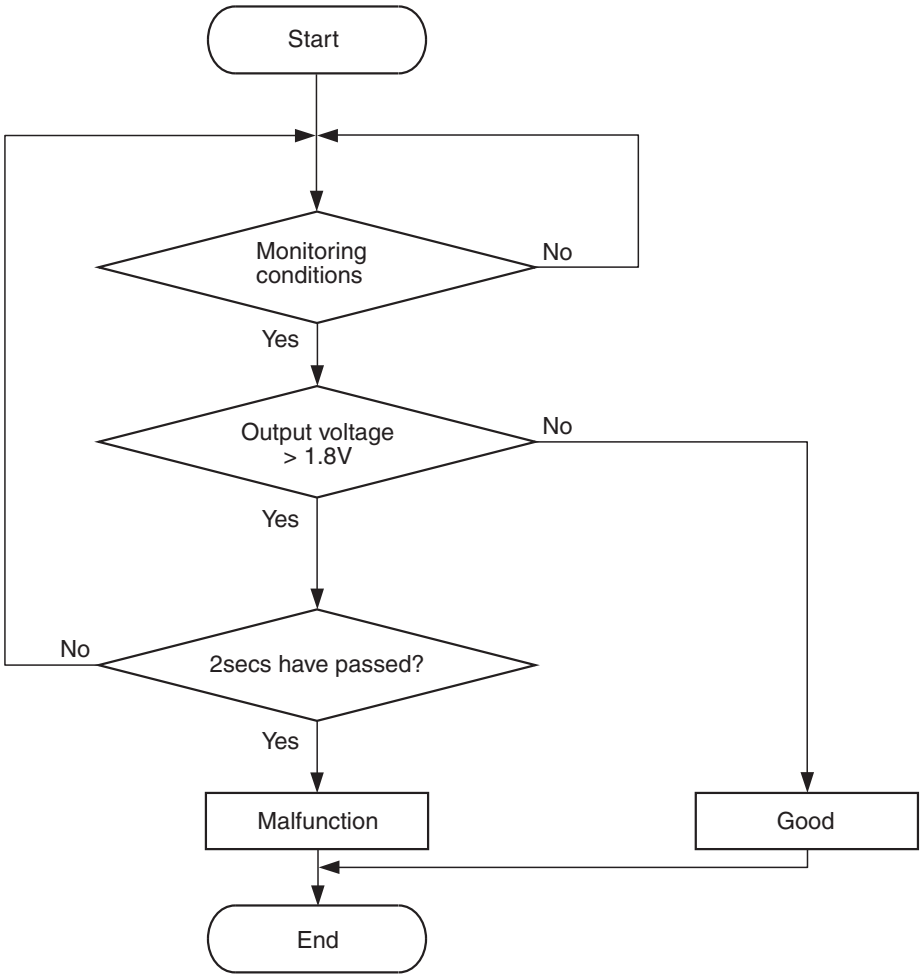
Sensor (The sensor below is determined to be normal)

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

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

- Shorted heated oxygen sensor (rear) circuit, or connector damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector D-37 at heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

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

STEP 2. Check for short circuit to power supply between heated oxygen sensor (rear) connector D-37 (terminal No. 3) and ECM connector B-10 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-13 and C-129. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.13A-11.

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

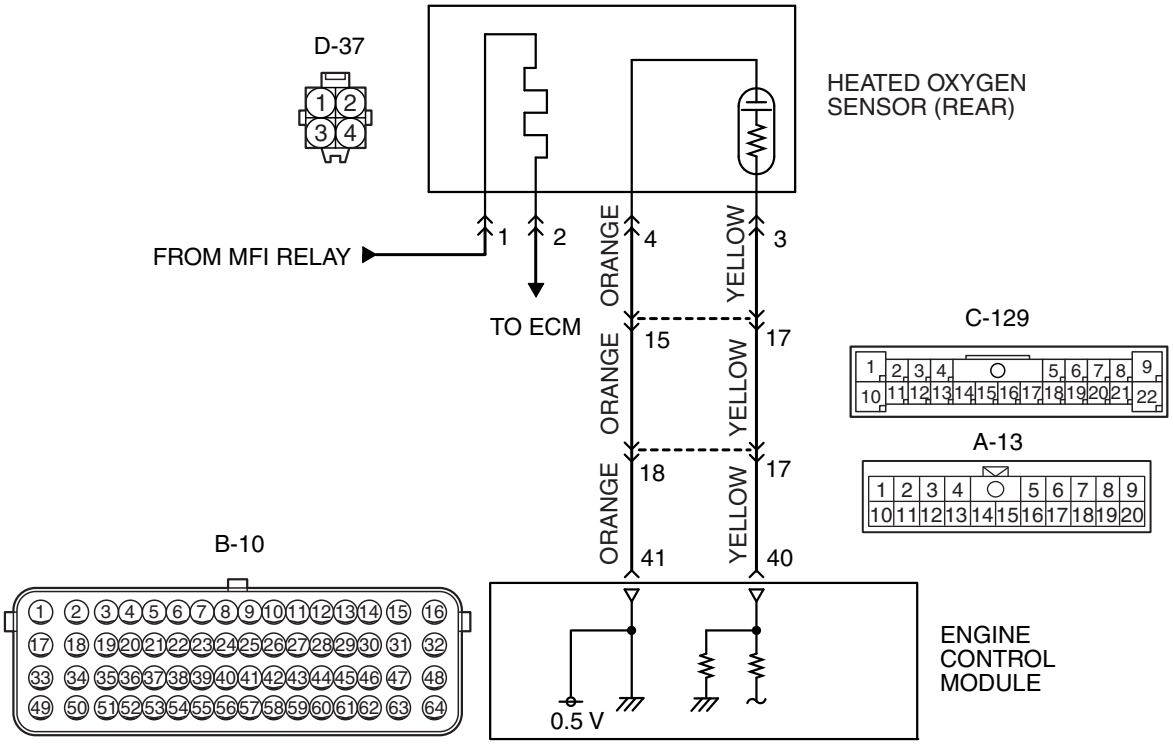
Q: Is DTC P0138 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: Heated Oxygen Sensor (rear) Circuit Slow Responce

HEATED OXYGEN SENSOR (REAR) CIRCUIT



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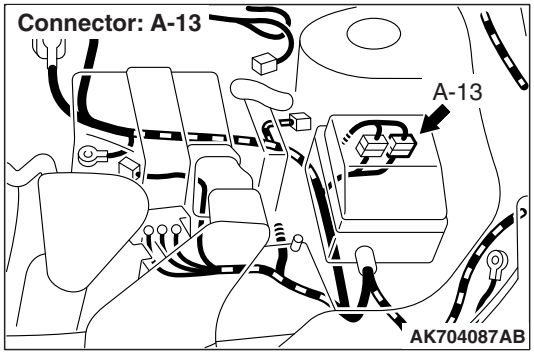
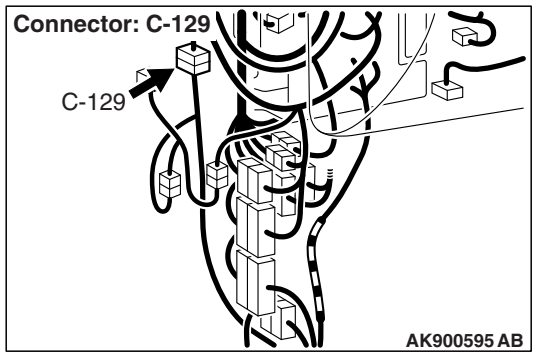
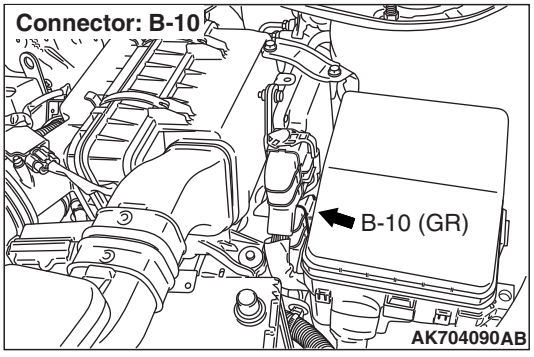
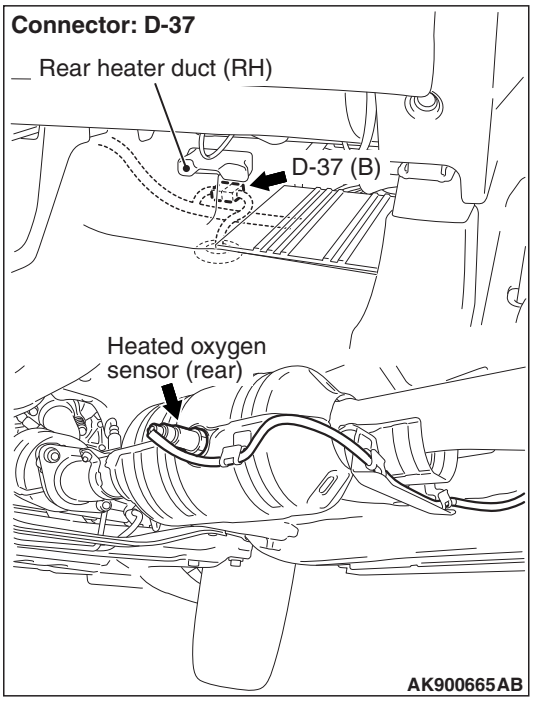






TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear)

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

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)

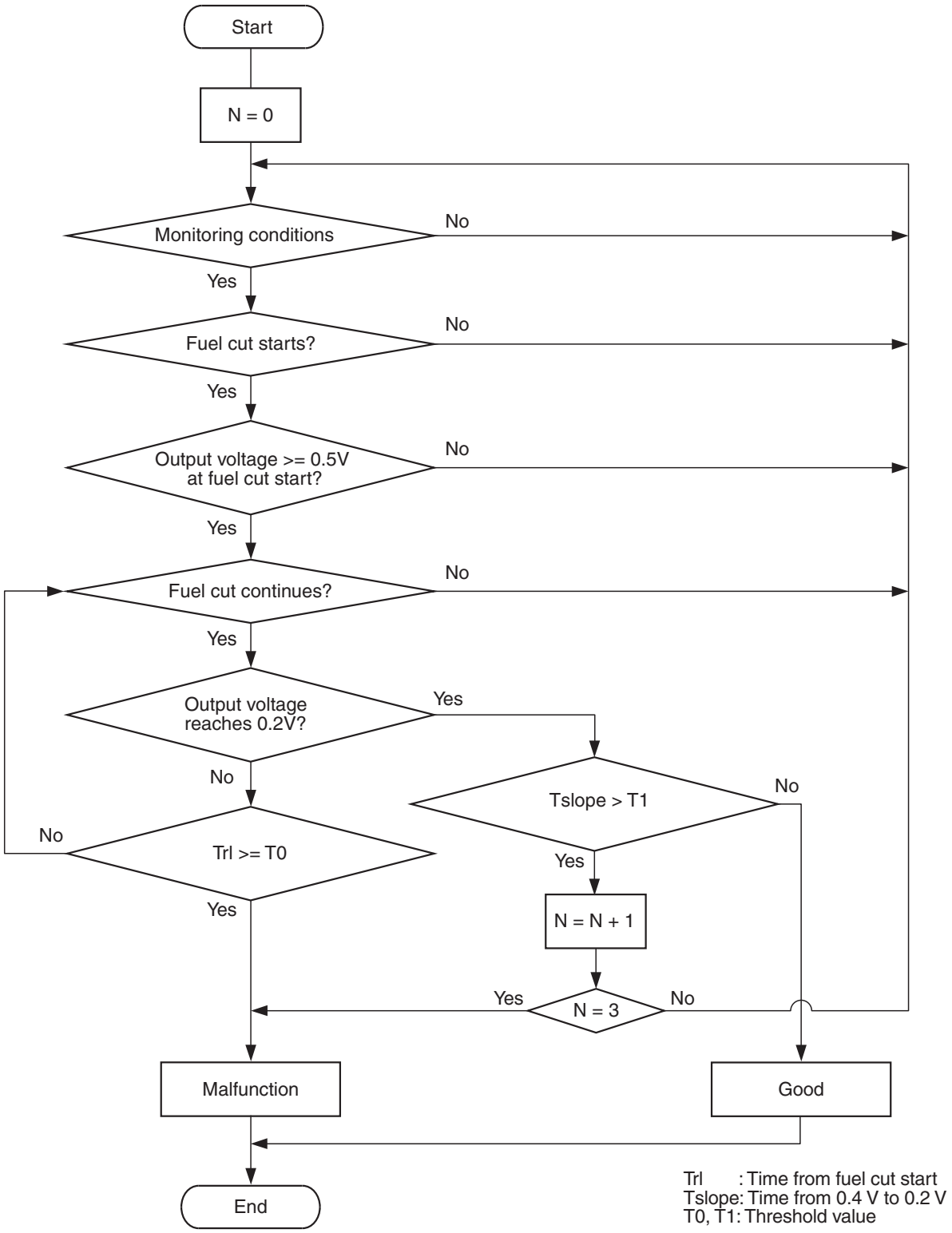
- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor offset voltage monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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TSB Revision

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is higher than 1,741 g.
- Fuel is being shut off.
- Heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).

Judgement Criterion
- Heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

Check Conditions
- Engine coolant temperature is higher than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is higher than 1,741 g.
- Fuel is being shut off.
- The heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.
- It has been taking more than 180 seconds since the drive signal of the heated oxygen sensor (rear) heater was turned on.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The ECM monitors for this condition for 3 cycles of 0.5 second each during drive cycles.

Judgement Criteria
- The heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 0.5 second from 0.4 volt while fuel is being shut off.
- The ECM monitors for this condition once during the drive cycle.

NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

OBD-II DRIVE CYCLE PATTERN

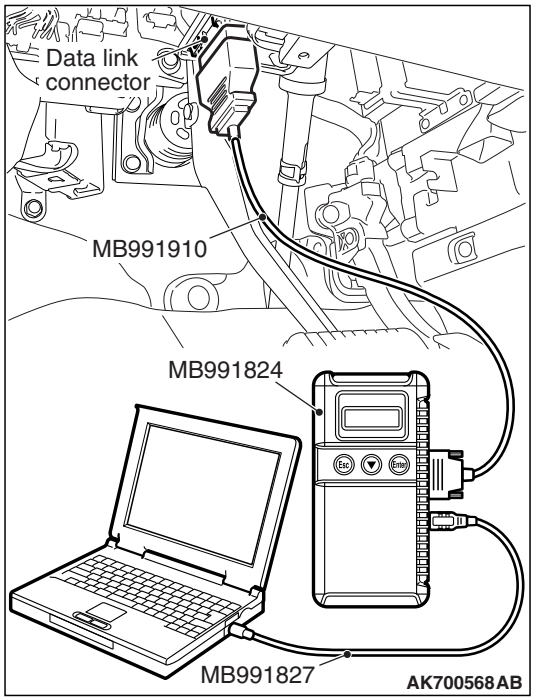
Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 11 P.13A-11.

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

- Heated oxygen sensor (rear) deteriorated.
- 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 AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
- After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. 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 11 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

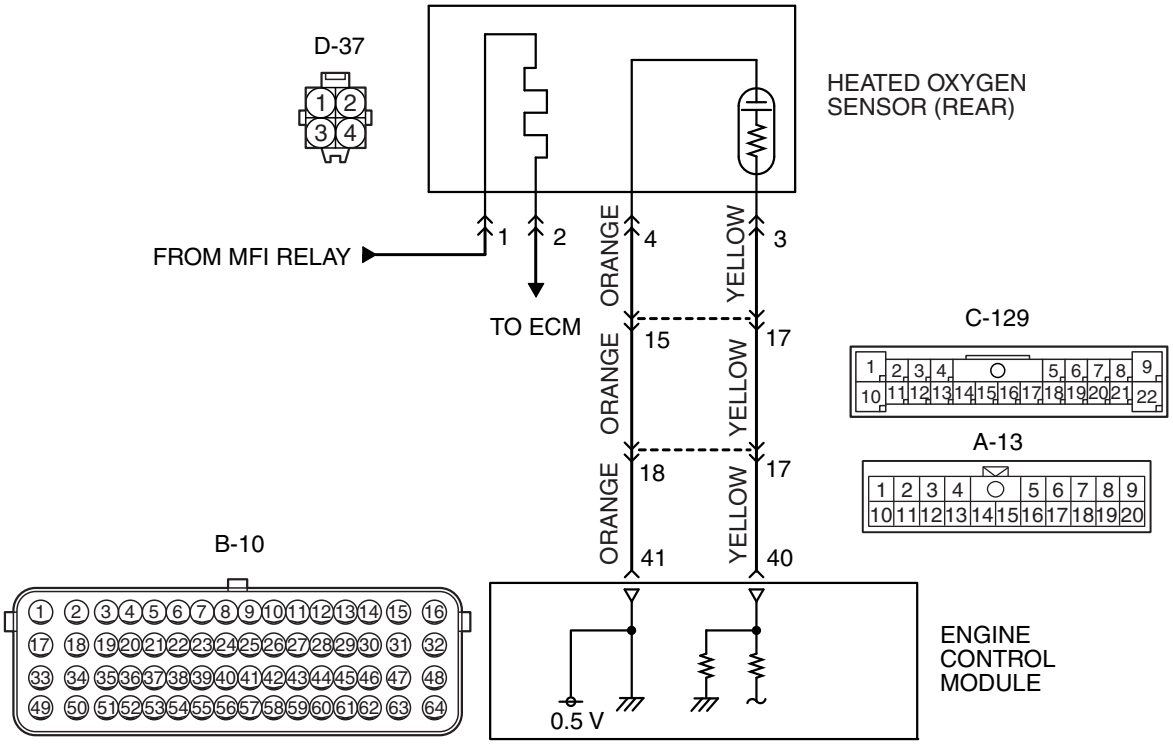
Q: Is DTC P0139 set?

YES : Refer to DTC P0137 – Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-241, DTC P0138 – Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-249.

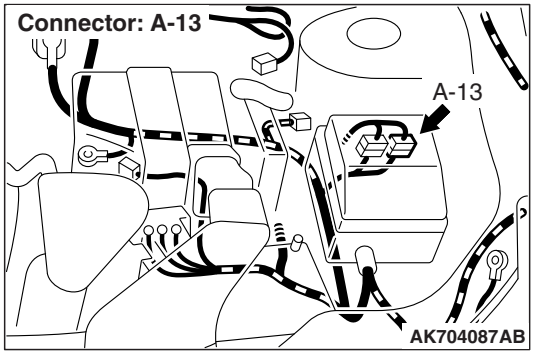
NO : The inspection is complete.

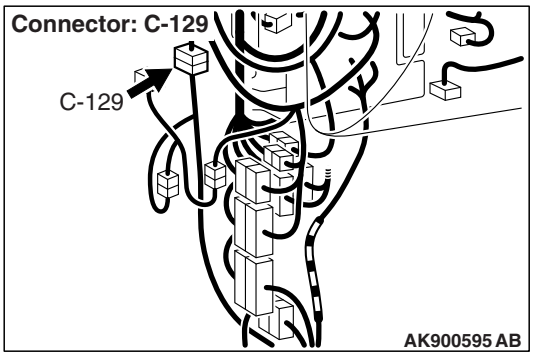
DTC P0140: Heated Oxygen Sensor (rear) Circuit No Activity Detected

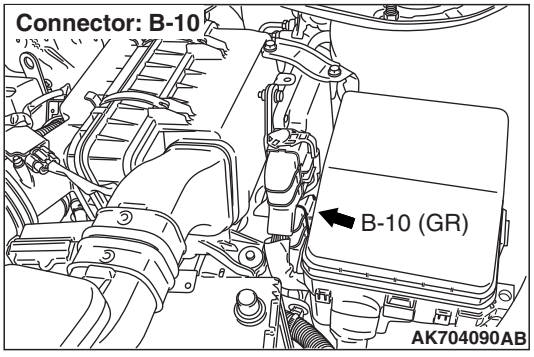
HEATED OXYGEN SENSOR (REAR) CIRCUIT



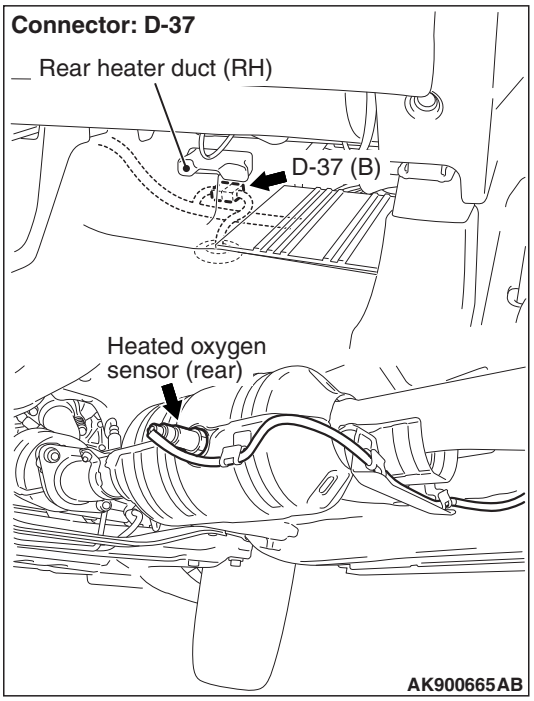
AK900383 AD







TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the linear air-fuel ratio sensor is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

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)

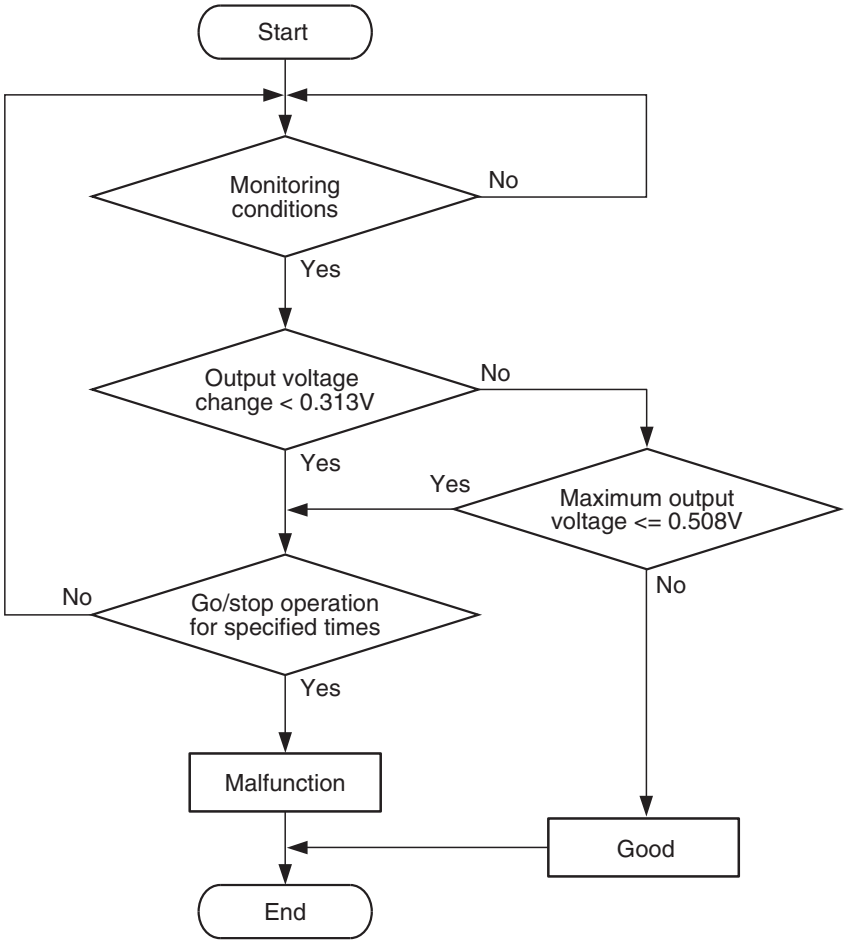
- Linear air-fuel ratio sensor monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor offset voltage monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



*: See DTC SET CONDITIONS-Judgment Criterion

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Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The linear air-fuel ratio sensor is active.
- The cumulative mass airflow sensor output is higher than 1,741 g.
- Repeat 1 time or more: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 60 seconds have elapsed with the above mentioned conditions, and more than 3 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the heated oxygen sensor (rear) is lower than 0.313 volt.

or

- The maximum output voltage of the heated oxygen sensor (rear) is lower than 0.508 volt.

NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 13 P.13A-11.

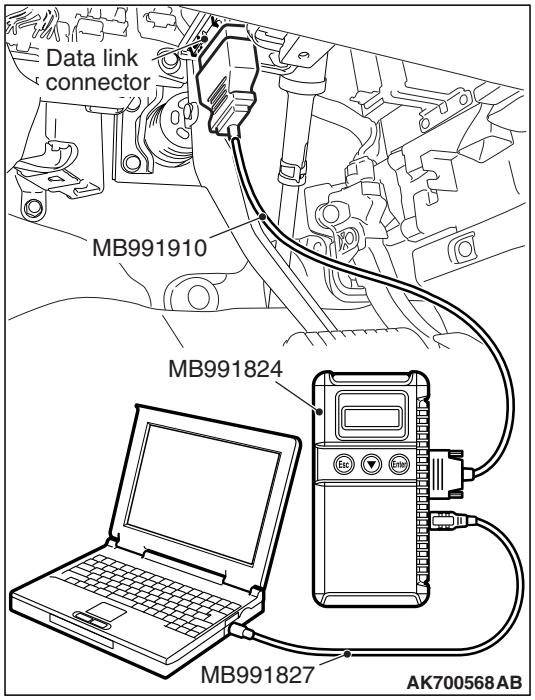
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) deteriorated.
- 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 AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : 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.00-15.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. 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 13 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0140 set?

YES : Refer to DTC P0137 – Heated Oxygen Sensor (rear) Circuit Low Voltage P.13A-241, DTC P0138 – Heated Oxygen Sensor (rear) Circuit High Voltage P.13A-249.

NO : The inspection is complete.

DTC P0171: System too Lean

Fuel Trim Circuit

- Refer to DTC P0201 – Injector Circuit-Cylinder 1 P.13A-292, DTC P0202 – Injector Circuit-Cylinder 2 P.13A-302, DTC P0203 – Injector Circuit-Cylinder 3 P.13A-312, DTC P0204 – Injector Circuit-Cylinder 4 P.13A-322.

CIRCUIT OPERATION

- Refer to DTC P0201 – Injector Circuit-Cylinder 1 P.13A-292, DTC P0202 – Injector Circuit-Cylinder 2 P.13A-302, DTC P0203 – Injector Circuit-Cylinder 3 P.13A-312, DTC P0204 – Injector Circuit-Cylinder 4 P.13A-322.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

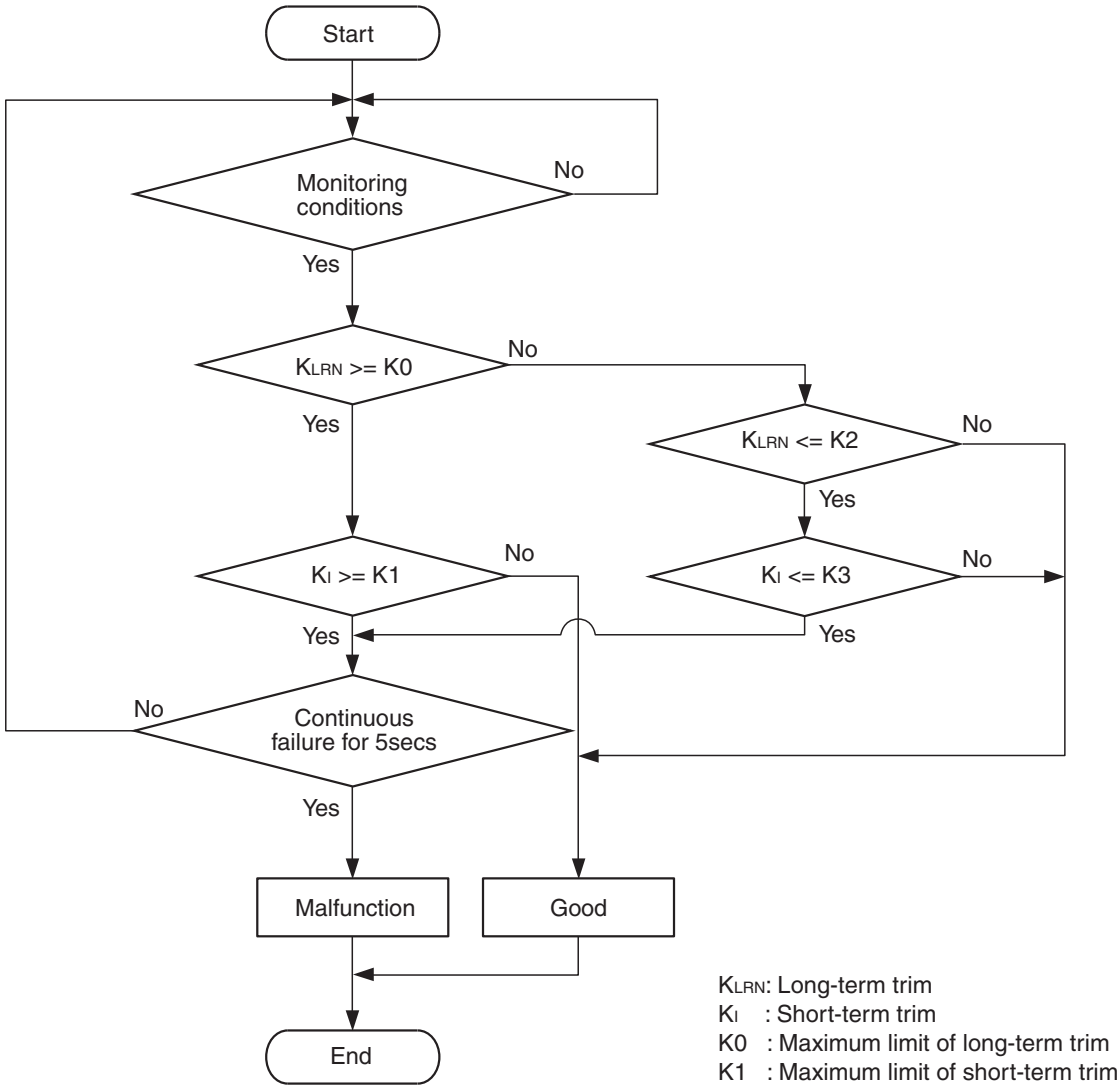
- Misfire monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or more.

Judgement Criterion

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

or

- Short-term fuel trim has continued to be higher than +5.5 percent for 5 seconds.

Check Conditions

- Engine coolant temperature is lower than 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or less.

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

or
- Short-term fuel trim has continued to be higher than +10.5 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or more.

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

or
- Short-term fuel trim has continued to be higher than +15.6 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or less.

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

or
- Short-term fuel trim has continued to be higher than +20.7 percent for 5 seconds.

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

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

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Injector 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. Check for exhaust leak.

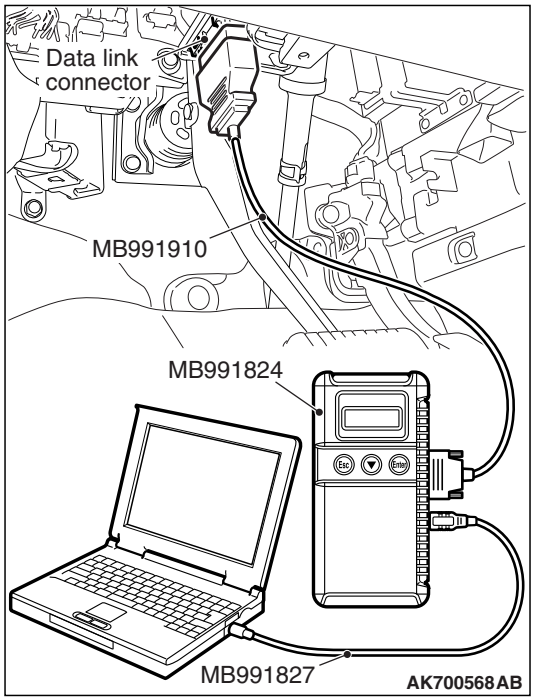
Q: Are there any abnormalities?

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

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

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



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

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
- When idling, between 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 millivolts.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-121, DTC P0102 – Mass Airflow Circuit Low Input P.13A-127, DTC P0103 – Mass Airflow Circuit High Input P.13A-134.

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

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

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

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-161, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-167, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-171.

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

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

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

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-177, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-187.

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

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

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

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

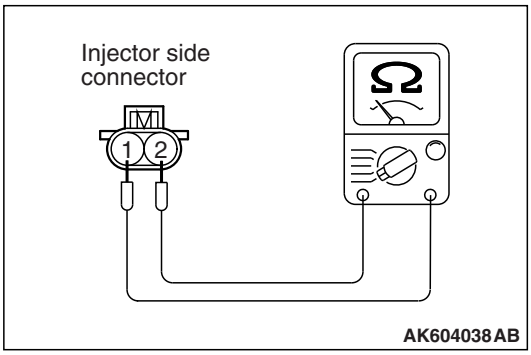
Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-139, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-148, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-156.

STEP 7. Check harness connector B-101, B-120, B-103 and B-116 at injector 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 14.



STEP 8. Check the injector.

(1) Disconnect the injector connector B-101, B-120, B-103 and B-116.

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

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

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

YES : Go to Step 9.

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

STEP 9. Check harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step10.

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

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

a. Check the harness wire between injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.

b. Check the harness wire between injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No.3) at No. 2 cylinder injector.

c. Check the harness wire between injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.

d. Check the harness wire between injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-868.

Q: Is the fuel pressure normal?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

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

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 14.

NO : Go to Step 13.

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STEP 13. Replace the injector.
(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 set?

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

DTC P0172: System too Rich

Fuel Trim Circuit
- Refer to DTC P0201 – Injector Circuit-Cylinder 1 P.13A-292, DTC P0202 – Injector Circuit-Cylinder 2 P.13A-302, DTC P0203 – Injector Circuit-Cylinder 3 P.13A-312, DTC P0204 – Injector Circuit-Cylinder 4 P.13A-322.

CIRCUIT OPERATION
- Refer to DTC P0201 – Injector Circuit-Cylinder 1 P.13A-292, DTC P0202 – Injector Circuit-Cylinder 2 P.13A-302, DTC P0203 – Injector Circuit-Cylinder 3 P.13A-312, DTC P0204 – Injector Circuit-Cylinder 4 P.13A-322.

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

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

MONITOR EXECUTION
Continuous

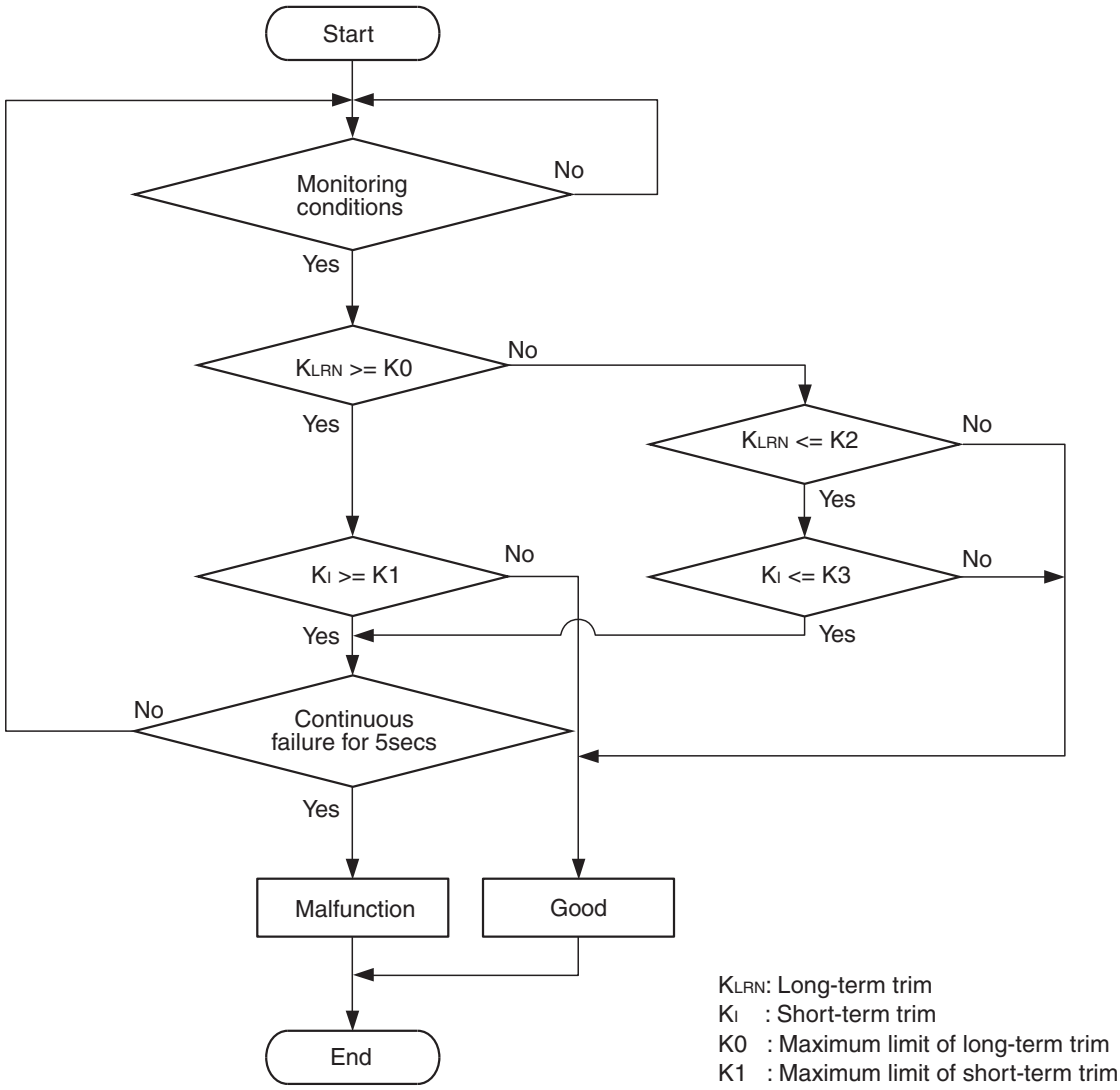
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or more.

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

or
- Short-term fuel trim has continued to be lower than –10.2 percent for 5 seconds.

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76°C (169°F).
- Mass airflow sensor output is 9 g/sec or less.

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

or
- Short-term fuel trim has continued to be lower than –15.2 percent for 5 seconds.

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

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Judgement Criterion

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

or

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.

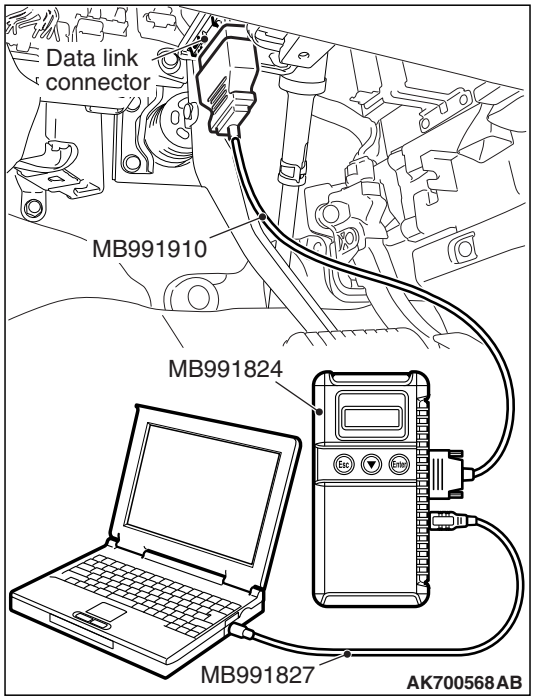
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor 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



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

⚠ CAUTION

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

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 1,350 and 1,670 millivolts.
  - When 2,500 r/min, between 1,620 and 2,020 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.

NO : Refer to DTC P0101 – Mass Airflow Circuit Range/Performance Problem P.13A-121, DTC P0102 – Mass Airflow Circuit Low Input P.13A-127, DTC P0103 – Mass Airflow Circuit High Input P.13A-134.

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

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

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

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-161, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-167, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-171.

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

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

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-177, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-183, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-187.

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

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

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

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

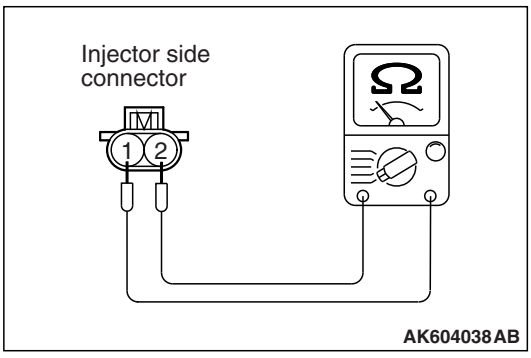
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 – Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-139, DTC P0107 – Manifold Absolute Pressure Circuit Low Input P.13A-148, DTC P0108 – Manifold Absolute Pressure Circuit High Input P.13A-156.

STEP 5. Check the injector.

(1) Disconnect the injector connector B-101, B-120, B-103 and B-116.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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



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

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

STEP 6. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13A-868.

Q: Is the fuel pressure normal?

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

STEP 7. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

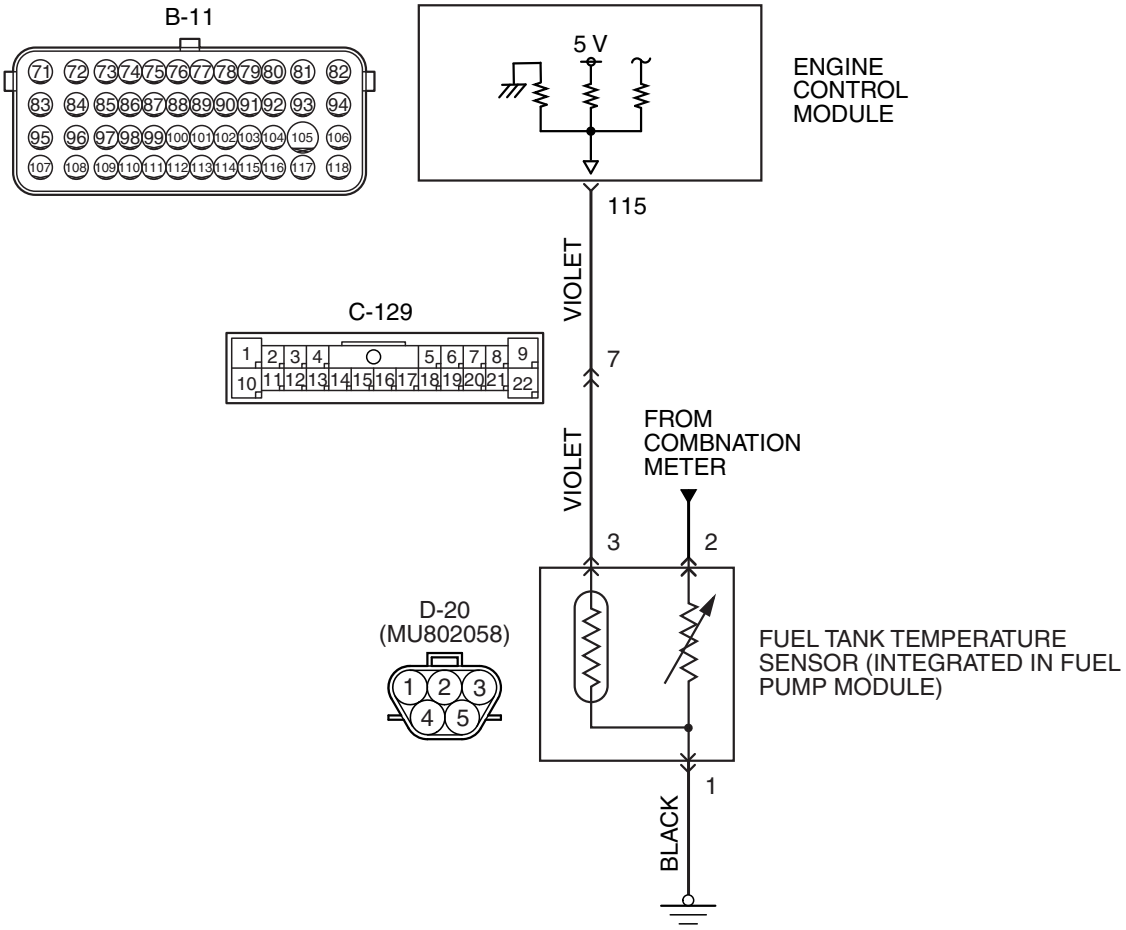
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 21 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

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

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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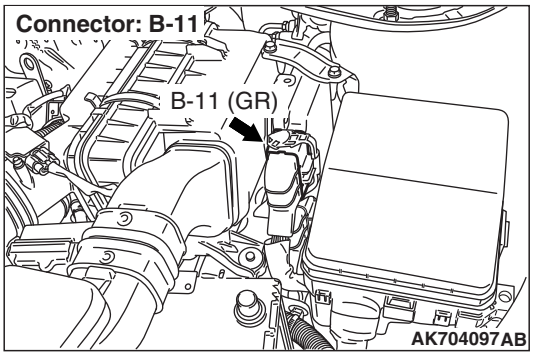

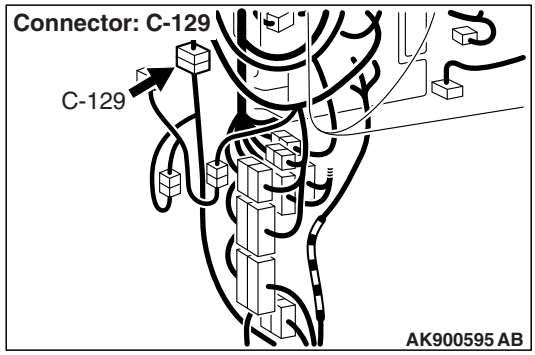

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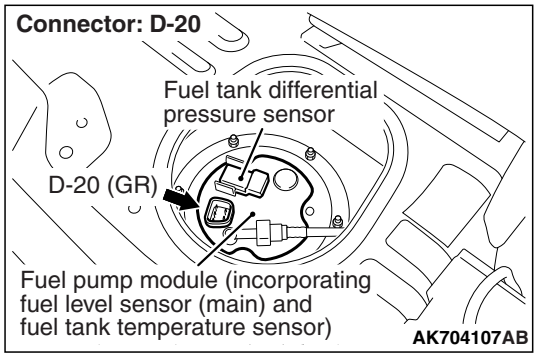


CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

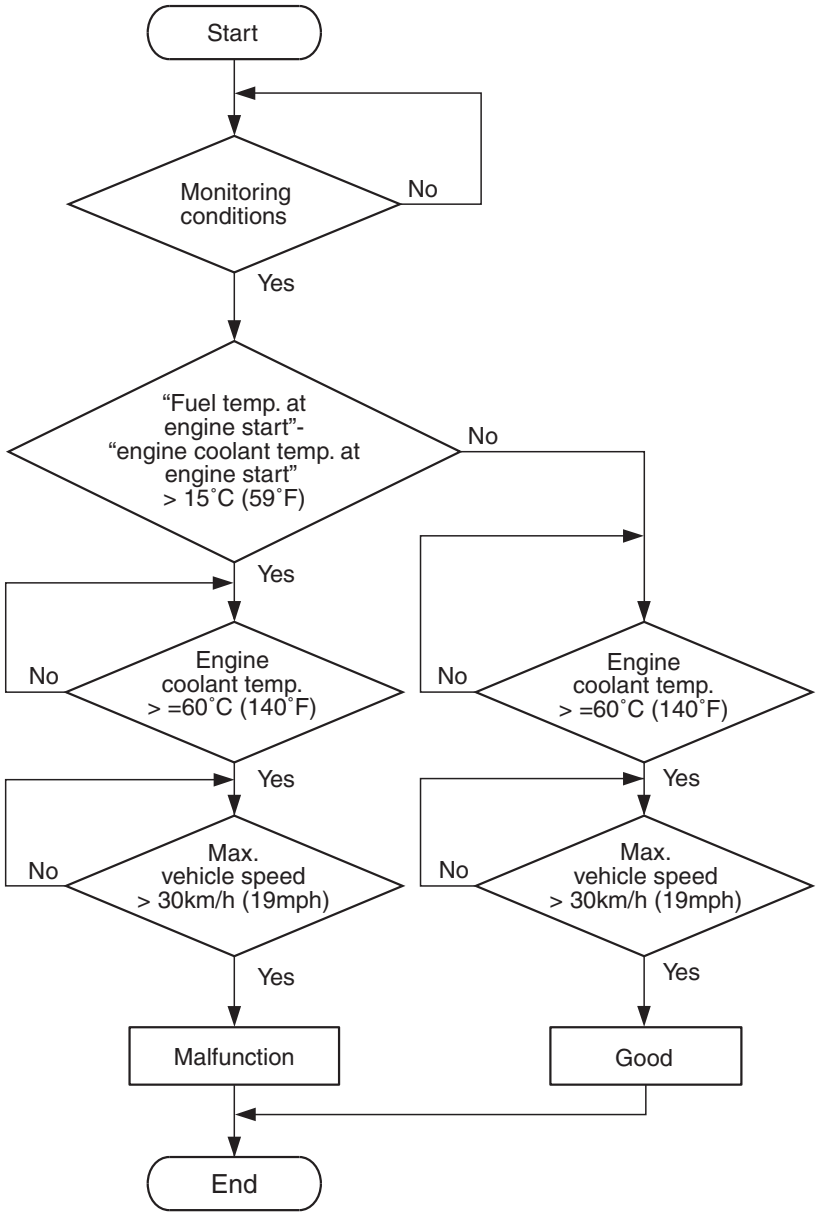
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

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

Judgement Criterion

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

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-11.

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

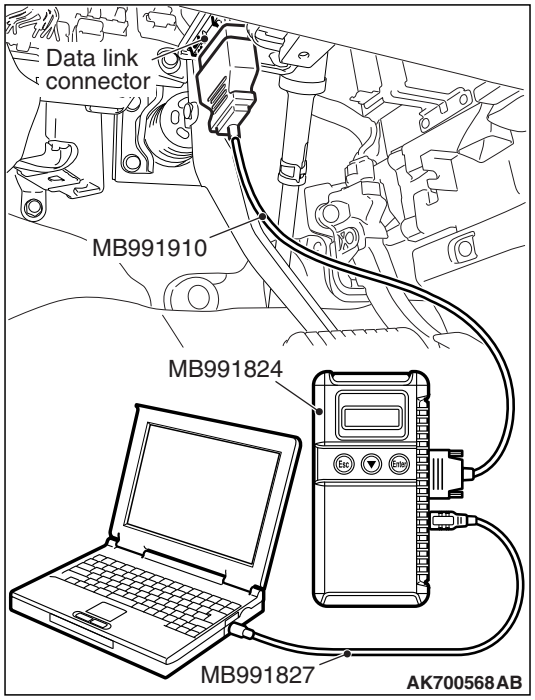
- Fuel tank temperature sensor failed.
- Fuel tank temperature sensor circuit harness damage, or connector damage.
- ECM failed.

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

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (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 53: Fuel Tank Temperature Sensor.

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

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

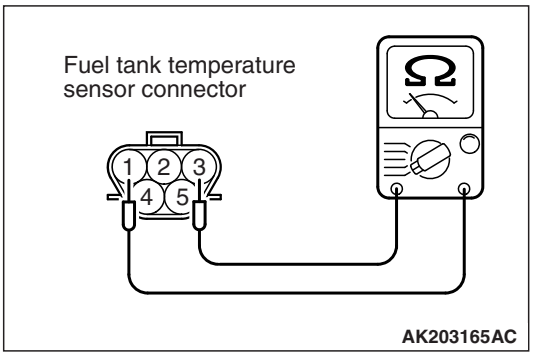
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.
NO : Go to Step 2.

STEP 2. Check harness connector D-20 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

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



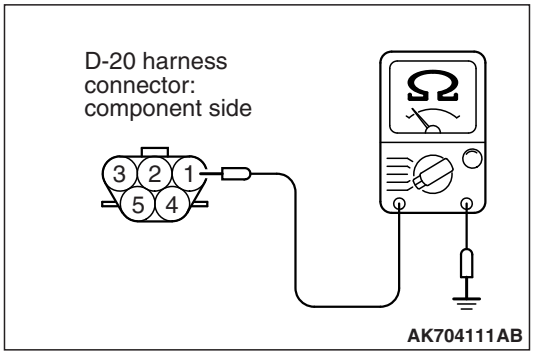
STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-20.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value: 0.5 – 12.0 kΩ

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

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 7.



STEP 4. Check the continuity at fuel tank temperature sensor harness side connector D-20.

(1) Disconnect the connector D-20 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 5.
NO : Repair harness wire between fuel tank temperature sensor connector D-20 (terminal No. 1) and ground because of harness damage. Then go to Step 7.

STEP 5. Check harness connector B-11 at ECM for damage.

Q: Is the harness connector in good condition?

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

STEP 6. Check for harness damage between fuel tank temperature sensor connector D-20 (terminal No. 3) and ECM connector B-11 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-129. 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 : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 7.

NO : Repair it. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 14 P.13A-11.

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

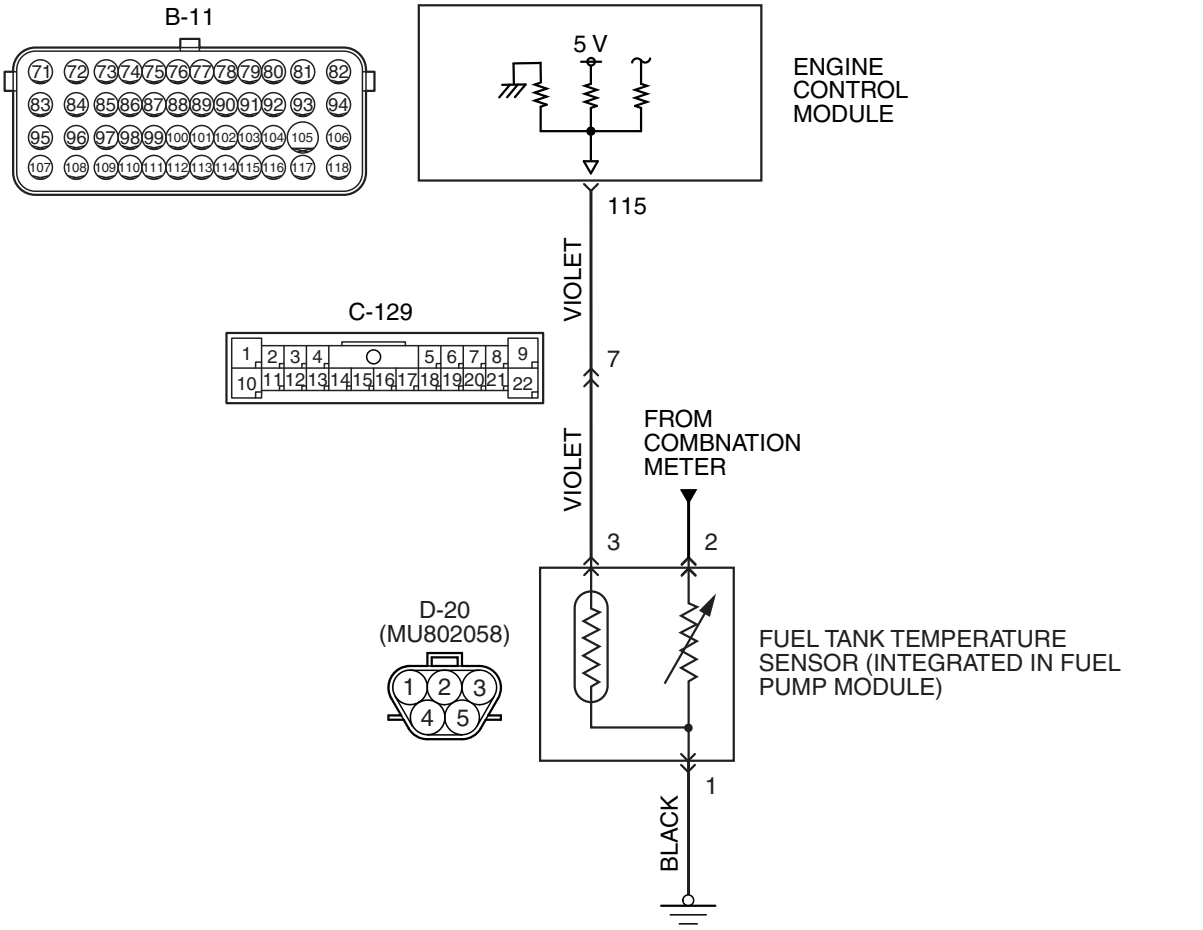
Q: Is DTC P0181 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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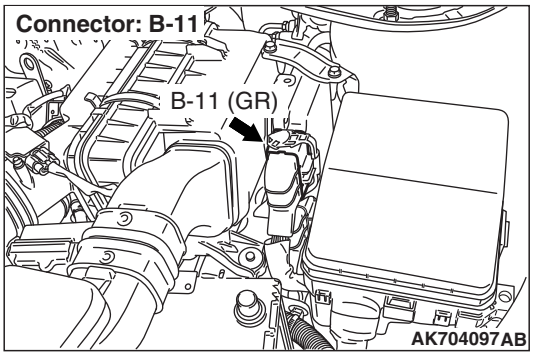
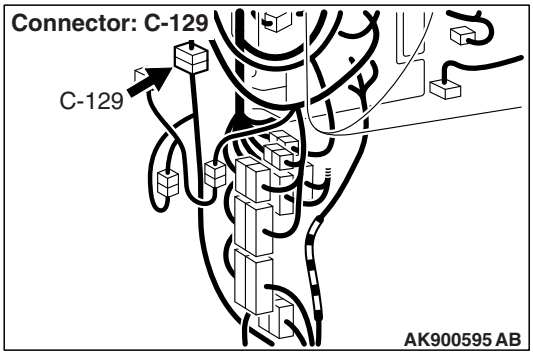
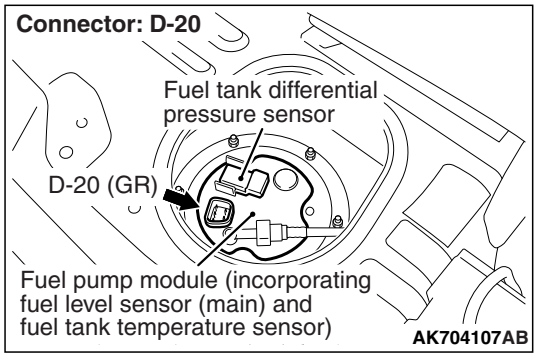




TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

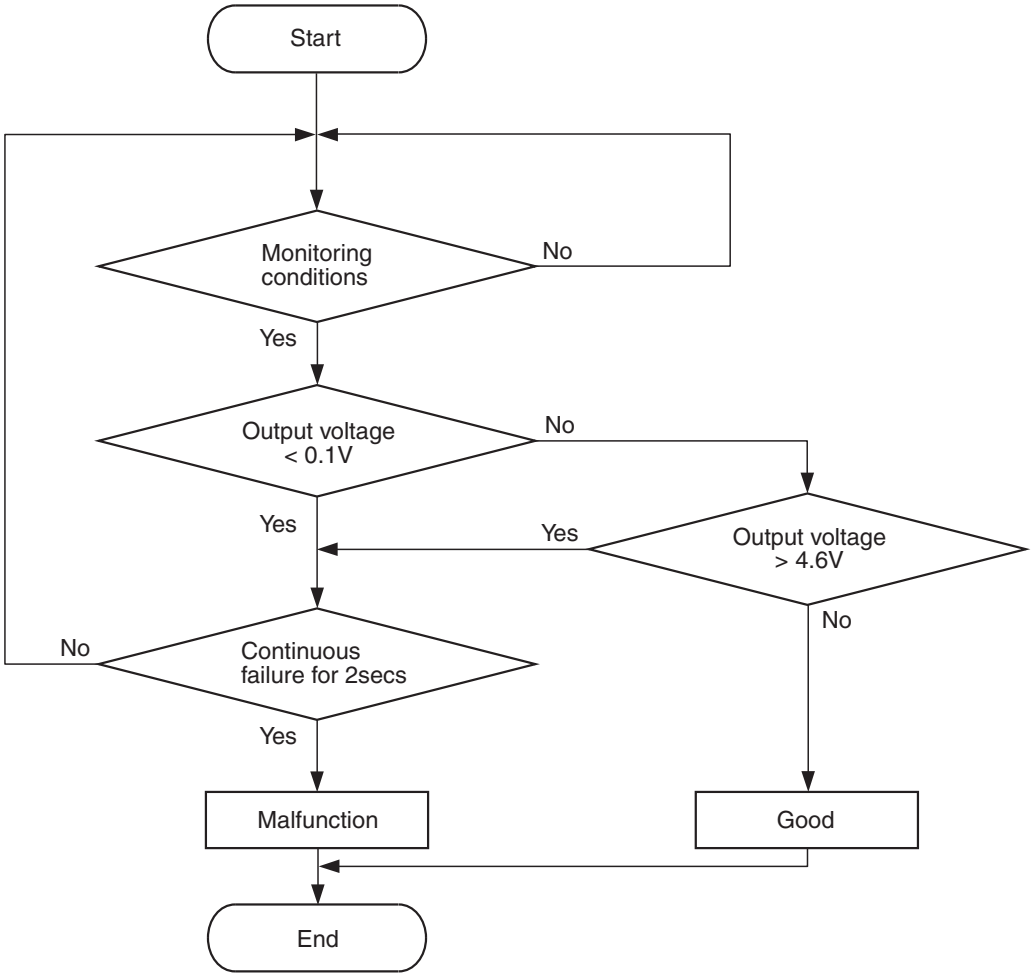
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

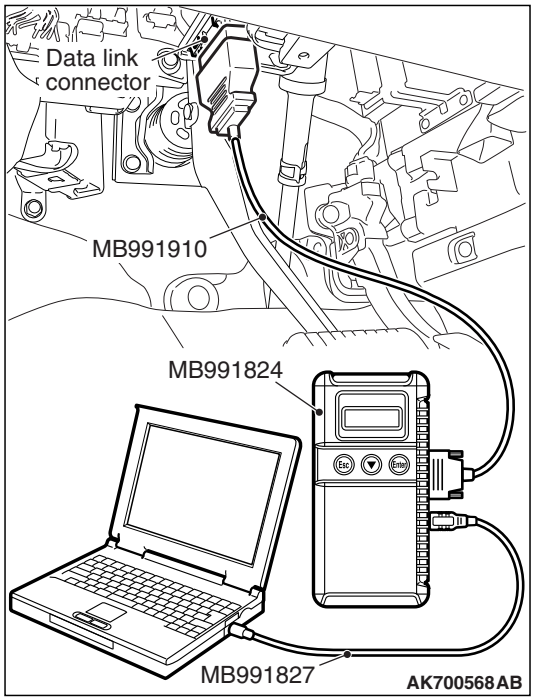
- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



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

⚠ CAUTION

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

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

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Go to Step 2.

STEP 2. Check harness connector D-20 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

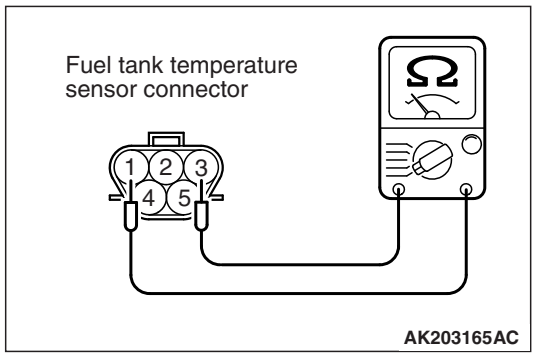
YES : Go to Step 3.

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

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-20.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value: 0.5 – 12.0 kΩ



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

YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 6.

STEP 4. Check harness connector B-11 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 6.

STEP 5. Check for short circuit to ground between fuel tank temperature sensor connector D-20 (terminal No. 3) and ECM connector B-11 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-129. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 6.

NO : Repair it. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

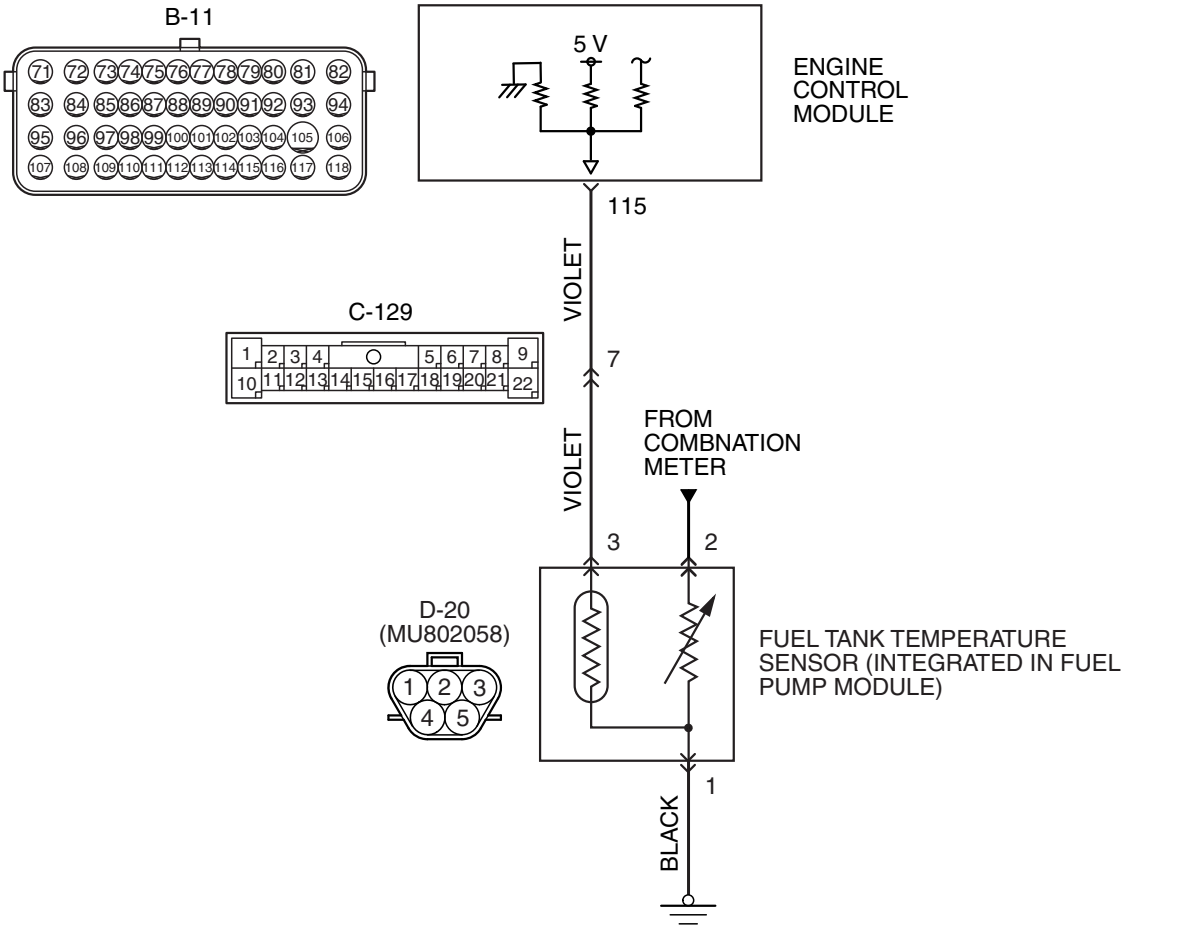
Q: Is DTC P0182 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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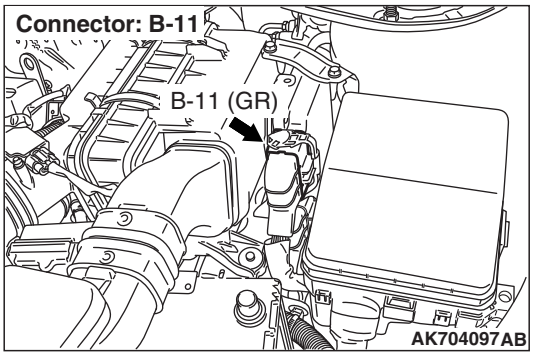
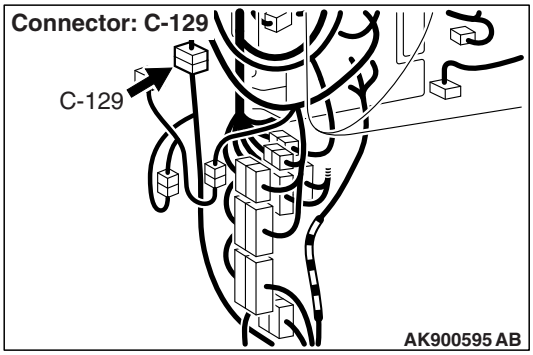
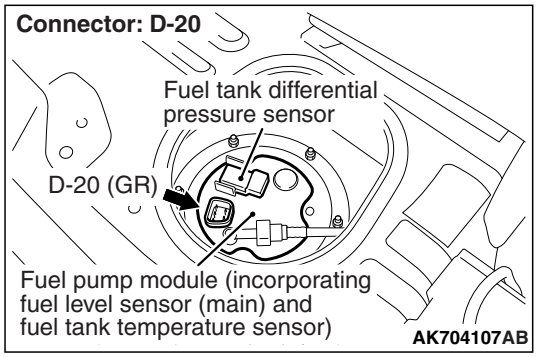




TSB Revision



CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

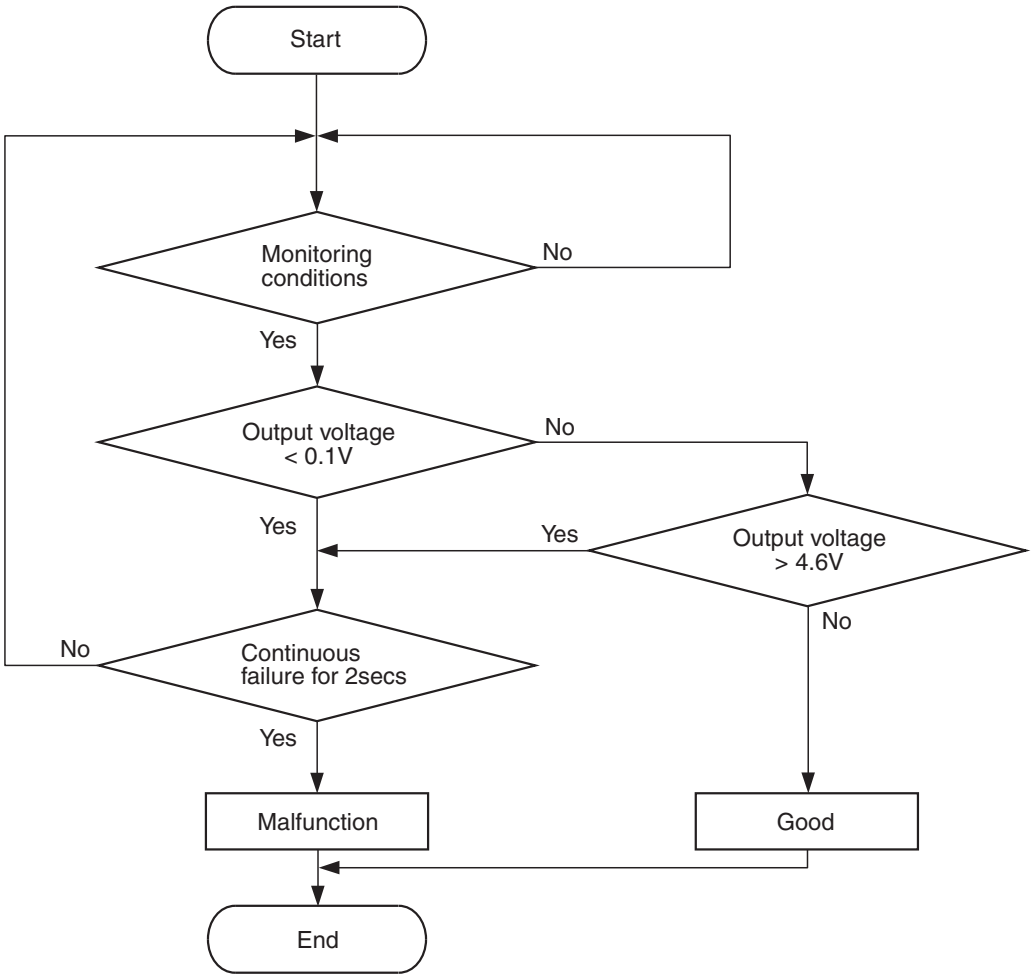
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK704390

Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

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

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

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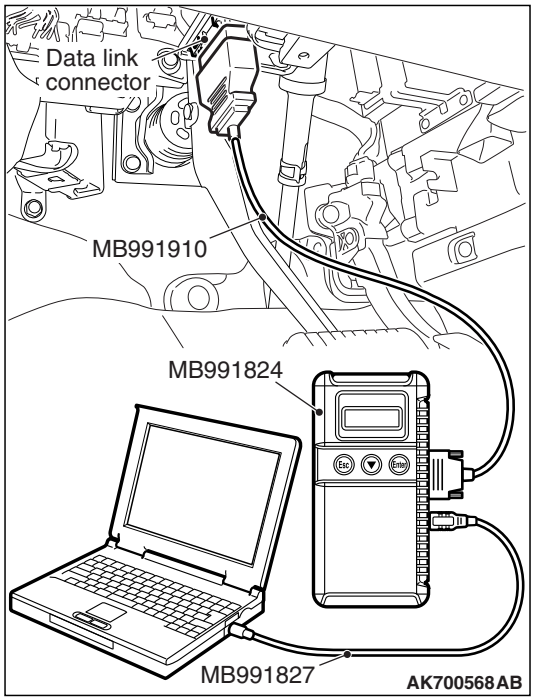


STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION

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

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

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

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Go to Step 2.

STEP 2. Check harness connector D-20 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

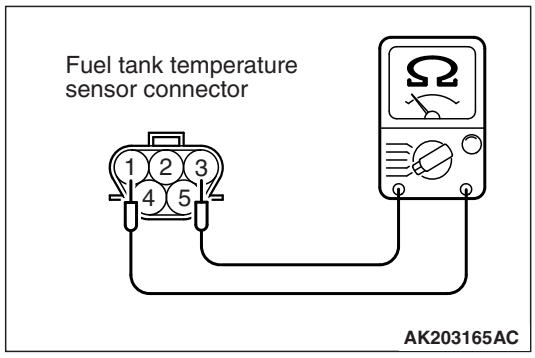
YES : Go to Step 3.

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

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-20.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

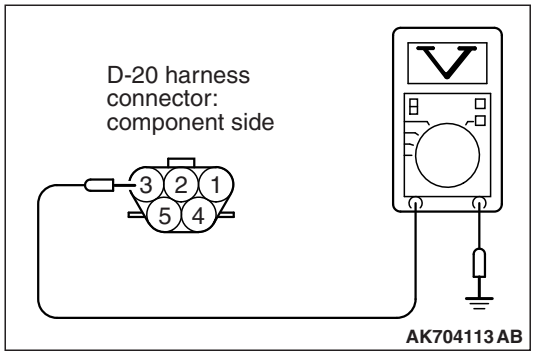
Standard value: 0.5 – 12.0 kΩ



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

YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 10.



STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector D-20.

(1) Disconnect the connector D-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

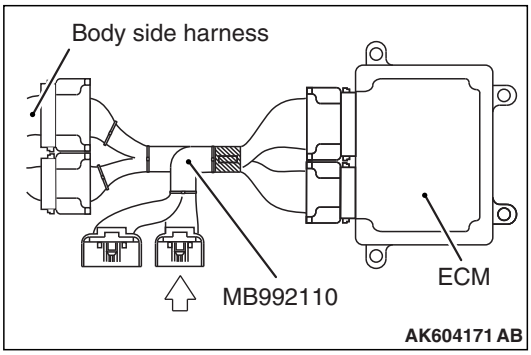
Q: Is the measured voltage between 4.5 and 4.9 volts?

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

STEP 5. Check harness connector B-11 at ECM for damage.

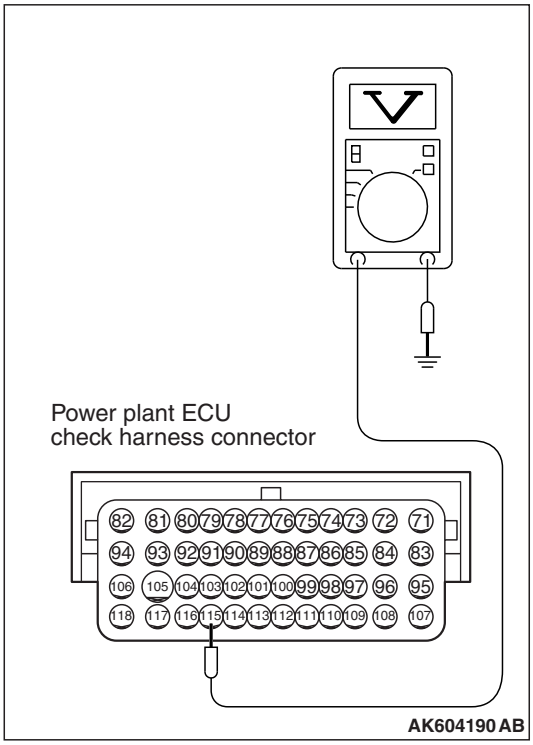
Q: Is the harness connector in good condition?

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



STEP 6. Check the sensor supply voltage at ECM connector B-11 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 fuel tank temperature sensor connector D-20.
(3) Turn the ignition switch to the "ON" position.



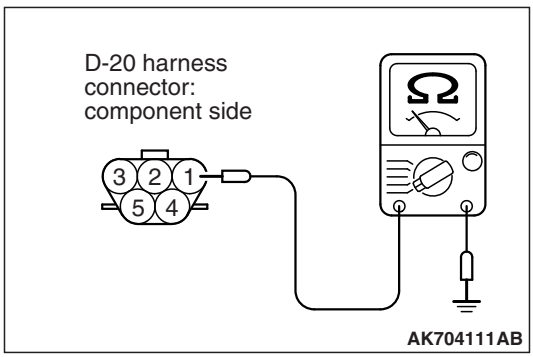
(4) Measure the voltage between terminal No. 115 and ground.
- Voltage should be between 4.5 and 4.9 volts.

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

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

YES : Check harness connector C-129 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between fuel tank temperature sensor connector D-20 (terminal No. 3) and ECM connector B-11 (terminal No. 115) because of open circuit. Then go to Step 10.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 10.



STEP 7. Check the continuity at fuel tank temperature sensor harness side connector D-20.

(1) Disconnect the connector D-20 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 8.

NO : Repair harness wire between fuel tank temperature sensor connector D-20 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 10.

STEP 8. Check harness connector B-11 at ECM 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 10.

STEP 9. Check for harness damage between fuel tank temperature sensor connector D-20 (terminal No. 3) and ECM connector B-11 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-129. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 10.

NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

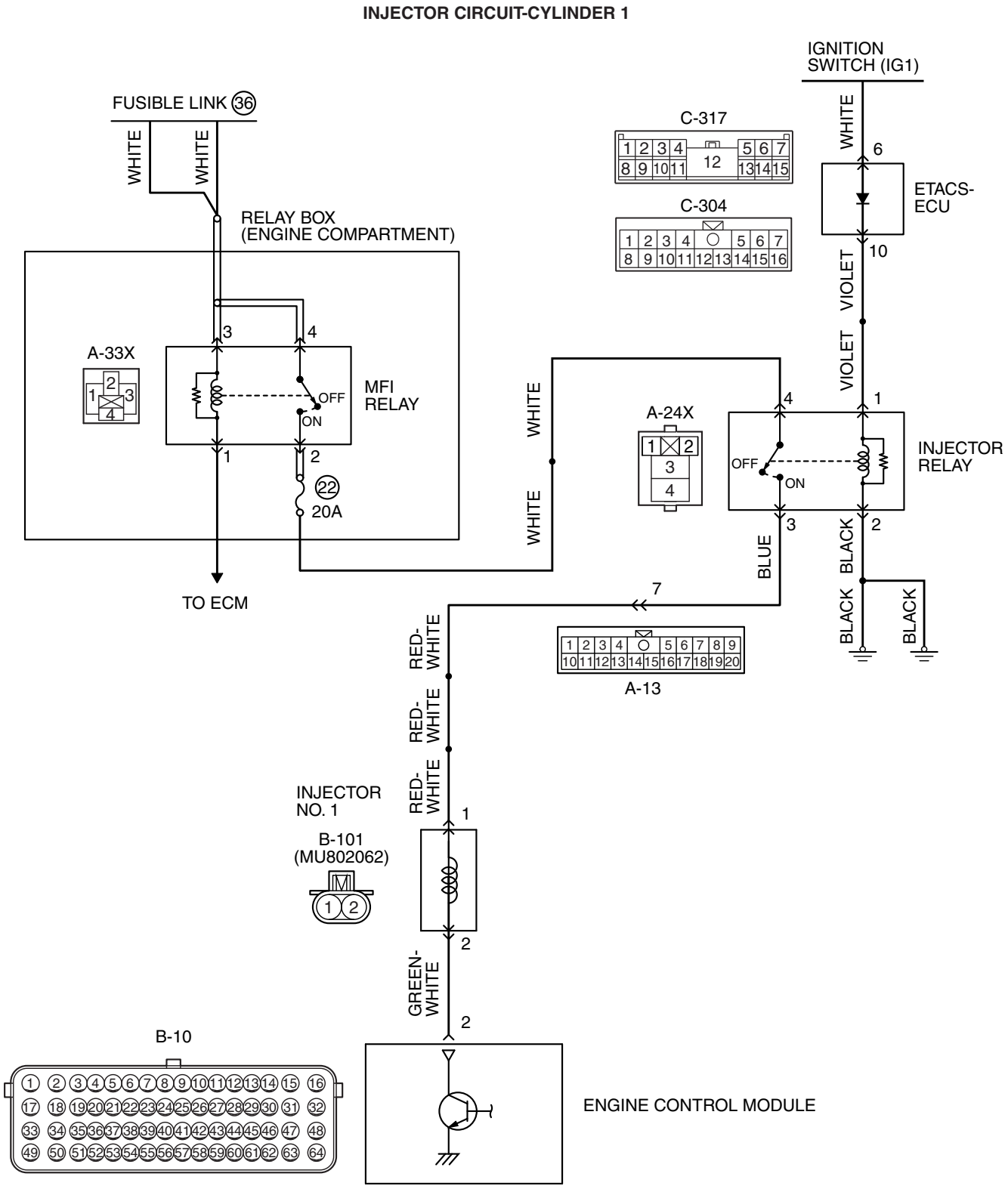
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0183 set?

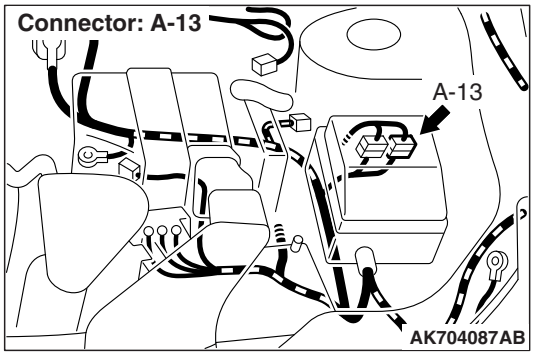
YES : Retry the troubleshooting.

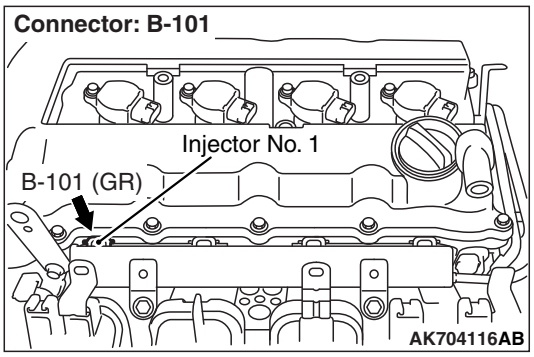
NO : The inspection is complete.

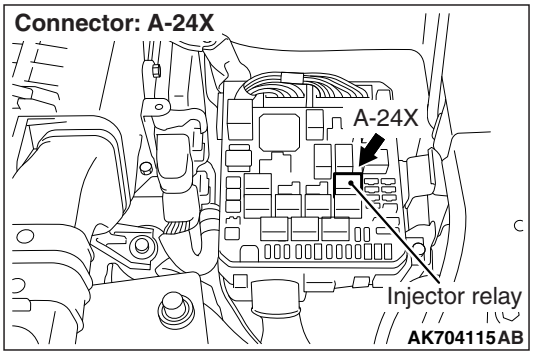
DTC P0201: Injector Circuit-Cylinder 1

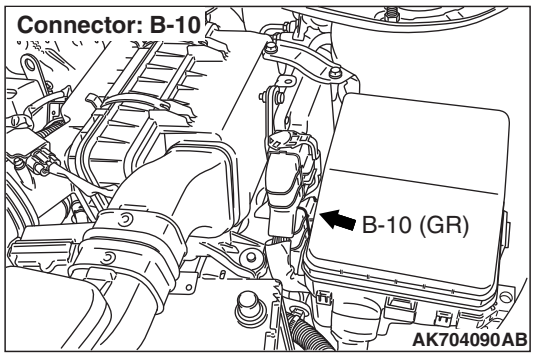


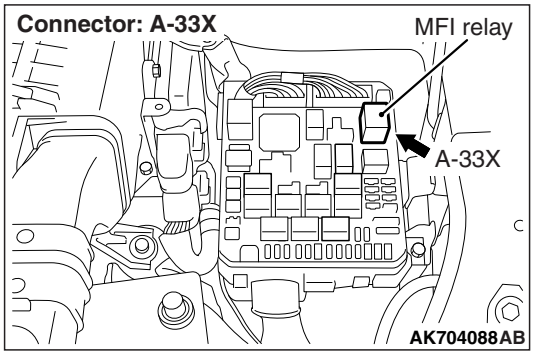
TSB Revision

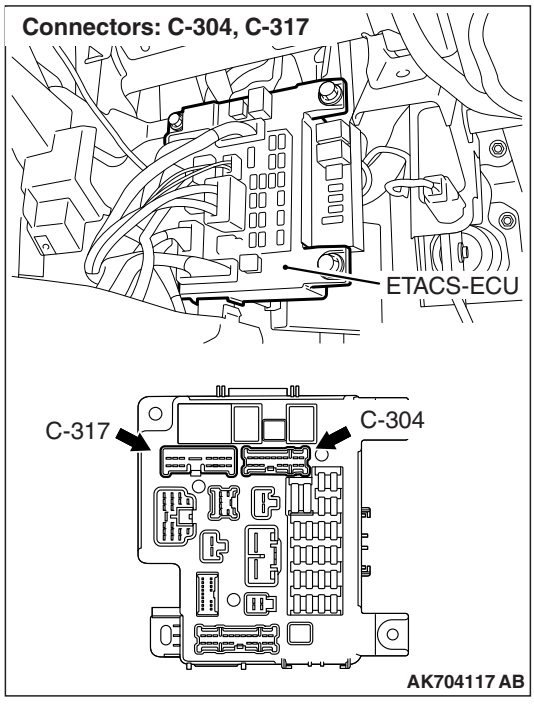












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

TSB Revision

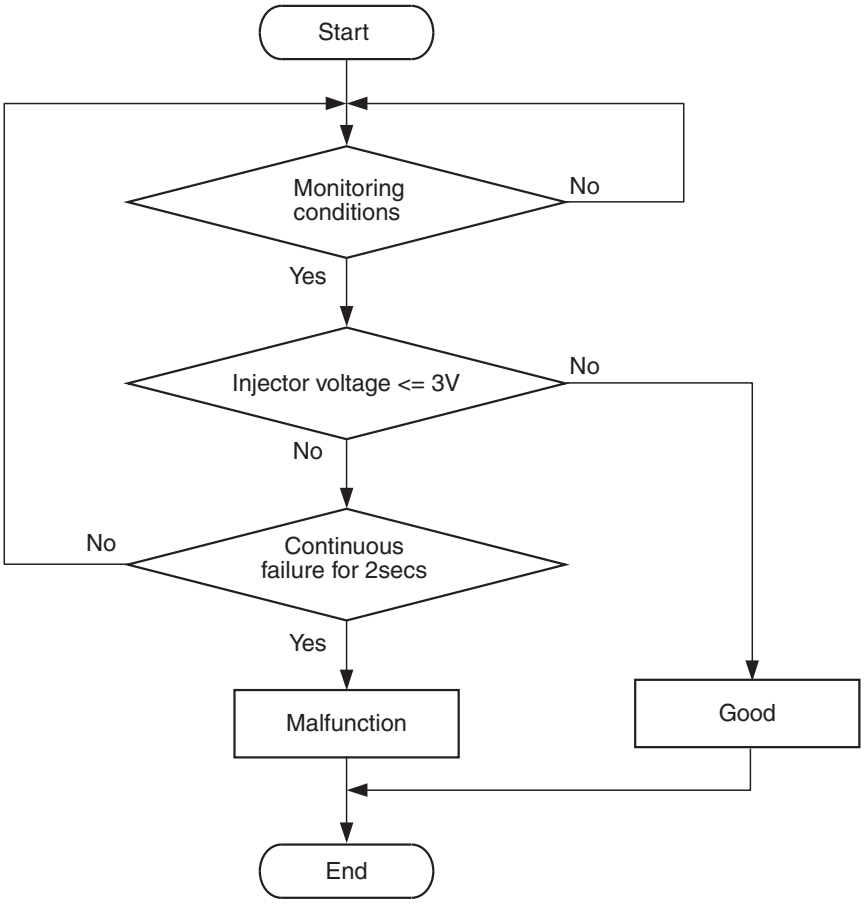
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Not applicable

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

Logic Flow Chart



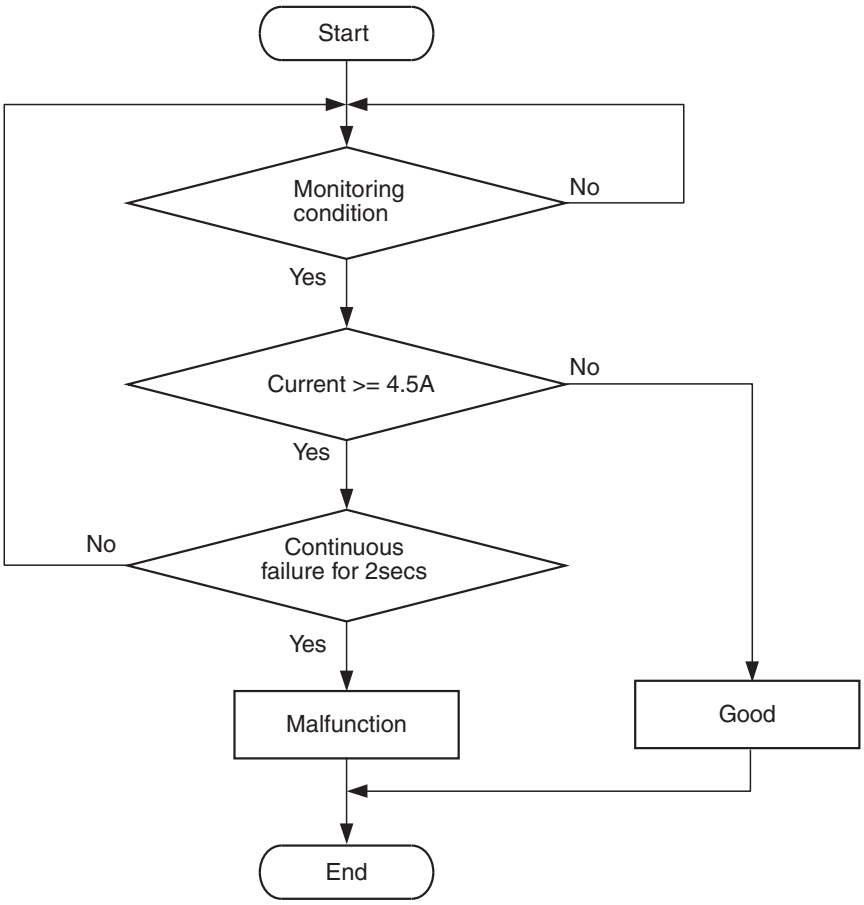
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK604332

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

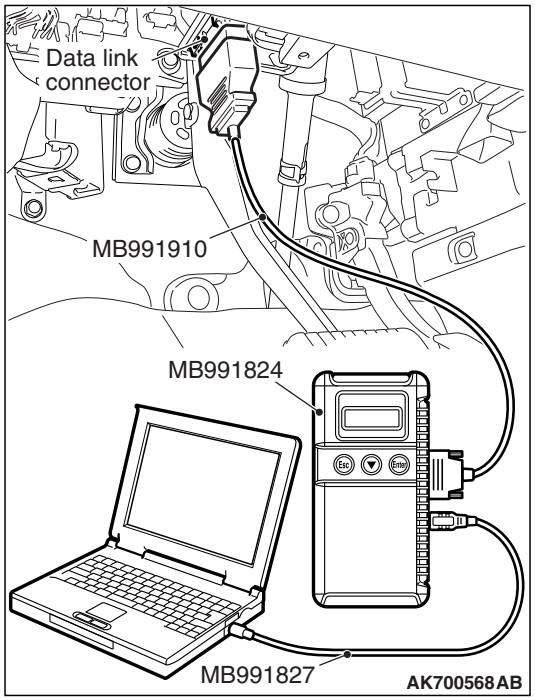
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 1 cylinder injector failed.
- Open or shorted No. 1 cylinder injector 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
- MB992110: Power Plant ECU Check Harness



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

⚠ CAUTION

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

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

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

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

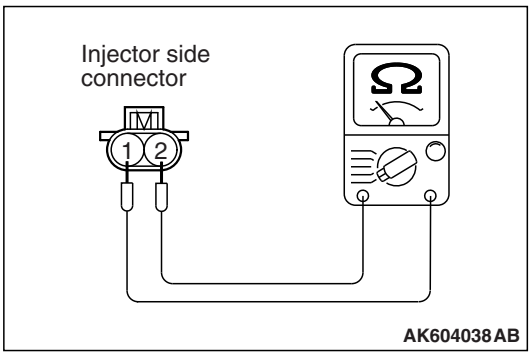
NO : Go to Step 2.

STEP 2. Check harness connector B-101 at No. 1 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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



STEP 3. Check the No. 1 cylinder injector.

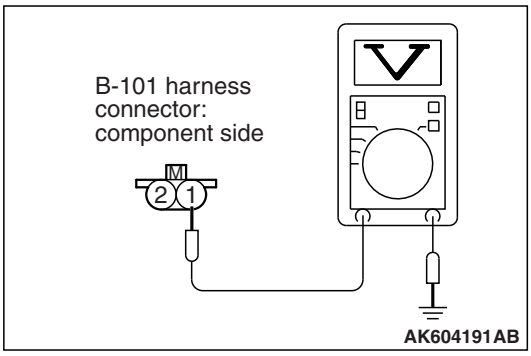
(1) Disconnect the No. 1 cylinder injector connector B-101.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.

NO : Replace the No. 1 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 1 cylinder injector connector.

(1) Disconnect connector B-101 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 14.
NO : Go to Step 5.

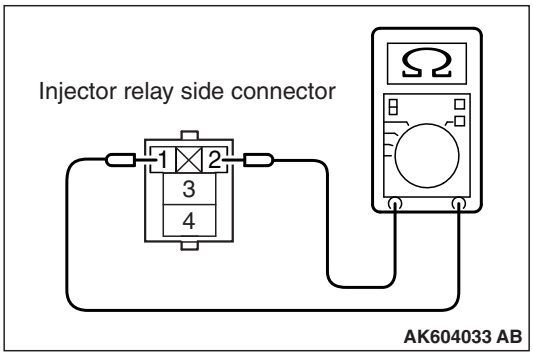
STEP 5. Check harness connector A-24X at injector relay for damage.

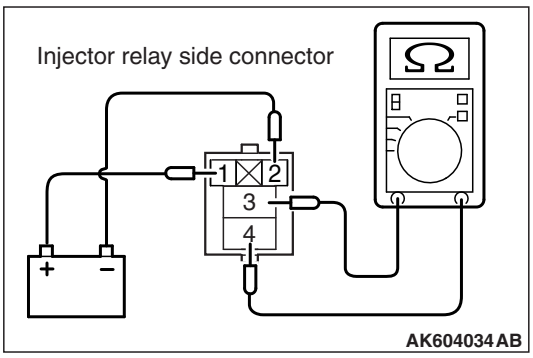
Q: Is the harness connector in good condition?

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. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity.





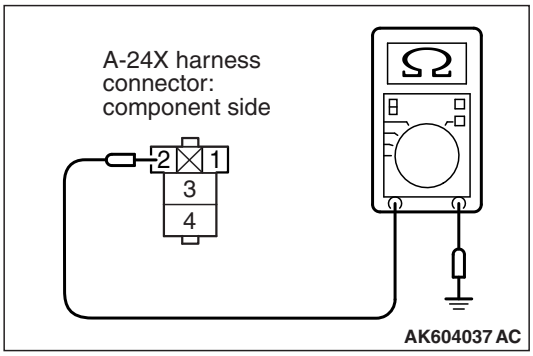
(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

TSB Revision

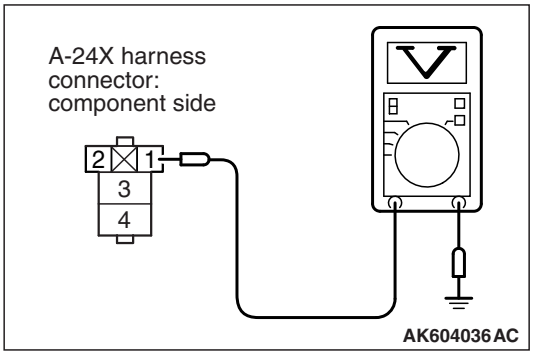


STEP 7. Check for continuity at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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 8.
NO : Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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.

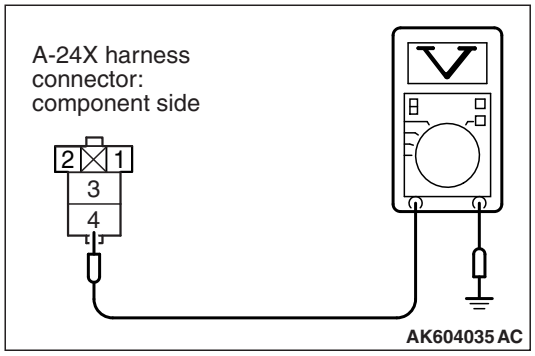
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

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

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

STEP 11. Check harness connector A-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit and short circuit to ground between injector relay connector A-24X (terminal No. 3) and No. 1 cylinder injector connector B-101 (terminal No. 1).

NOTE: Check harness connector after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check harness connector A-33X at MFI relay 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 harness damage between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-24X (terminal No. 3) and No. 1 cylinder injector connector B-101 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-10 at ECM for damage.

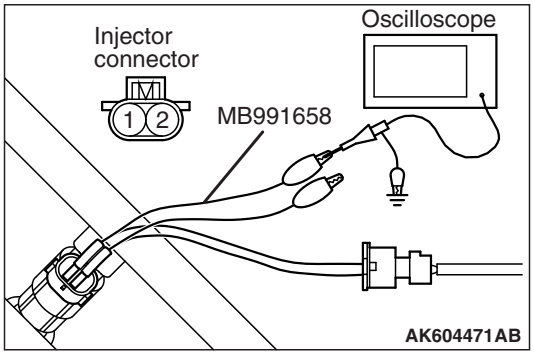
Q: Is the harness connector in good condition?

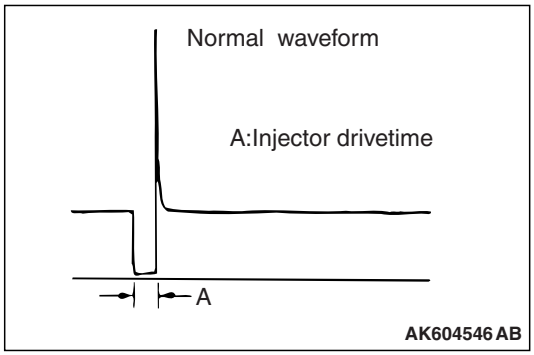
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit, short circuit to ground and harness damage between No. 1 cylinder injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 1 cylinder injector.

(1) Disconnect the No. 1 cylinder injector connector B-101 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

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

NOTE: When measuring with the ECM 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. 2.

(3) Start the engine and run at idle.

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

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

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.13A-11.

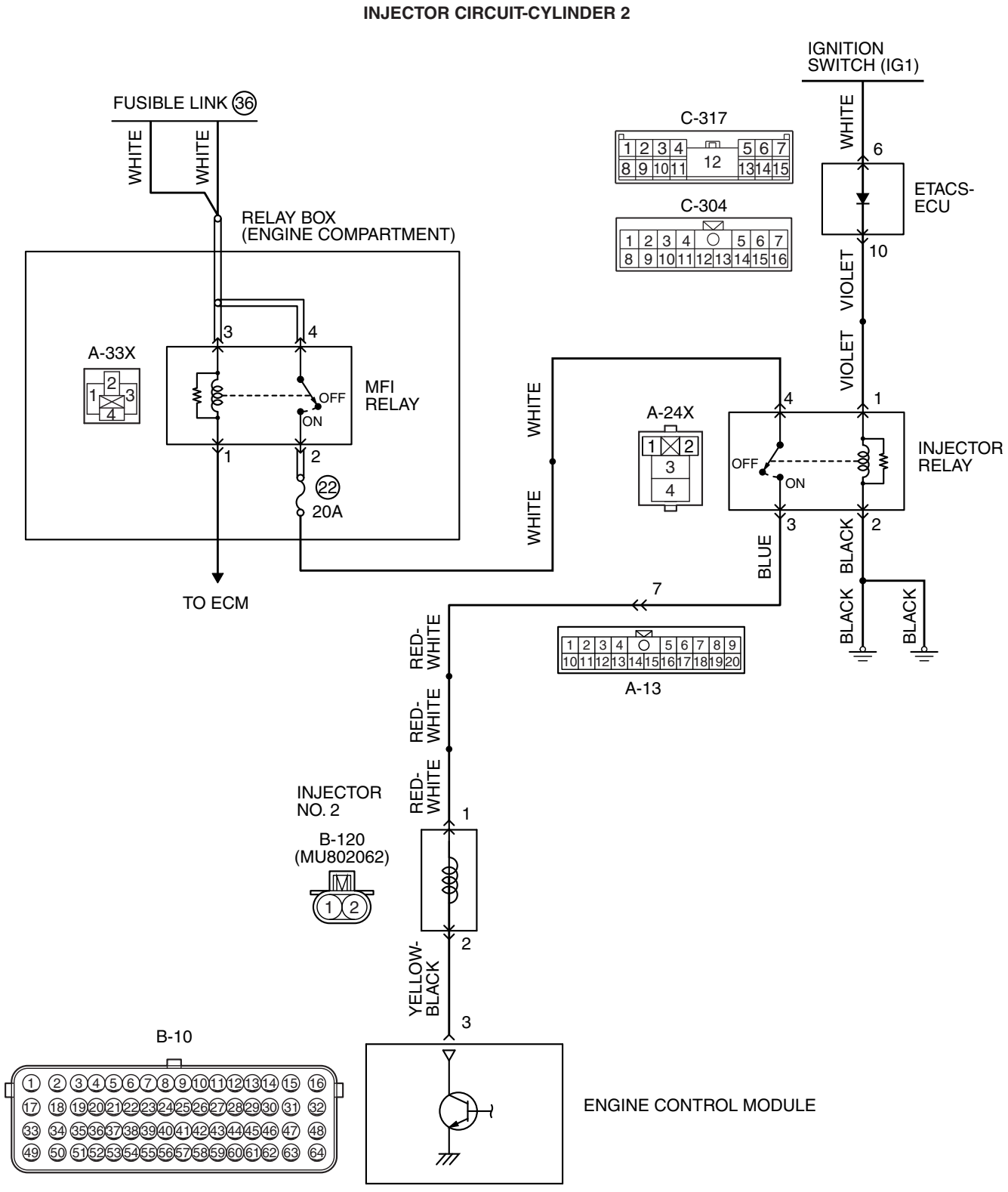
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0201 set?

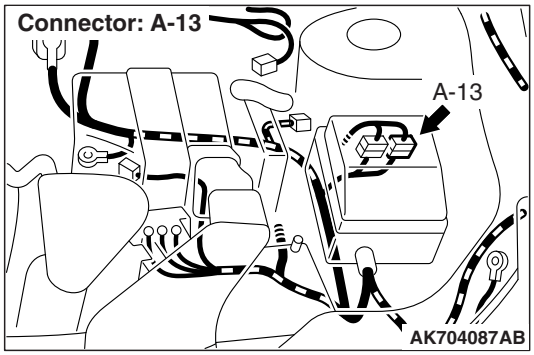
YES : Retry the troubleshooting.

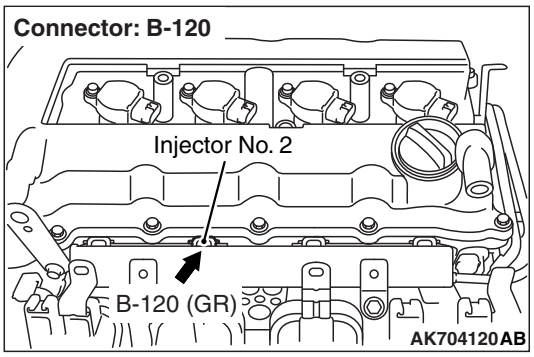
NO : The inspection is complete.

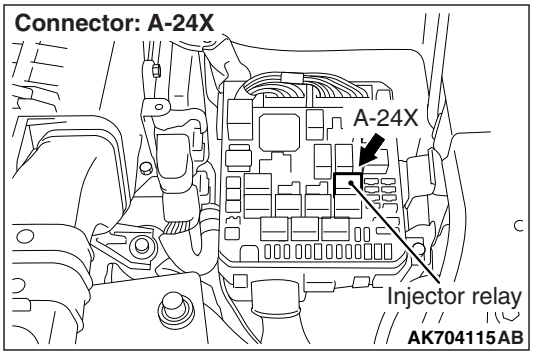
DTC P0202: Injector Circuit-Cylinder 2

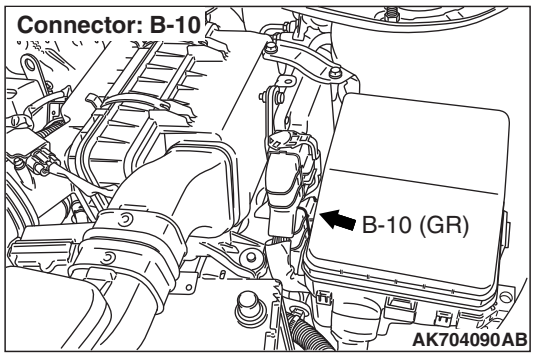


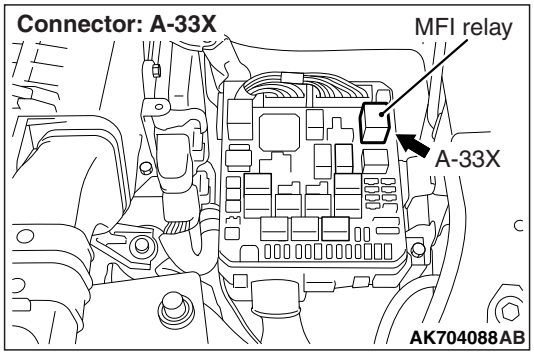
TSB Revision

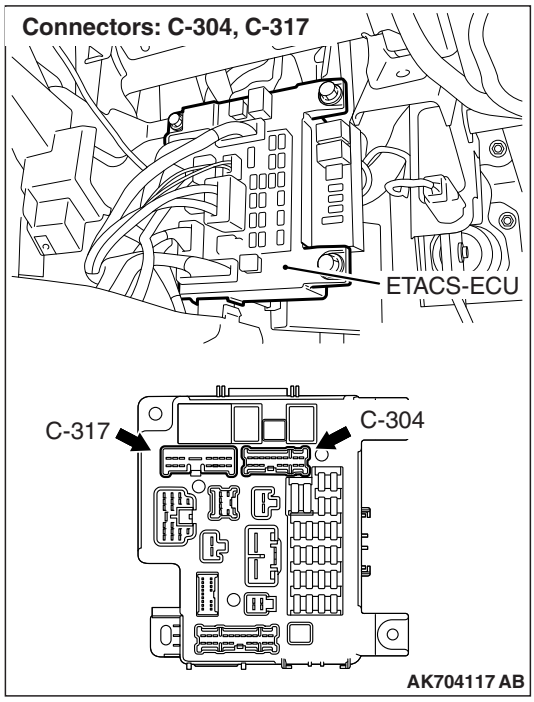












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

TSB Revision

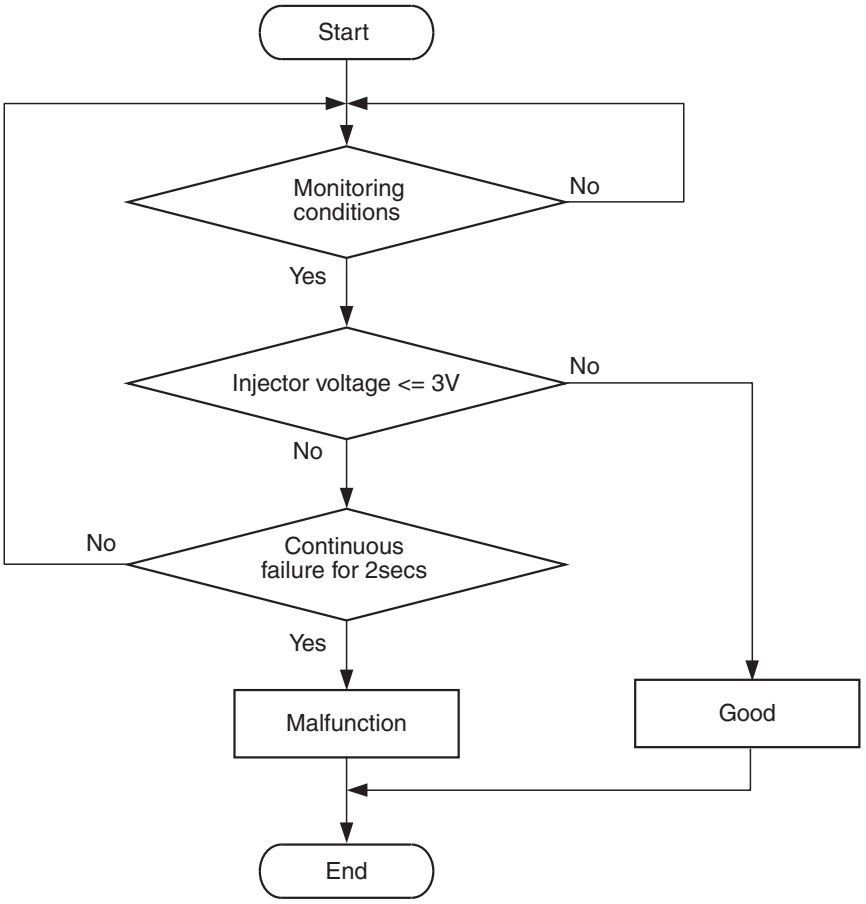
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Not applicable

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

Logic Flow Chart



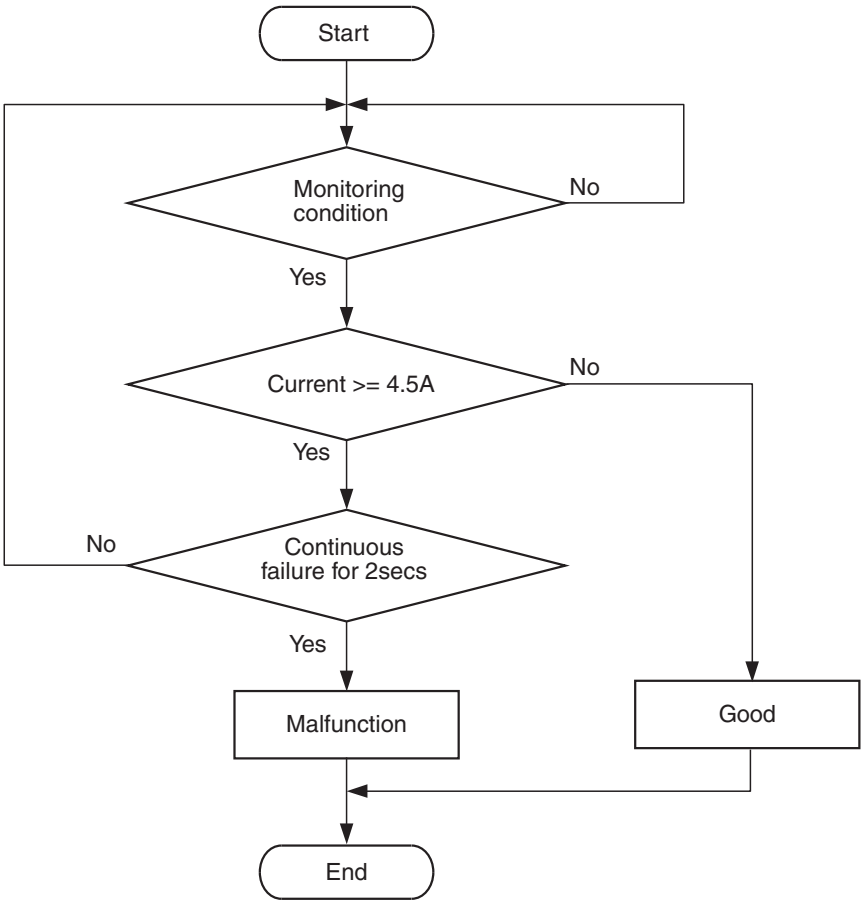
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK604332

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving for 2 seconds.

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

- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage, or connector damage.
- ECM failed.

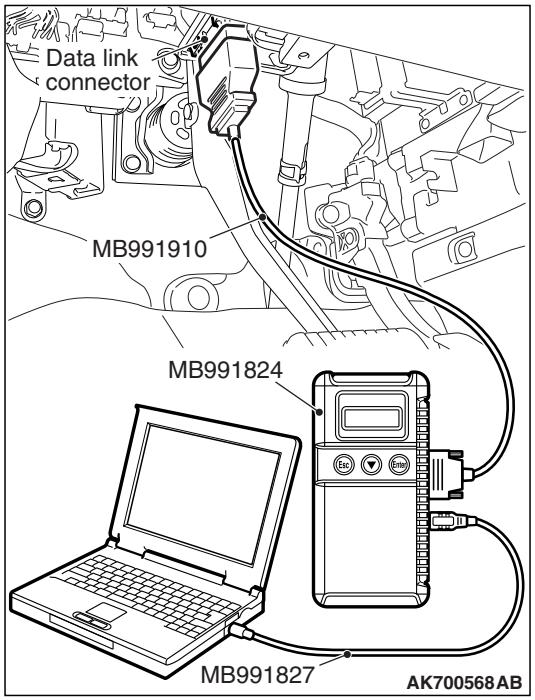
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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
- MB992110: Power Plant ECU Check Harness



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

⚠ CAUTION

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

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

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

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

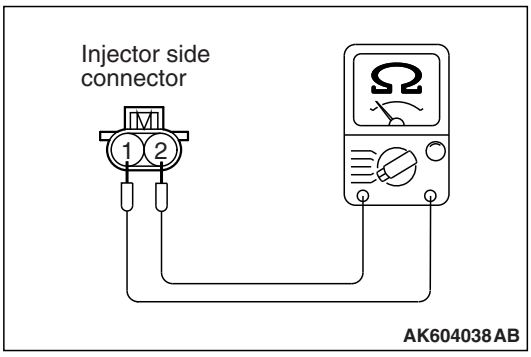
NO : Go to Step 2.

STEP 2. Check harness connector B-120 at No. 2 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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



STEP 3. Check the No. 2 cylinder injector.

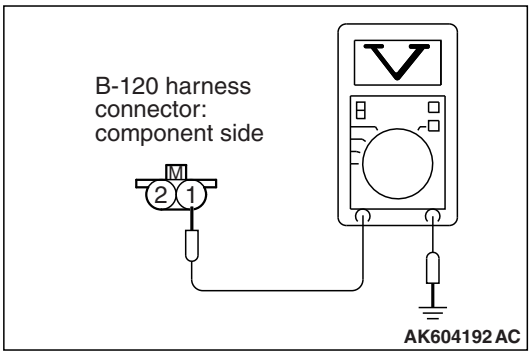
(1) Disconnect the No. 2 cylinder injector connector B-120.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.

NO : Replace the No. 2 cylinder injector. Then go to Step 20.



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

(1) Disconnect connector B-120 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 14.
NO : Go to Step 5.

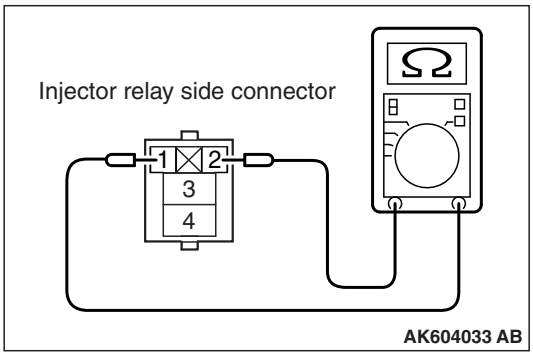
STEP 5. Check harness connector A-24X at injector relay for damage.

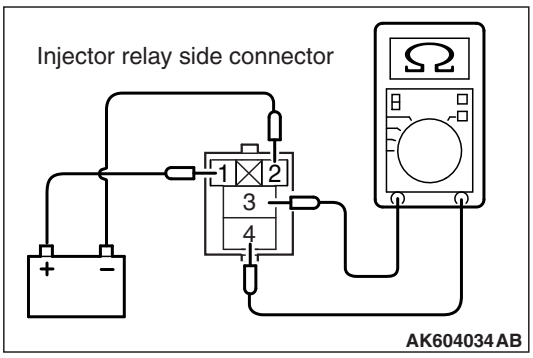
Q: Is the harness connector in good condition?

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. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity.





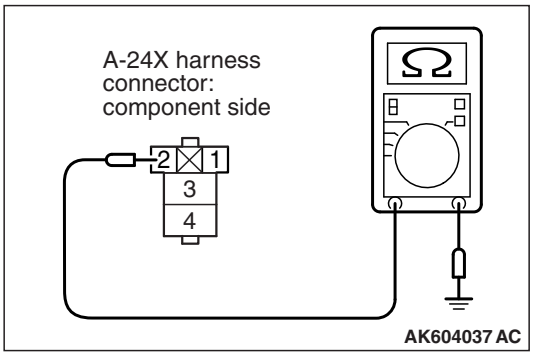
(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

TSB Revision

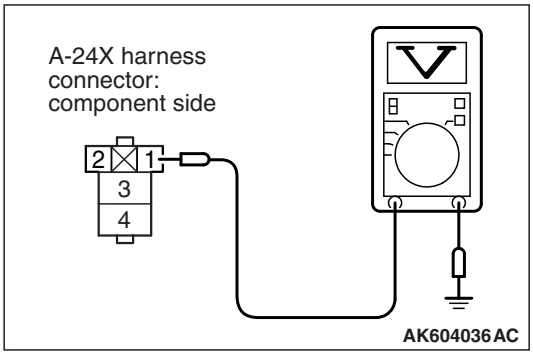


STEP 7. Check for continuity at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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 8.
NO : Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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.

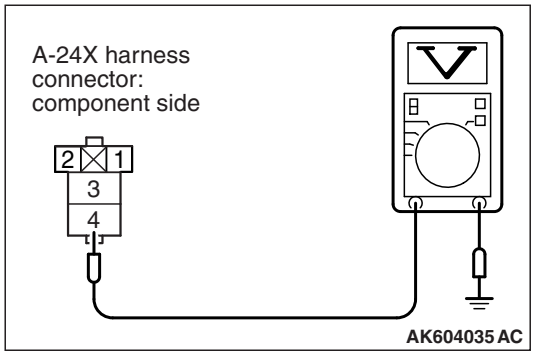
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

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

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

STEP 11. Check harness connector A-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit and short circuit to ground between injector relay connector A-24X (terminal No. 3) and No. 2 cylinder injector connector B-120 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check harness connector A-33X at MFI relay 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 harness damage between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-24X (terminal No. 3) and No. 2 cylinder injector connector B-120 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-10 at ECM for damage.

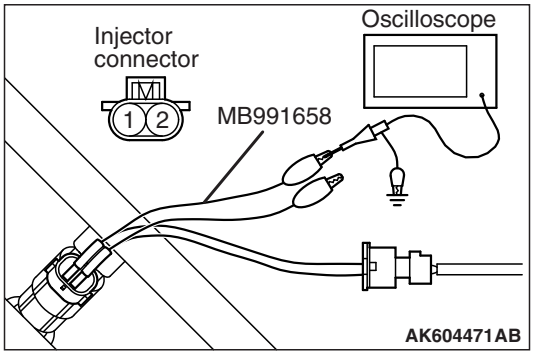
Q: Is the harness connector in good condition?

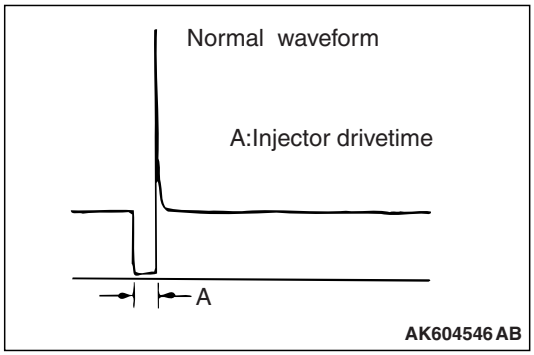
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit, short circuit to ground and harness damage between No. 2 cylinder injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-120 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

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

NOTE: When measuring with the ECM 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. 3.

(3) Start the engine and run at idle.

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

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

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.13A-11.

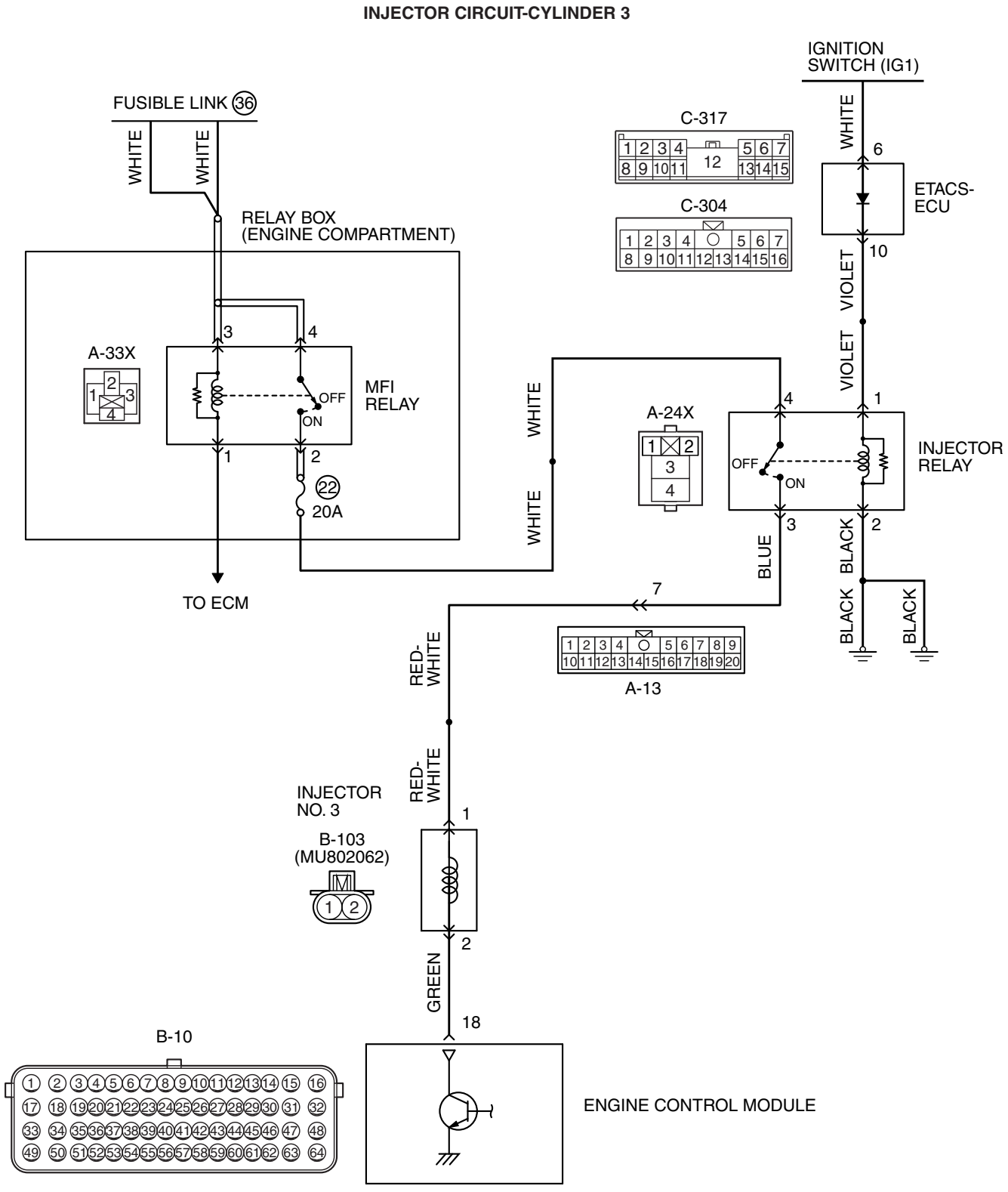
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0202 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0203: Injector Circuit-Cylinder 3



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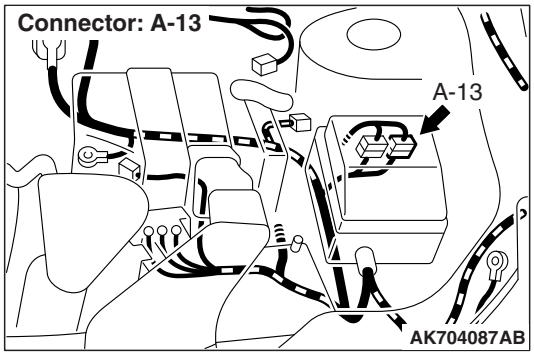

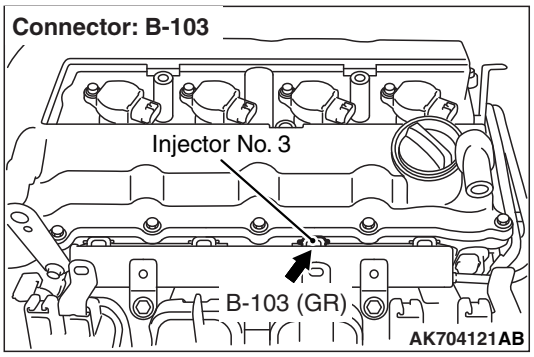

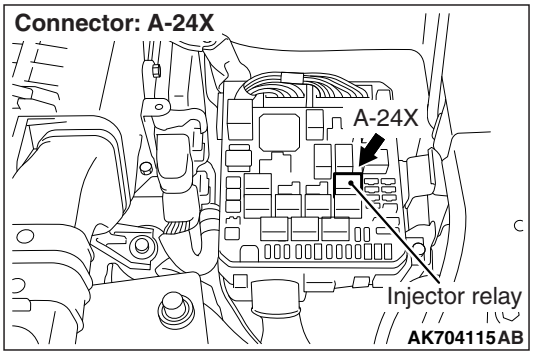

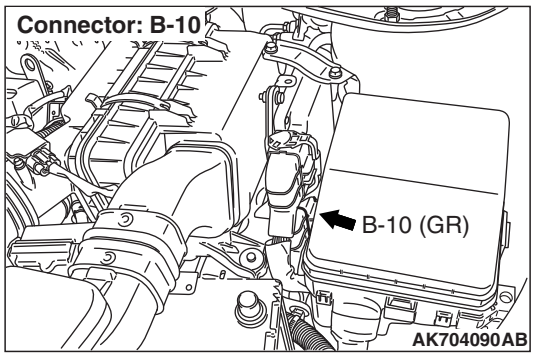

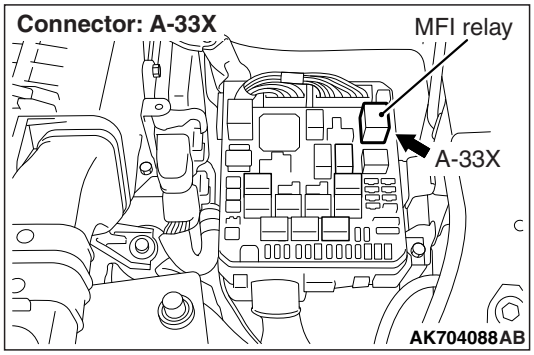

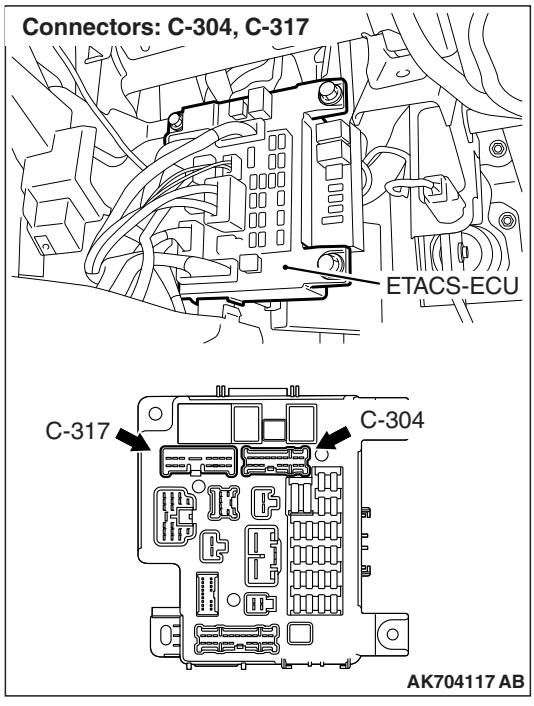

CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

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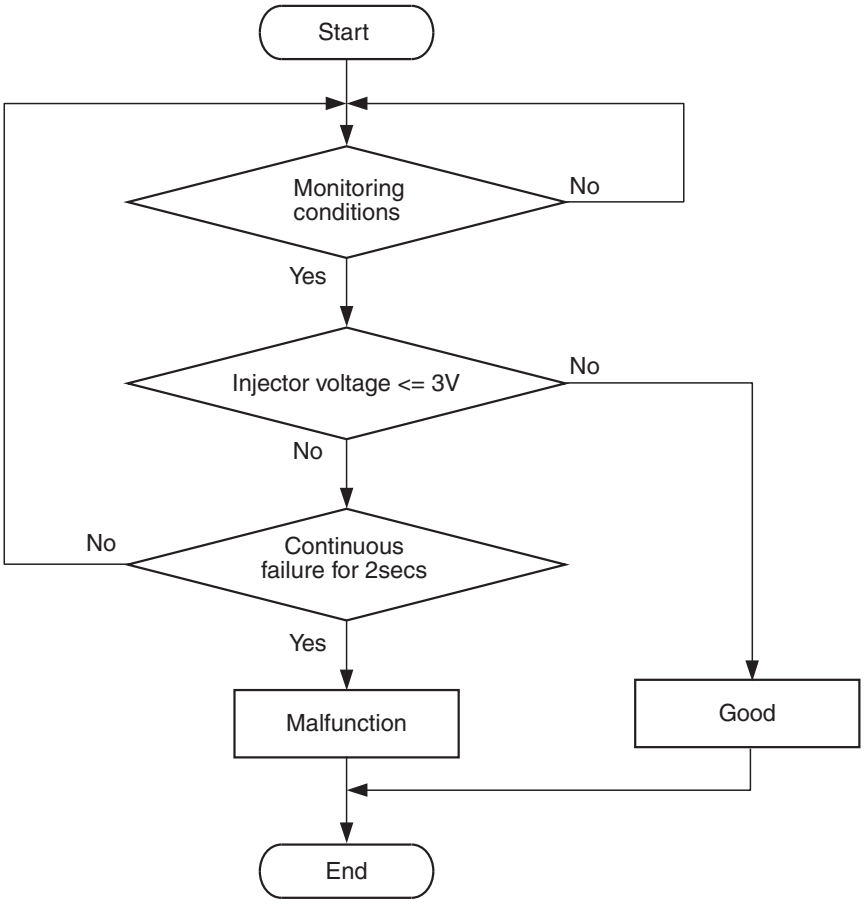
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Not applicable

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

Logic Flow Chart



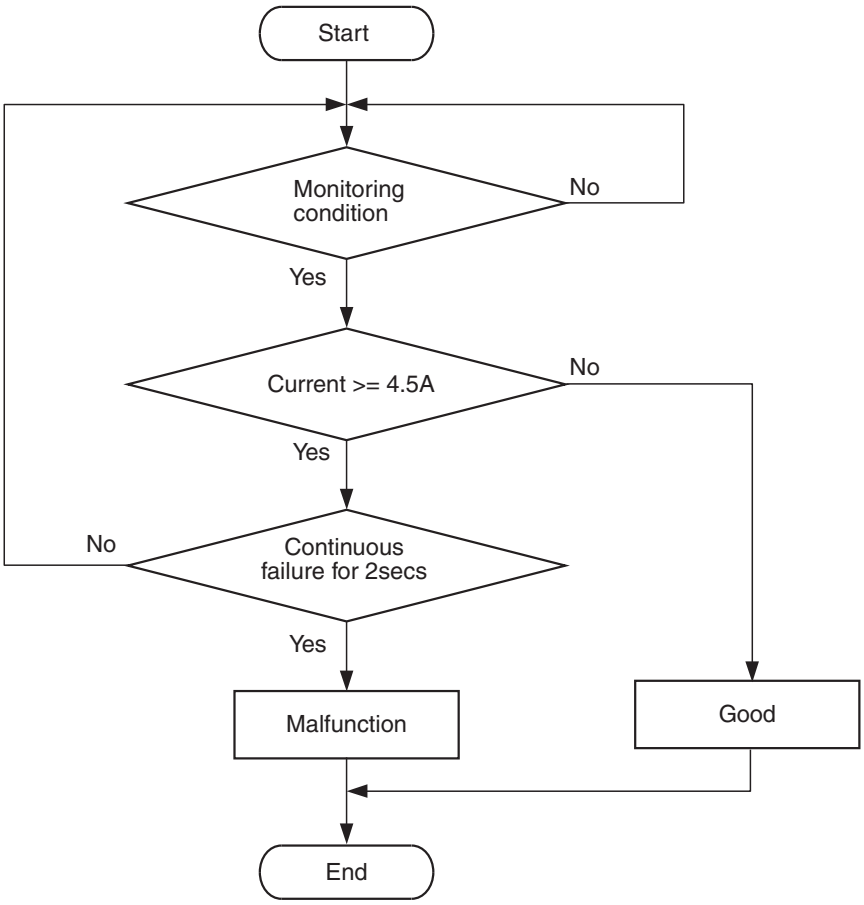
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



AK604332

Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage, or connector damage.
- ECM failed.

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
- MB992110: Power Plant ECU Check Harness

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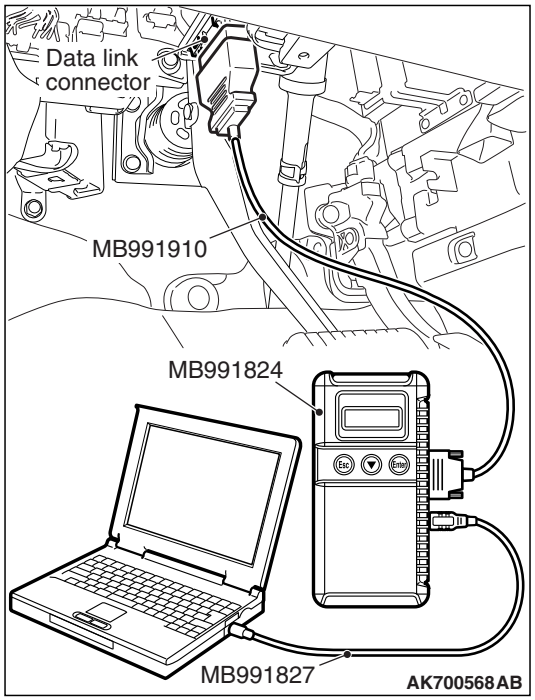


STEP 1. Using scan tool MB991958, check actuator test item 1: No. 3 Injector.

⚠ CAUTION

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

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

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

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

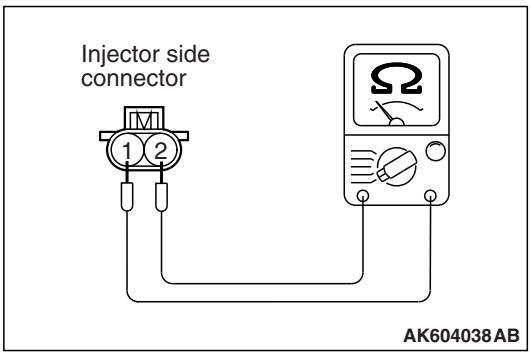
NO : Go to Step 2.

STEP 2. Check harness connector B-103 at No. 3 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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



STEP 3. Check the No. 3 cylinder injector.

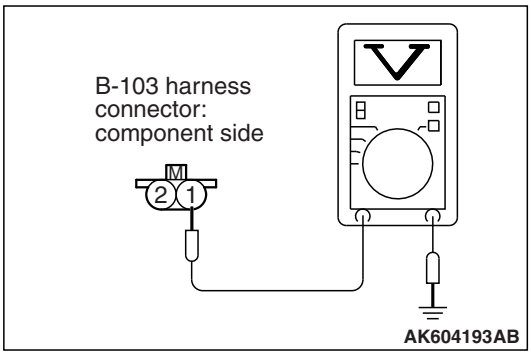
(1) Disconnect the No. 3 cylinder injector connector B-103.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.

NO : Replace the No. 3 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 3 cylinder injector connector.

(1) Disconnect connector B-103 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 14.
NO : Go to Step 5.

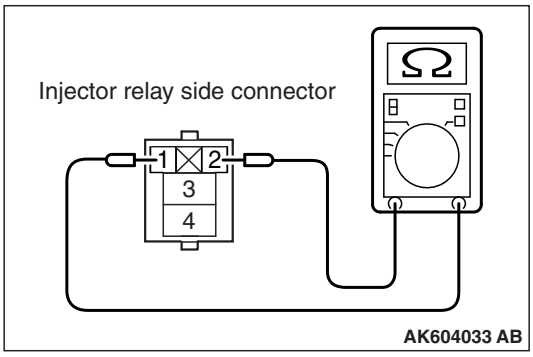
STEP 5. Check harness connector A-24X at injector relay for damage.

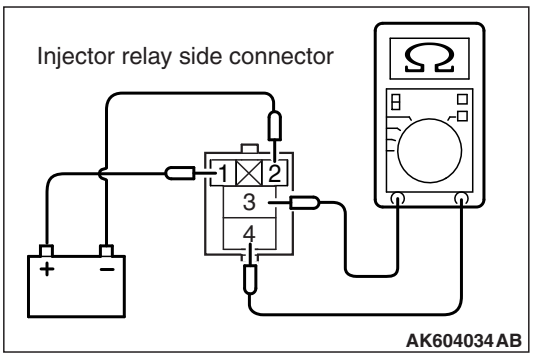
Q: Is the harness connector in good condition?

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. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity.





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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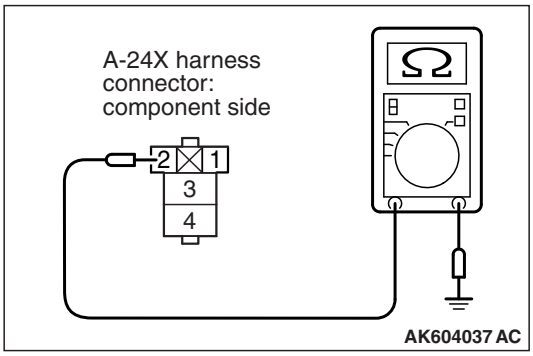
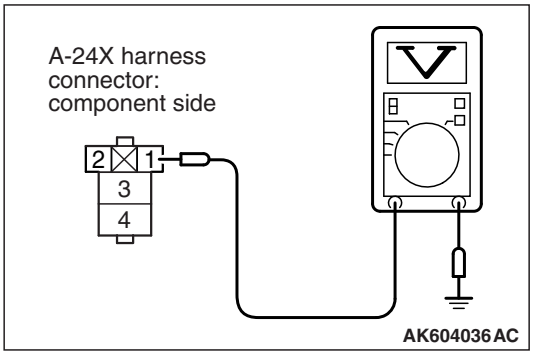


STEP 7. Check for continuity at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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 8.
NO : Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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.

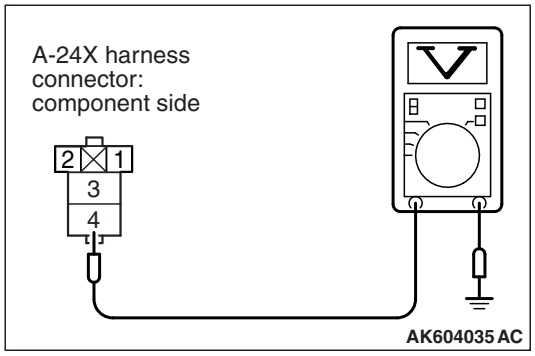
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

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

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

STEP 11. Check harness connector A-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit and short circuit to ground between injector relay connector A-24X (terminal No. 3) and No. 3 cylinder injector connector B-103 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check harness connector A-33X at MFI relay 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 harness damage between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-24X (terminal No. 3) and No. 3 cylinder injector connector B-103 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-10 at ECM for damage.

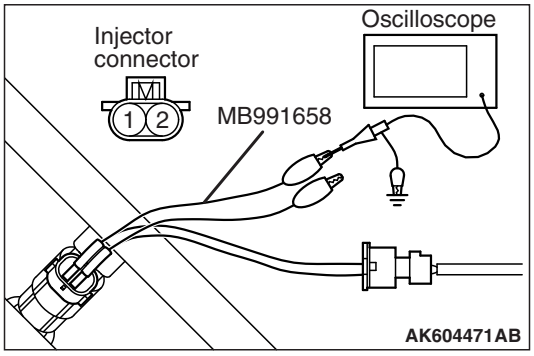
Q: Is the harness connector in good condition?

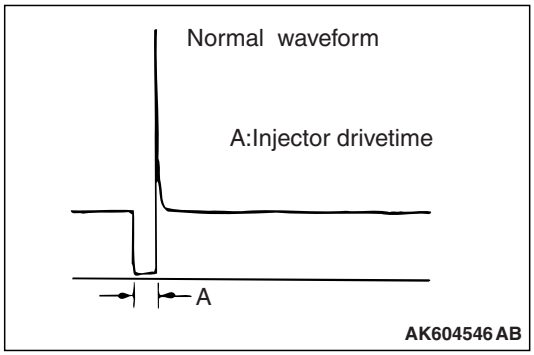
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit, short circuit to ground and harness damage between No. 3 cylinder injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 3 cylinder injector.

(1) Disconnect the No. 3 cylinder injector connector B-103 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

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

NOTE: When measuring with the ECM 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. 18.

(3) Start the engine and run at idle.

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

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

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.13A-11.

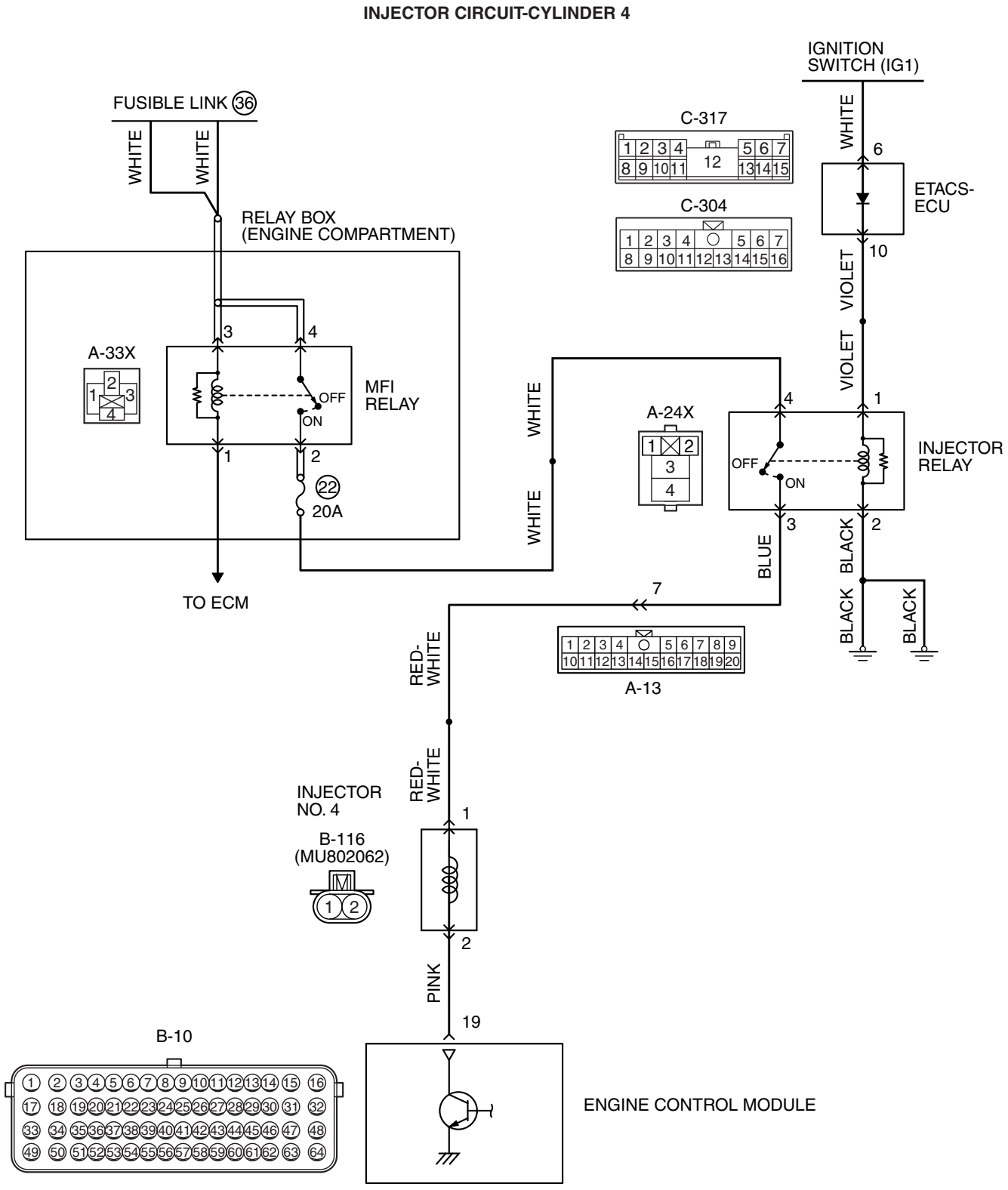
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0203 set?

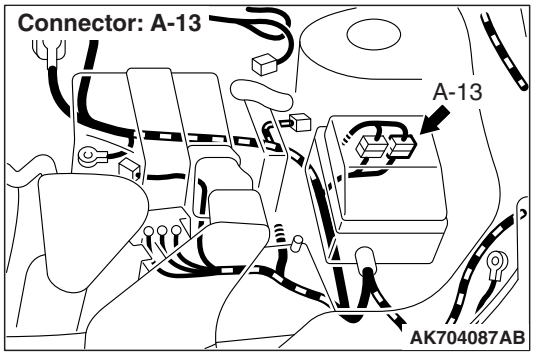
YES : Retry the troubleshooting.

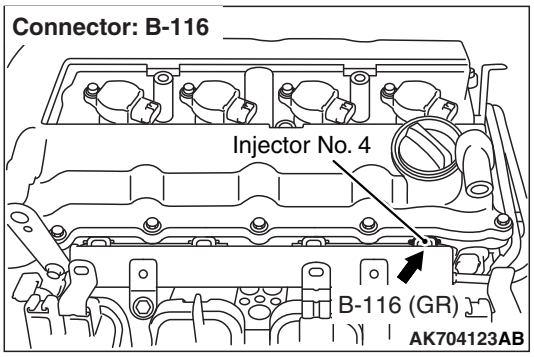
NO : The inspection is complete.

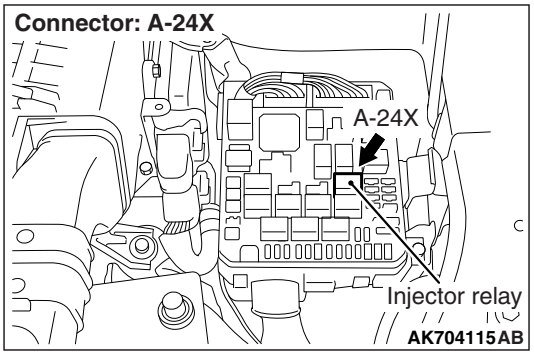
DTC P0204: Injector Circuit-Cylinder 4

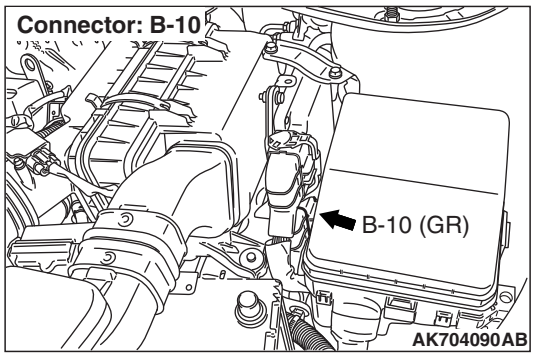


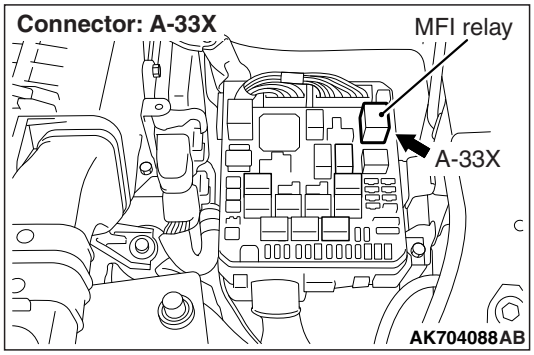
TSB Revision

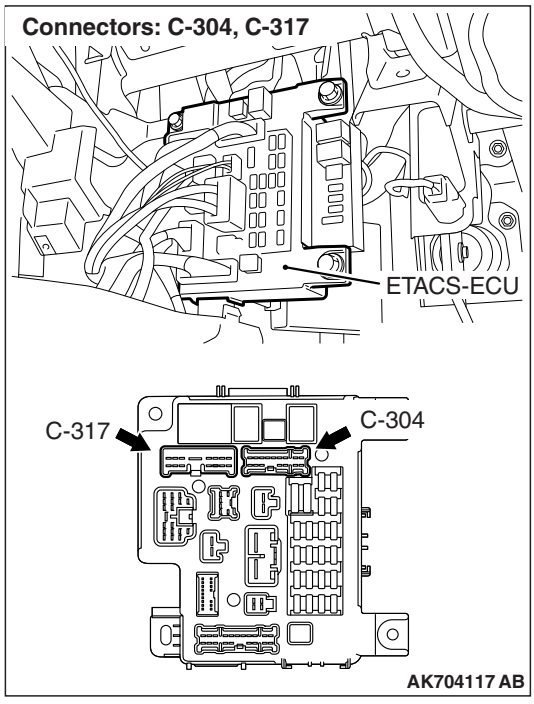












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

TSB Revision

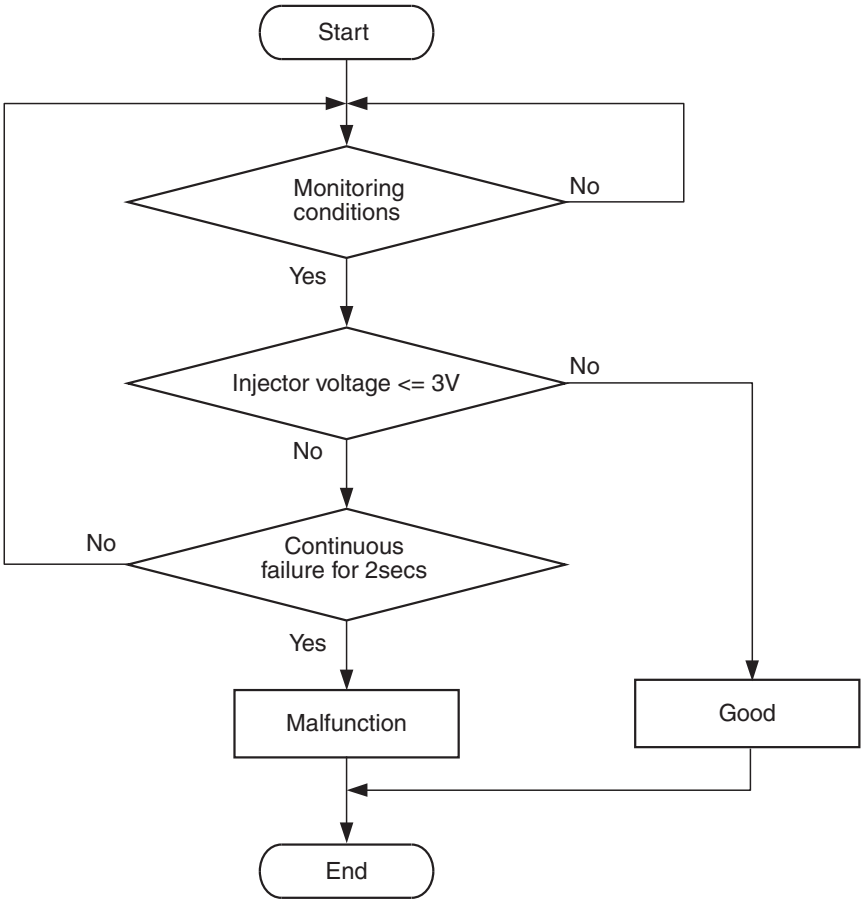
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Not applicable

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

Logic Flow Chart



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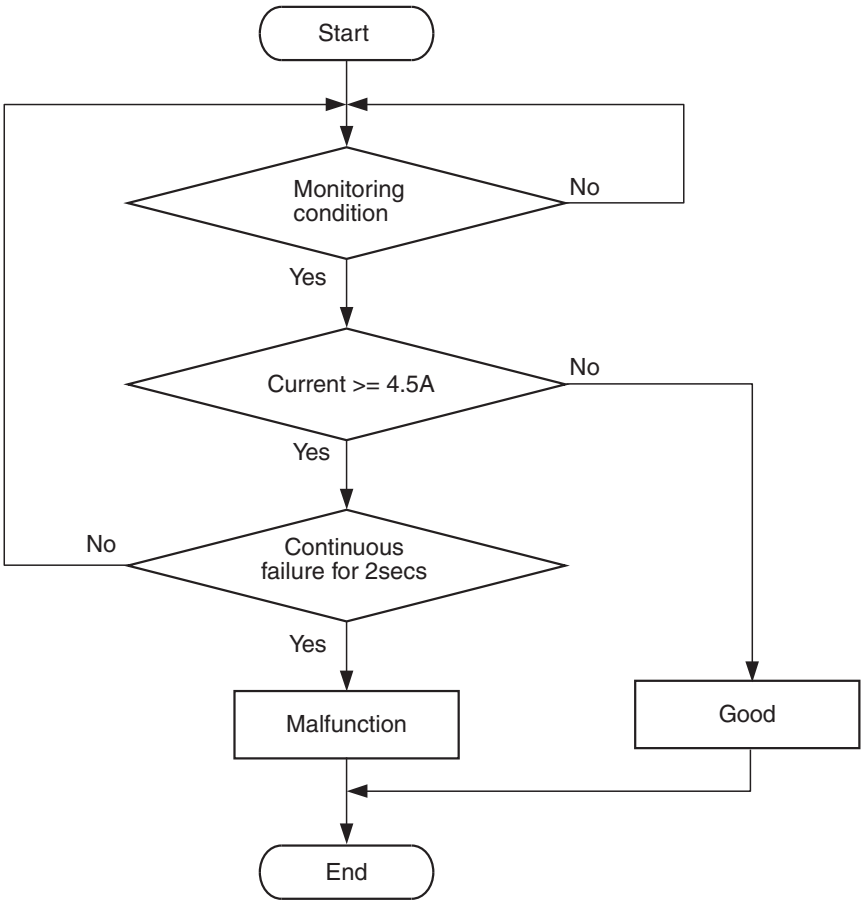
Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity – shorted high>

Logic Flow Chart



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Check Condition

- Engine is running.

Judgement Criterion

- The coil current is 4.5 amperes or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

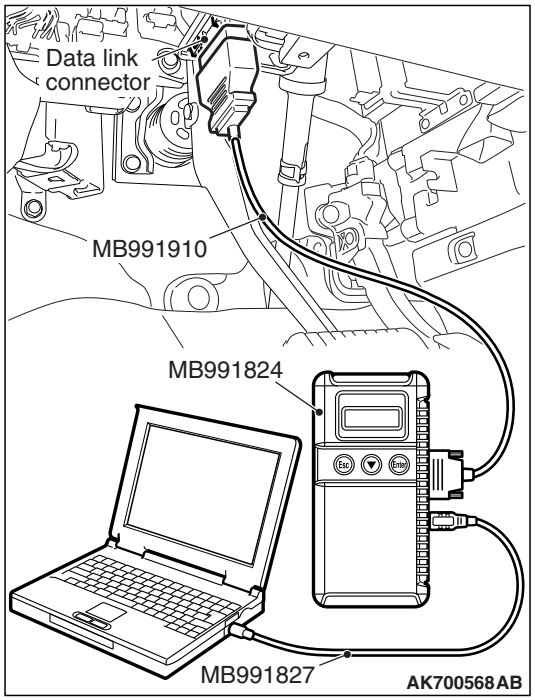
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 4 cylinder injector failed.
- Open or shorted No. 4 cylinder injector circuit, harness damage, or connector damage.
- ECM failed.

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
- MB992110: Power Plant ECU Check Harness



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

⚠ CAUTION

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

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

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

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

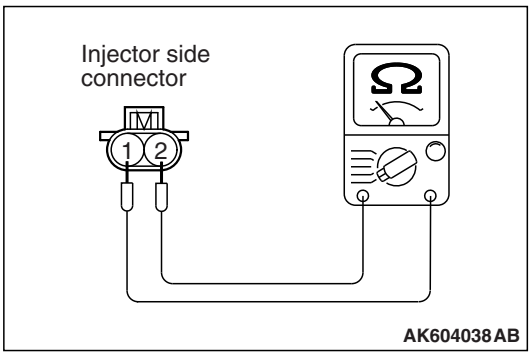
NO : Go to Step 2.

STEP 2. Check harness connector B-116 at No. 4 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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



STEP 3. Check the No. 4 cylinder injector.

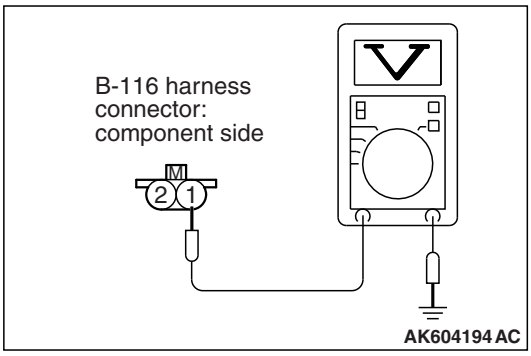
(1) Disconnect the No. 4 cylinder injector connector B-116.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.

NO : Replace the No. 4 cylinder injector. Then go to Step 20.



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

(1) Disconnect connector B-116 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 14.
NO : Go to Step 5.

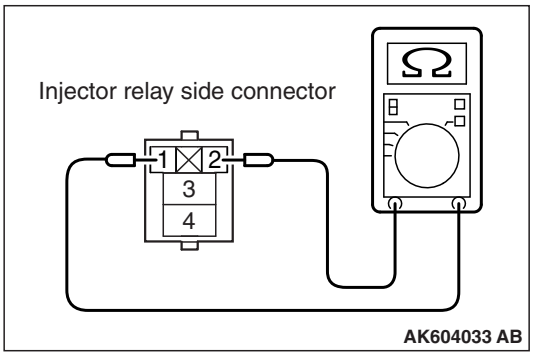
STEP 5. Check harness connector A-24X at injector relay for damage.

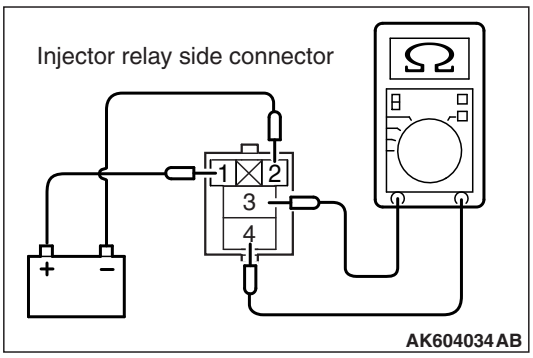
Q: Is the harness connector in good condition?

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. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity.





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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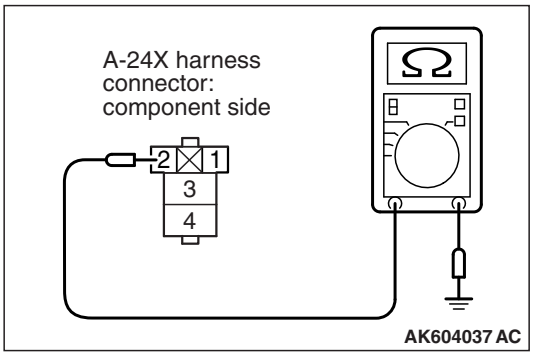
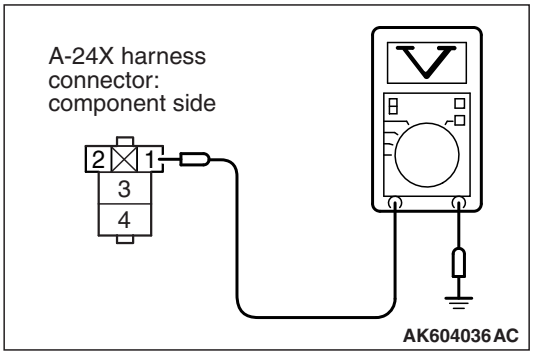


STEP 7. Check for continuity at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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 8.
NO : Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X 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.

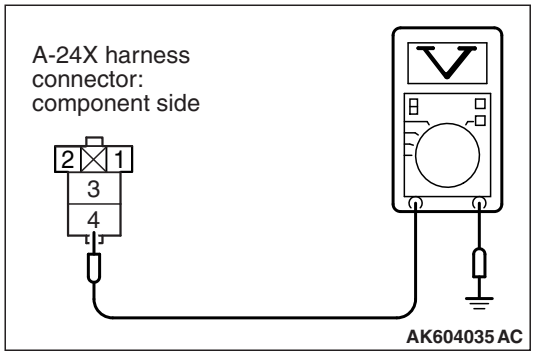
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-24X.

(1) Disconnect the connector A-24X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

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

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

STEP 11. Check harness connector A-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit and short circuit to ground between injector relay connector A-24X (terminal No. 3) and No. 4 cylinder injector connector B-116 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-24X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 14. Check harness connector A-33X at MFI relay 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 harness damage between MFI relay connector A-33X (terminal No. 2) and injector relay connector A-24X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-24X (terminal No. 3) and No. 4 cylinder injector connector B-116 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-10 at ECM for damage.

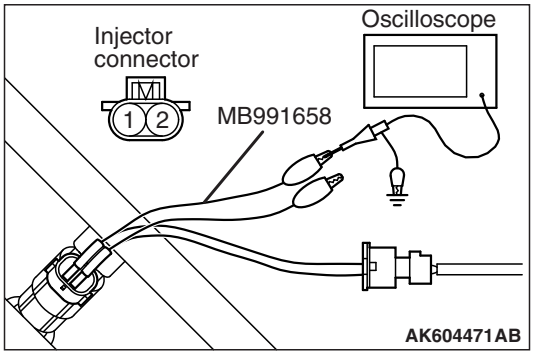
Q: Is the harness connector in good condition?

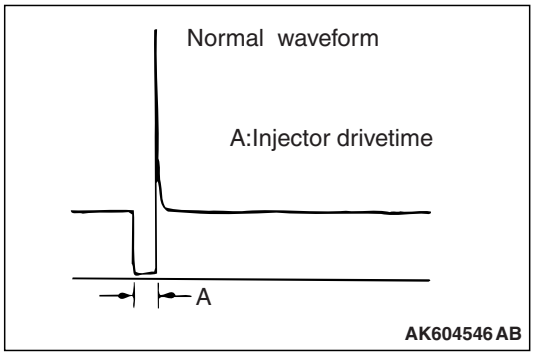
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit, short circuit to ground and harness damage between No. 4 cylinder injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-116 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

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

NOTE: When measuring with the ECM 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. 19.

(3) Start the engine and run at idle.

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

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

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.13A-11.

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

Q: Is DTC P0204 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0221: Throttle Position Sensor (Sub) Plausibility

TECHNICAL DESCRIPTION

Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (sub) signal.

MONITOR EXECUTION

Continuous

TSB Revision

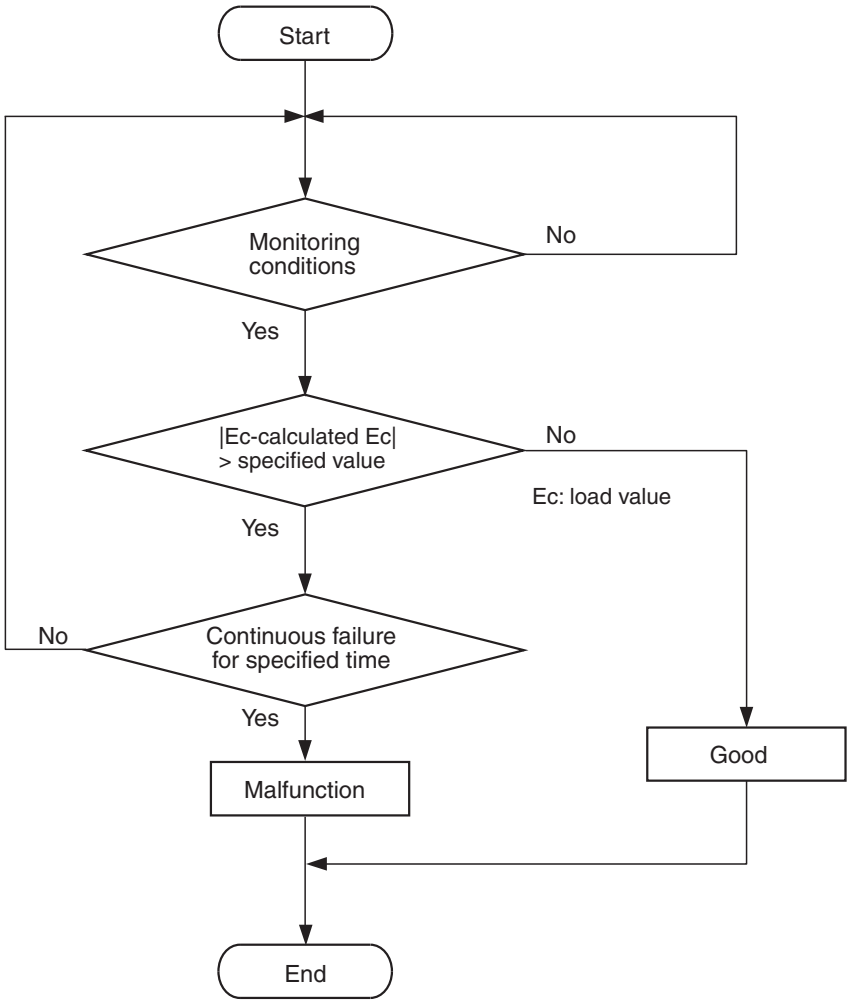
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 0 percent or more. Or, the volumetric efficiency is 60 percent or less.
- The engine speed is between 750 and 3,000 r/min. Or, the throttle position sensor (main) output voltage is 3 volts or less.

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Judgment Criterion

- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (sub) is 33 percent or more.

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

- Throttle position sensor (sub) system failed.
- Intake system vacuum leak.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle Pattern 17 P.13A-11.

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).

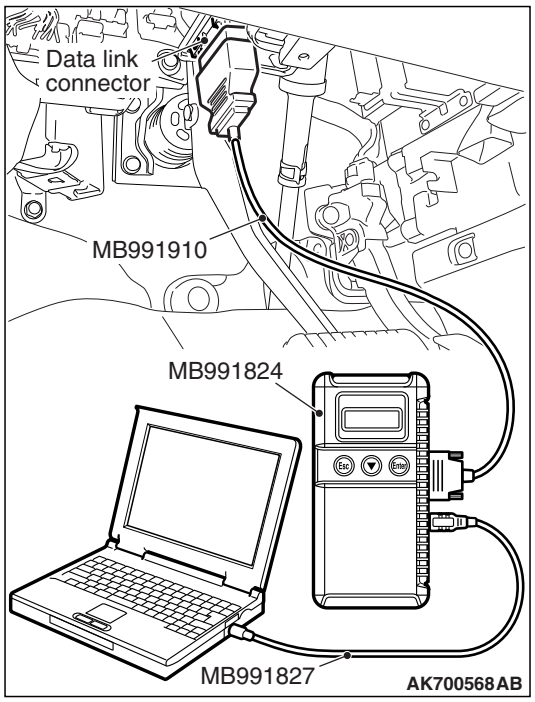
⚠ CAUTION

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 the diagnostic trouble code other than P0221 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-49.
NO : Go to Step 2.



STEP 2. 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.00-15.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair 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 17 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0221 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. The 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.00-15.

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 17 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0221 set?

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

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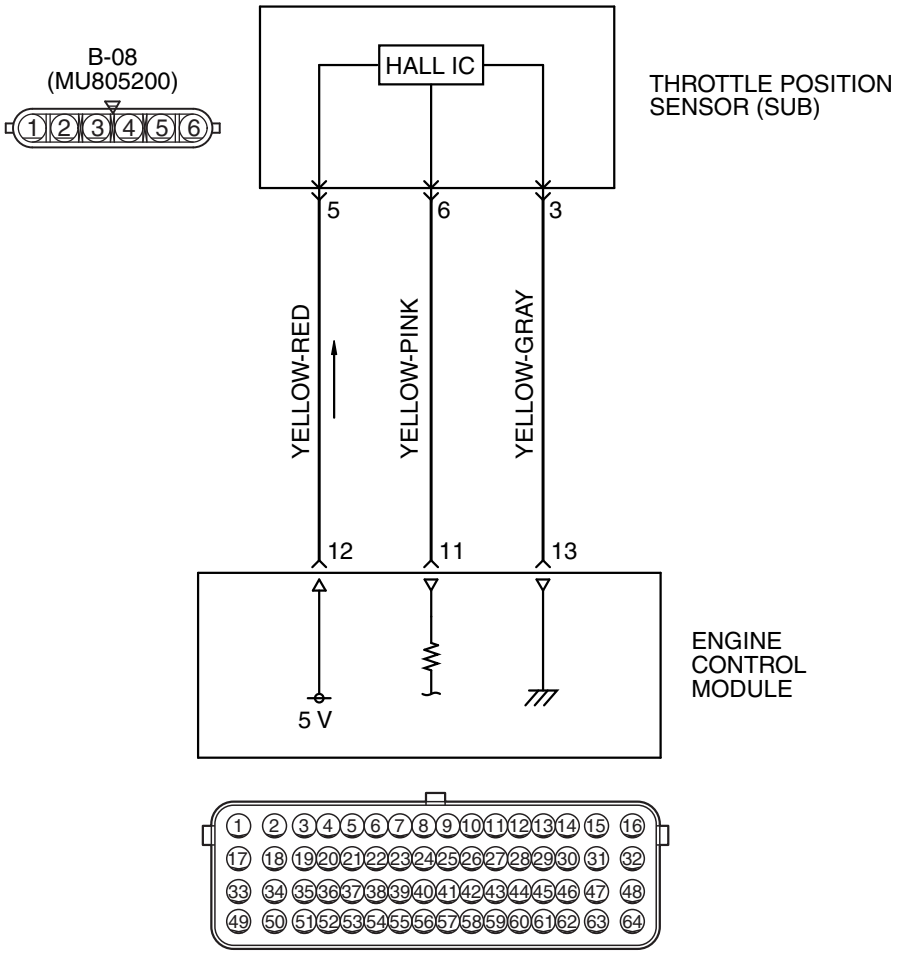
DTC P0222: Throttle Position Sensor (sub) Circuit Low Input

THROTTLE POSITION SENSOR (SUB) CIRCUIT



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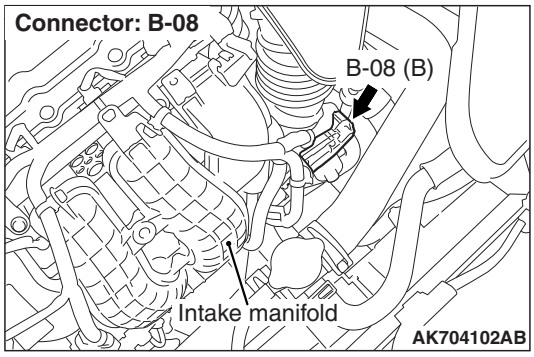
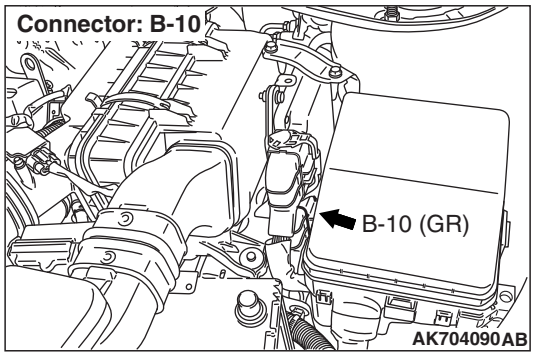




CIRCUIT OPERATION

- 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).

TSB Revision

- 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)

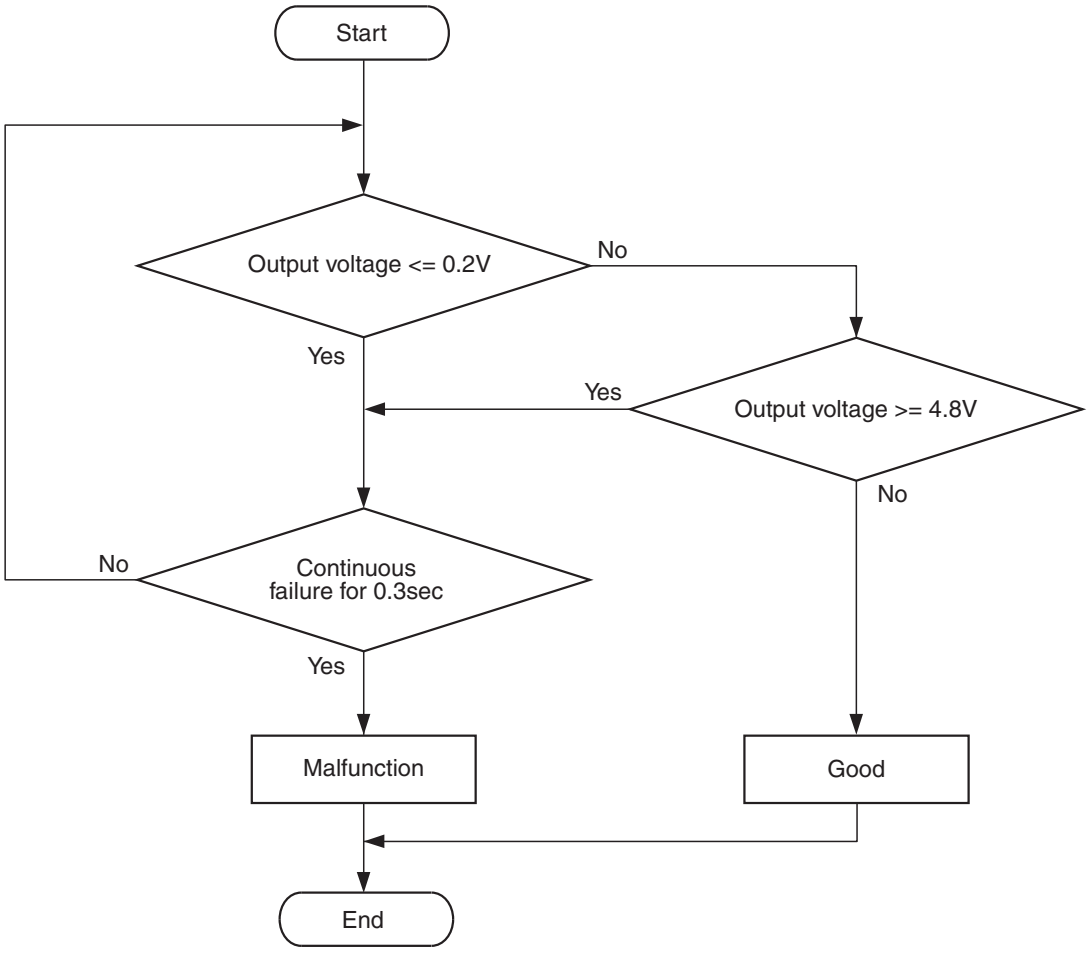
- Not applicable

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 should be 0.2 volt or less for 0.3 second.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

None.

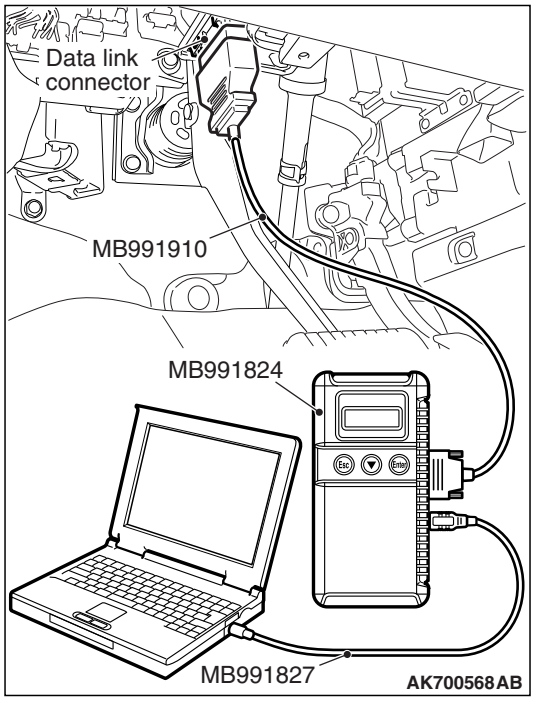
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.

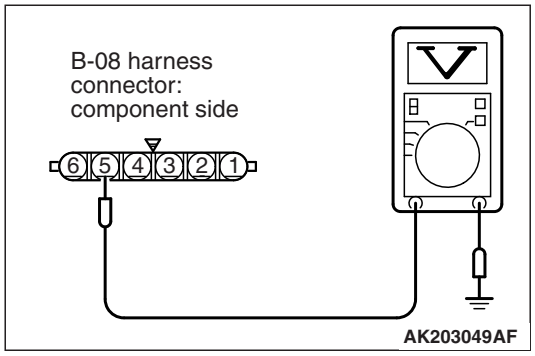
Q: Is the sensor operating properly?

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.00-15.
NO : Go to Step 2.

STEP 2. Check harness connector B-08 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-08.

(1) Disconnect the connector B-08 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-10 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-08 (terminal No. 5) and ECM connector B-10 (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.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 11.

STEP 7. Check harness connector B-10 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.

STEP 8. Check for harness damage between throttle position sensor connector B-08 (terminal No. 5) and ECM connector B-10 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-08 (terminal No. 6) and ECM connector B-10 (terminal No. 11).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP 10. Replace the throttle body assembly.

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

Q: Is DTC P0222 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 11.
NO : The inspection is complete.

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

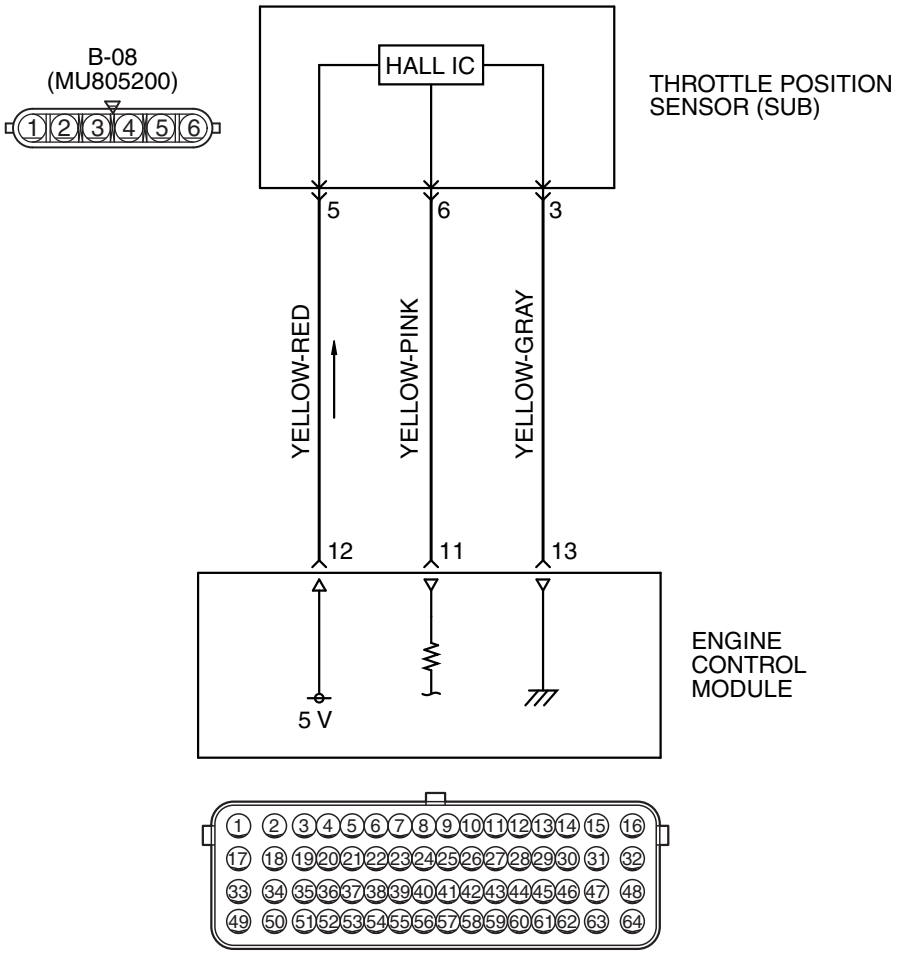
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

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



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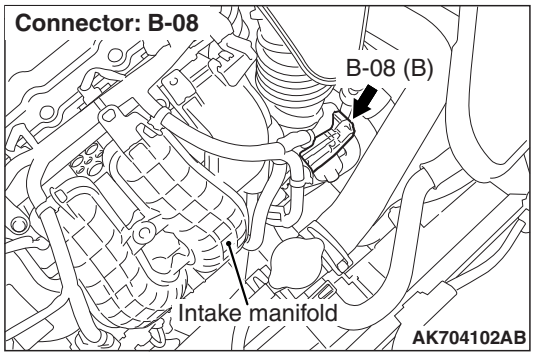

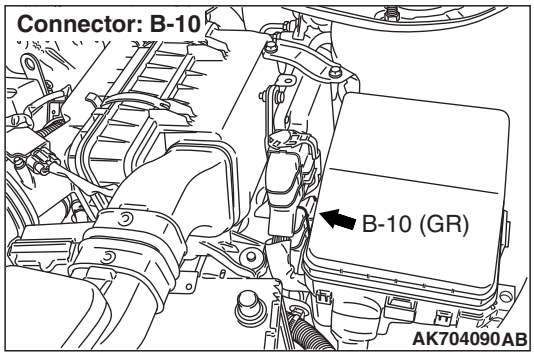

CIRCUIT OPERATION

- 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).

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- 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)

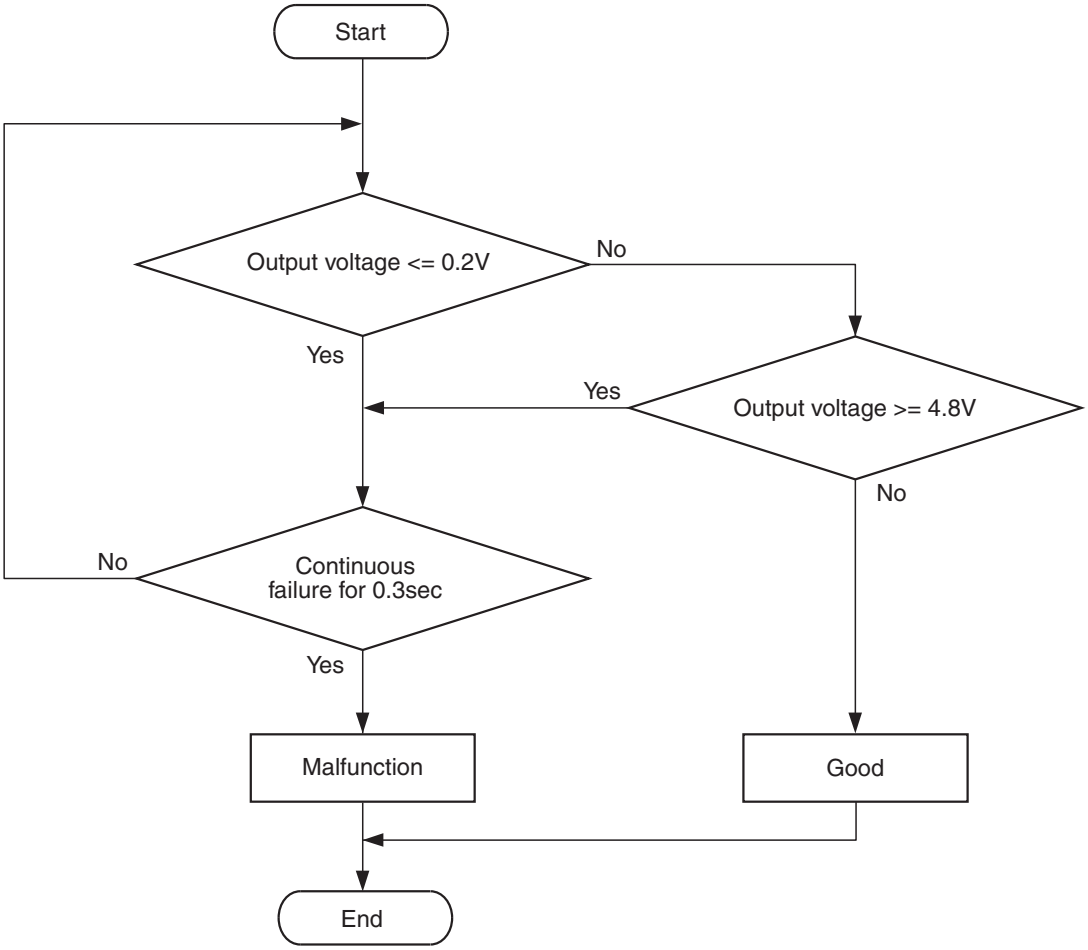
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (sub) output voltage should be 4.8 volts or more for 0.3 second.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

None.

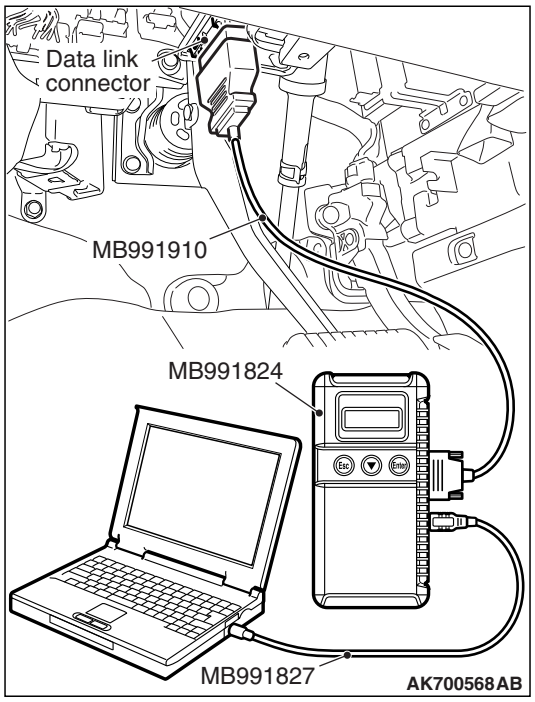
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.

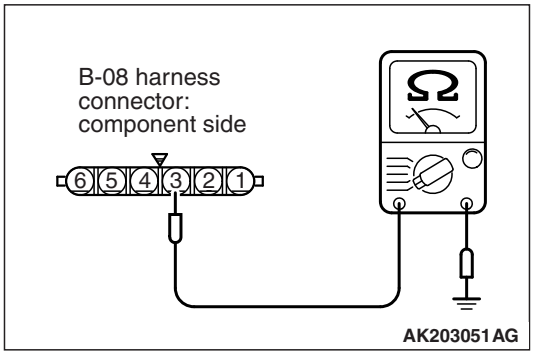
Q: Is the sensor operating properly?

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.00-15.
NO : Go to Step 2.

STEP 2. Check harness connector B-08 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-08.

(1) Disconnect the connector B-08 and measure at the harness side.
(2) Measure 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-10 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-08 (terminal No. 3) and ECM connector B-10 (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.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 8.

STEP 7. Replace the throttle body assembly.

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

Q: Is DTC P0223 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 8.

NO : The inspection is complete.

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 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)

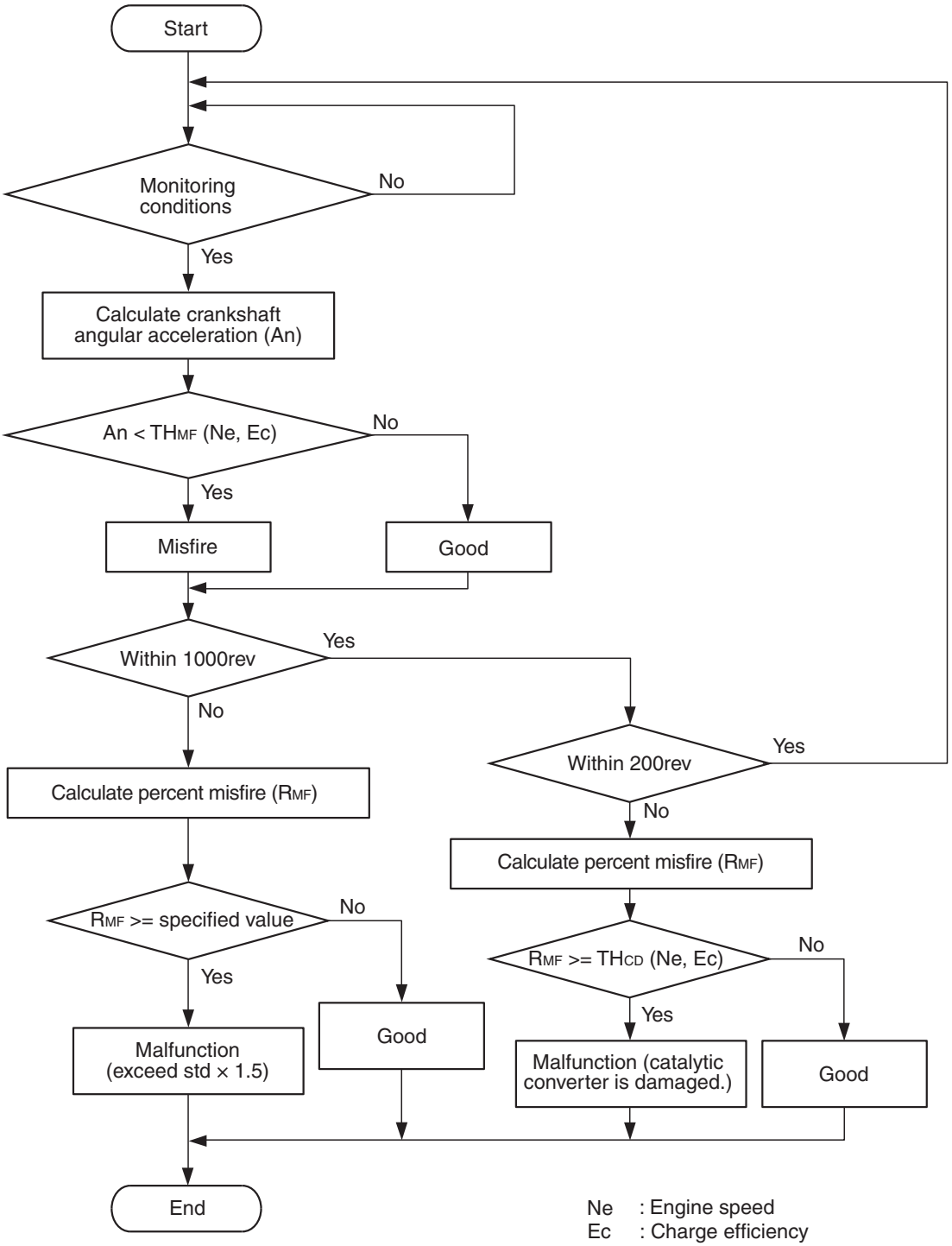
- Not applicable

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



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TSB Revision

Check Conditions
- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The engine load is with in 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 higher 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).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

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

- Included air due to lack of fuel
- Ignition system related part(s) failed.
- Crankshaft position sensor failed.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- ECM failed.

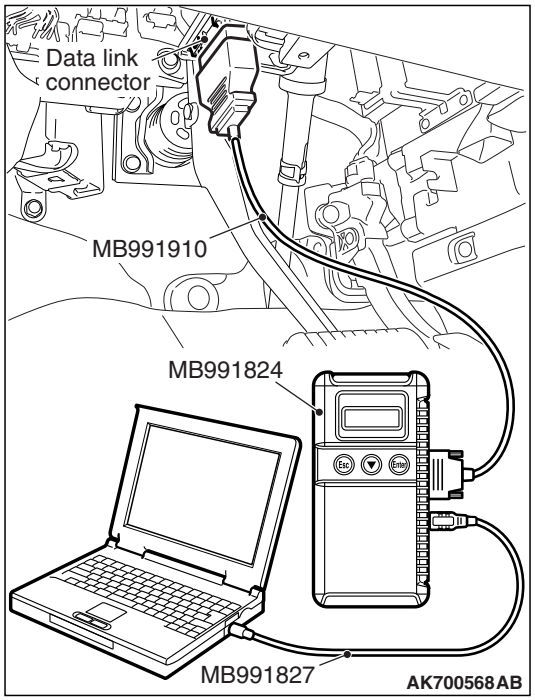
DIAGNOSIS

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

STEP 1. Check whether air is included due to the lack of fuel or not.
- Check whether users have experienced the lack of fuel or not.

Q: Has the user ever experienced the lack of fuel?

YES : Erase the diagnosis codes to finish the check.
NO : Go to Step 2.



STEP 2. 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 3.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit P.13A-372.

STEP 3. 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 4.
NO : Refer to DTC P0171 – System too Lean P.13A-262, DTC P0172 – System too Rich P.13A-268.

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

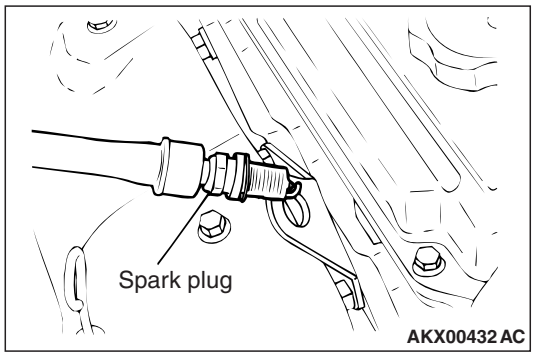
(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28, Short-Term Fuel Trim.
- The fuel trim should be between –7.4 and +7.4 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

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

Q: Is the specification normal?

YES : Go to Step 5.
NO : Refer to DTC P0171 – System too Lean P.13A-262, DTC P0172 – System too Rich P.13A-268.

TSB Revision



STEP 5. 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 7.
NO : Go to Step 6.

STEP 6. Check the spark plugs.

Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning.P.16-45

Q: Is the spark plug normal?

YES : Refer to Symptom Procedures 24 – Ignition Circuit System P.13A-807.
NO : Replace the faulty spark plug. Then go to Step 9.

STEP 7. Check the following items.

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

Q: Are there any abnormalities?

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

STEP 8. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 9.
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.00-15.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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)

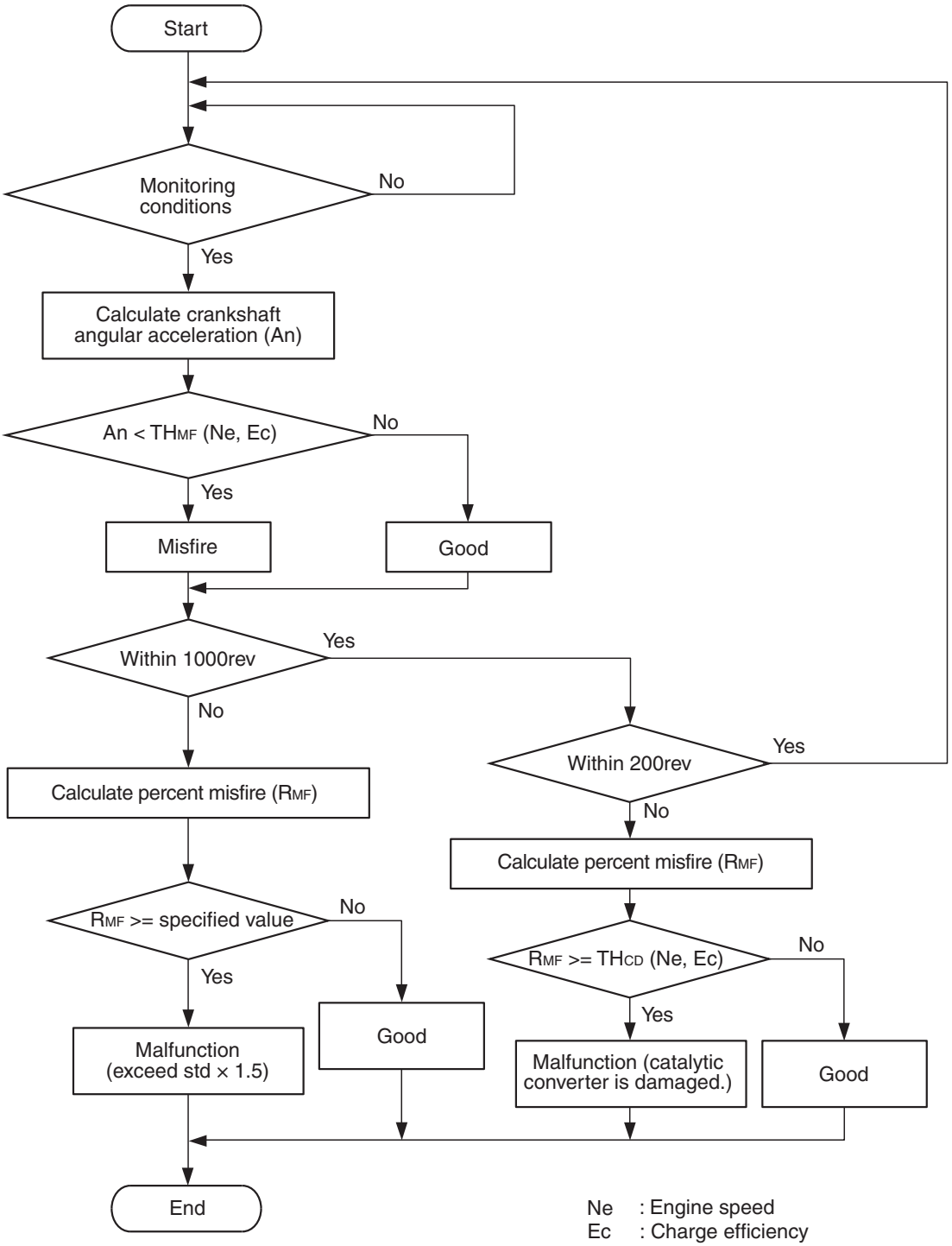
- Not applicable

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



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Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10°C (14°F).

TSB Revision

- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The engine load is with in 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 higher 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).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

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

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

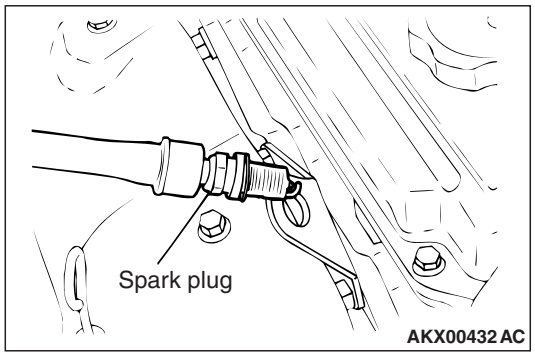
DIAGNOSIS

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.16-45.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 24 – Ignition Circuit System P.13A-807.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service – Compression Pressure Check P.11A-18.

Q: Are there any abnormalities?

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

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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)

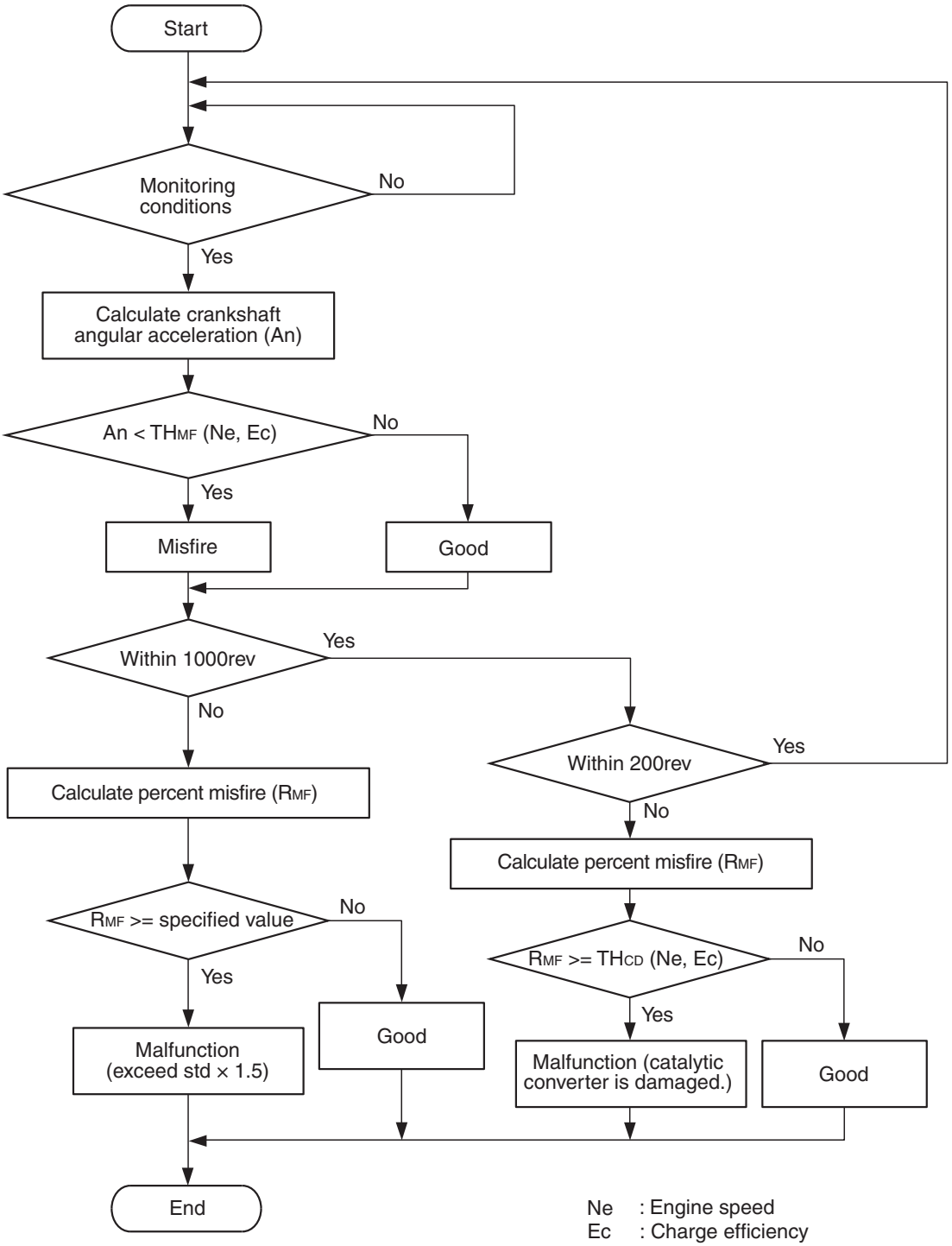
- Not applicable

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



AK800585

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10°C (14°F).

TSB Revision

- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The engine load is with in 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 higher 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).

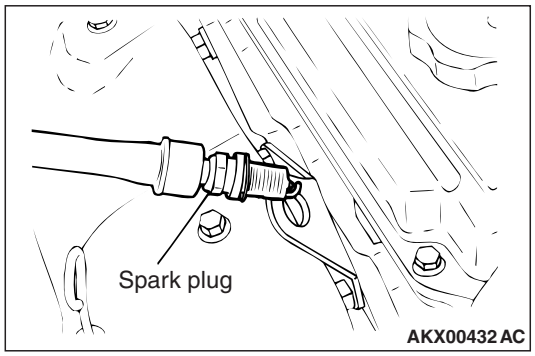
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

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.16-45.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 24 – Ignition Circuit System P.13A-807.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service – Compression Pressure Check P.11A-18.

Q: Are there any abnormalities?

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

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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)

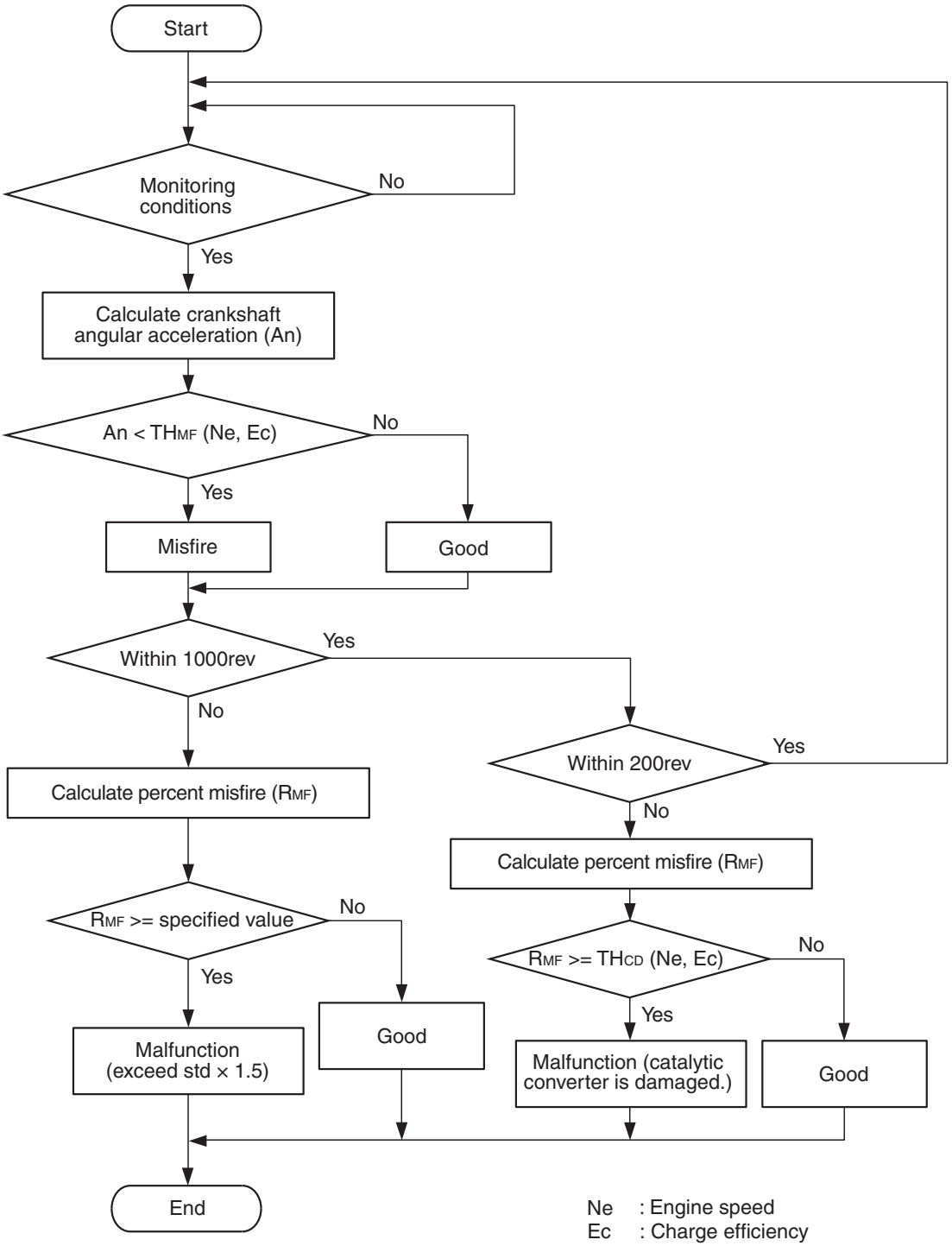
- Not applicable

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



AK800585

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10°C (14°F).

TSB Revision

- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The engine load is with in 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 higher 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).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

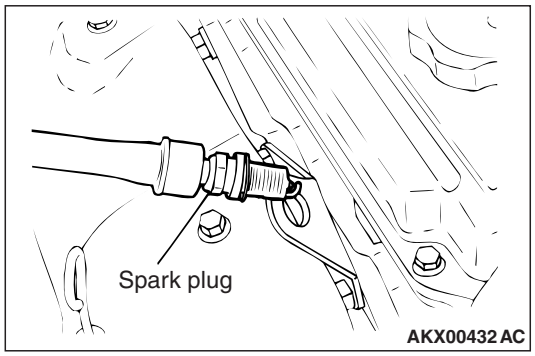
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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.16-45.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 24 – Ignition Circuit System P.13A-807.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service – Compression Pressure Check P.11A-18.

Q: Are there any abnormalities?

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

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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)

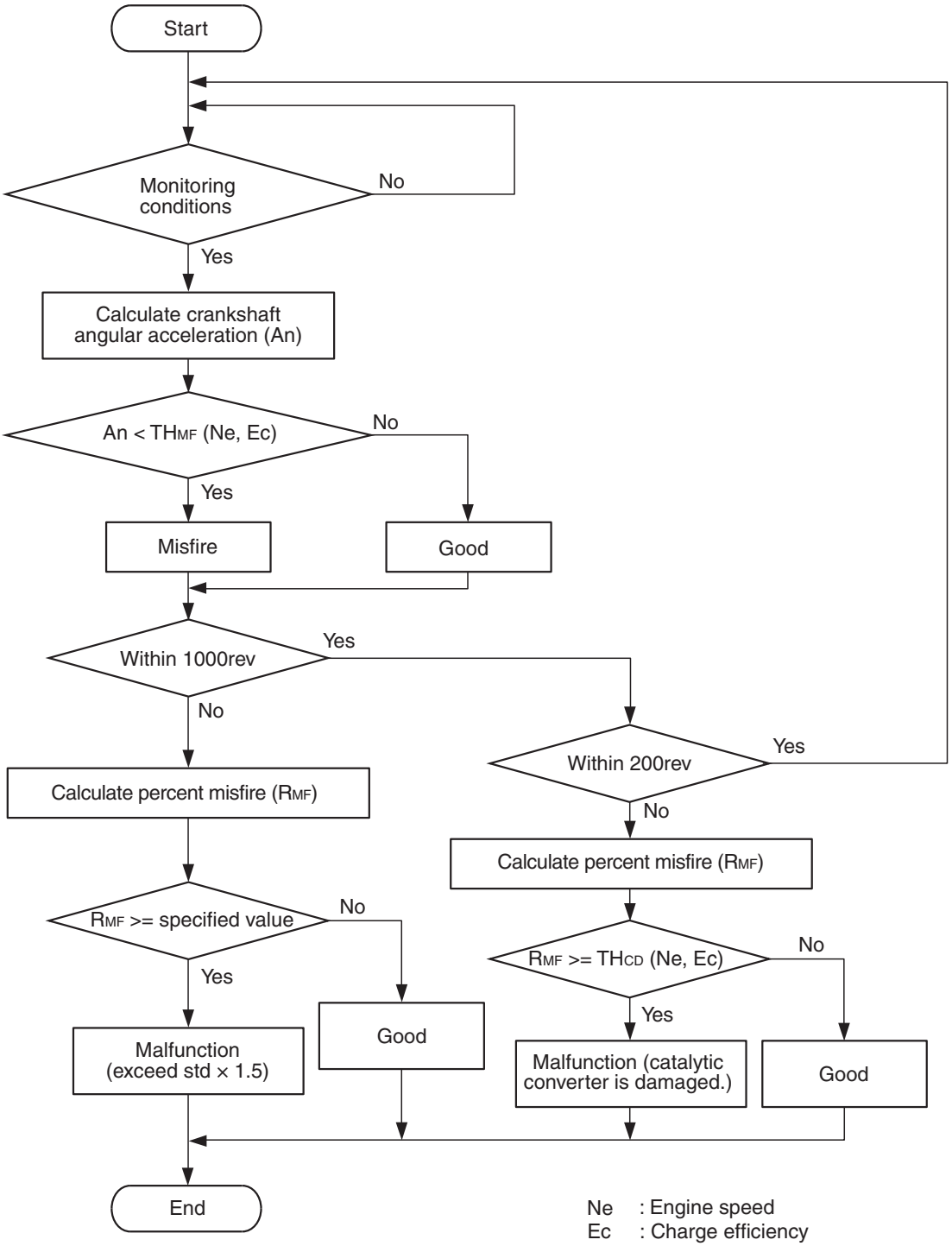
- Not applicable

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



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Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10°C (14°F).

TSB Revision

- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- The engine load is with in 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 higher 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).

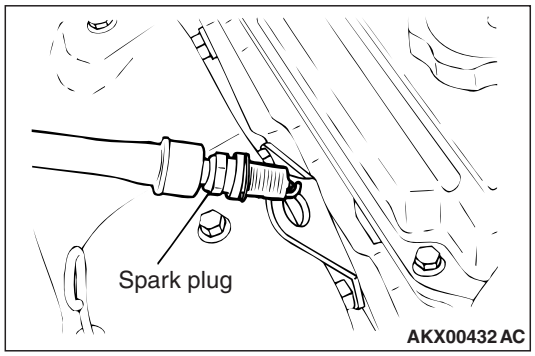
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

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.16-45.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 24 – Ignition Circuit System P.13A-807.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service – Compression Pressure Check P.11A-18.

Q: Are there any abnormalities?

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

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 15 P.13A-11.

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

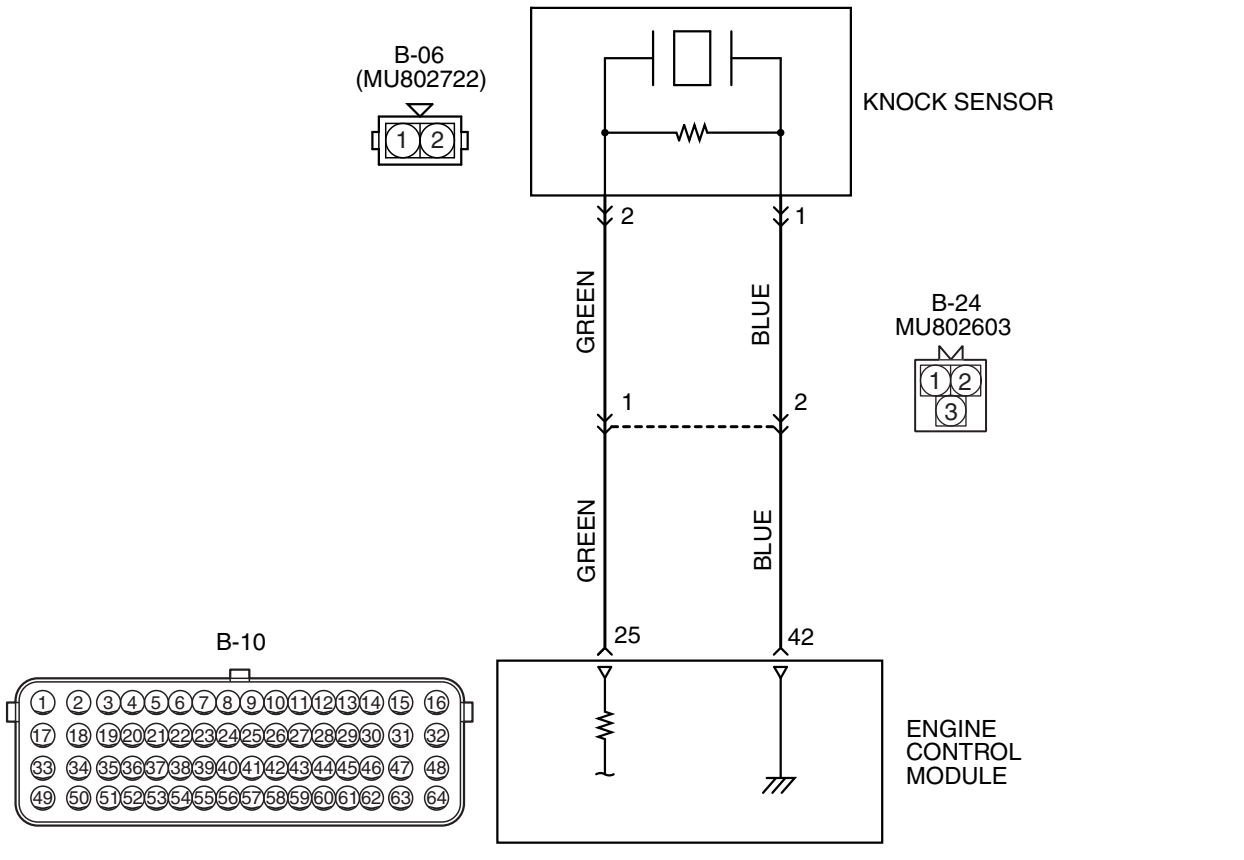
Q: Is DTC P0304 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0327: Knock Sensor Circuit Low

KNOCK SENSOR CIRCUIT



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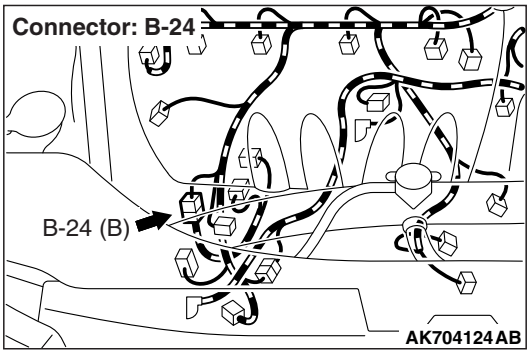
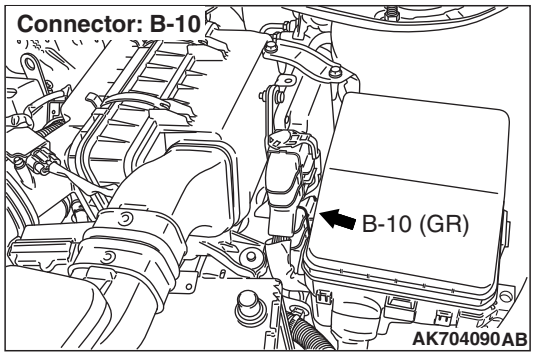
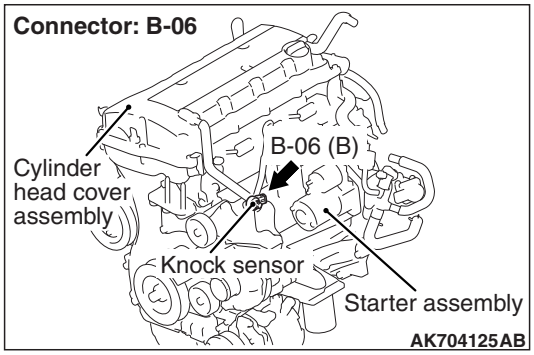






TSB Revision

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)

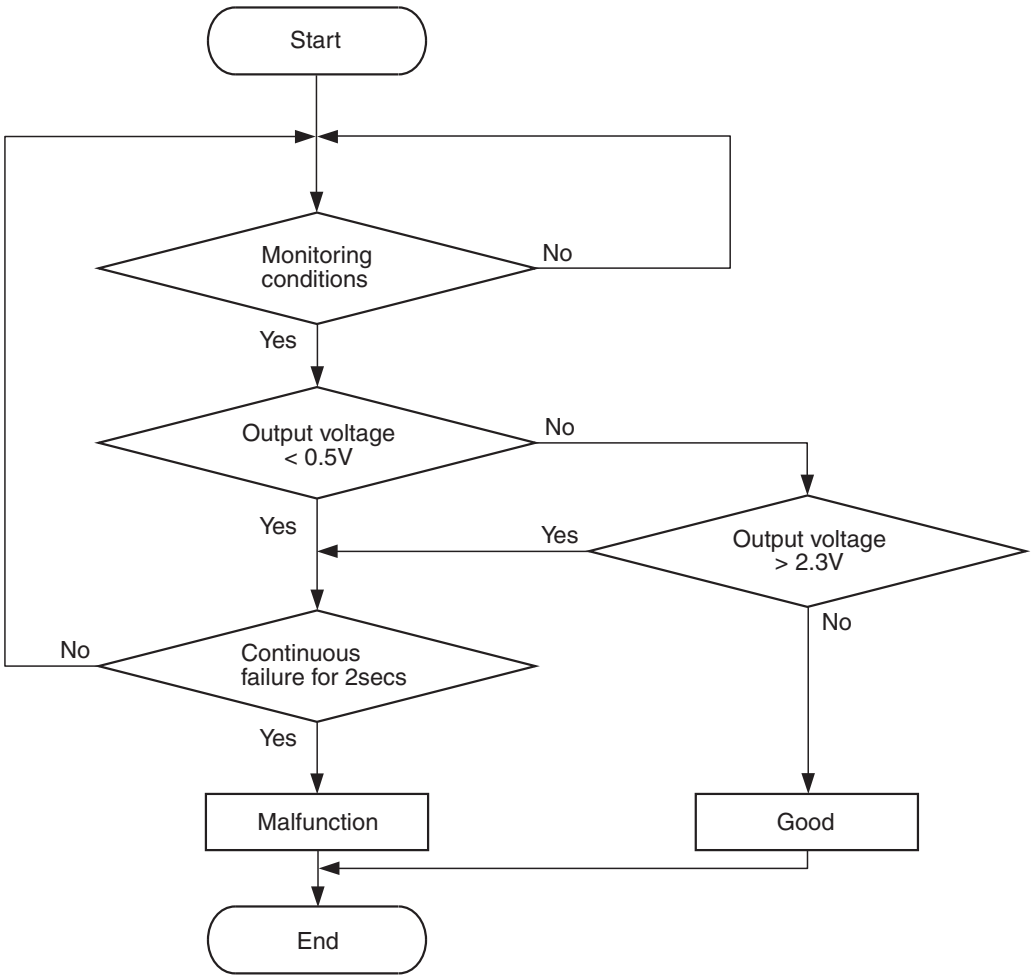
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

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

Judgement Criterion

- Knock sensor output voltage has continued to be lower 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.13A-11.

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-06 at the knock sensor and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

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

STEP 2. Check for open circuit between knock sensor connector B-06 (terminal No. 1) and ECM connector B-10 (terminal No. 42).

NOTE: Check harness after checking intermediate connector B-24. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : 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-06 (terminal No. 2) and ECM connector B-10 (terminal No. 25).

NOTE: Check harness after checking intermediate connector B-24. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : 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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 5.
NO : Replace the knock sensor. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

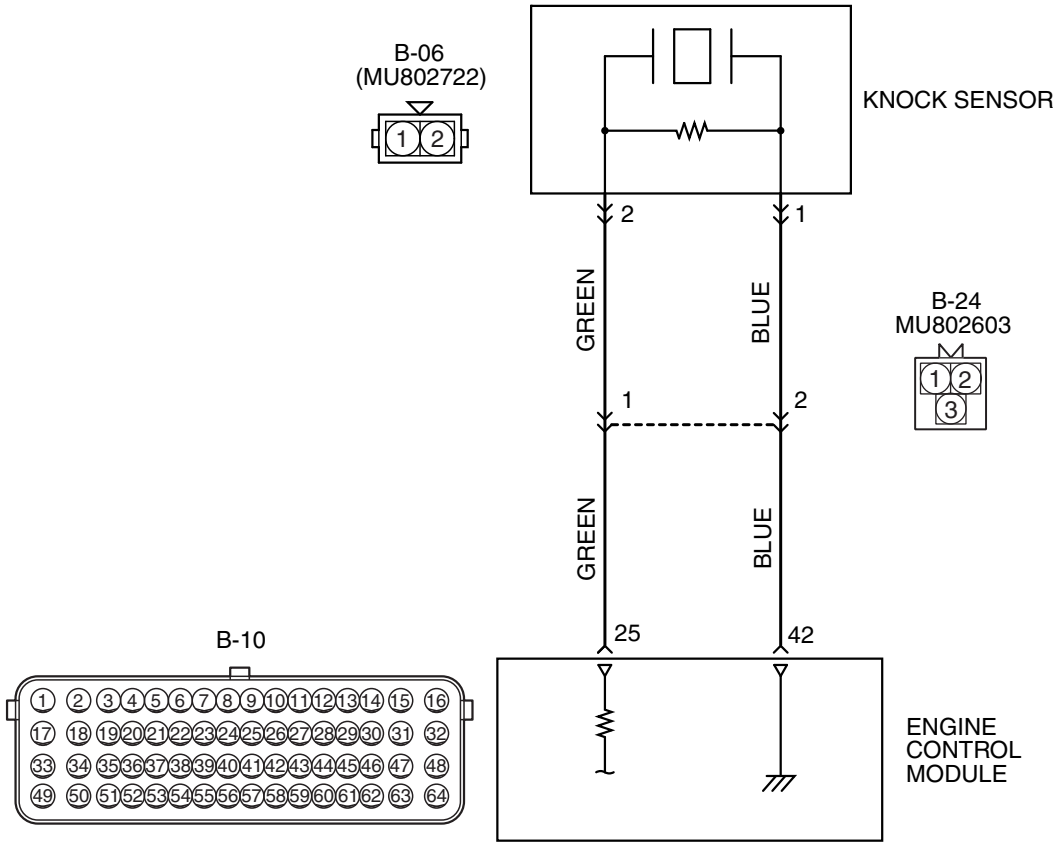
Q: Is DTC P0327 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0328: Knock Sensor Circuit High

KNOCK SENSOR CIRCUIT



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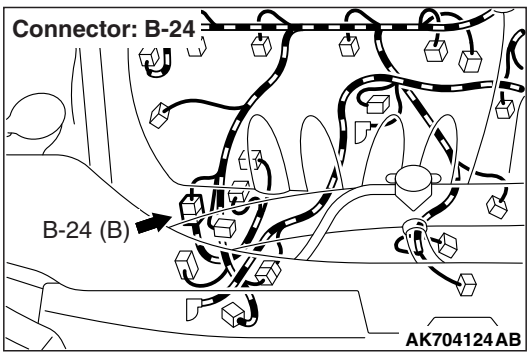

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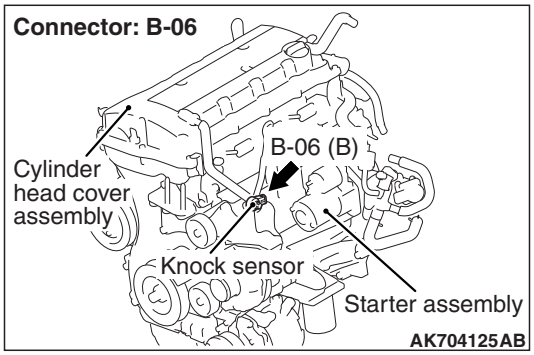

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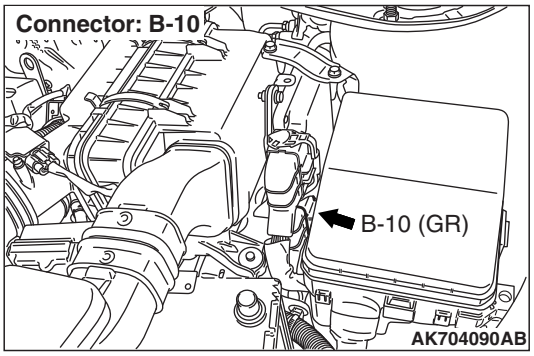
TSB Revision



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)

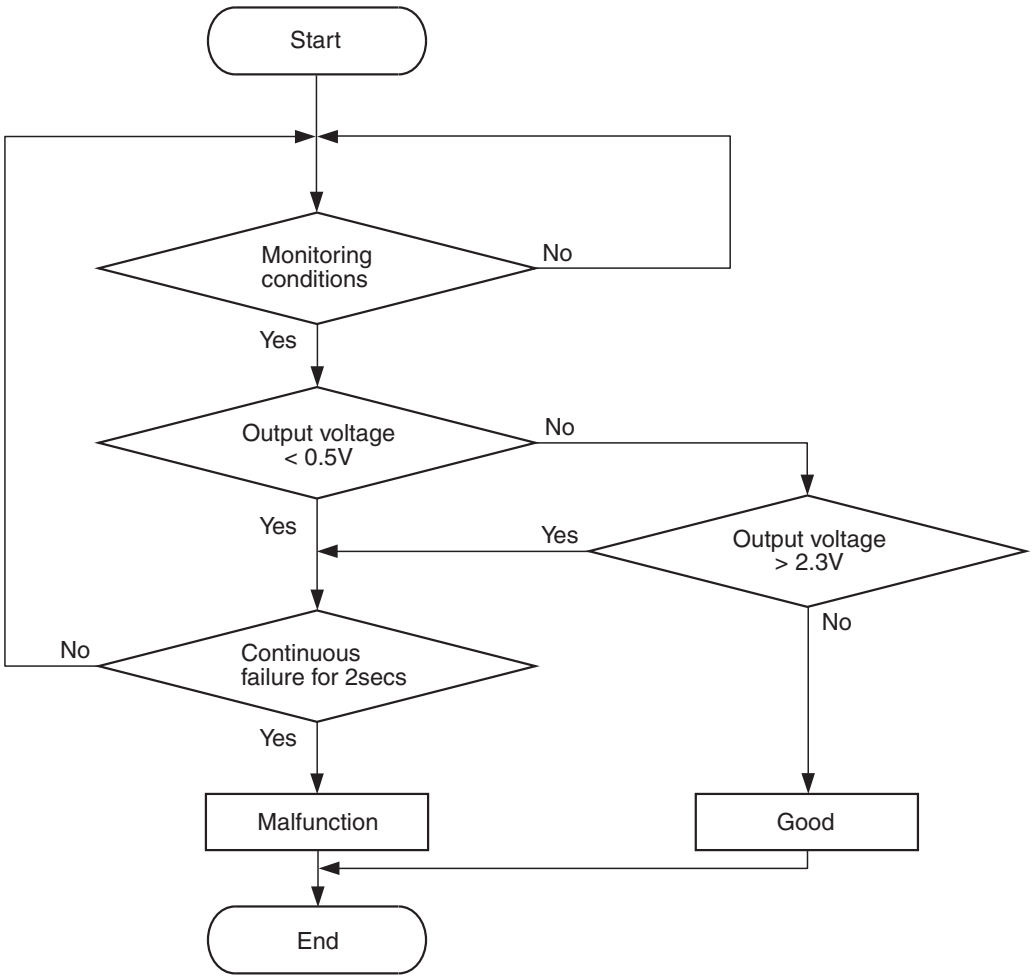
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

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

Judgement Criterion

- Knock sensor output voltage has continued to be higher 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.13A-11.

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

- Shorted knock sensor circuit or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check harness connector B-06 at the knock sensor and harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

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

STEP 2. Check for short circuit to power supply between knock sensor connector B-06 (terminal No. 2) and ECM connector B-10 (terminal No. 25).

NOTE: Check harness after checking intermediate connector B-24. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 3.
NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

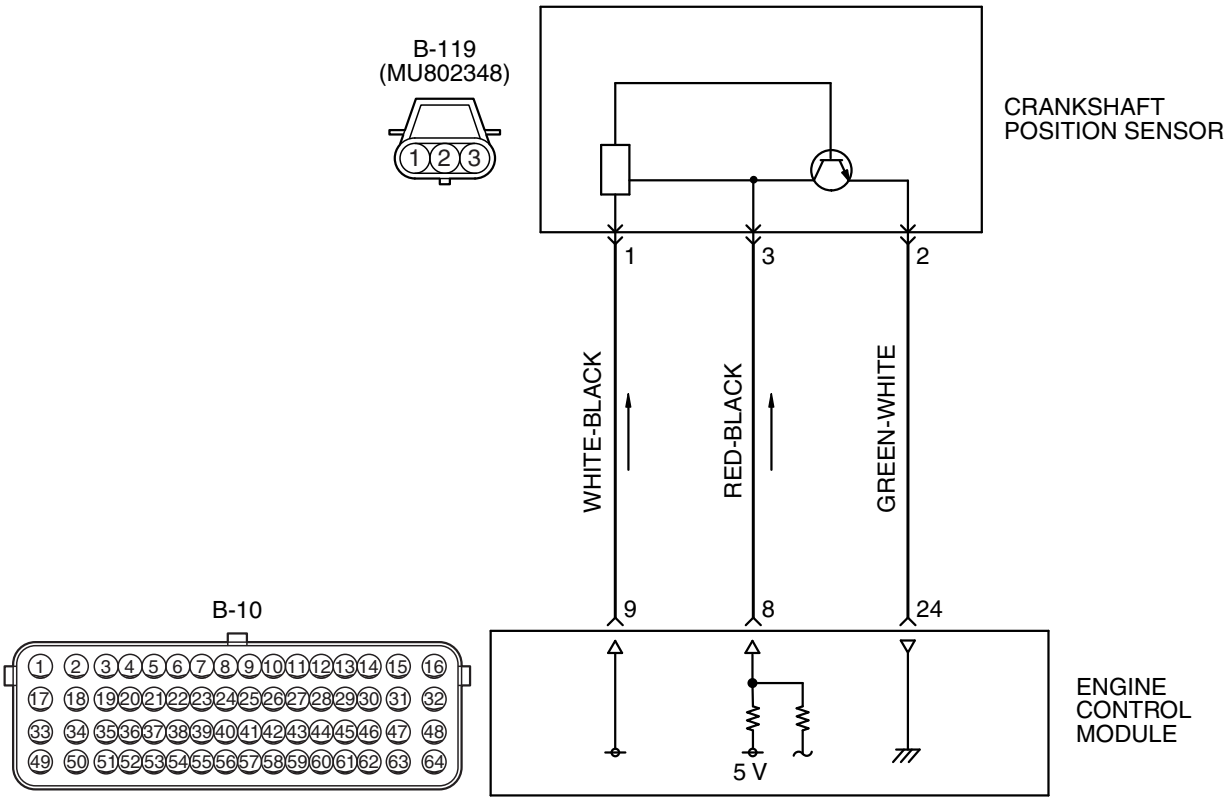
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0328 set?

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

DTC P0335: Crankshaft Position Sensor Circuit

CRANKSHAFT POSITION SENSOR CIRCUIT



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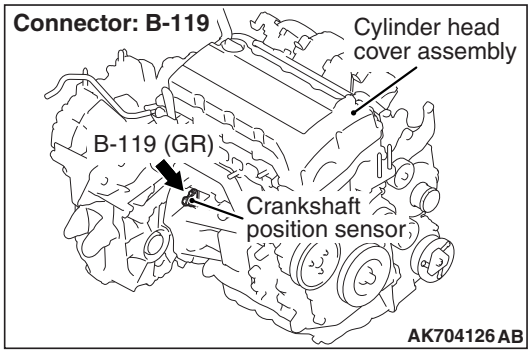
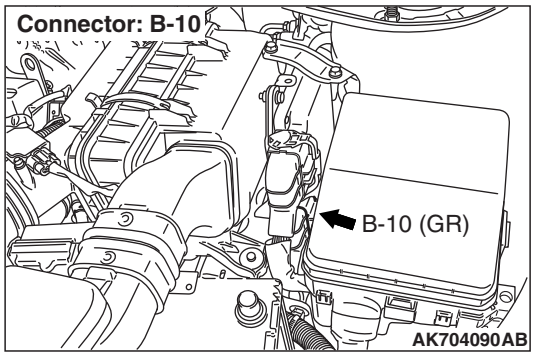




CIRCUIT OPERATION

- 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.

TSB Revision

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)

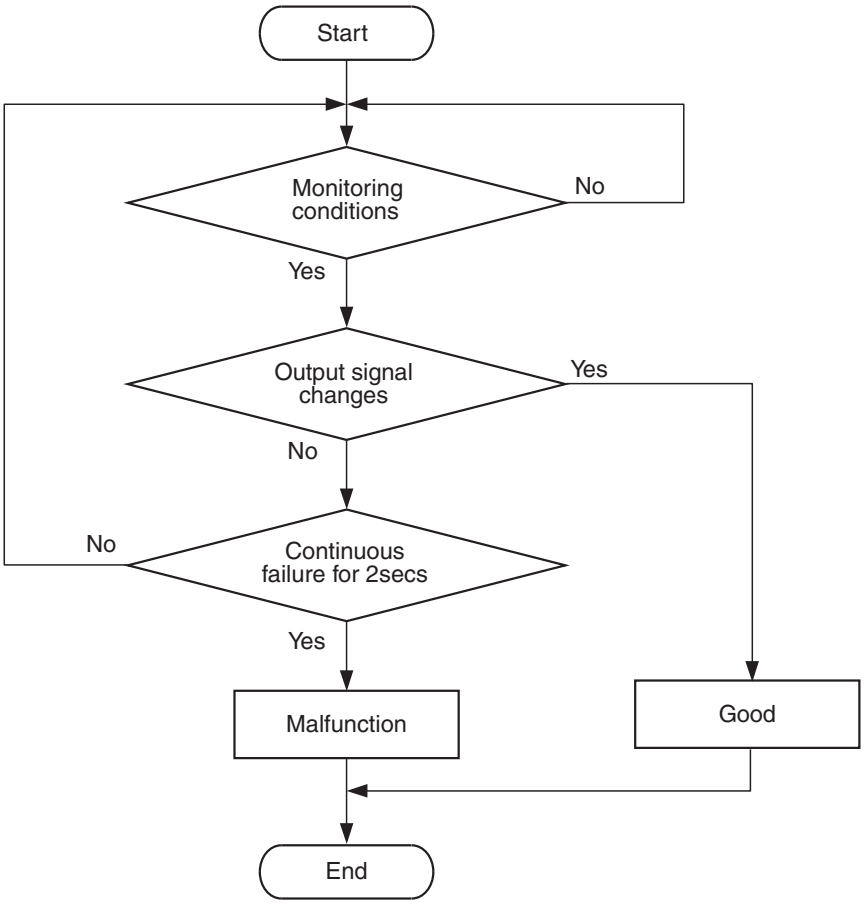
- Not applicable

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 higher than 500 r/min excluding during cranking.

Judgement Criterion

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

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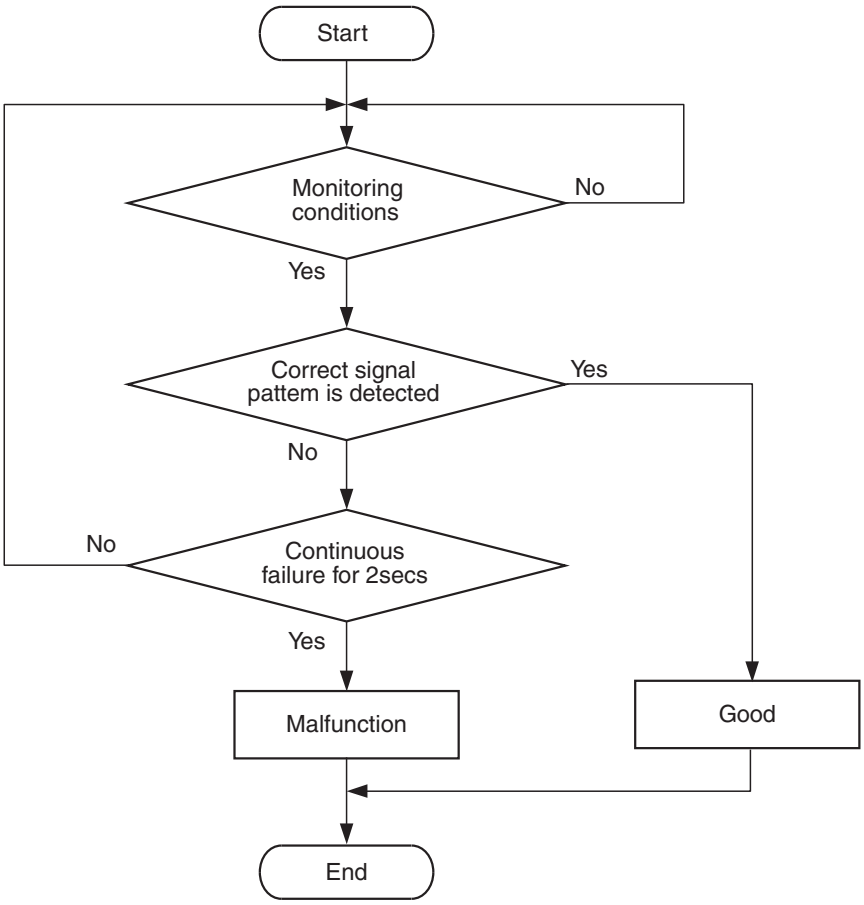
DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK604335

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

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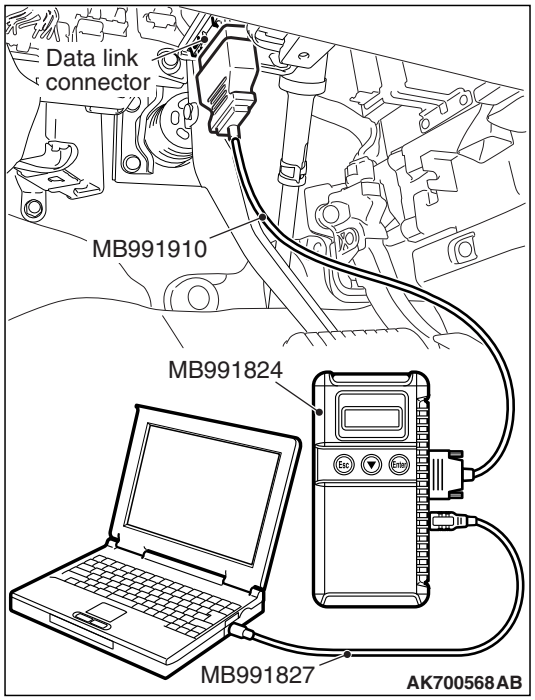


STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

⚠ 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.

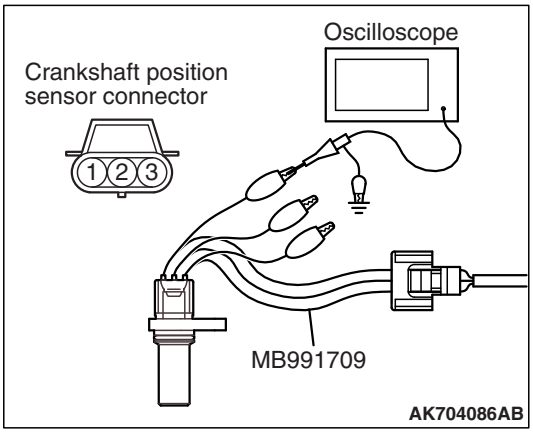
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(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.00-15.

NO : Go to Step 2.



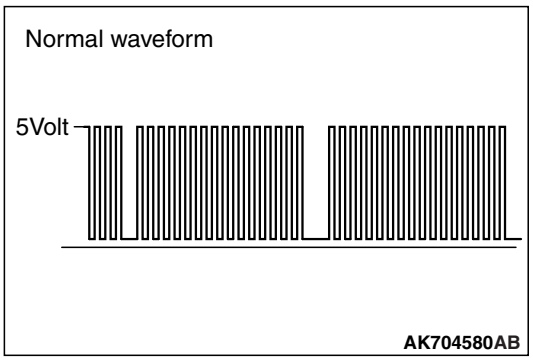
STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor connector B-119 and connect the test harness special tool (MB991709) between the separated connectors.

(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-119 at the crankshaft position sensor and harness connector B-10 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 20.

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

(1) Turn the ignition switch to the "ON" position.
(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.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 20.

STEP 5. Check harness connector B-119 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

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

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-119.

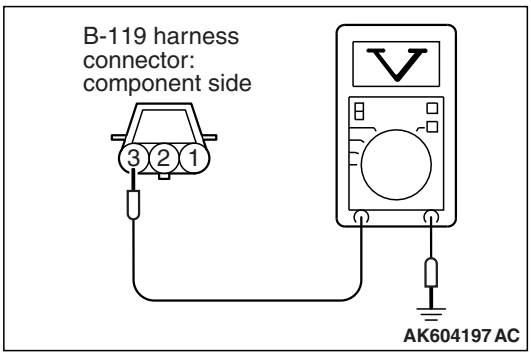
(1) Disconnect the connector B-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(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.

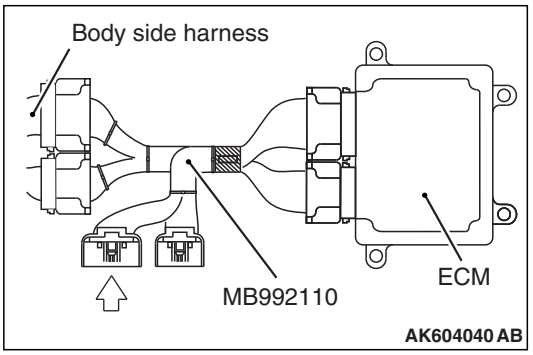


STEP 7. Check harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

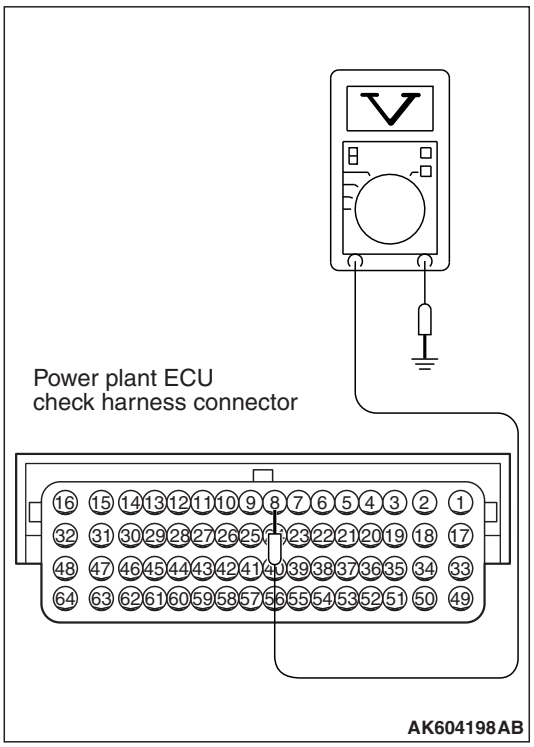
YES : Go to Step 8.

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-10 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-119.
(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-10 (terminal No. 3) and ECM connector B-119 (terminal No. 8) because of open circuit. Then go to Step 20.

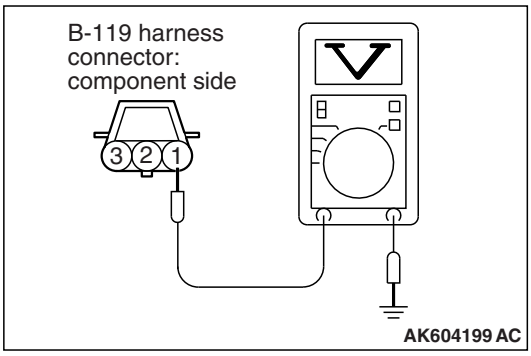
NO : Go to Step 9.

STEP 9. Check for short circuit to ground between crankshaft position sensor connector B-119 (terminal No. 3) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 20.

NO : Repair it. Then go to Step 20.



STEP 10. Measure the power supply voltage at crankshaft position sensor harness side connector B-119.

(1) Disconnect the connector B-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 13.
NO : Go to Step 11.

STEP 11. Check harness connector B-10 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-119 (terminal No. 1) and ECM connector B-10 (terminal No. 9).

Q: Is the harness wire in good condition?

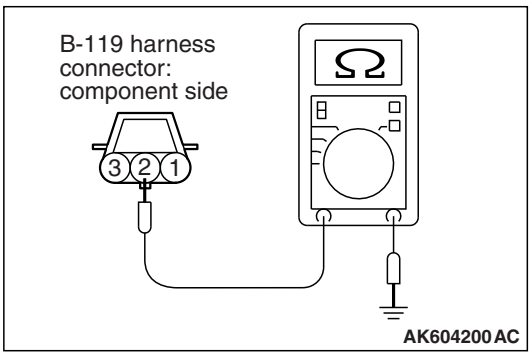
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 13. Check the continuity at crankshaft position sensor harness side connector B-119.

(1) Disconnect the connector B-119 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-10 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-119 (terminal No. 2) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 16. Check harness connector B-10 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-10 (terminal No. 9) and crankshaft position sensor connector B-119 (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-119 (terminal No. 3) and ECM connector B-10 (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.13A-11.

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

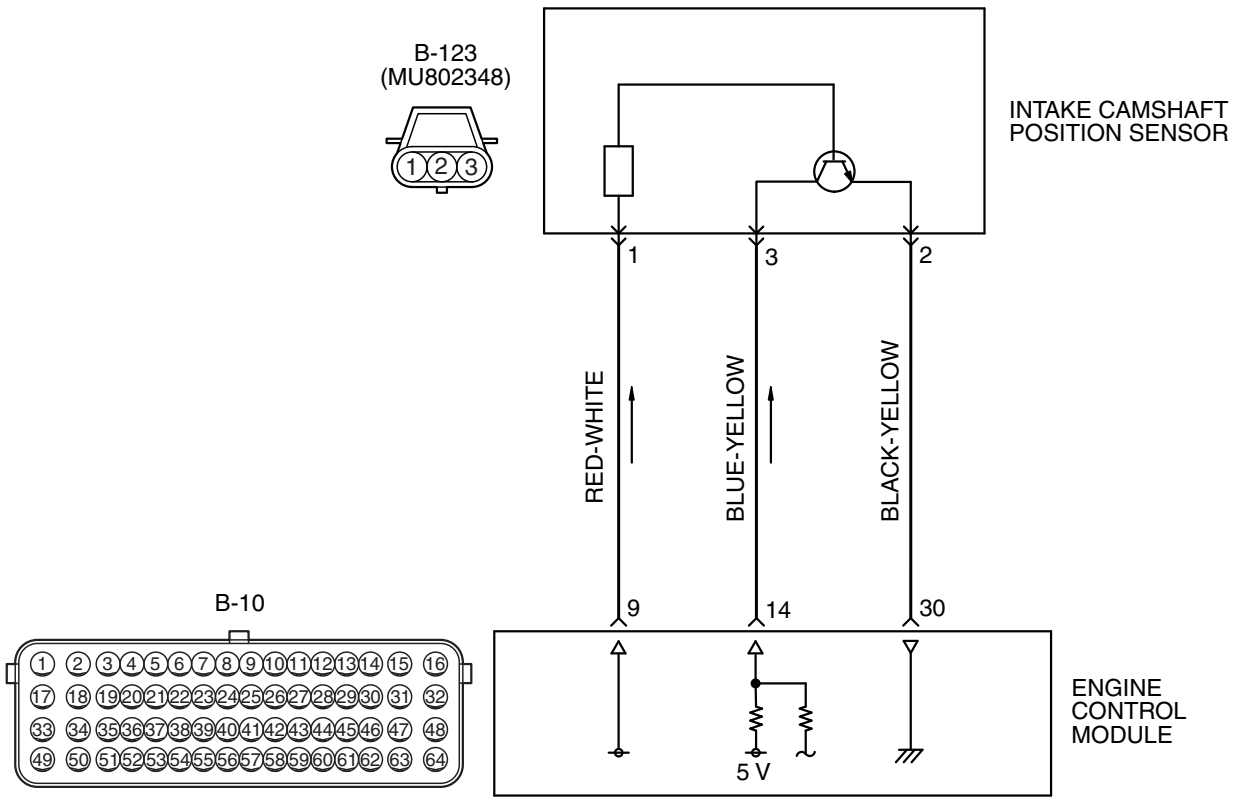
Q: Is DTC P0335 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0340: Intake Camshaft Position Sensor Circuit

INTAKE CAMSHAFT POSITION SENSOR CIRCUIT



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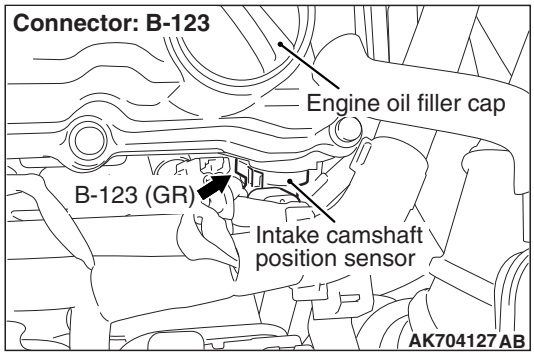
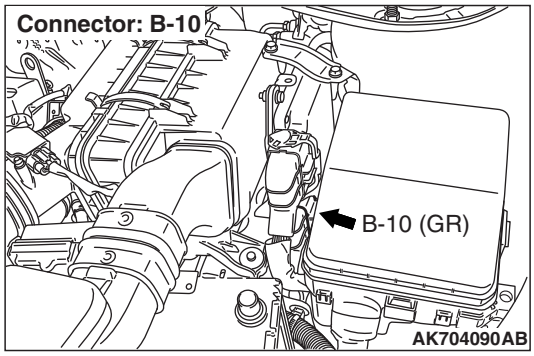




CIRCUIT OPERATION

- 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 detects the position of the intake camshaft and inputs the pulse signal to the ECM.
- In response to the intake camshaft position sensor signal and the crankshaft sensor signal, the ECM detects the compression top dead center of the No. 1 cylinder.
- Also, in response to the intake camshaft position sensor signal, the ECM controls variable valve timing (V.V.T.).

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)

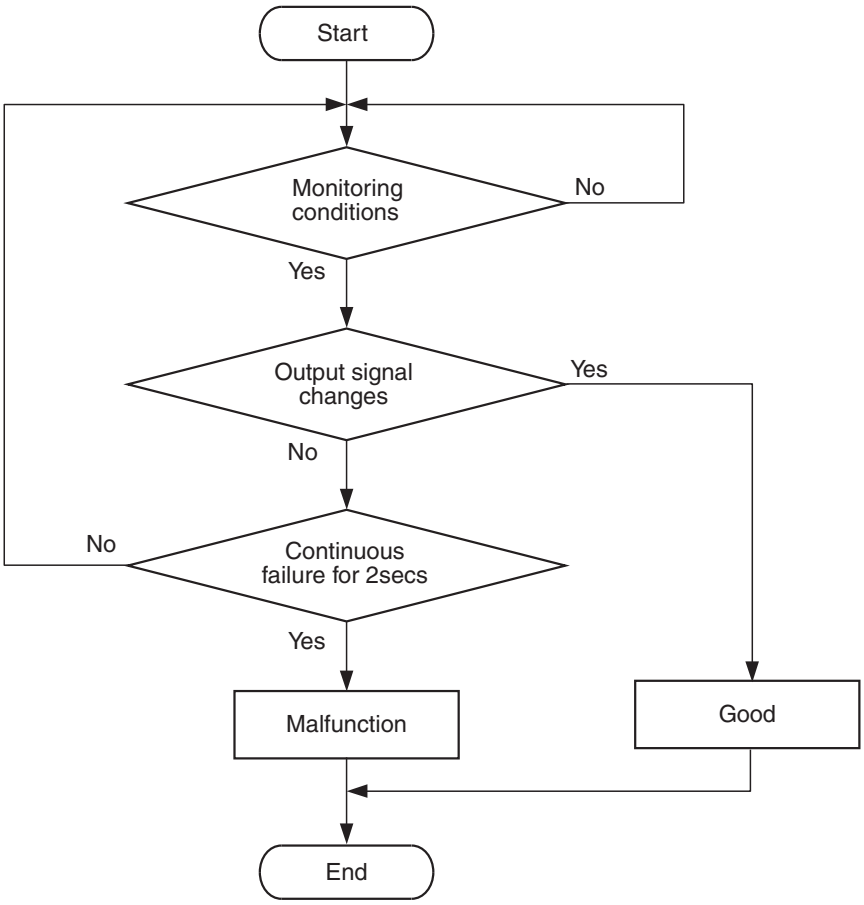
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK604334

Check Condition

- Engine is being cranked.

or

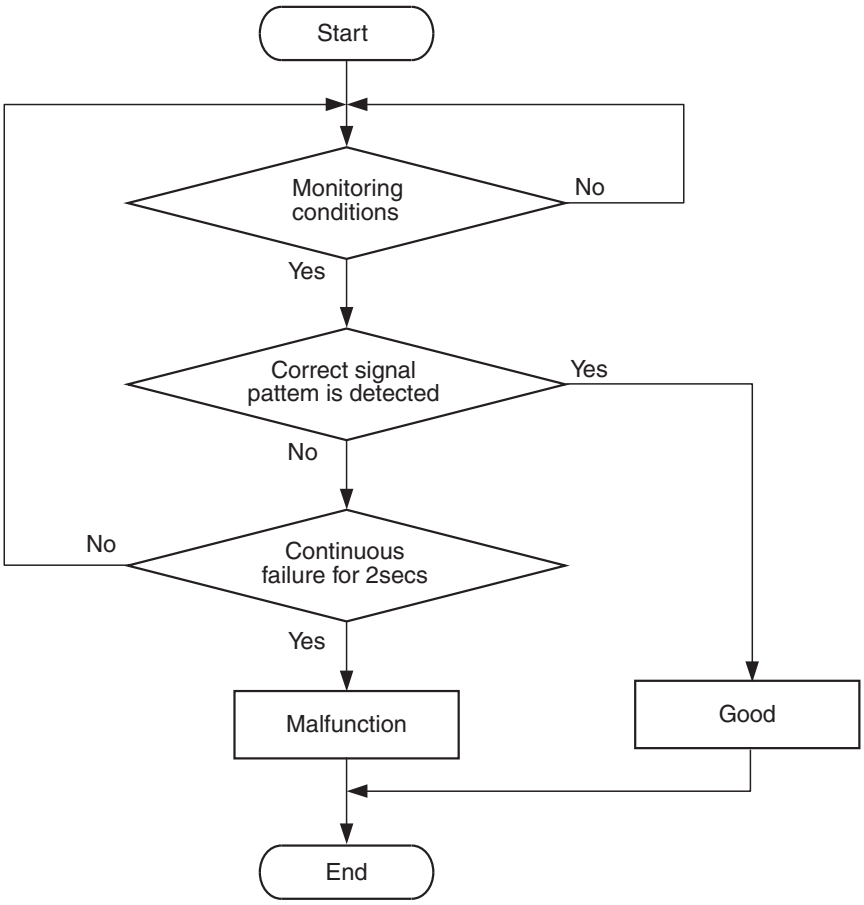
- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

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

DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK604335

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

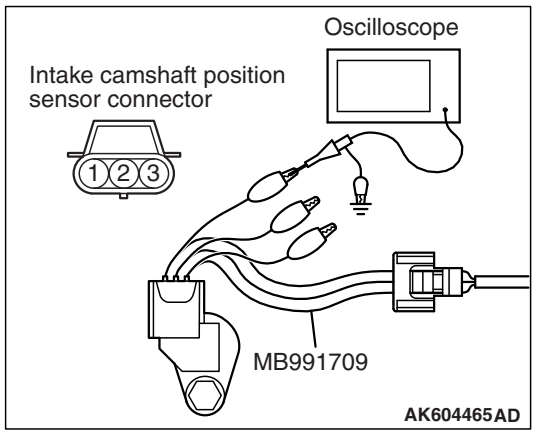
STEP 1. Using the oscilloscope, check the intake camshaft position sensor.

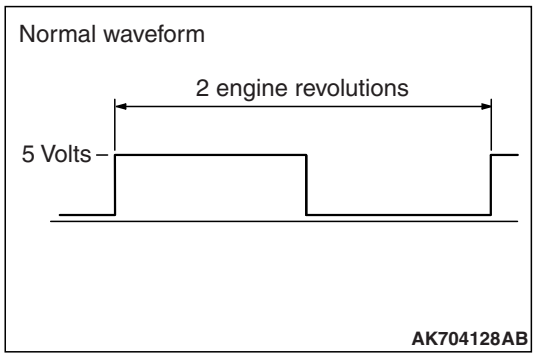
(1) Disconnect the intake camshaft position sensor connector B-123, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)

(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-123 at intake camshaft position sensor and harness connector B-10 at ECM 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 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.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 4. Check harness connector B-123 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 connector B-123.

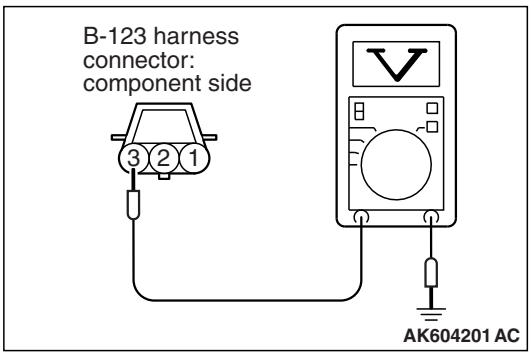
(1) Disconnect the connector B-123 and measure at the harness side.

(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.

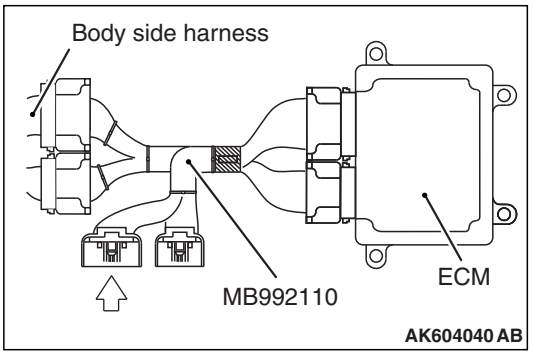
NO : Go to Step 6.

STEP 6. Check harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

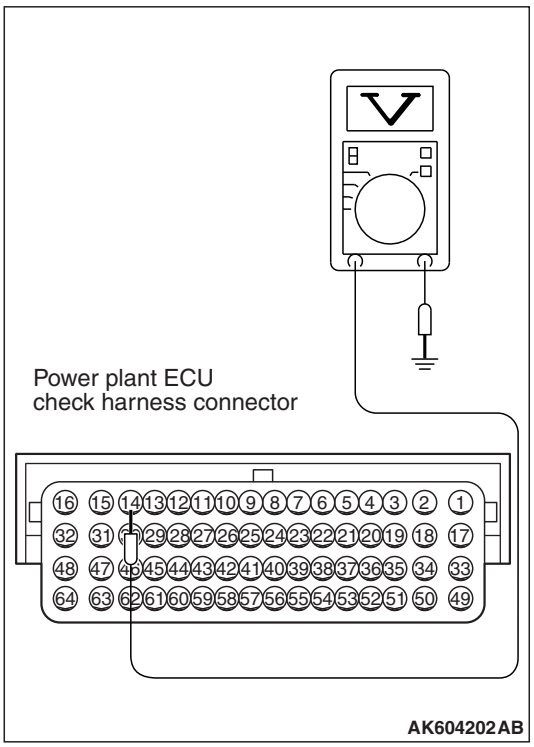
YES : Go to Step 7.

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-10 by using power plant ECU check harness special tool MB992110.

(1) Disconnect the 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-123.
(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-123 (terminal No. 3) and ECM connector B-10 (terminal No. 14) because of open circuit. Then go to Step 19.

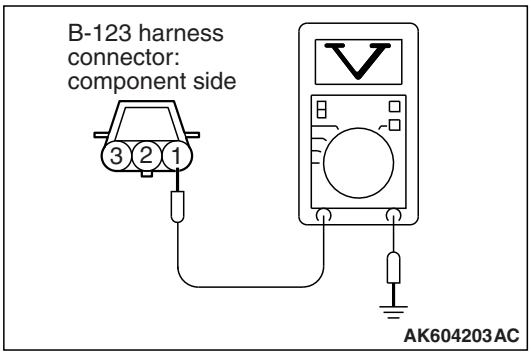
NO : Go to Step 8.

STEP 8. Check for short circuit to ground between intake camshaft position sensor connector B-123 (terminal No. 3) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.

NO : Repair it. Then go to Step 19.



STEP 9. Measure the power supply voltage at intake camshaft position sensor connector B-123.

(1) Disconnect the connector B-123 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 12.
NO : Go to Step 10.

STEP 10. Check harness connector B-10 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-123 (terminal No. 1) and ECM connector B-10 (terminal No. 9).

Q: Is the harness wire in good condition?

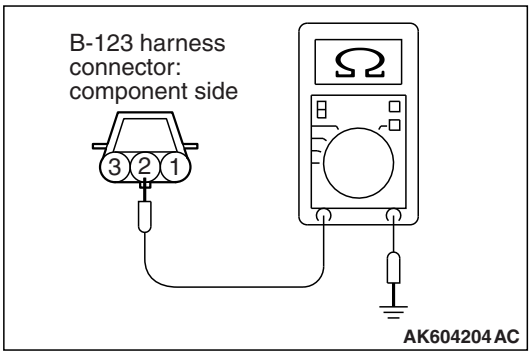
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 12. Check the continuity at intake camshaft position sensor connector B-123.

(1) Disconnect the connector B-123 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-10 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-123 (terminal No. 2) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 15. Check harness connector B-10 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-10 (terminal No. 9) and intake camshaft position sensor connector B-123 (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-123 (terminal No. 3) and ECM connector B-10 (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.13A-11.

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

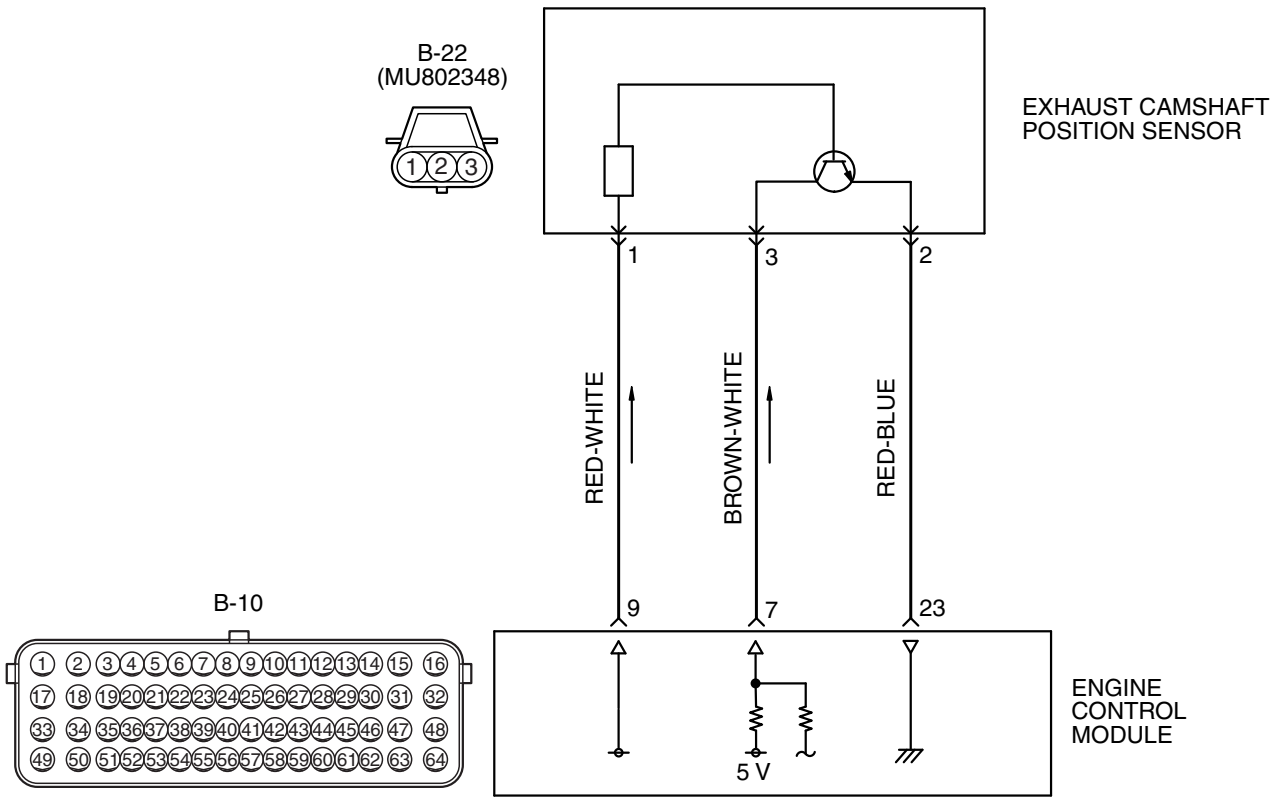
Q: Is DTC P0340 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0365: Exhaust Camshaft Position Sensor Circuit

EXHAUST CAMSHAFT POSITION SENSOR CIRCUIT



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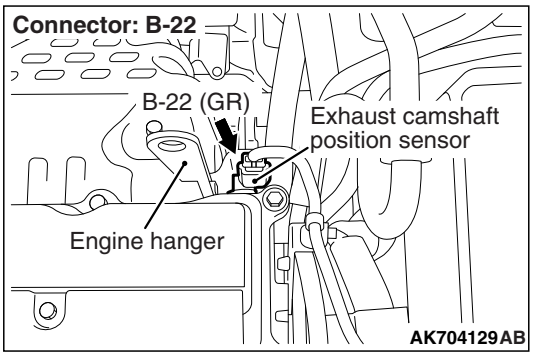
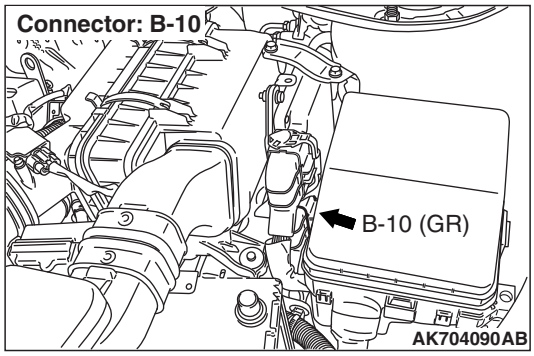




CIRCUIT OPERATION

- 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 detects the position of the exhaust camshaft and inputs the pulse signal to the ECM.
- In response to the exhaust camshaft position sensor signal, the ECM controls variable valve timing (V.V.T.).

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)

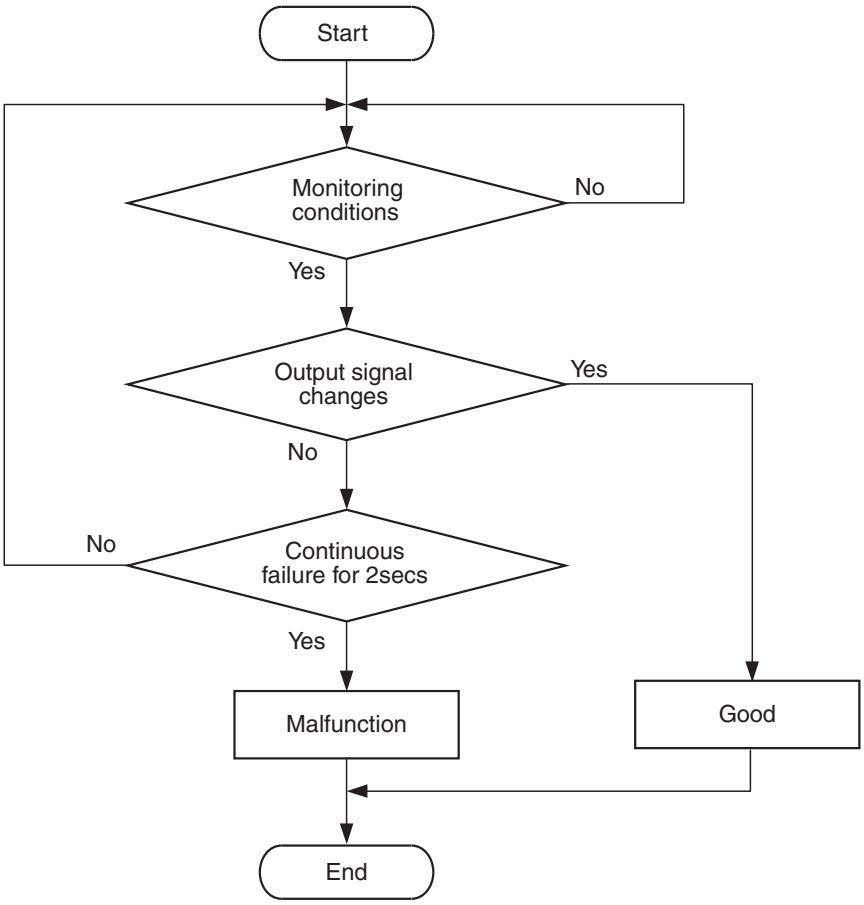
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



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Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

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

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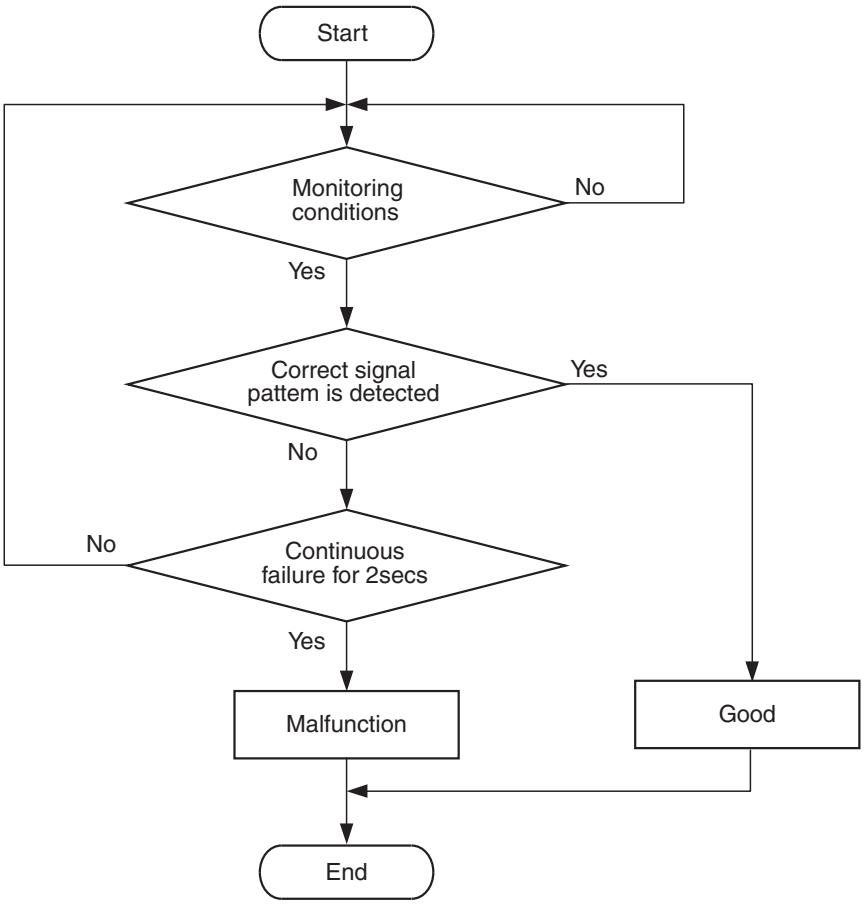
DTC SET CONDITIONS <Range/Performance problem – alignment>

Logic Flow Chart



AK604335

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

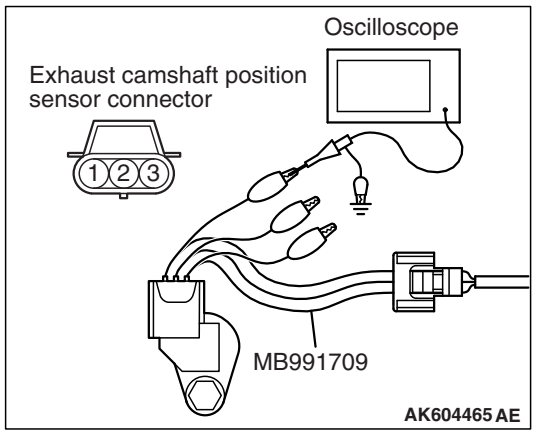
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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



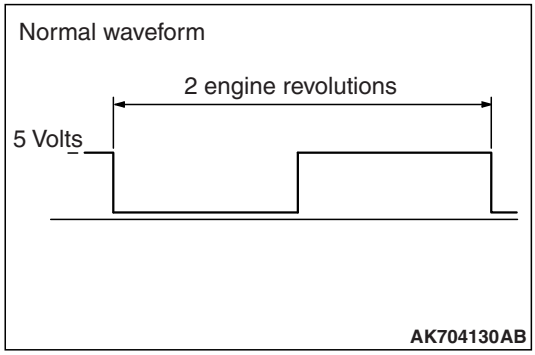
STEP 1. Using the oscilloscope, check the exhaust camshaft position sensor.

(1) Disconnect the exhaust camshaft position sensor connector B-22, 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-22 at exhaust camshaft position sensor and harness connector B-10 at ECM 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 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.13A-11.

(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. 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.00-15.

STEP 4. Check harness connector B-22 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 connector B-22.

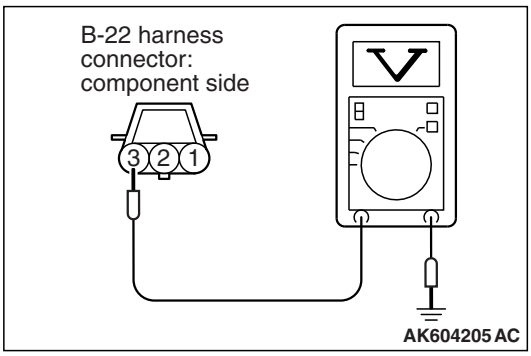
(1) Disconnect the connector B-22 and measure at the harness side.

(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.

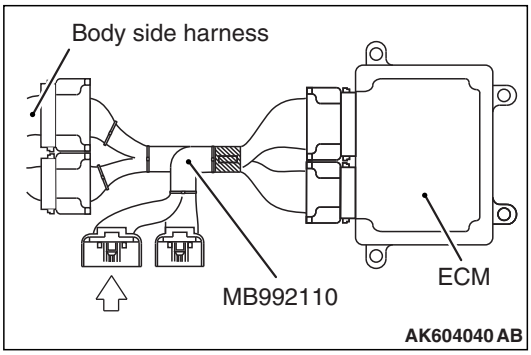
NO : Go to Step 6.

STEP 6. Check harness connector B-10 at ECM for damage.

Q: Is the harness connector in good condition?

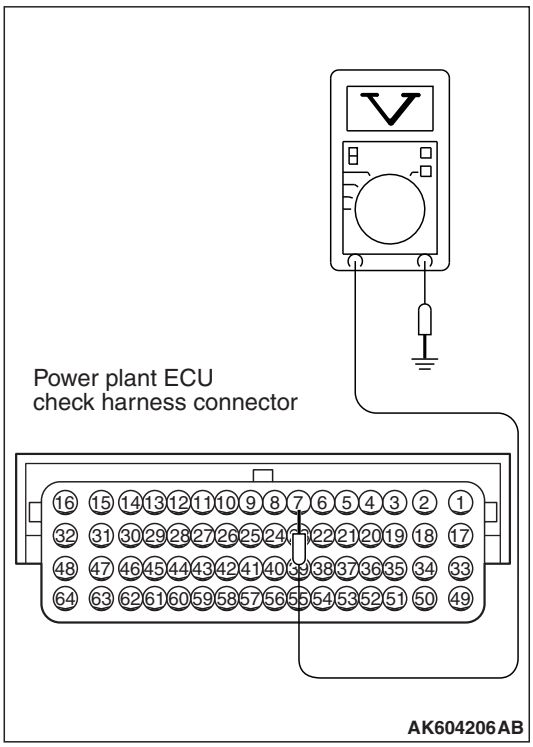
YES : Go to Step 7.

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-10 by using power plant ECU check harness special tool MB992110.

(1) Disconnect the 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-22.
(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-22 (terminal No. 3) and ECM connector B-10 (terminal No. 7) because of open circuit. Then go to Step 19.

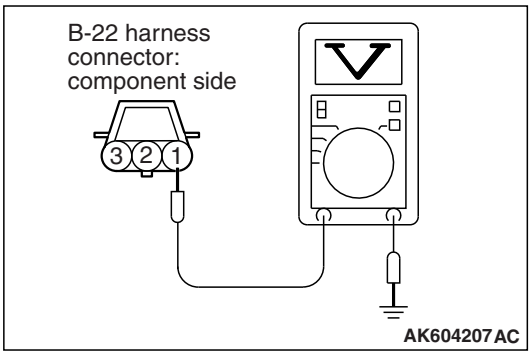
NO : Go to Step 8.

STEP 8. Check for short circuit to ground between exhaust camshaft position sensor connector B-22 (terminal No. 3) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.

NO : Repair it. Then go to Step 19.



STEP 9. Measure the power supply voltage at exhaust camshaft position sensor connector B-22.

(1) Disconnect the connector B-22 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 12.
NO : Go to Step 10.

STEP 10. Check harness connector B-10 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-22 (terminal No. 1) and ECM connector B-10 (terminal No. 9).

Q: Is the harness wire in good condition?

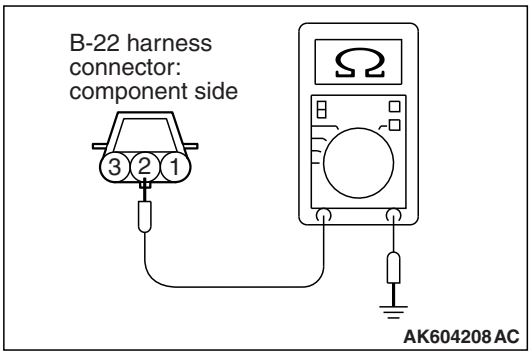
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 12. Check the continuity at exhaust camshaft position sensor connector B-22.

(1) Disconnect the connector B-22 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-10 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-22 (terminal No. 2) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 15. Check harness connector B-10 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-10 (terminal No. 9) and exhaust camshaft position sensor connector B-22 (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-22 (terminal No. 3) and ECM connector B-10 (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.13A-11.

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

Q: Is DTC P0365 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

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

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

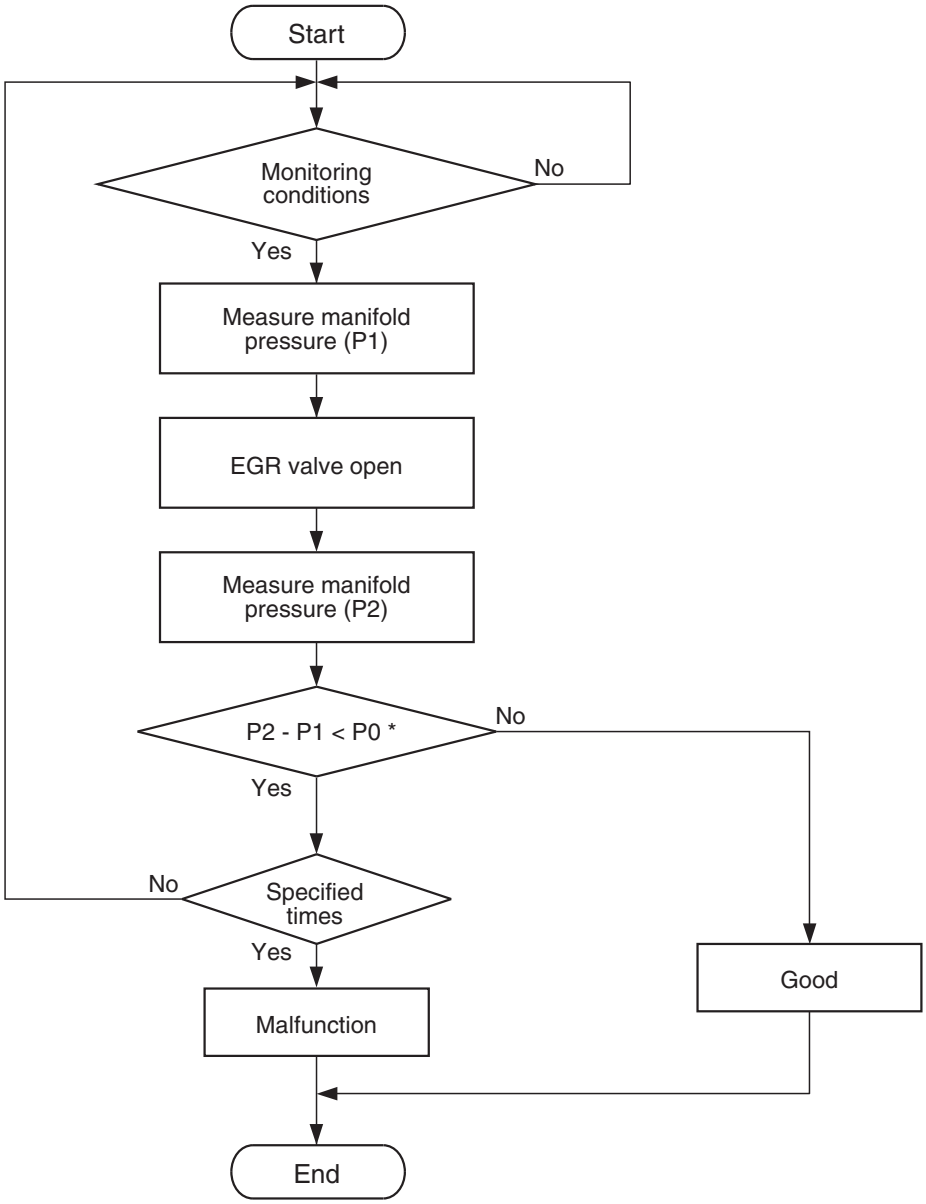
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



∗ P0 : Threshold value

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Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,125 and 2,500 r/min.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Fuel is being shut off.
- Vehicle speed is 30 km/h (19 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- Accelerator pedal is closed.
- Volumetric efficiency is lower than 24 percent.

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- The ECM monitors for this condition for 3 cycles of 1.8 seconds each during the drive cycle.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 3 P.13A-11.

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

- Contaminated EGR valve and EGR passage.
- ECM failed

DIAGNOSIS

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information P.17-80.

Q: Are there any abnormalities?

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

STEP 2. Check the EGR valve contamination and the EGR passage contamination.

Q: Are the EGR valve and the EGR passage clogged?

YES : Repair the EGR valve and the EGR passage contamination.
NO : 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 3 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0401 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 linear air-fuel ratio sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the linear air-fuel ratio sensor becomes similar to the heated oxygen sensor (rear).
- The ECM compares the output of the linear air-fuel ratio sensor and heated oxygen sensor (rear) signals.

DESCRIPTIONS OF MONITOR METHODS

Linear air-fuel ratio sensor and heated oxygen sensor (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)

- Linear air-fuel ratio sensor monitor

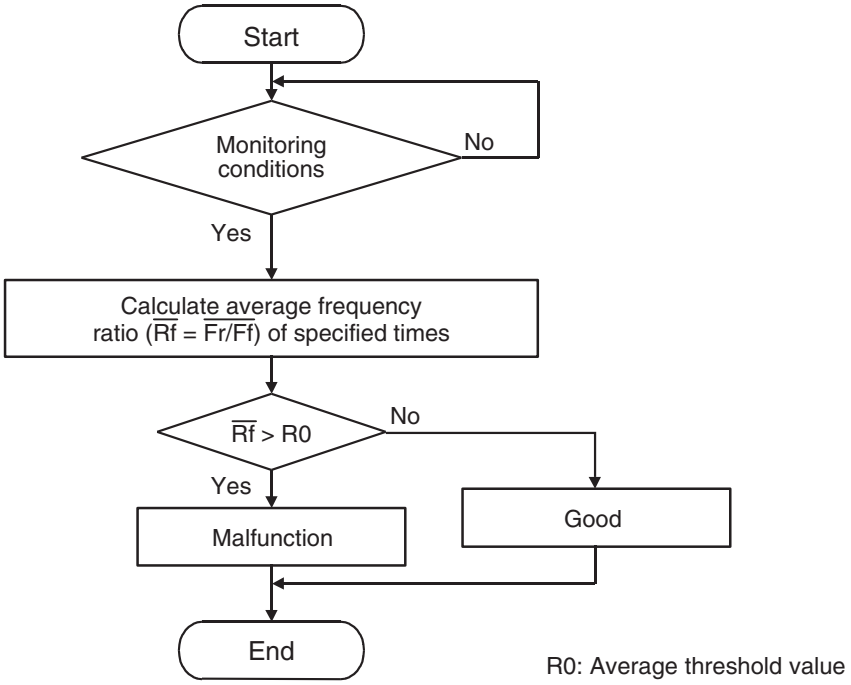
- Heated oxygen sensor (rear) monitor
- Linear air-fuel ratio sensor heater monitor
- Heated oxygen sensor (rear) heater monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- Heated oxygen sensor (rear) feedback control system

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



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Check Conditions

- Engine speed is lower than 3,000 r/min.
- Accelerator pedal is depressed.
- Mass airflow is between 10 and 45 g/sec.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The ECM monitors the maximum 3 times per drive cycle under these conditions.
- Short-term fuel trim is higher than −25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,741 g.
- The linear air-fuel ratio sensor rich/lean switching frequency is more than 8 times.

Judgement Criterion

- When the monitoring for 10 seconds is carried out 5 times, the frequency ratio of heated oxygen sensor (rear) and linear air-fuel ratio sensor signals is the specified value or more.

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

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OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-11.

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

- Catalytic converter deteriorated.
- ECM failed.

DIAGNOSIS

STEP 1. Replace the catalytic converter.

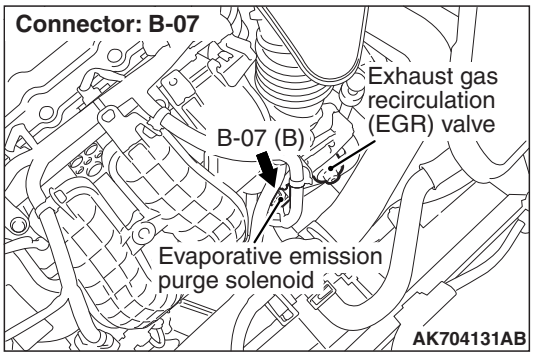
(1) Replace the catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 4 P.13A-11.
(3) Check the diagnostic trouble code (DTC).

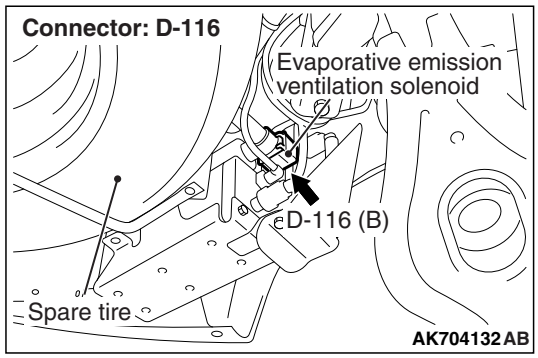
Q: Is DTC P0420 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10.

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)

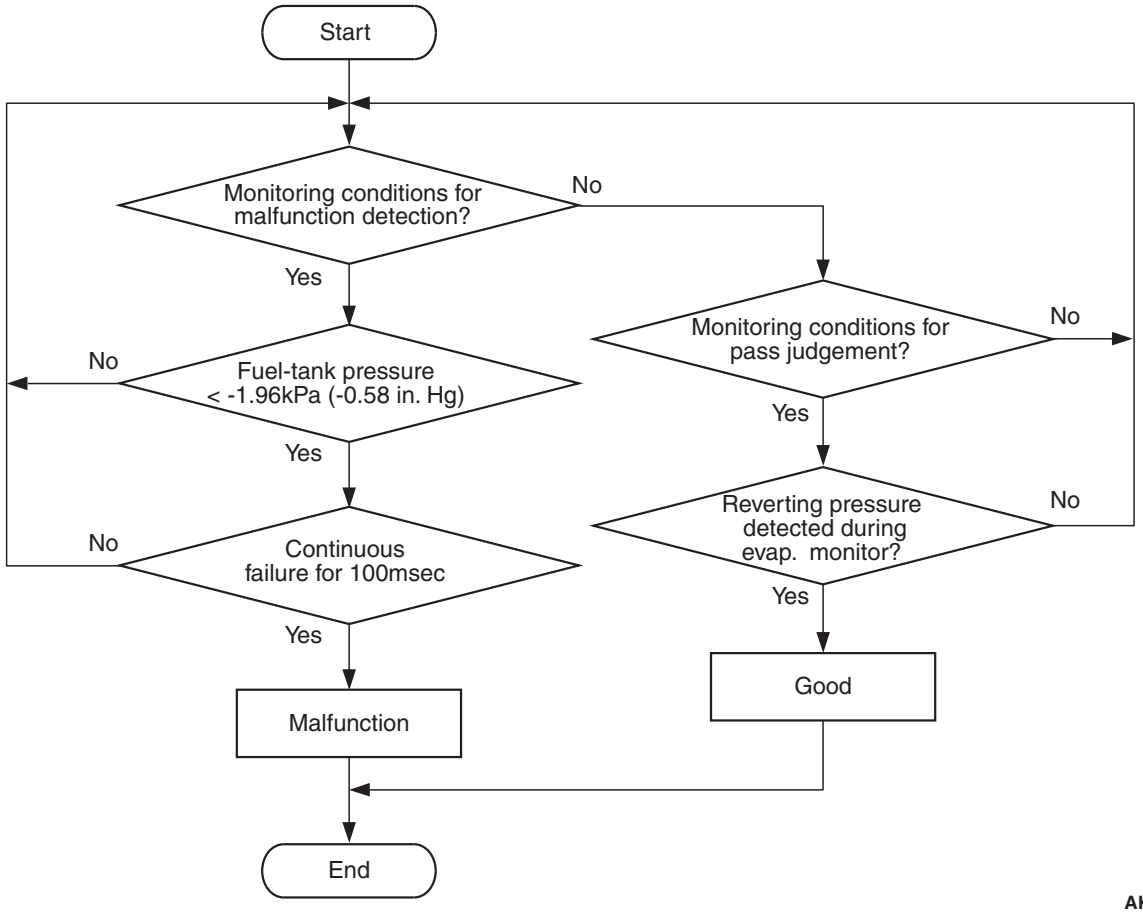
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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

Judgement Criterion
- The pressure in the fuel tank is –1.96 kPa (–0.58 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.

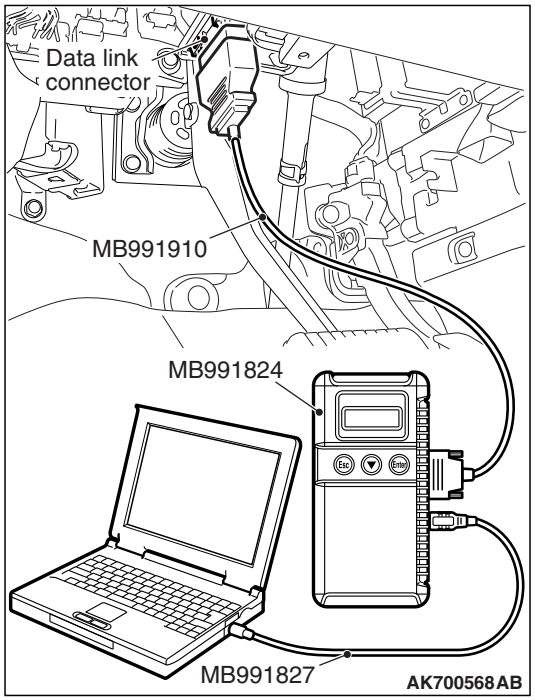
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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

TSB Revision



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

⚠ CAUTION

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

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

Q: Is DTC P0451 set?

YES : Refer to DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-442.
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 – Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-442.

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

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

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

Q: Is the solenoid operating properly?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.

STEP 4. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

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

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

Q: Is the solenoid operating properly?

YES : Repair or replace the vent hose and air filter. Then go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

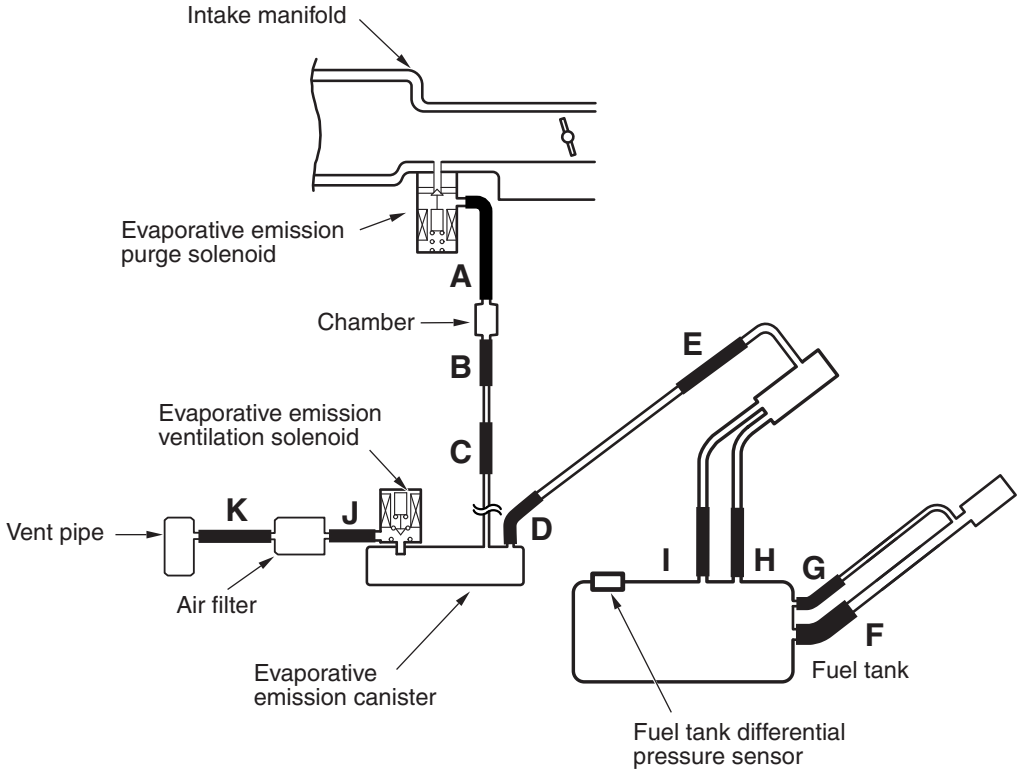
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.
(2) Read the diagnostic trouble code.

Q: Is DTC P0441 set?

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

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

System diagram



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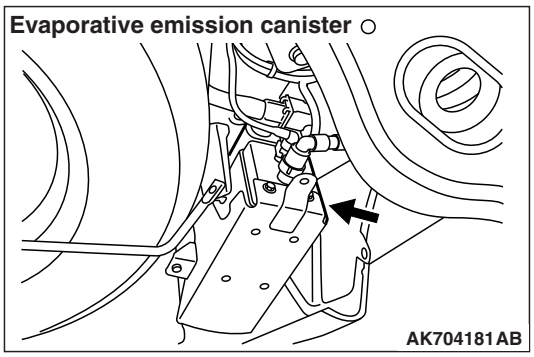

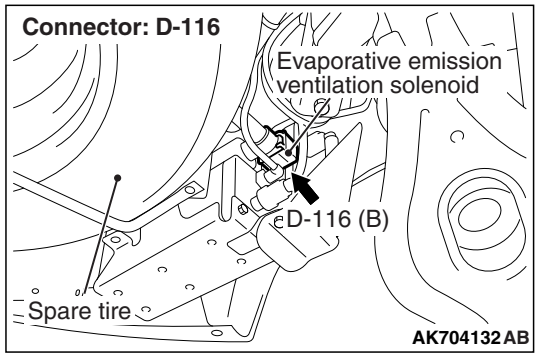

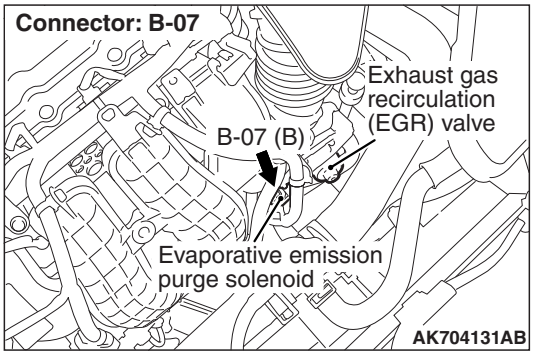

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TECHNICAL DESCRIPTION

- 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)

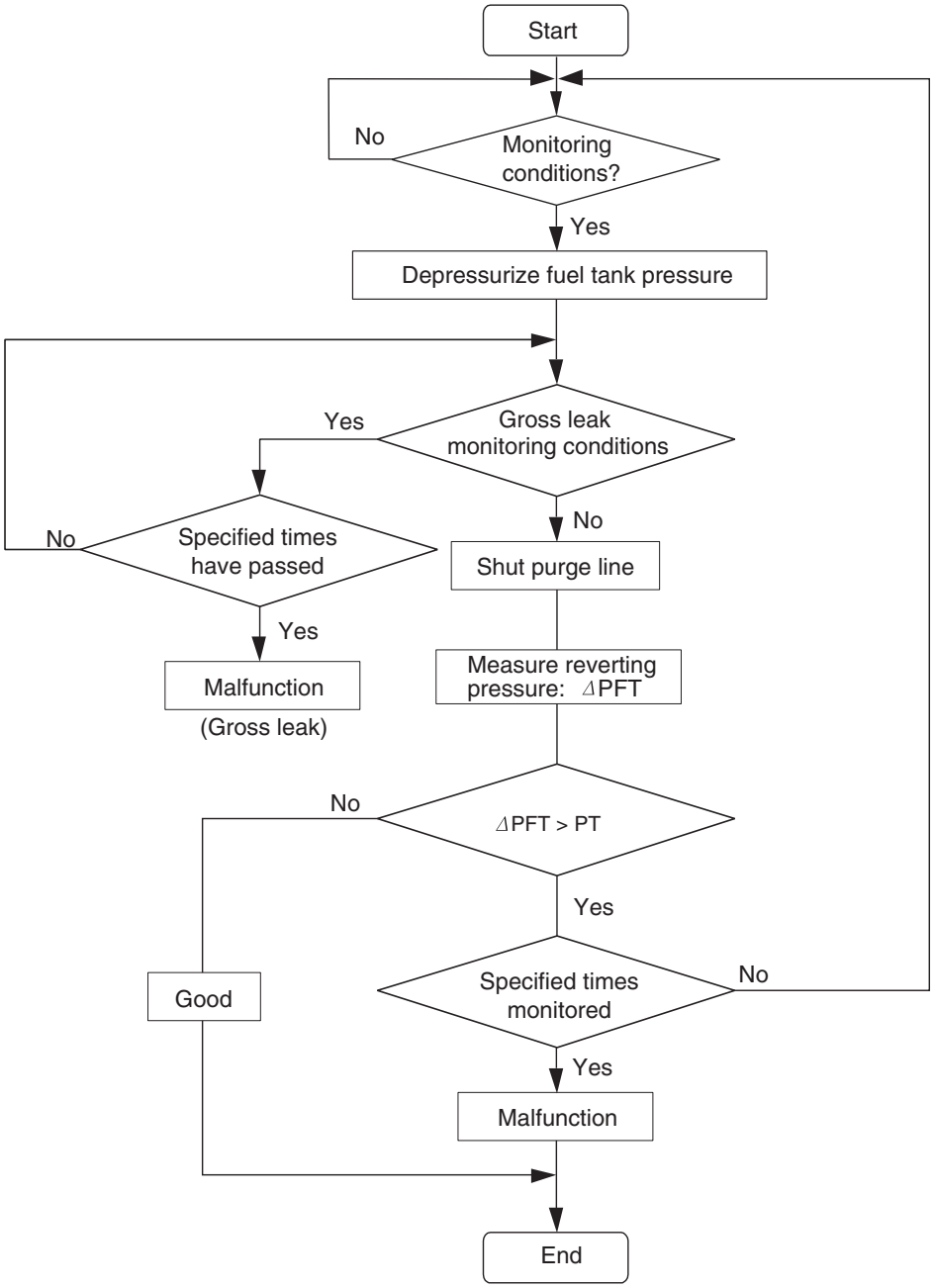
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

- Amount of remaining fuel is 15 – 40 percent of capacity.
- Engine coolant temperature is 36°C (97°F) or less when the engine is started.
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Intake air temperature is higher than –10°C (14°F)
- Fuel tank 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 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).

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

Judgement Criterion

- Internal pressure of the fuel tank has changed more than 1,010 Pa (0.146 psi) 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 – 80 percent of capacity.
- Engine coolant temperature is 36°C (97°F) or less when the engine is started.
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- Engine coolant temperature is higher than 20°C (68°F).
- Intake air temperature is higher than –10°C (14°F)
- Fuel tank temperature is less than 36°C (97°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Fuel tank differential pressure sensor output voltage is 1.0 – 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.

Judgment Criterion

- Internal pressure of the fuel tank has changed more than 1,922 Pa (0.279 psi) 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.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.

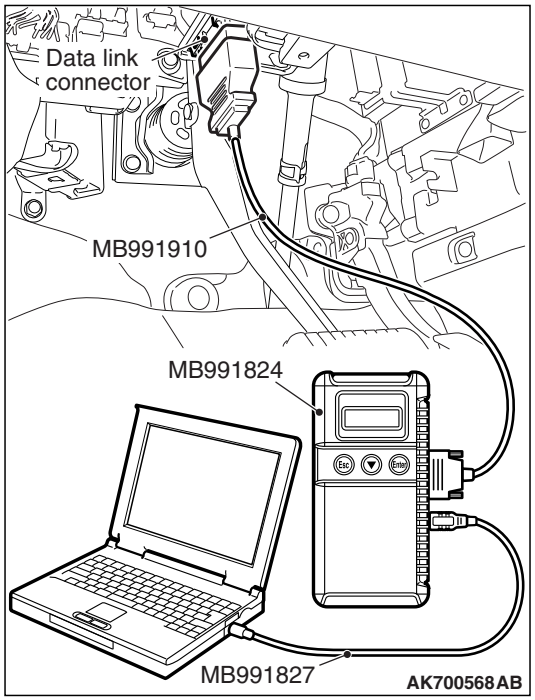
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

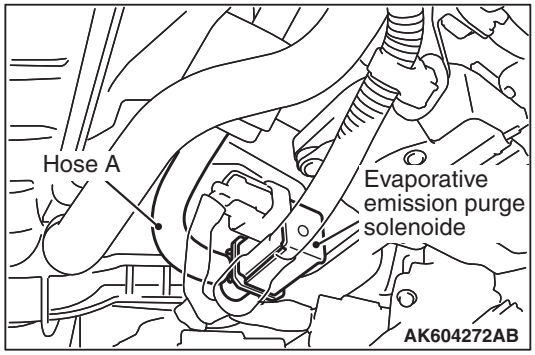
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select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

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

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-49. If no other DTC's have been set, go to Step 2 .

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

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1 .

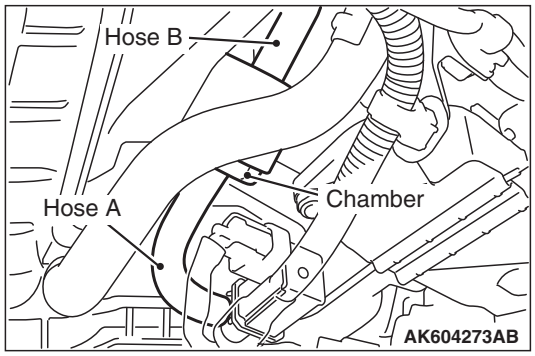


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand pump (pressure-application type) to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand pump (pressure-application type) to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3 .
NO : Replace the evaporative emission purge solenoid. Then go to Step 13 .

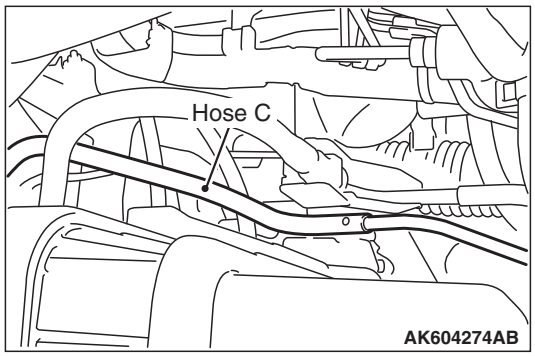


STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4 .
NO : Replace any damaged hose. Then go to Step 13 .

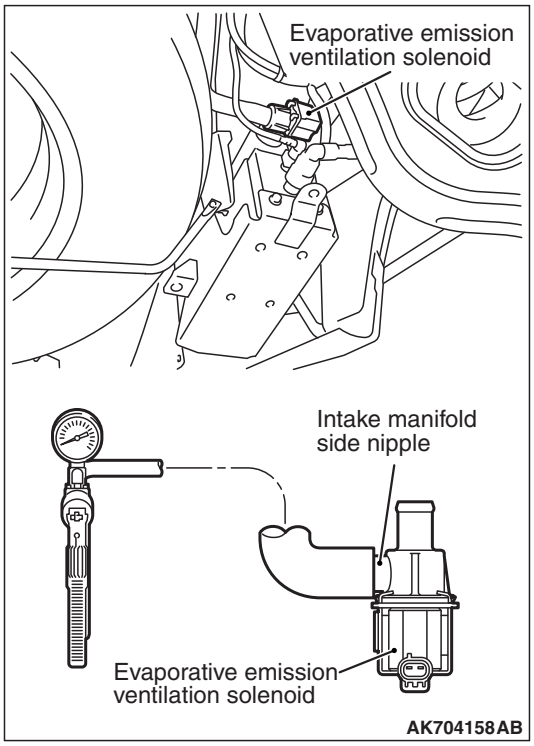


STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5 .
NO : Replace any damaged hose. Then go to Step 13 .



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

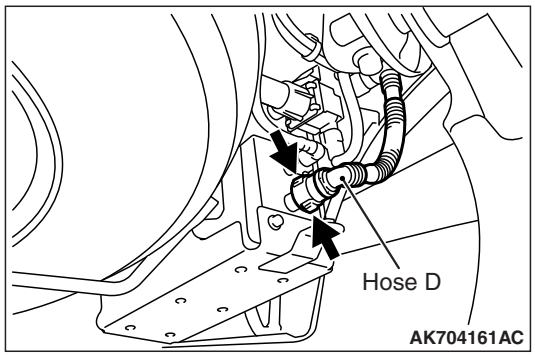
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator testing mode for 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.

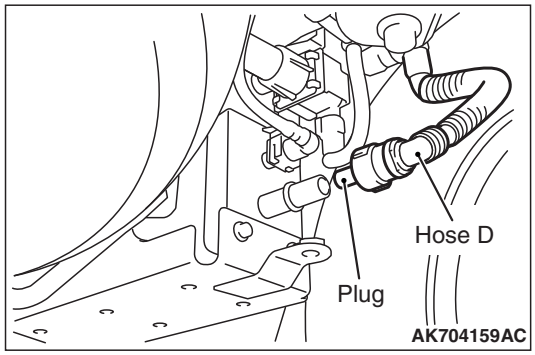
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6 .
NO : Replace the evaporative emission ventilation solenoid Then go to Step 13 .

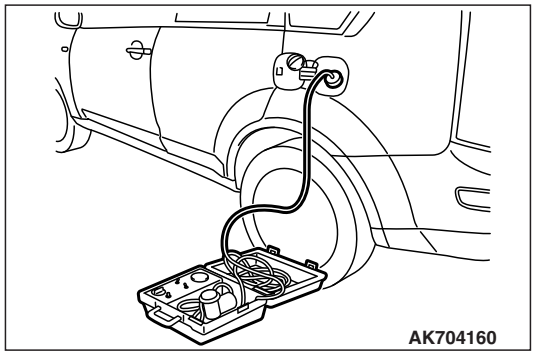
STEP 6. Perform the pressure test on the evaporative emission system.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose D.
(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.

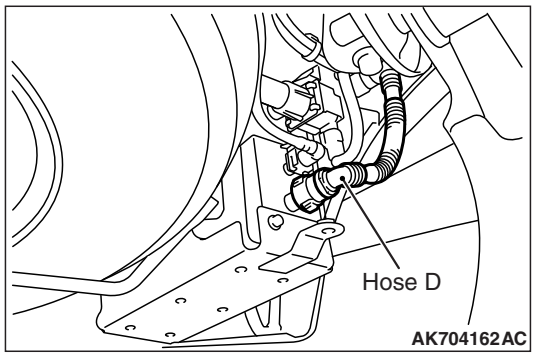
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

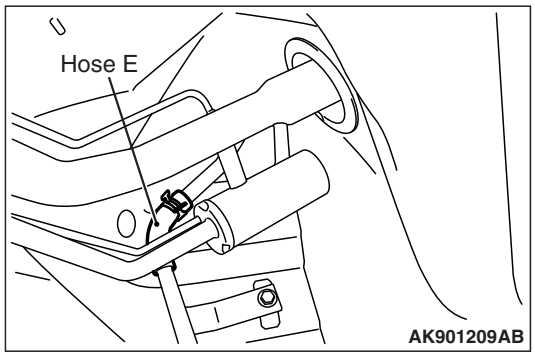
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

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

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

STEP 7. Check for leaks in evaporative emission hoses D and E.





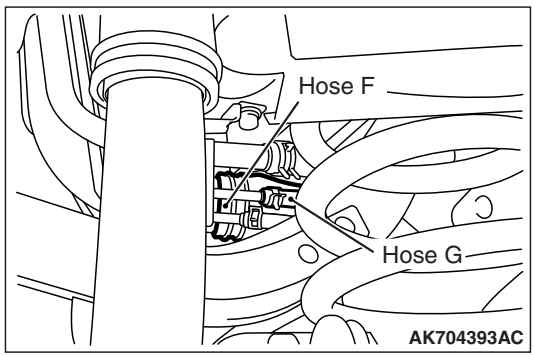
Use a hand vacuum pump to test each hose D and E.

Q: Do the hoses hold vacuum?

YES : Go to Step 8 .

NO : Replace any damaged hose. Then go to Step 13 .

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



(1) Remove the fuel tank assembly

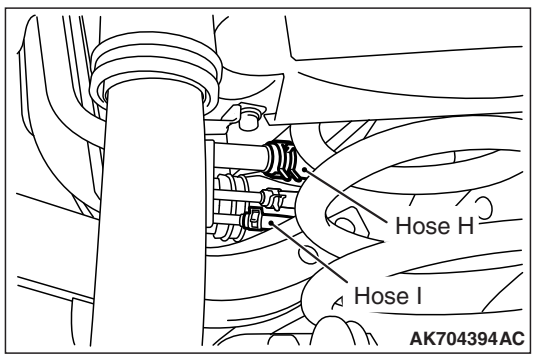
(2) Use a hand vacuum pump to test each hose F and G.

Q: Do the hoses hold vacuum?

YES : Go to Step 9 .

NO : Replace any damaged hose. Then go to Step 13 .

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



(1) Remove the fuel tank assembly.

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

Q: Does the hose hold vacuum?

YES : Go to Step 10 .

NO : Replace the hose and reinstall the fuel tank assembly. Then go to Step 13 .

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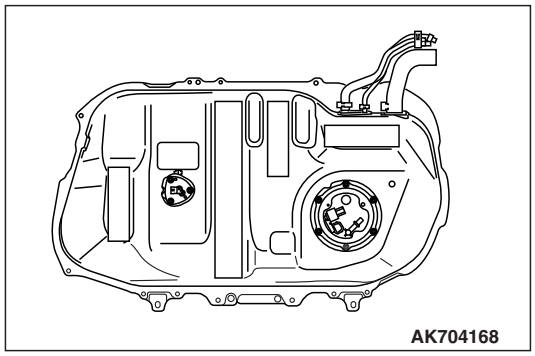
STEP 10. Check for leaks in the fuel tank.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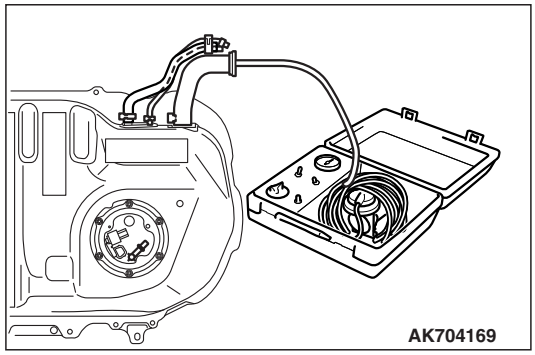
(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.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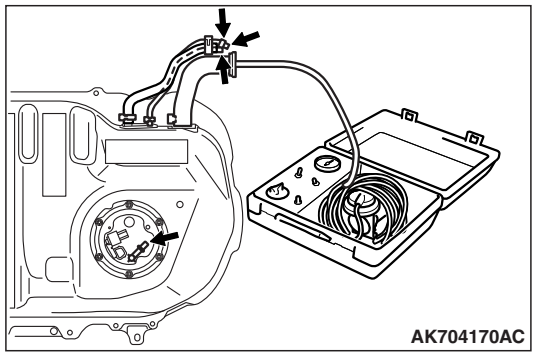
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.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(3) Plug the hose and the nipple shown in the illustration.

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.

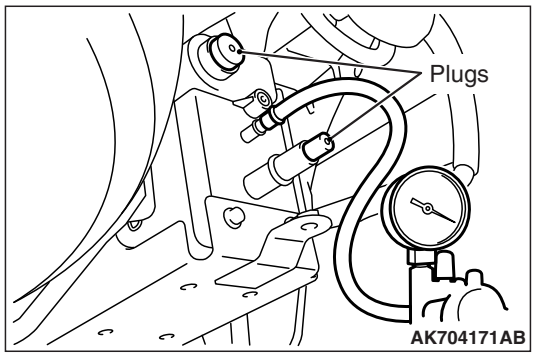
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13 .

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Go to Step 13 .

NO : When there is no leak, reinstall the fuel tank. Then go to Step 11 .



STEP 11. 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 12 .
NO : Replace the evaporative emission canister. Then go to Step 13 .

STEP 12. 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 "System Test."
(6) Select "Evap Leak Mon."
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 13 .
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 13 .
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 12 .

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STEP 13. Perform the OBD-II drive cycle.

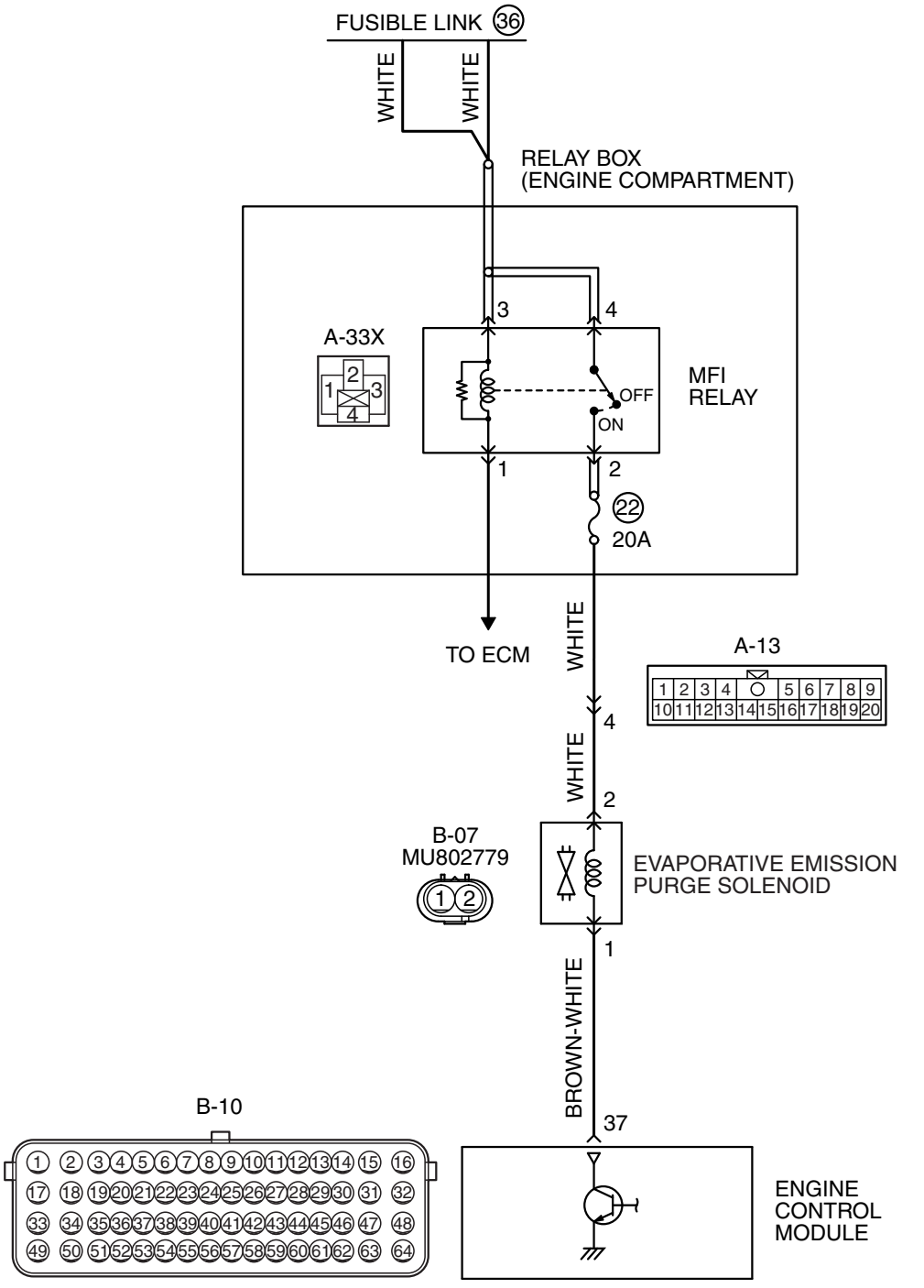
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11).
(2) Read the DTC.

Q: Is DTC P0442 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

EVAPORATIVE EMISSION PURGE SOLENOID CIRCUIT



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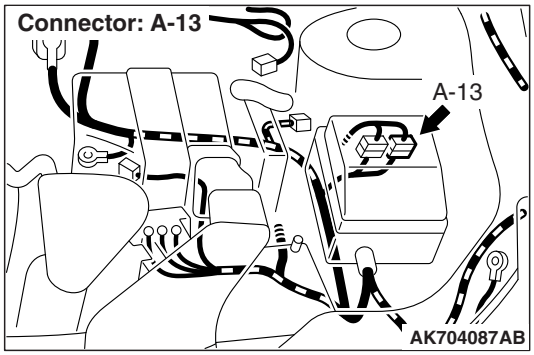
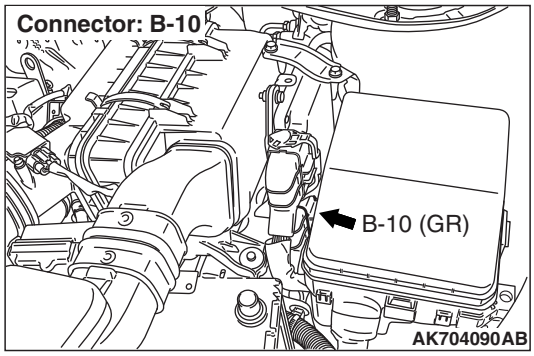
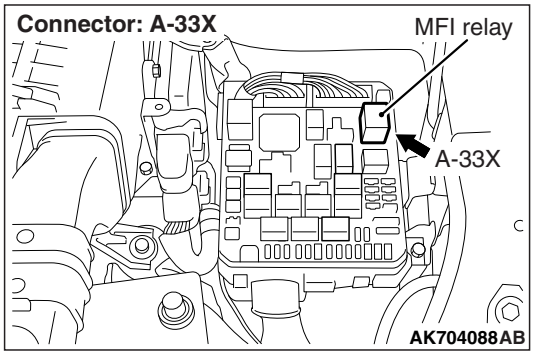
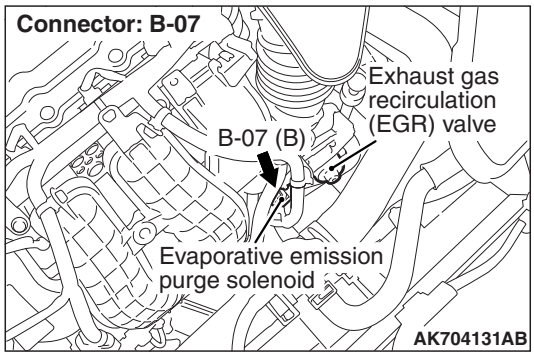








CIRCUIT OPERATION

- 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)

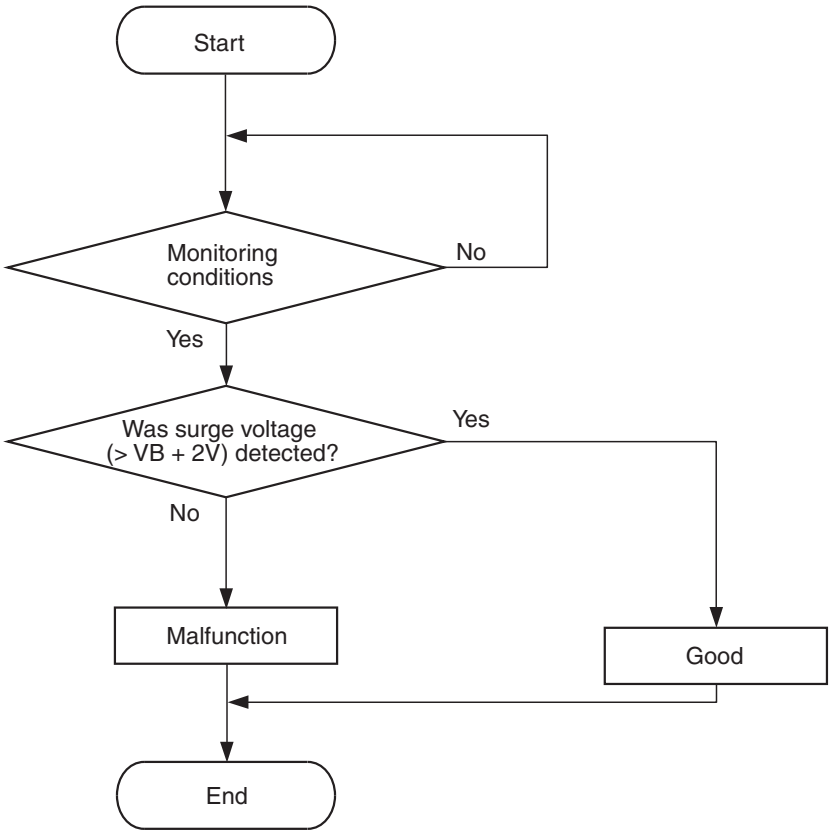
- Not applicable

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 elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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.

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DIAGNOSIS

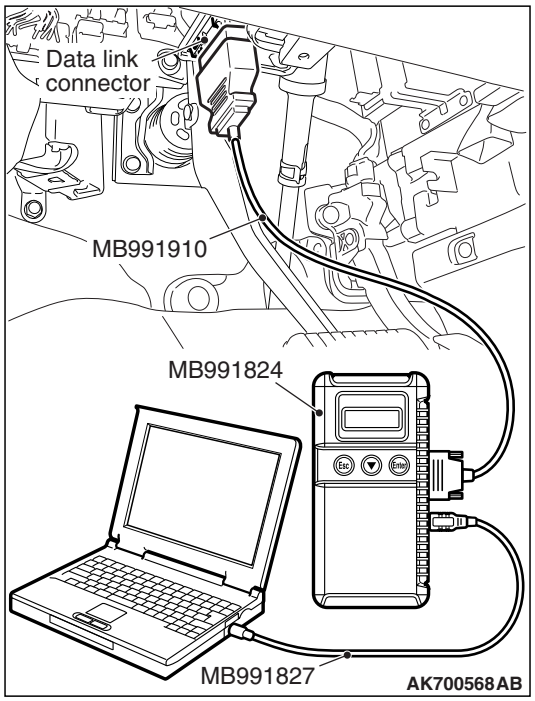
Required Special Tools:

- 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.00-15.

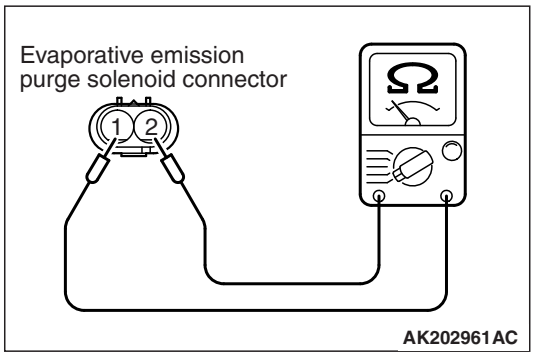
NO : Go to Step 2.

STEP 2. Check harness connector B-07 at the evaporative emission purge solenoid for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

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



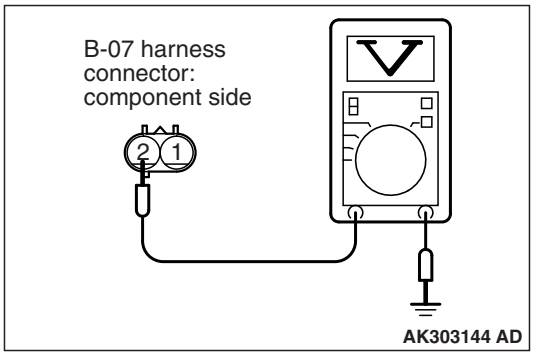
STEP 3. Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-07.
(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

Standard value: 22 – 26 ohms [at 20°C (68°F)]

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

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 10.



STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-07.

(1) Disconnect the connector B-07 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-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-13 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-33X (terminal No. 2) and evaporative emission purge solenoid connector B-07 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check harness connector B-10 at the 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 10.

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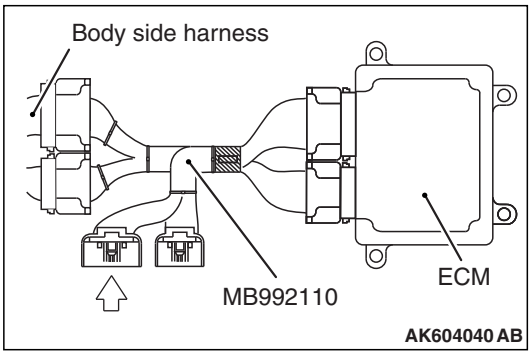
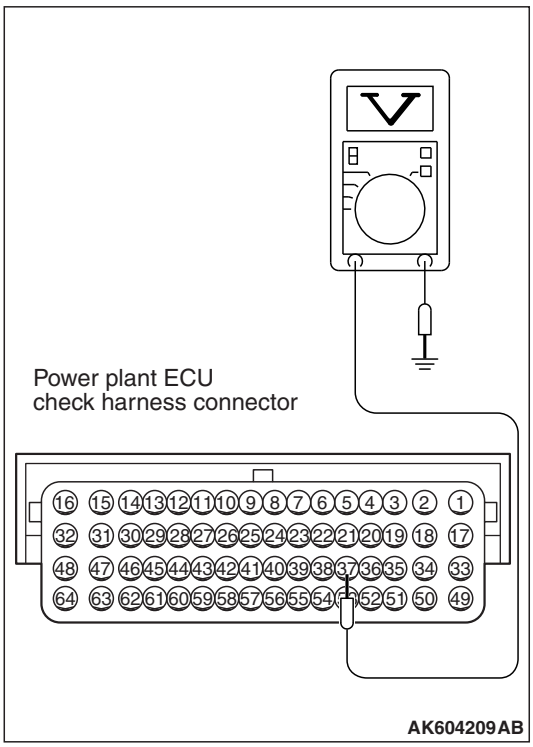
STEP 7. Measure the power supply voltage at ECM connector B-10 by using power plant ECU check harness special tool MB992110.



(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-07 (terminal No. 1) and ECM connector B-10 (terminal No. 37) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 8. Check for harness damage between MFI relay connector A-33X (terminal No. 2) and evaporative emission purge solenoid connector B-07 (terminal No. 2).

NOTE: Check harness connector after checking intermediate connector A-13. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

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

STEP 9. Check for harness damage between evaporative emission purge solenoid connector B-07 (terminal No. 1) and ECM connector B-10 (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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 10.

NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

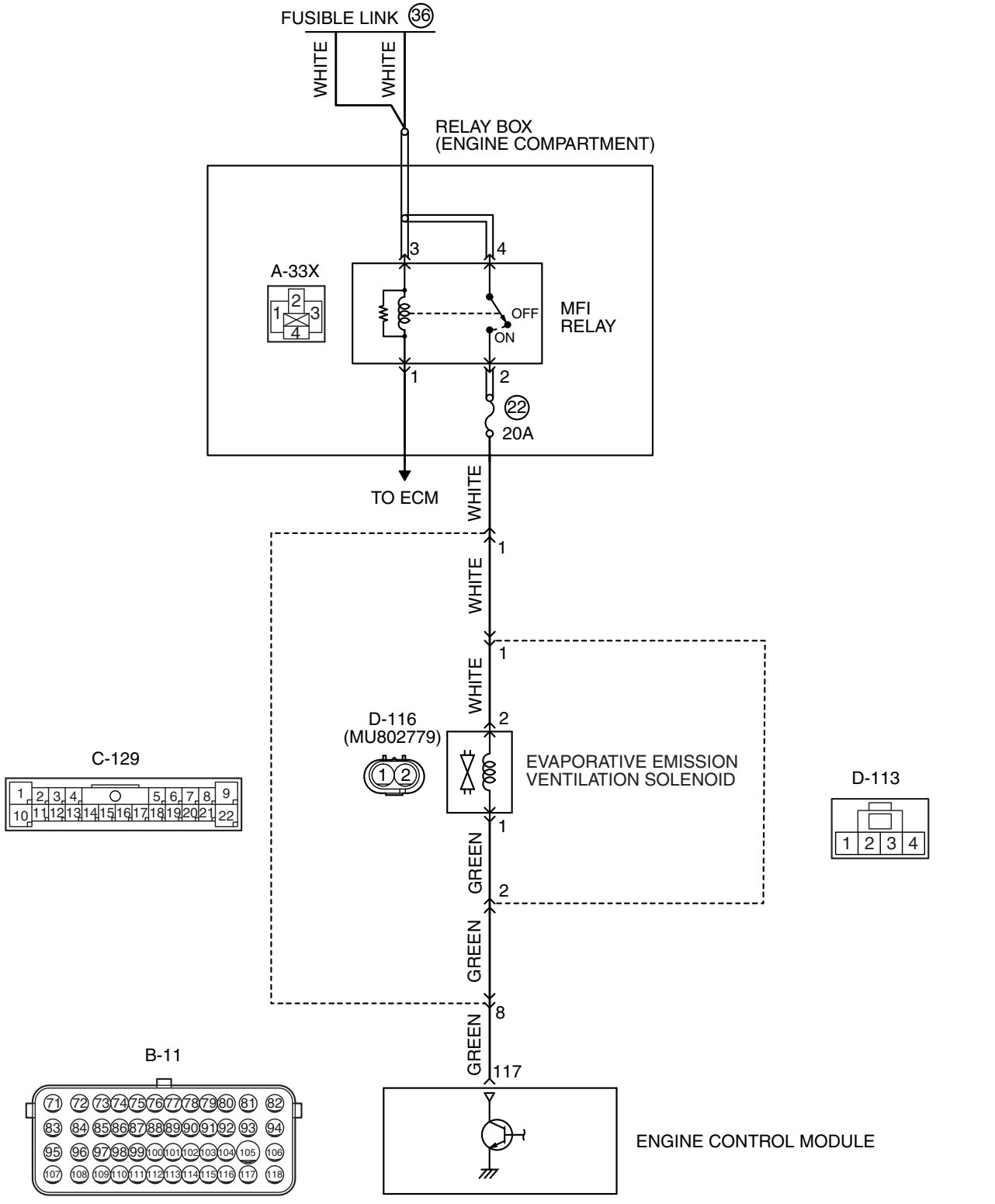
Q: Is DTC P0443 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0446: Evaporative Emission Control System Vent Control Circuit

EVAPORATIVE EMISSION VENTILATION SOLENOID CIRCUIT



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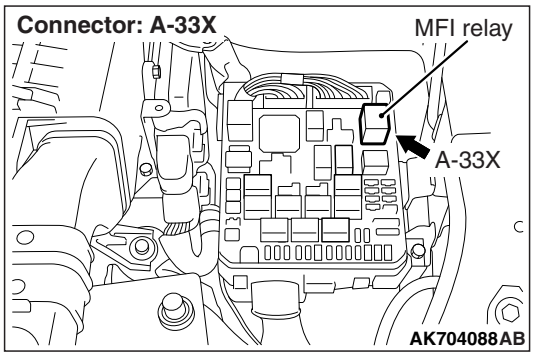

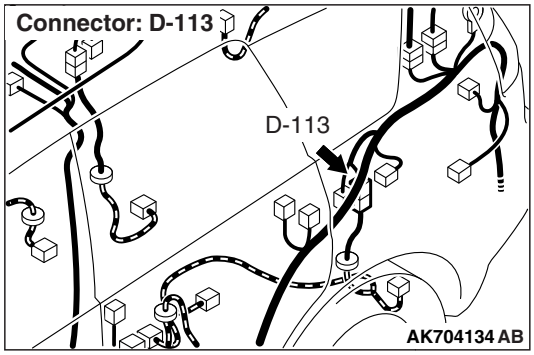

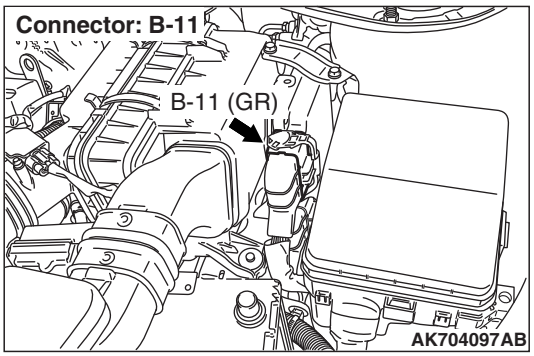

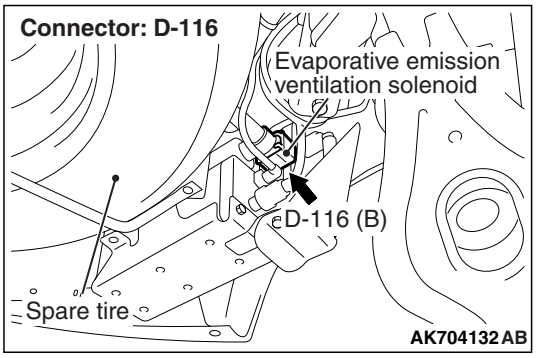

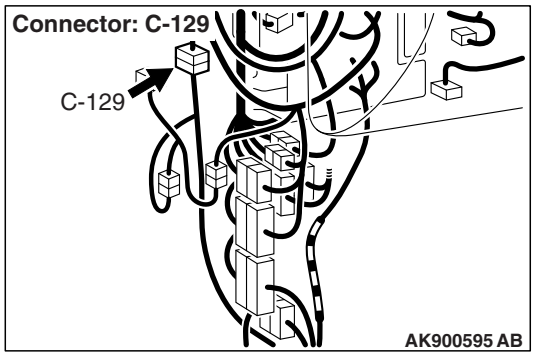

CIRCUIT OPERATION

- 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

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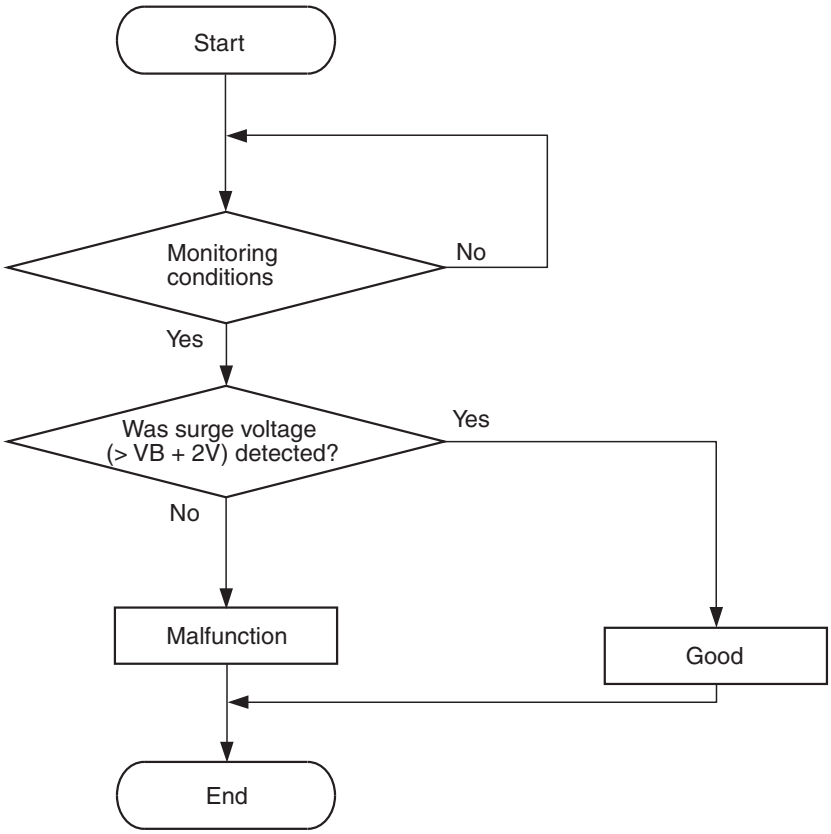
DTC SET CONDITIONS

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 elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission ventilation solenoid is turned OFF.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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.

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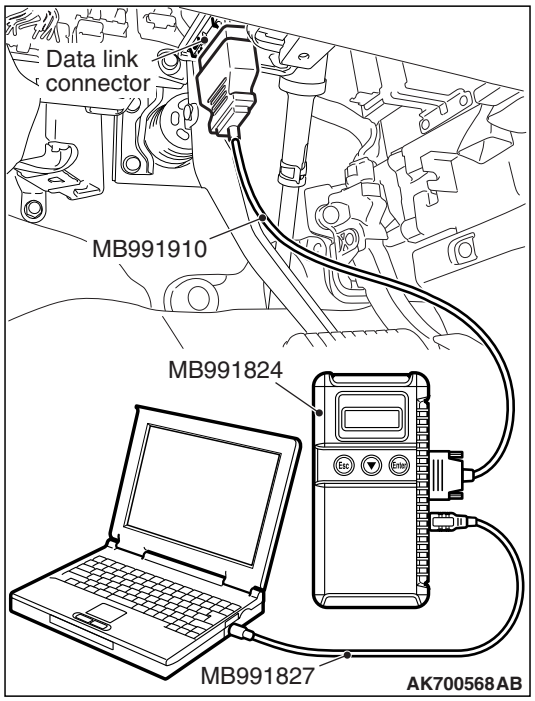
DIAGNOSIS

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.

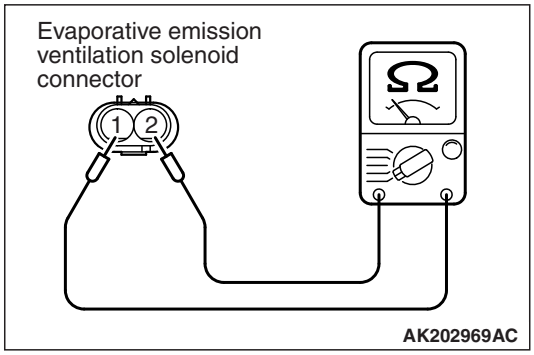
Q: Is the solenoid operating properly?

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.00-15.
NO : Go to Step 2.

STEP 2. Check harness connector D-116 at the evaporative emission ventilation solenoid for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



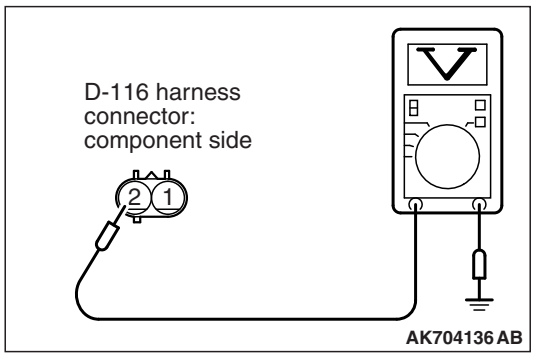
STEP 3. Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector D-116.
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 4.
NO : Replace it. Then go to Step 10.



STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector D-116.

(1) Disconnect the connector D-116 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-33X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check connectors D-113 and C-129 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-33X (terminal No. 2) and evaporative emission ventilation solenoid connector D-116 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check harness connector B-11 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

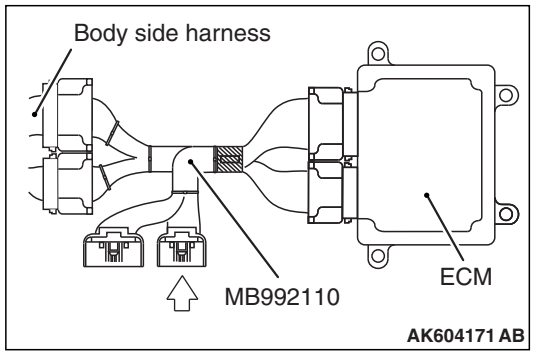
YES : Go to Step 7.

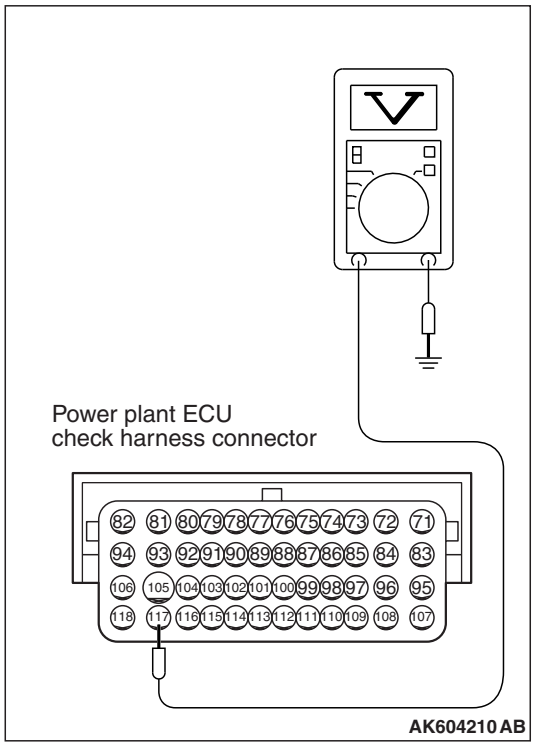
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Measure the power supply voltage at ECM connector B-11 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-129 and D-113 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 evaporative emission ventilation solenoid connector D-116 (terminal No. 1) and ECM connector B-11 (terminal No. 117) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 8. Check for harness damage between MFI relay connector A-33X (terminal No. 2) and evaporative emission ventilation solenoid connector D-116 (terminal No. 2).

NOTE: Check harness after checking intermediate connectors C-129 and D-113. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

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

STEP 9. Check for harness damage between evaporative emission ventilation solenoid connector D-116 (terminal No. 1) and ECM connector B-11 (terminal No. 117).

NOTE: Check harness after checking intermediate connector D-113 and C-129. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 10.
NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

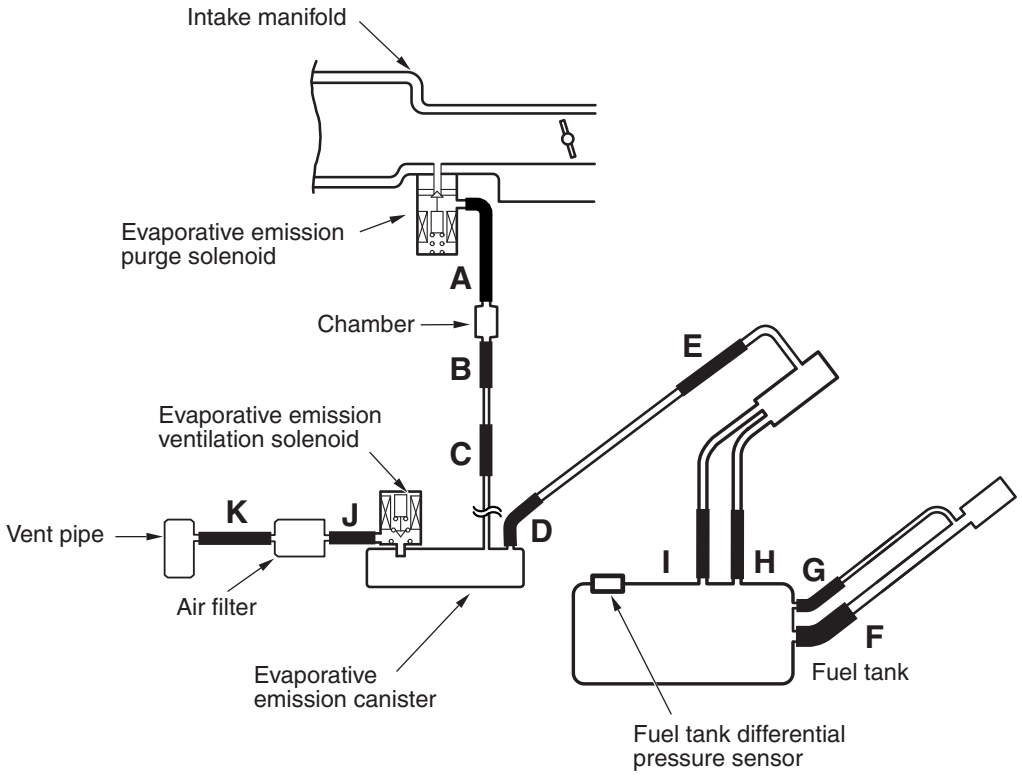
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0446 set?

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

DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction

System diagram



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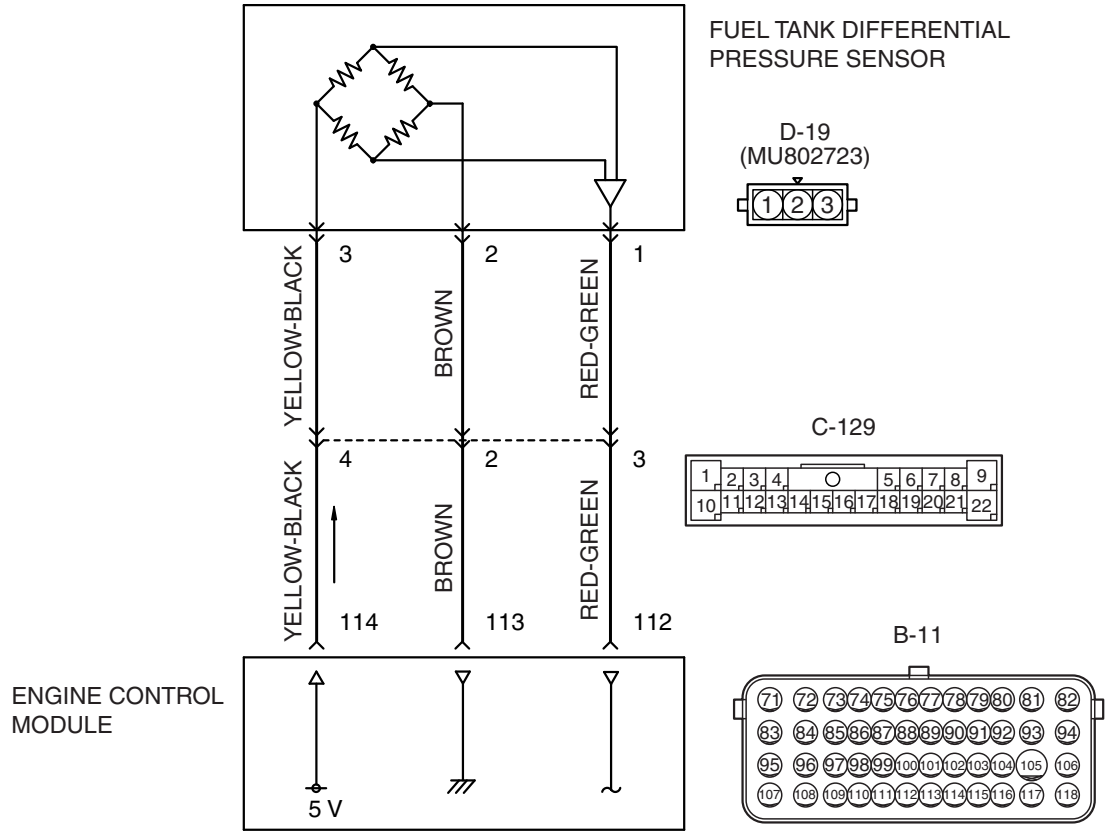
FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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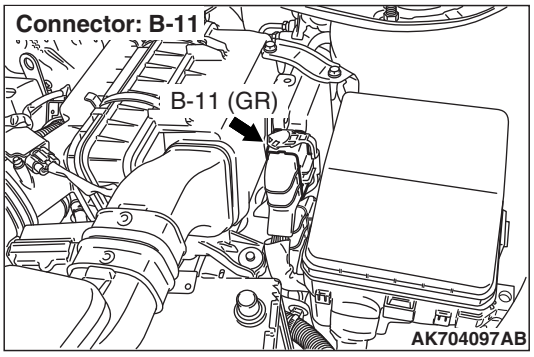

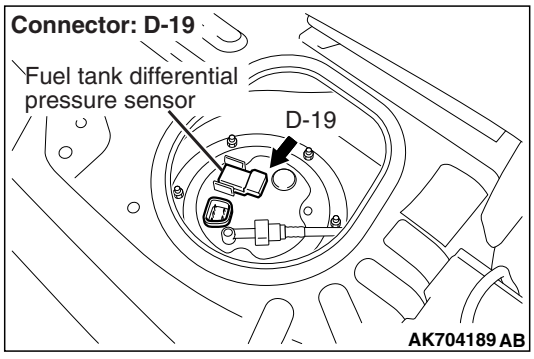

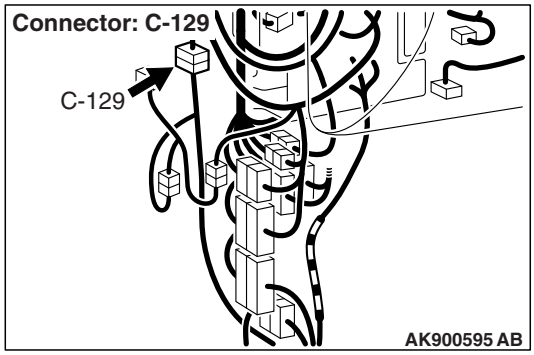

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CIRCUIT OPERATION

- 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 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)

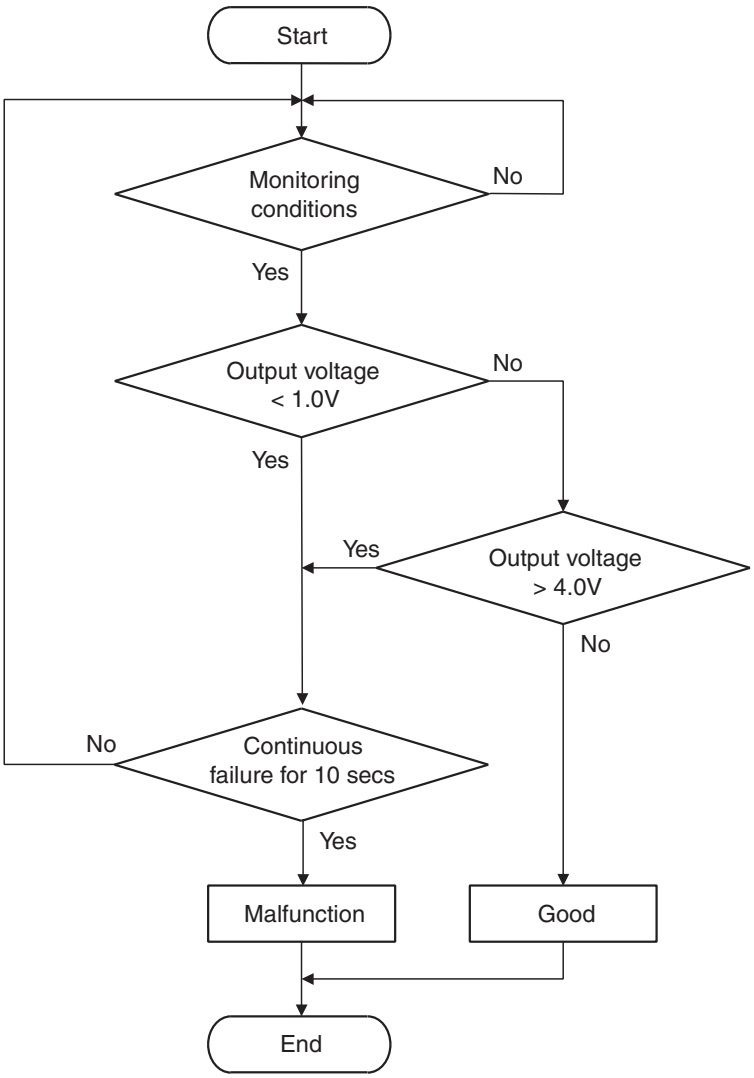
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK604517 AB

Check Conditions

- Intake air temperature is higher than 5°C (41°F).
- Engine speed is 1,594 r/min or higher.
- Volumetric efficiency is between 20 and 70 percent.

Judgement Criterion

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

Check Conditions

- Intake air temperature is between 5°C (41°F) and 45°C (113°F).
- Engine speed is 1,594 r/min or higher.
- Volumetric efficiency is between 20 and 70 percent.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.

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

- Fuel tank differential pressure sensor failed.

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

DIAGNOSIS

Required Special Tools:

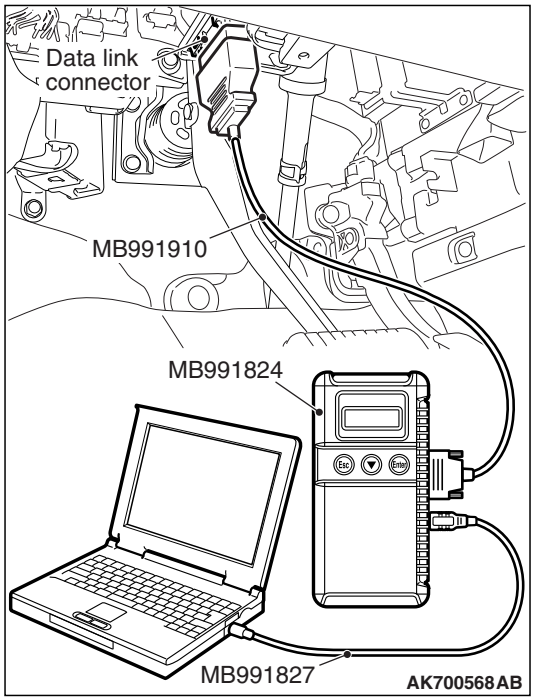
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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

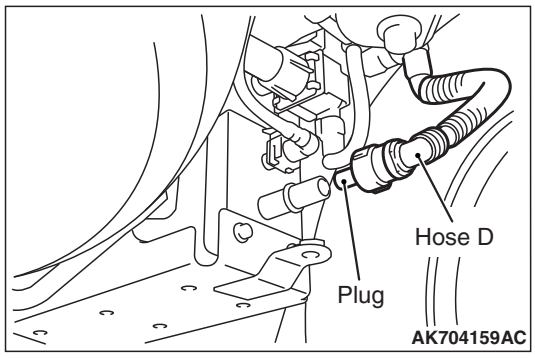
⚠ CAUTION

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.

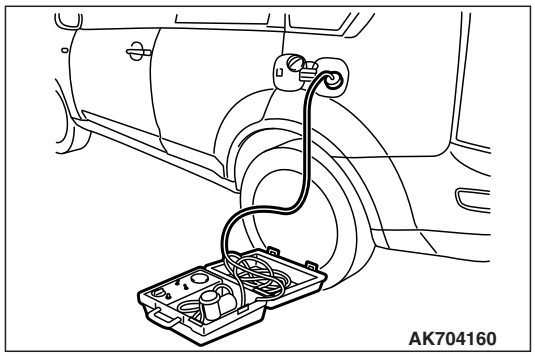


(2) Plug the disconnected end of hose D.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D 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.00-15.

NO : Go to Step 2 .

STEP 2. Check harness connector D-19 at fuel tank differential pressure sensor for damage.

Q: Is the harness connector in good condition?

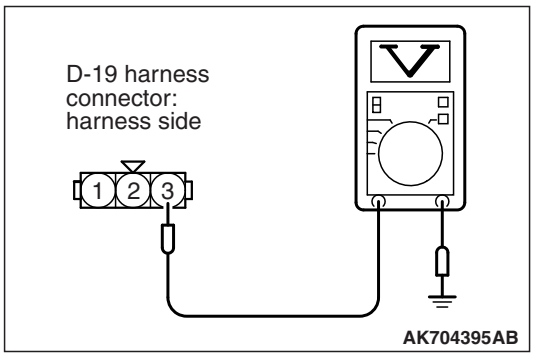
YES : Then go to Step 3 .

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-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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 D-19 at the fuel tank differential pressure 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 12.

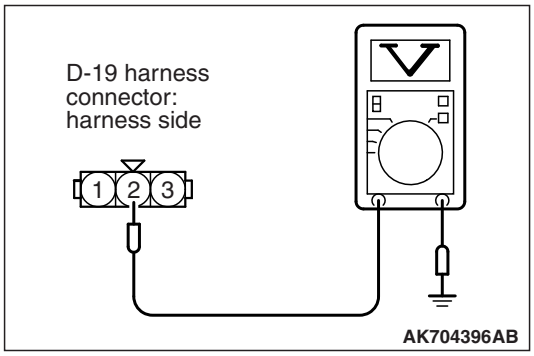
STEP 5. Check for harness damage between fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114).

NOTE: Check harness after checking intermediate connector C-129. 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-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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-11 at the 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-19 (terminal No. 2) and ECM connector B-11 (terminal No. 113).

NOTE: Check harness after checking intermediate connector C-129. 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-11 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-19 (terminal No. 1) and ECM connector B-11(terminal No. 112).

NOTE: Check harness after checking intermediate connector C-129. 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 test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 5 P.13A-11.
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 12 .
NO : The inspection is complete.

STEP 12. Perform the OBD-II drive cycle.

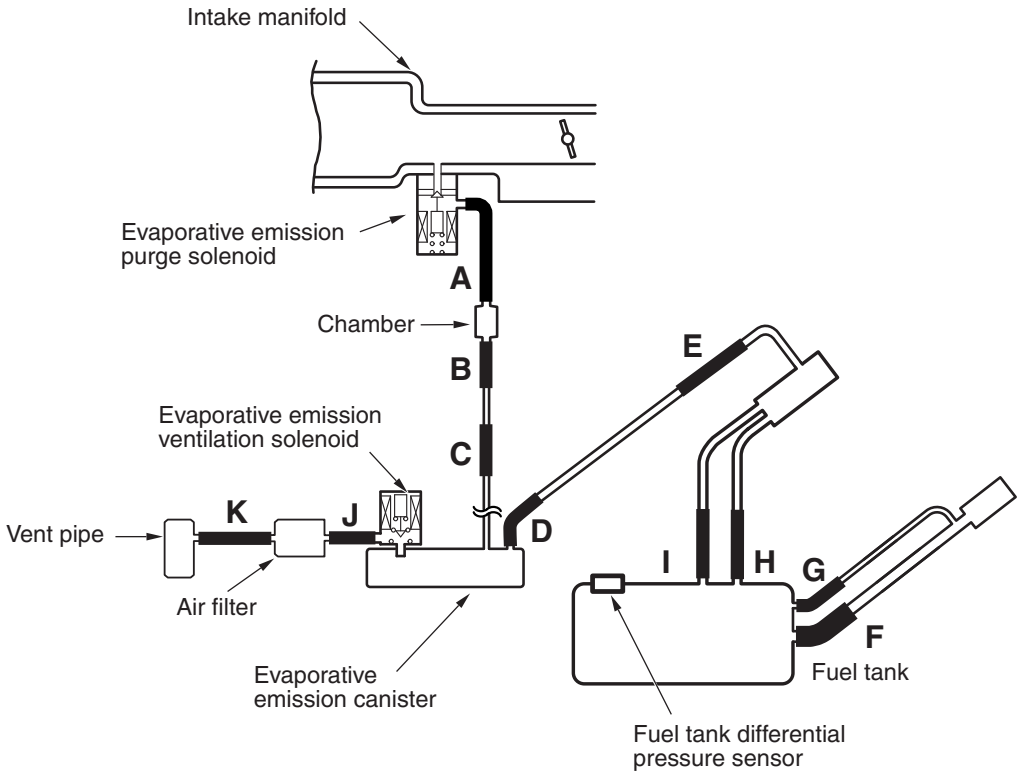
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0450 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

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

System diagram



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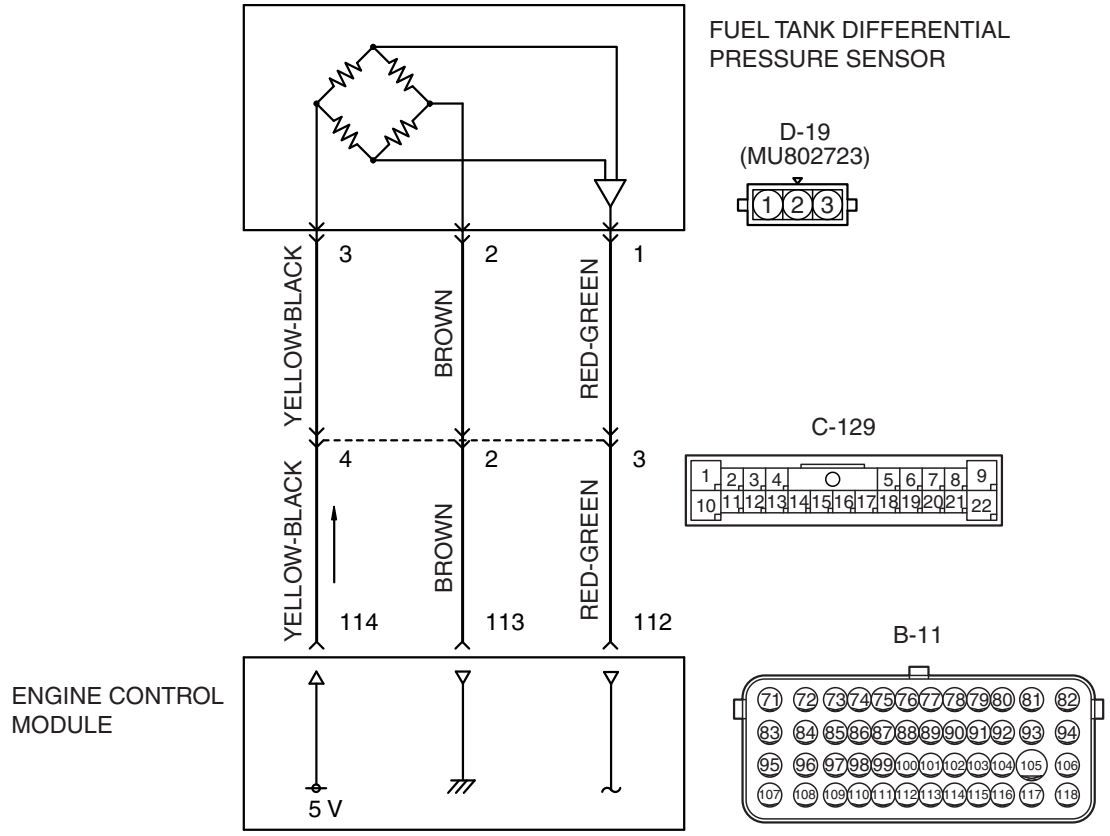
FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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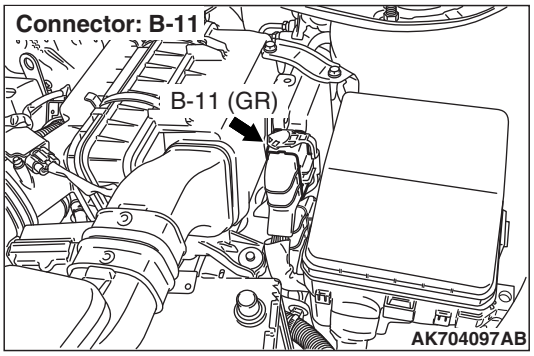
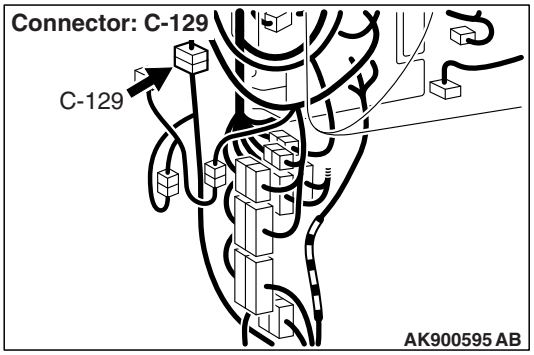
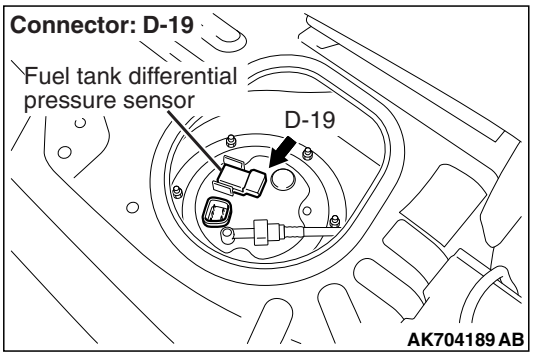




TSB Revision



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)

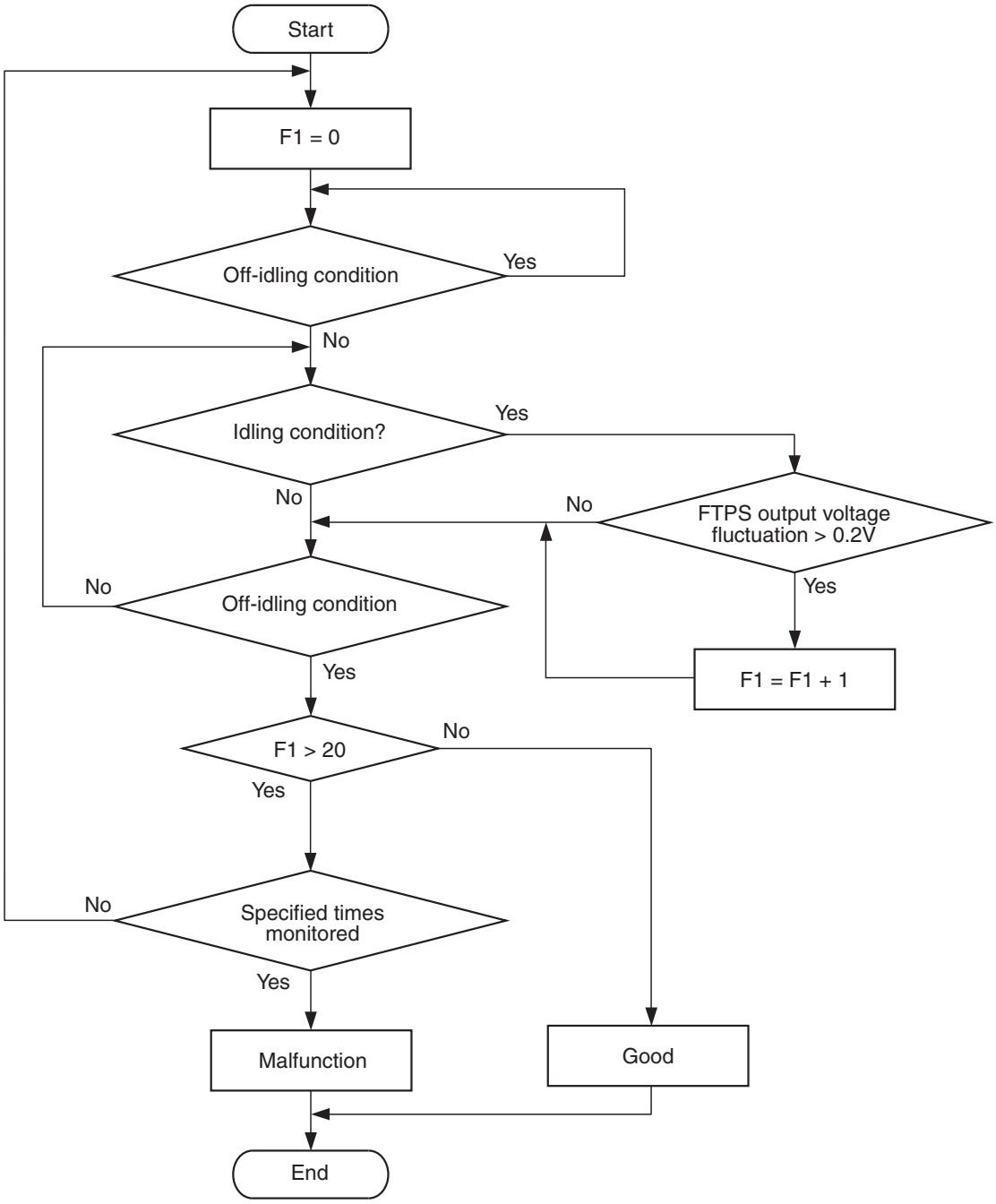
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

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

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

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

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 V or more.

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- 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 twenty during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to zero.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 16 P.13A-11.

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:

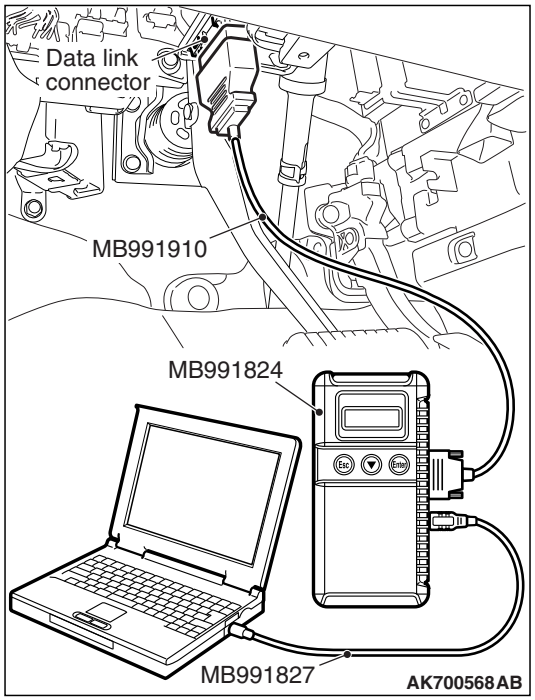
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

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

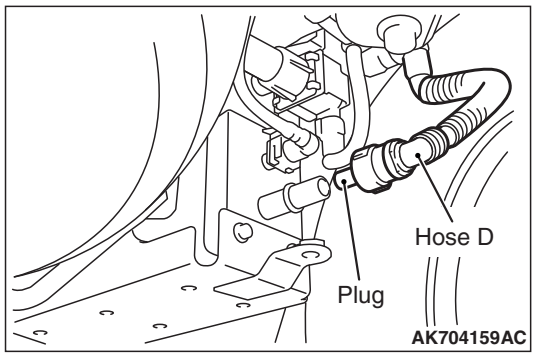
⚠ CAUTION

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.

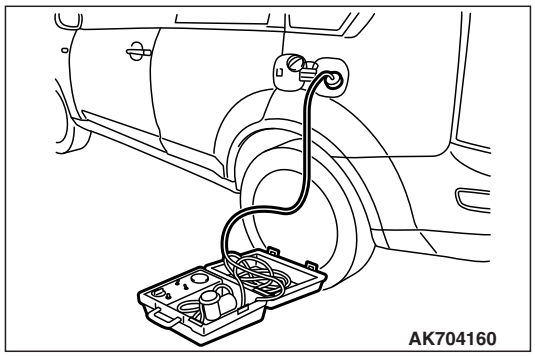


(2) Plug the disconnected end of hose D.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D 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.00-15.

NO : Go to Step 2 .

STEP 2. Check harness connector D-19 at fuel tank differential pressure sensor for damage.

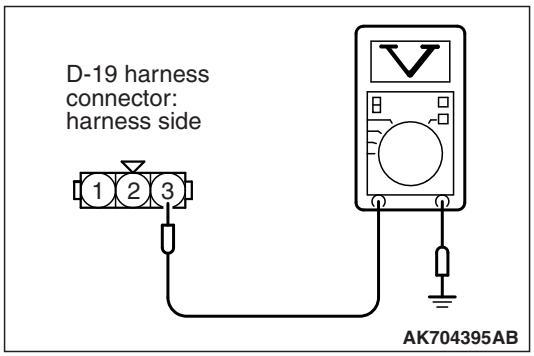
Q: Is the harness connector in good condition?

YES : Then 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-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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 D-19 at the fuel tank differential pressure sensor for damage.

Q: Is the harness connector in good condition?

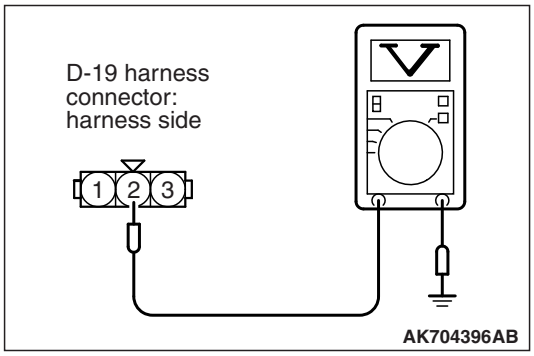
YES : Go to step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check for harness damage between fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114).

NOTE: Check harness after checking intermediate connector C-129. 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-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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-11 at the 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-19 (terminal No. 2) and ECM connector B-11 (terminal No. 113).

NOTE: Check harness after checking intermediate connector C-129. 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-11 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-19 (terminal No. 1) and ECM connector B-11(terminal No. 112).

NOTE: Check harness after checking intermediate connector C-129. 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 test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 16 P.13A-11.
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 12 .
NO : The inspection is complete.

STEP 12. Perform the OBD-II drive cycle.

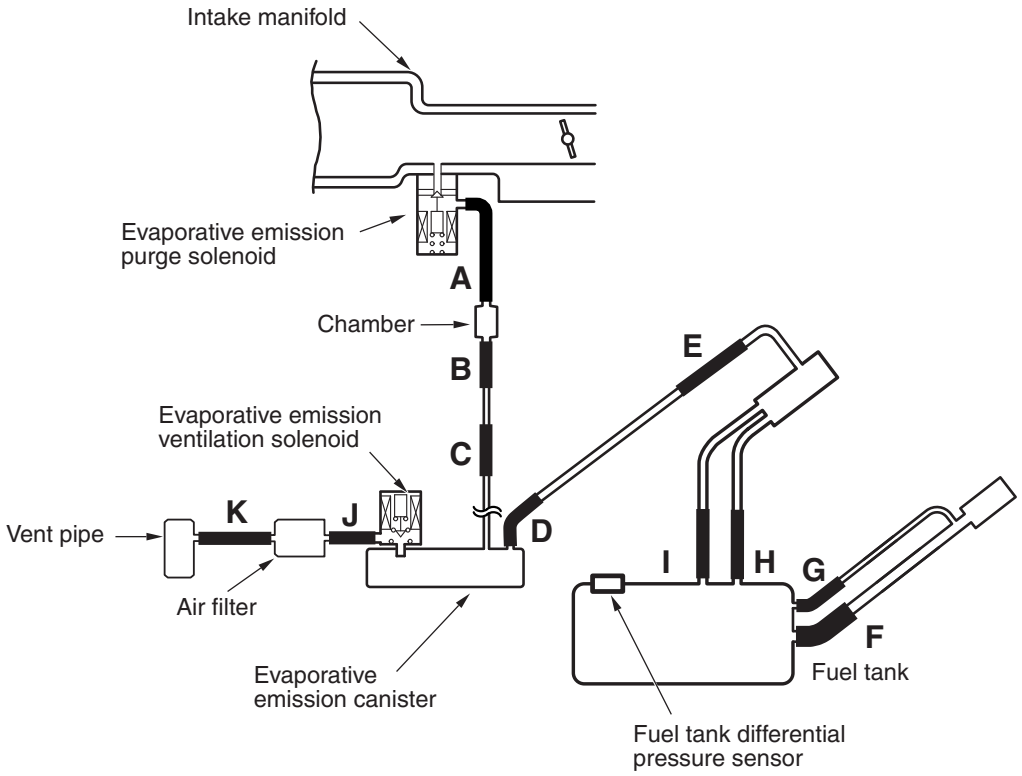
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 16 P.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0451 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

System diagram



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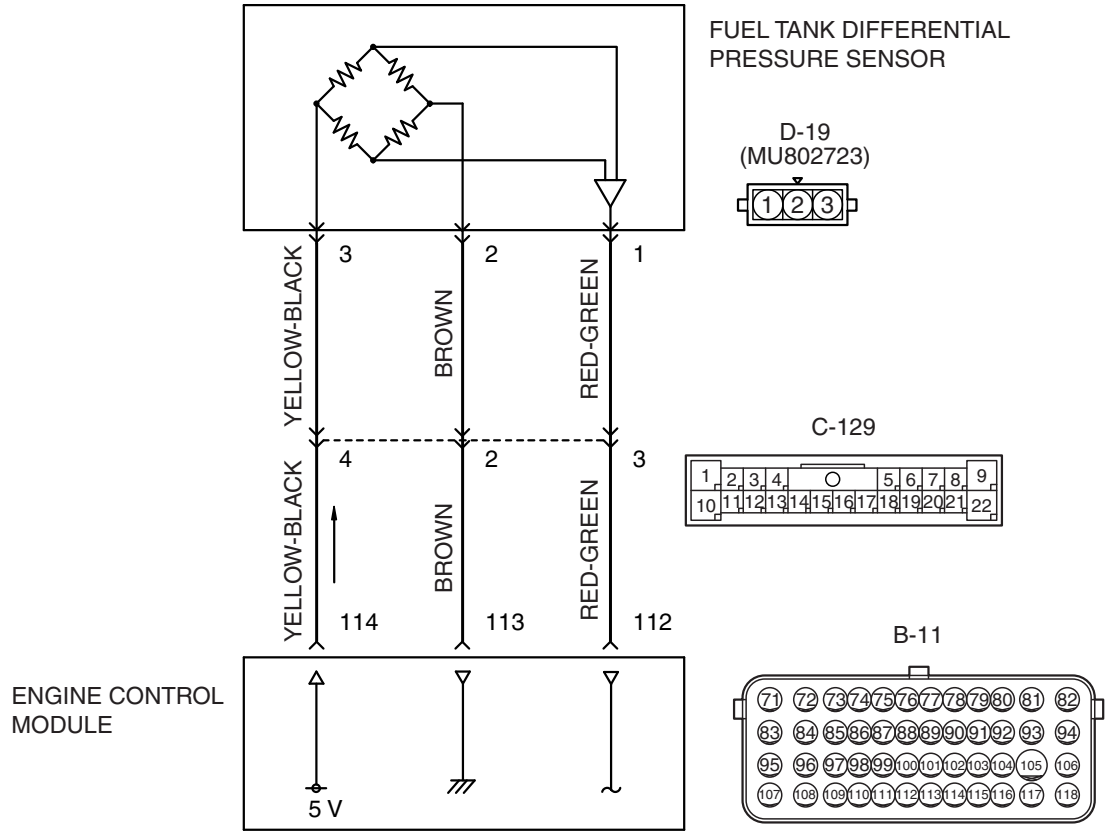
FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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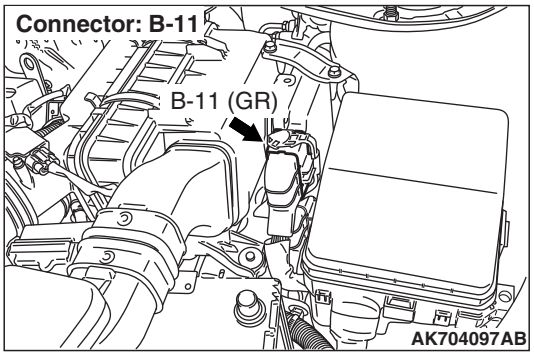

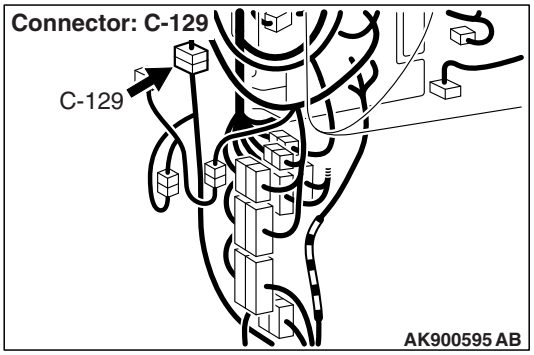

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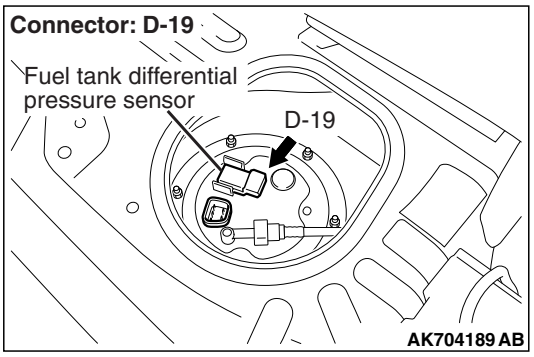


CIRCUIT OPERATION

- 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)

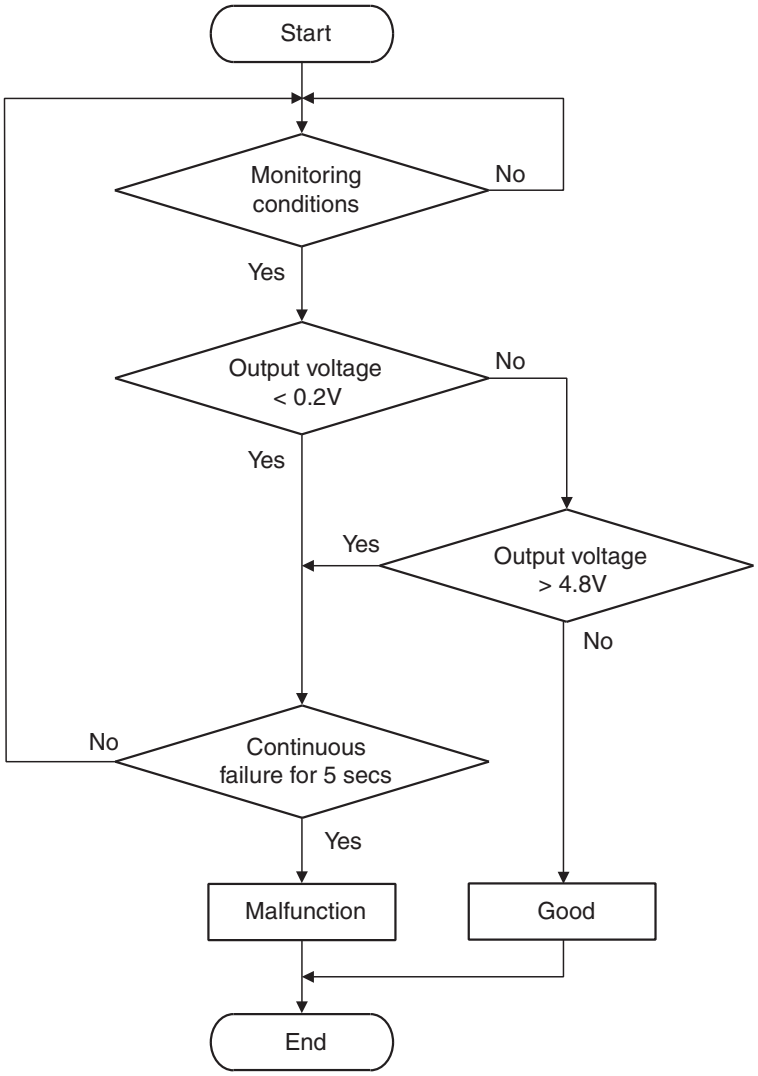
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Condition

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

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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.

TSB Revision

DIAGNOSIS

Required Special Tools:

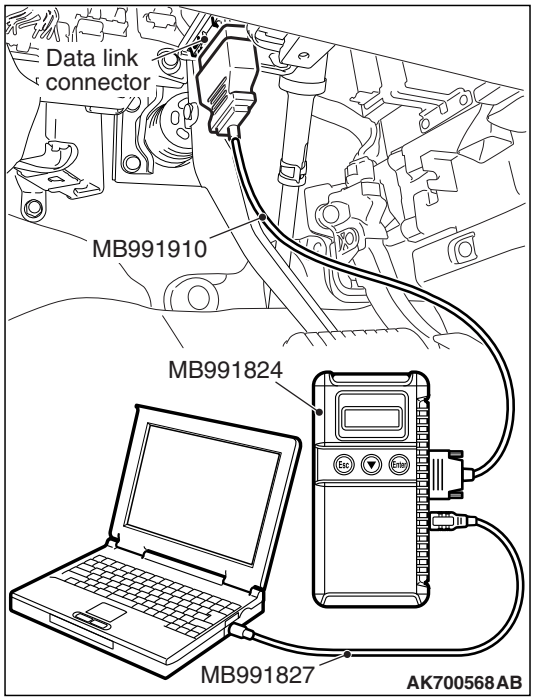
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB992110: Power Plant ECU Check Harness

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

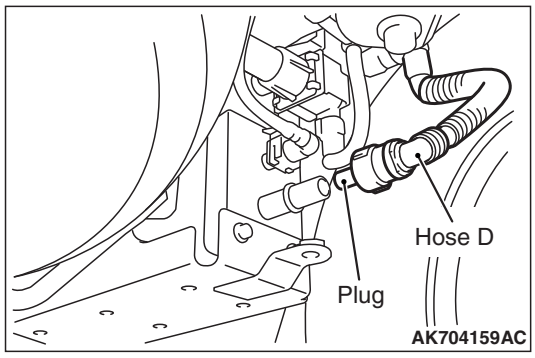
⚠ CAUTION

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.

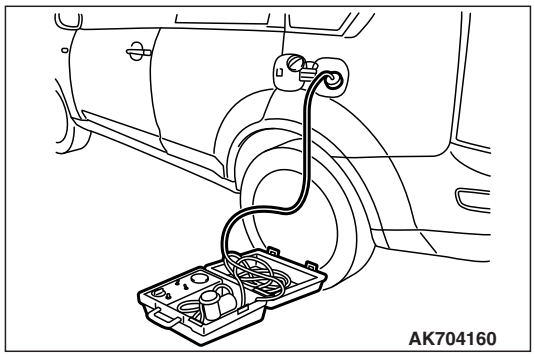


(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

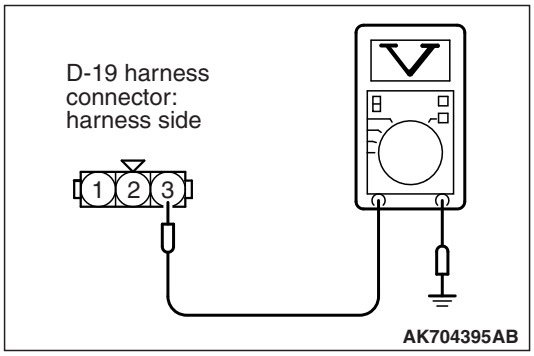
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.



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.00-15.

NO : Go to Step 2 .



STEP 2. Measure the sensor supply voltage at fuel tank differential pressure sensor connector D-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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?

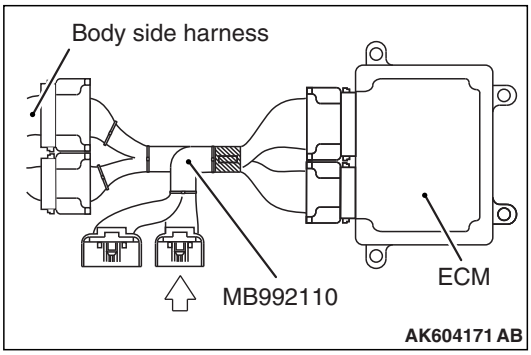
YES : Go to Step 8.
NO : Go to Step 3.

STEP 3. Check harness connector B-11 at ECM for damage.

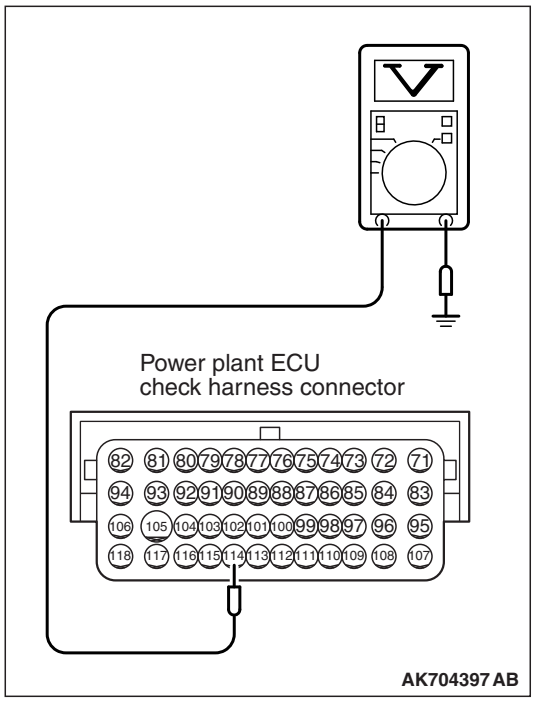
Q: Is the harness connector in good condition?

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-11 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-19 at the fuel tank differential pressure sensor for damage.

Q: Is the 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-19 (terminal No. 3) and ECM connector B-11 (terminal No. 114).

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-19 at the fuel tank differential pressure sensor for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between fuel tank differential pressure sensor connector D-19 (terminal No. 3) and ECM connector B-11 (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.

STEP 8. Check harness connector D-19 at the fuel tank differential pressure sensor and connector B-11 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

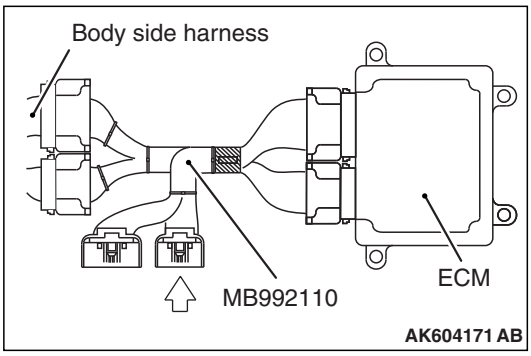
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Measure the sensor output voltage at ECM connector B-11 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



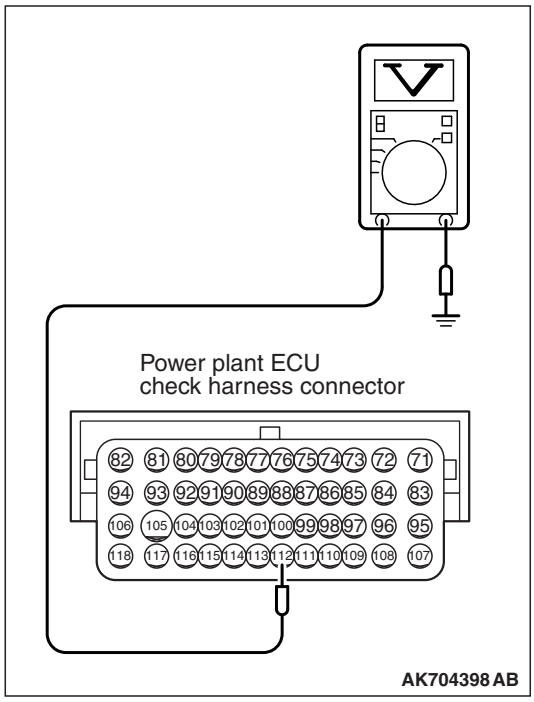
(4) Measure the voltage between terminal No. 112 and ground.
- Voltage should be between 1.5 and 3.5 volts.

(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 or short circuit to ground between fuel tank differential pressure sensor connector D-19 (terminal No. 1) and ECM connector B-11 (terminal No. 112).

Q: Is the harness wire in good condition?

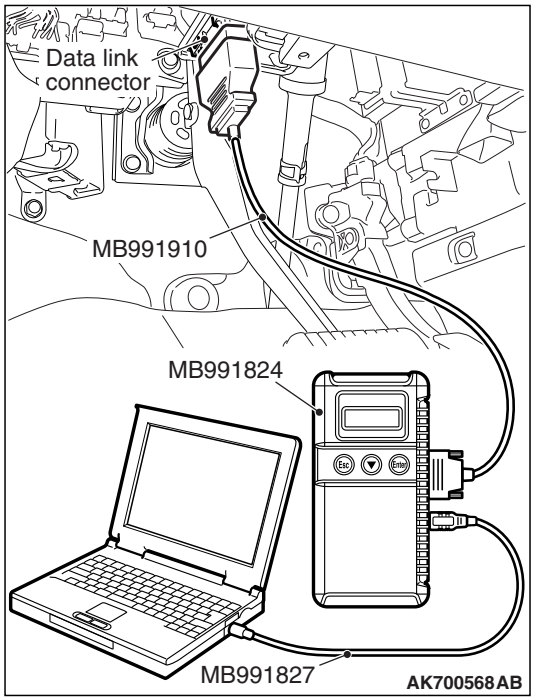
YES : Replace the fuel tank differential pressure sensor. Then go to Step 12.

NO : Repair it. Then go to Step 12.

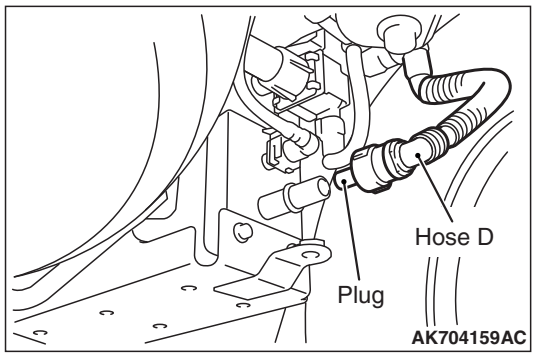
STEP 11. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ 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.

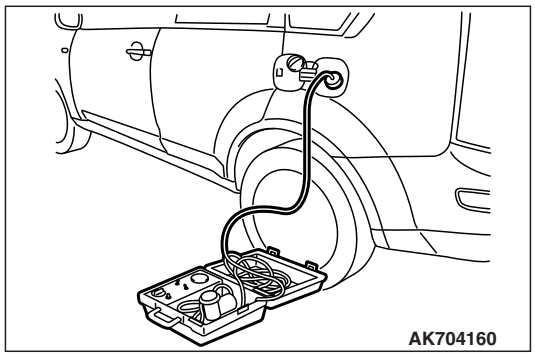


(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D 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/Intermittent Malfunctions P.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID

Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 12.

STEP 12. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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

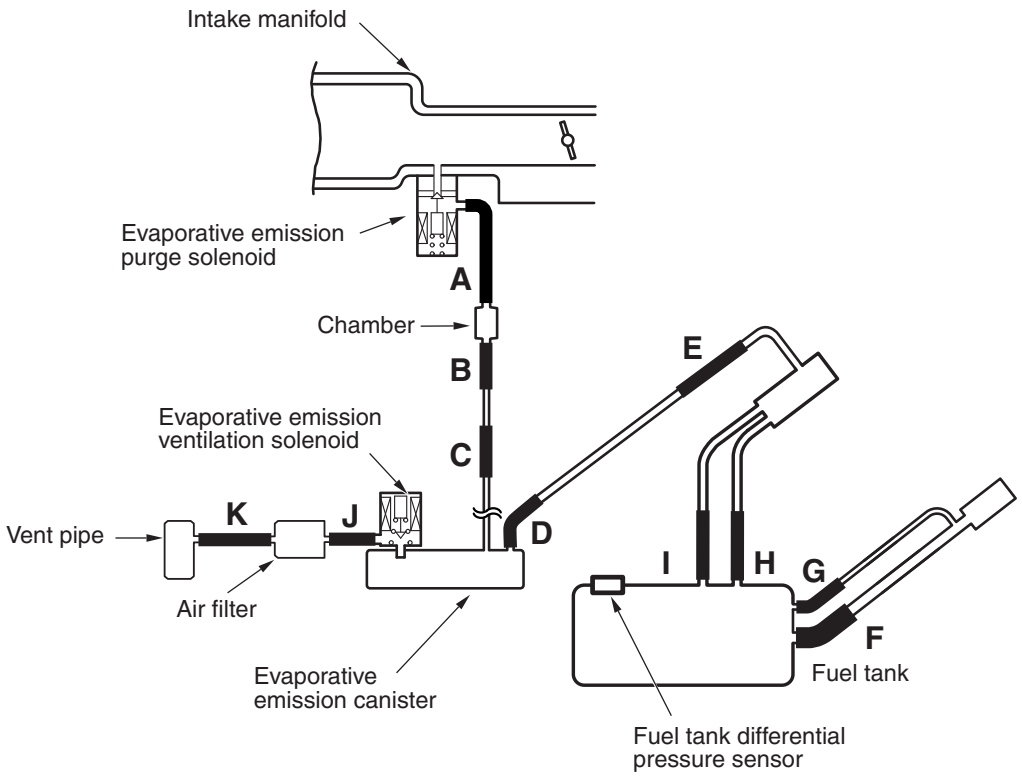
Q: Is DTC P0452 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0453: Evaporative Emission Control System Pressure Sensor High Input

System diagram



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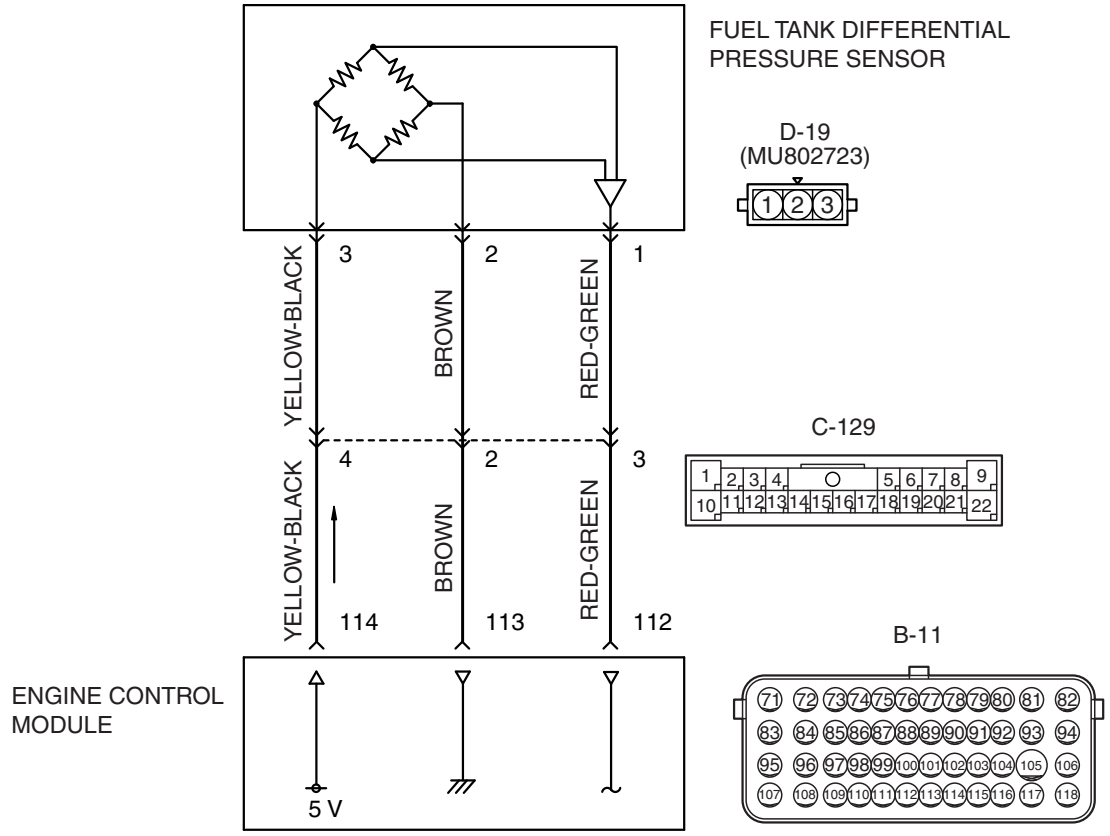
FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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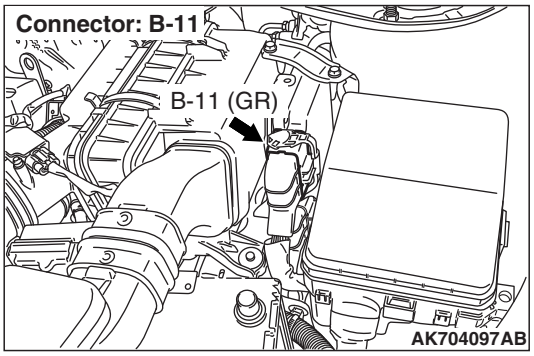

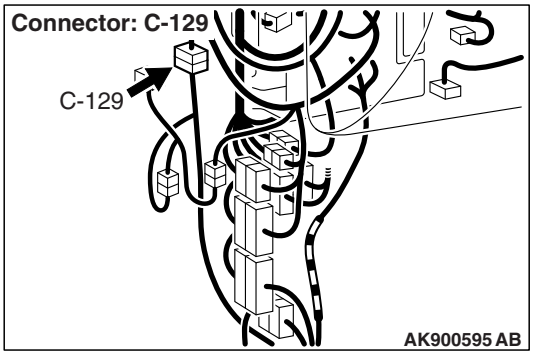

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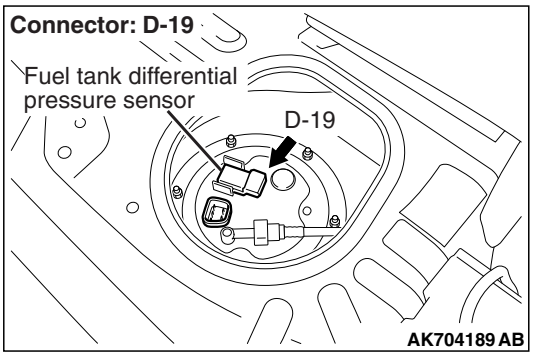


CIRCUIT OPERATION

- 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)

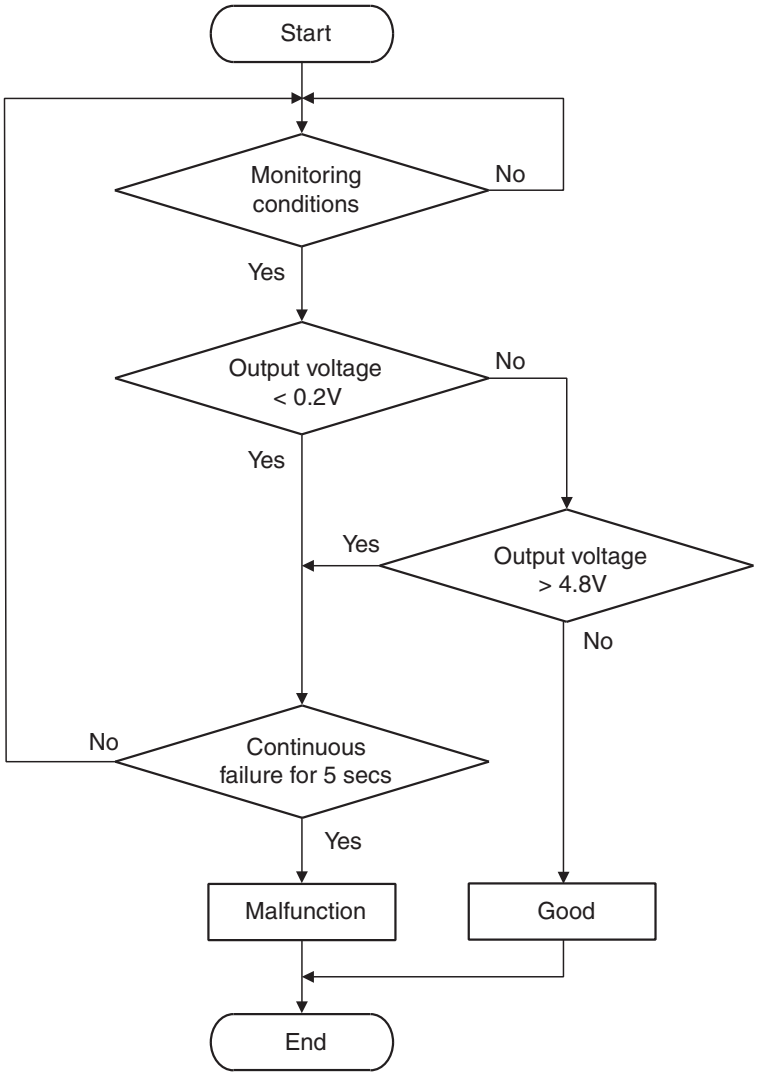
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor
- Fuel temperature sensor monitor
- Fuel level sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Remaining fuel level is 80 percent or less when the engine is started.

Judgement Criterion

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

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

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.

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DIAGNOSIS

Required Special Tools:

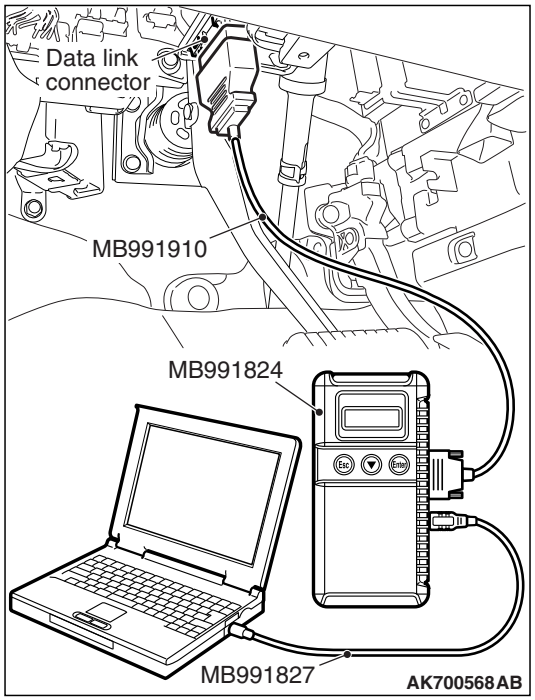
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

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

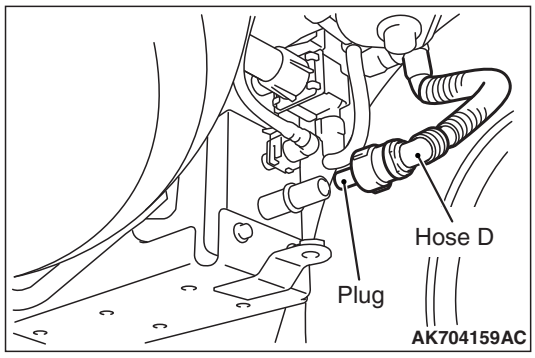
⚠ CAUTION

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.

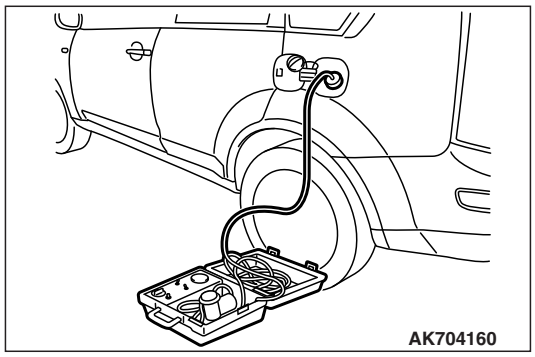


(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

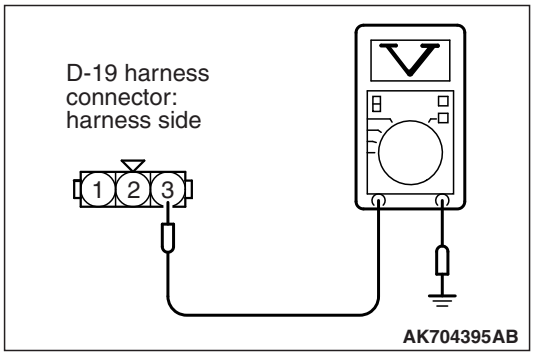
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.



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.00-15).

NO : Go to Step 2 .



STEP 2. Measure the ground voltage at fuel tank differential pressure sensor connector D-19 by backprobing.

(1) Do not disconnect the connector D-19.
(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-19 at the fuel tank differential pressure sensor and harness connector B-11 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 7.

STEP 4. Check for open circuit between fuel tank differential pressure sensor connector D-19 (terminal No. 2) and ECM connector B-11 (terminal No. 113).

Q: Is the harness wire in good condition?

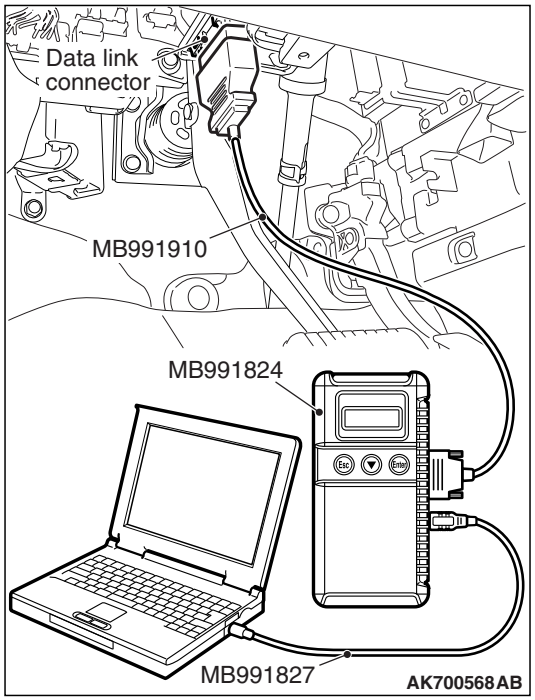
YES : Go to Step 5.
NO : Repair it. Then go to Step 7.

STEP 5. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

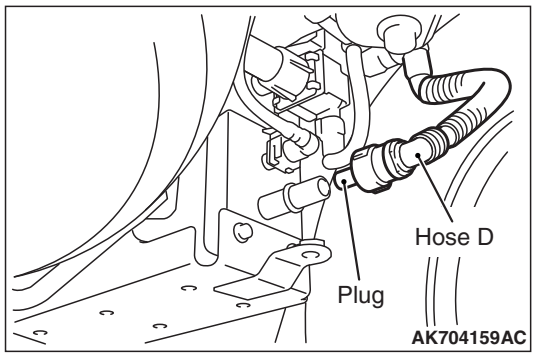
⚠ CAUTION

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.

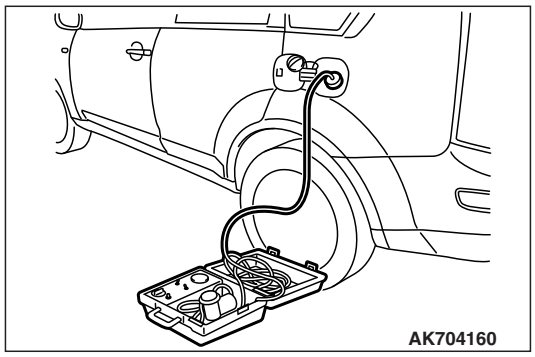


(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- Output voltage should be between 1,500 to 3,500 mV.



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

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D 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.00-15.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles

with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 7.

STEP 6. Check harness connector D-19 at the fuel tank differential pressure sensor and harness connector B-11 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 7.

NO : Repair or replace it. 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.13A-11.

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

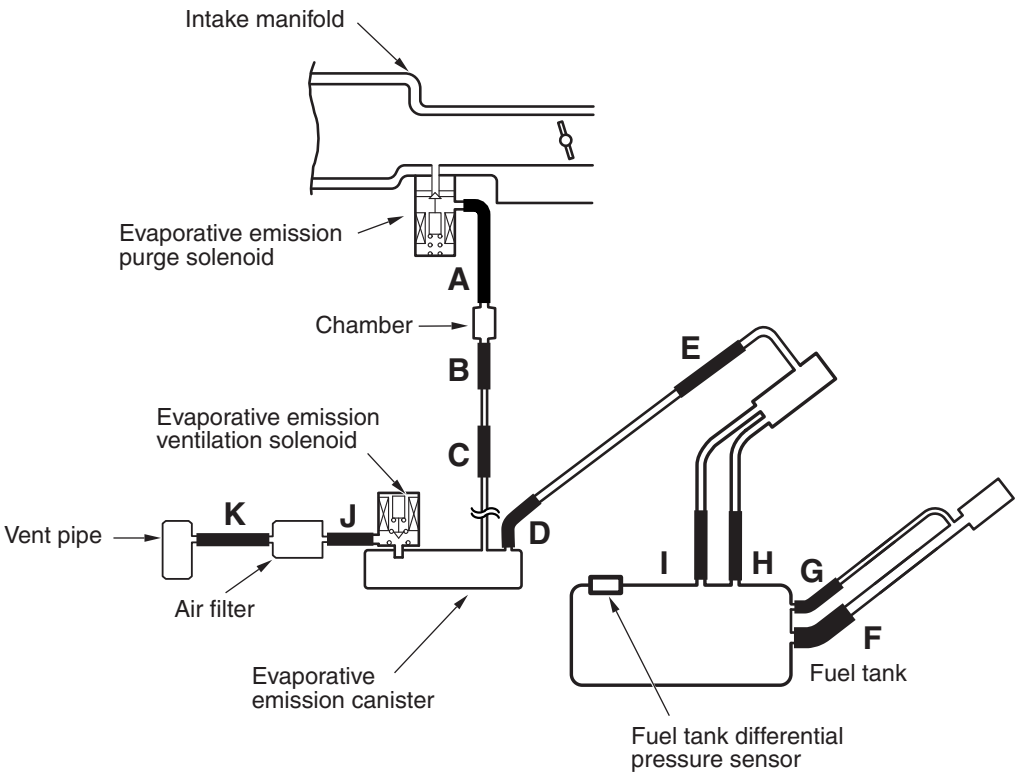
Q: Is DTC P0108 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0455: Evaporative Emission Control System Leak Detected (gross leak)

System diagram



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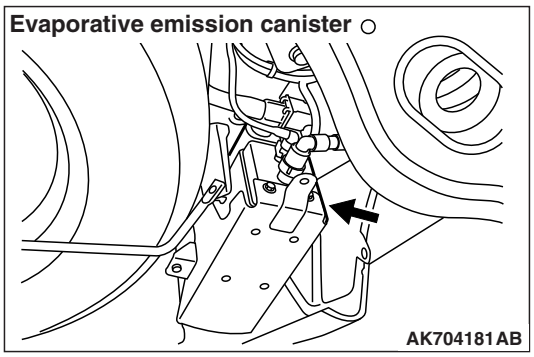
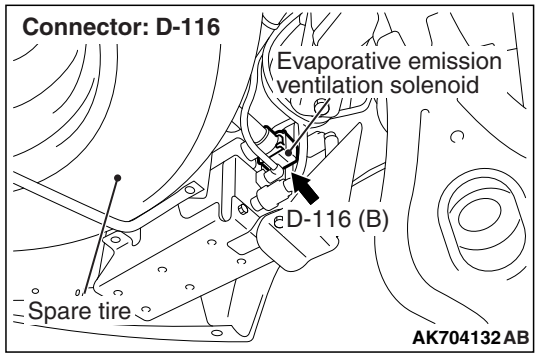
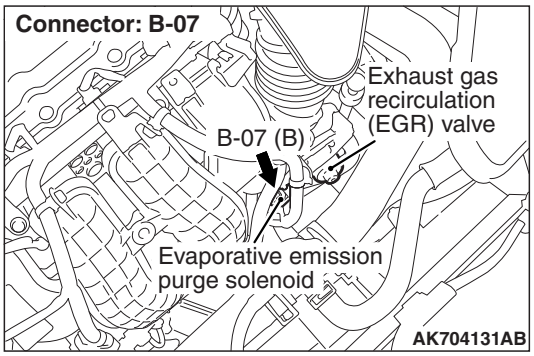






TECHNICAL DESCRIPTION

- 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)

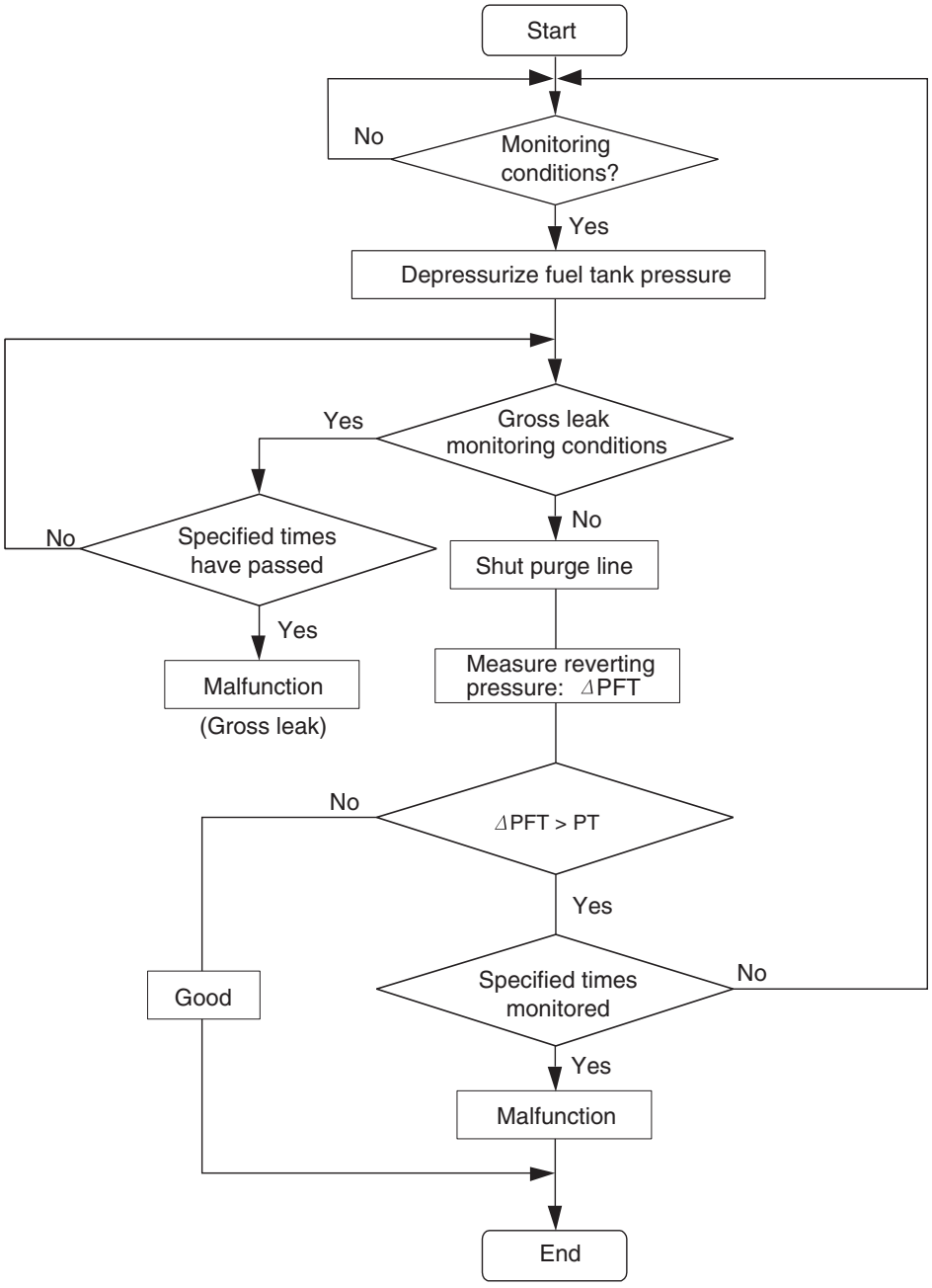
- Not applicable

Sensor (The sensors below are determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is 36°C (97°F) or less when the engine is started.
- Engine coolant temperature is higher than 60°C (140°F). <Amount of remaining fuel is 15 – 40 percent of capacity>
- Engine coolant temperature is higher than 20°C (67°F). <Amount of remaining fuel is 40 – 85 percent of capacity>
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- Volumetric efficiency is between 20 and 70 percent.
- Engine speed is 1,594 r/min or higher.

TSB Revision

- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.13 in.Hg). <Amount of remaining fuel is 15 – 40 percent of capacity>
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg). <Amount of remaining fuel is 40 – 85 percent of capacity>
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than 5°C (41°F)
- Fuel tank temperature is less than 36°C (97°F).
- Fuel tank differential pressure sensor output voltage is 1.0 – 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.

Judgment Criterion

- The fuel tank internal pressure is 1,961 Pa (0.284 psi) or more after the evaporative emission purge solenoid valve has been driven when the fuel tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11.

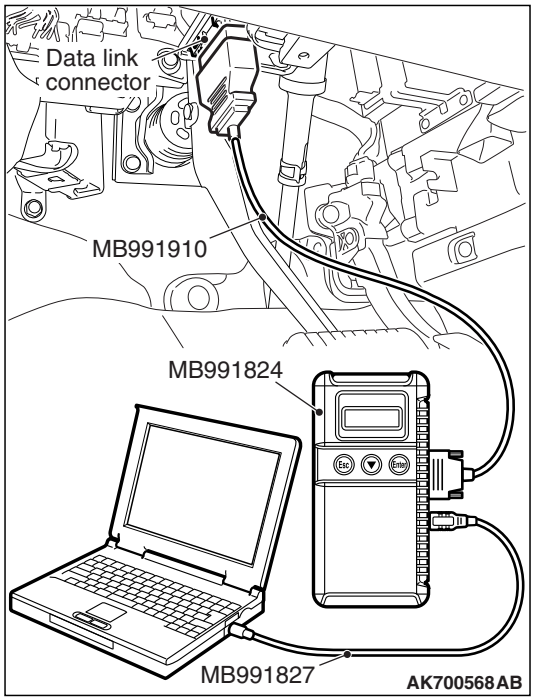
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

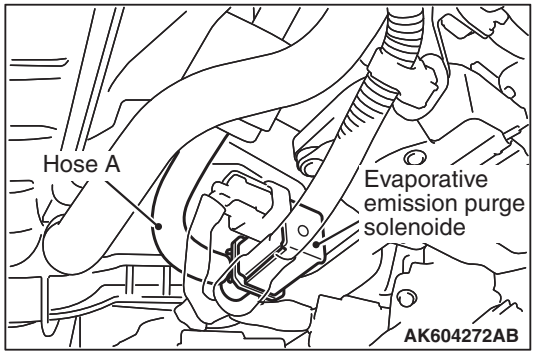
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select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

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

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-49. If no other DTC's have been set, go to Step 2 .

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

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1 .

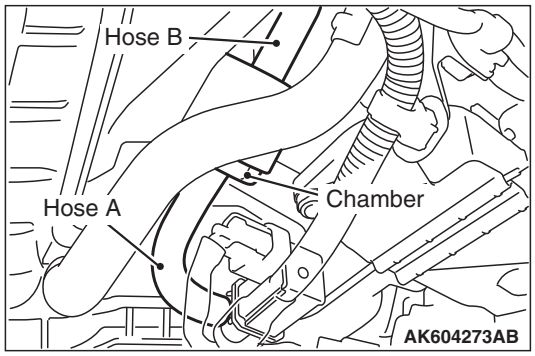


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand pump (pressure-application type) to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand pump (pressure-application type) to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3 .
NO : Replace the evaporative emission purge solenoid. Then go to Step 13 .

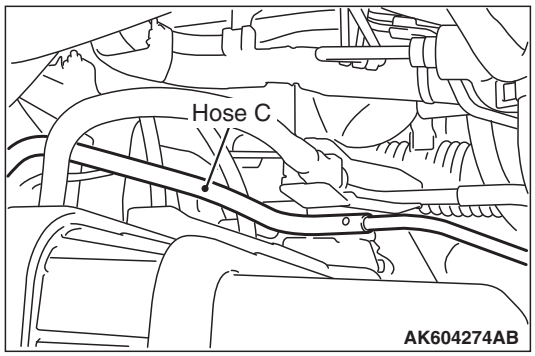


STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4 .
NO : Replace any damaged hose or chamber. Then go to Step 13 .

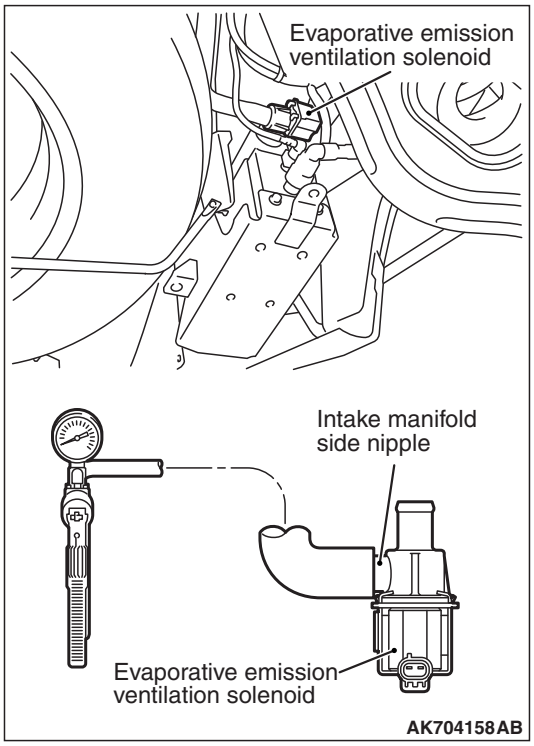


STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5 .
NO : Replace any damaged hose. Then go to Step 13 .



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

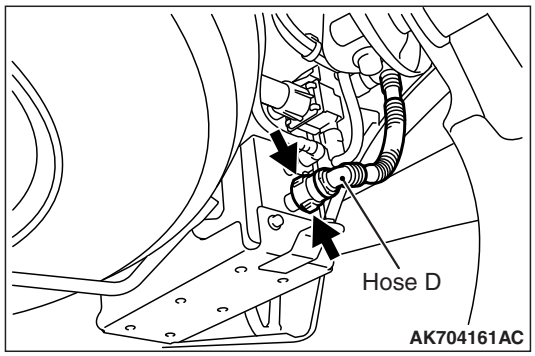
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator testing mode for 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.

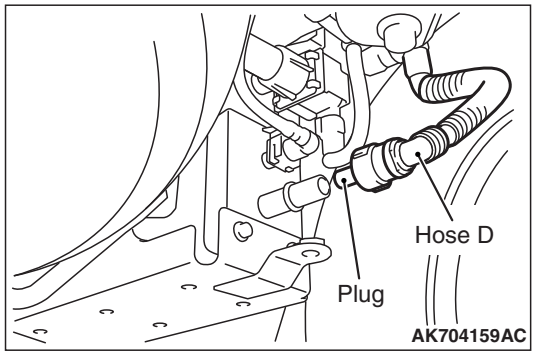
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6 .
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 13 .

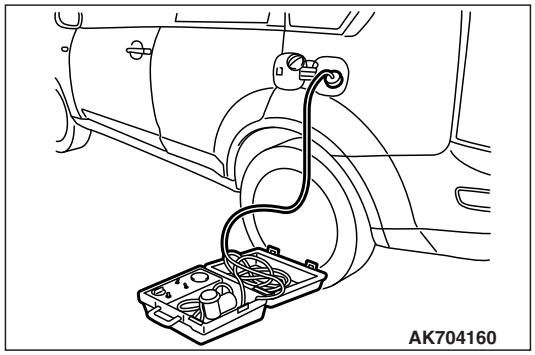
STEP 6. Perform the pressure test on the evaporative emission system.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose D.
(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.

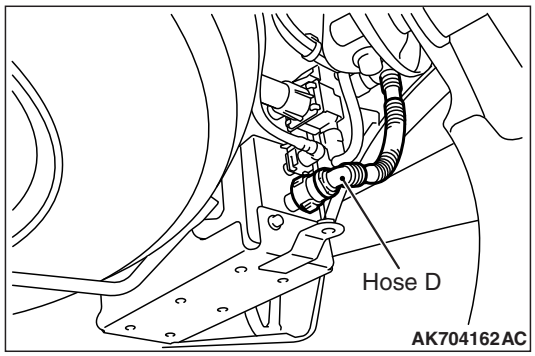
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

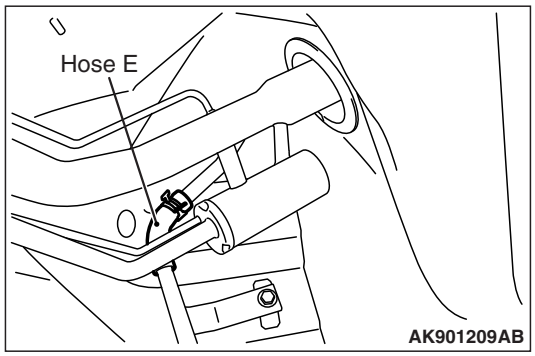
Q: Is the evaporative emission system line free of leaks?

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

STEP 7. Check for leaks in evaporative emission hoses D and E.

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





Q: Do the hoses hold vacuum?

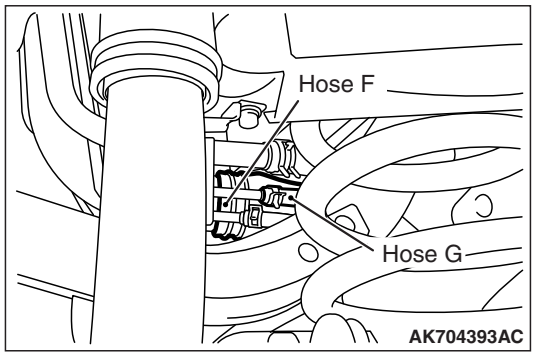
YES : Go to Step 8 .

NO : Replace any damaged hose. Then go to Step 13 .

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

(1) Remove the fuel tank assembly.

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



Q: Do the hoses hold vacuum?

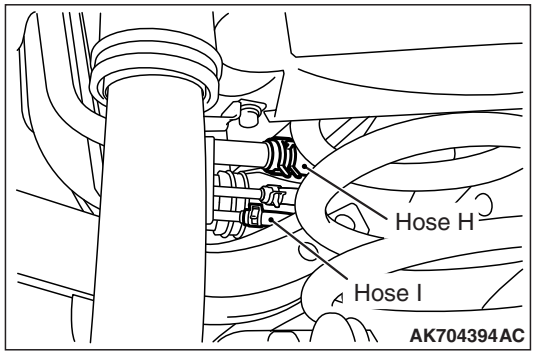
YES : Go to Step 9 .

NO : Replace any damaged hose. Then go to Step 13 .

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

(1) Remove the fuel tank assembly.

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



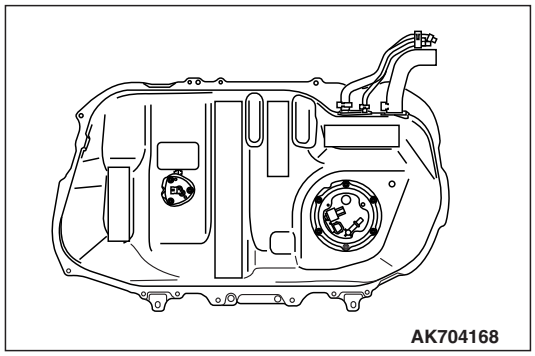
Q: Does the hose hold vacuum?

YES : Go to Step 10 .

NO : Replace the hose and reinstall the fuel tank assembly. Then go to Step 13 .

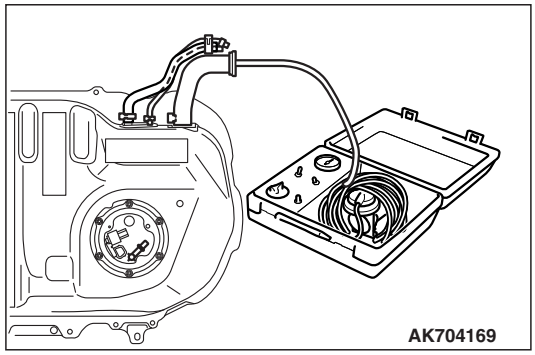
TSB Revision

STEP 10. Check for leaks in the fuel tank.


AK704168

(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.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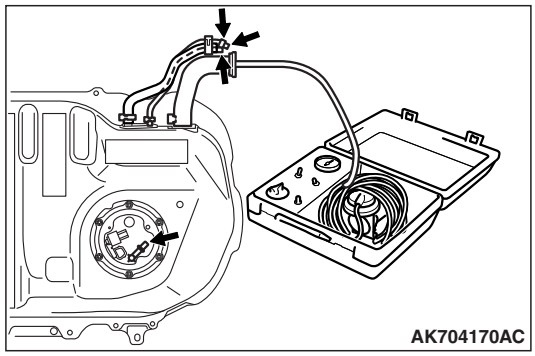
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.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(3) Plug the hose and the nipple shown in the illustration.

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.

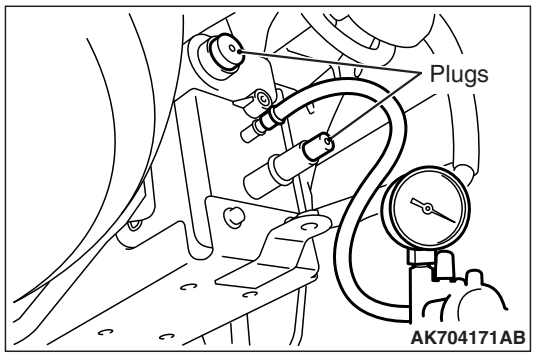
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13 .

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Go to Step 13 .

NO : When there is no leak, reinstall the fuel tank. Then go to Step 11 .



STEP 11. 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 12 .
NO : Replace the evaporative emission canister. Then go to Step 13 .

STEP 12. 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 "System Test."
(6) Select "Evap Leak Mon."
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 13 .
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 13 .
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 12 .

TSB Revision

STEP 13. Perform the OBD-II drive cycle.

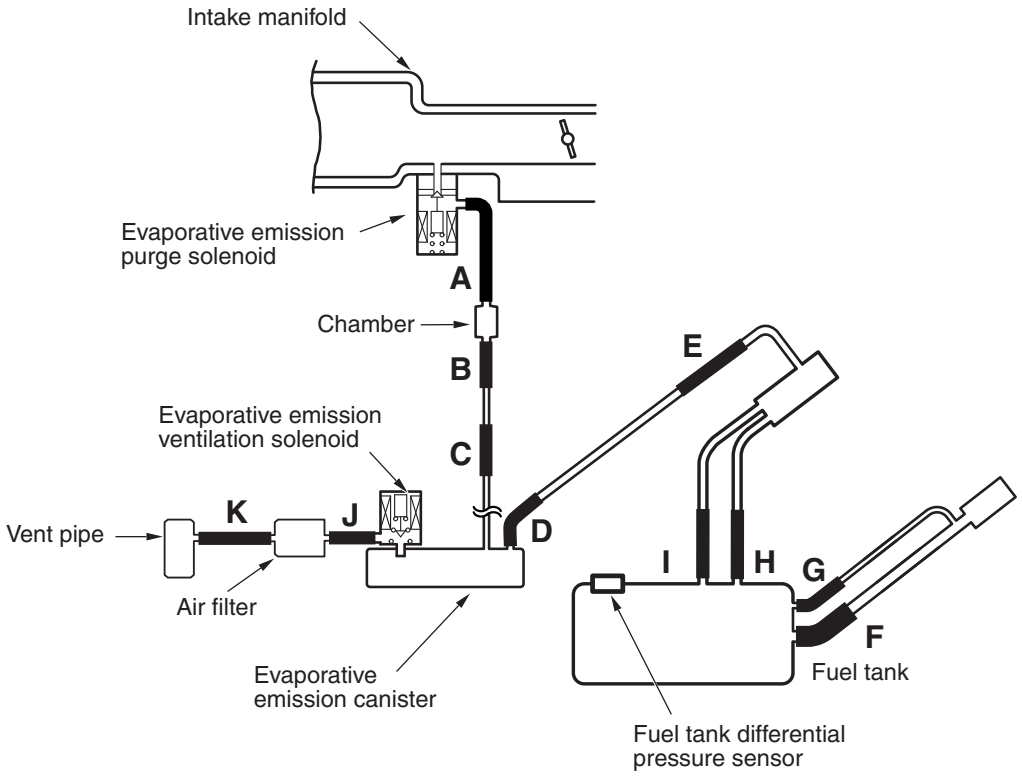
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 5 P.13A-11).
(2) Read the DTC.

Q: Is DTC P0455 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0456: Evaporative Emission Control System Leak Detected (very small leak)

System diagram



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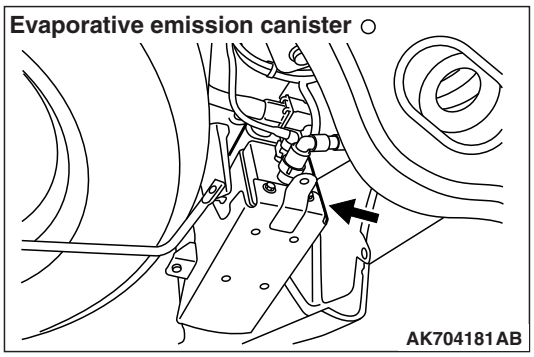
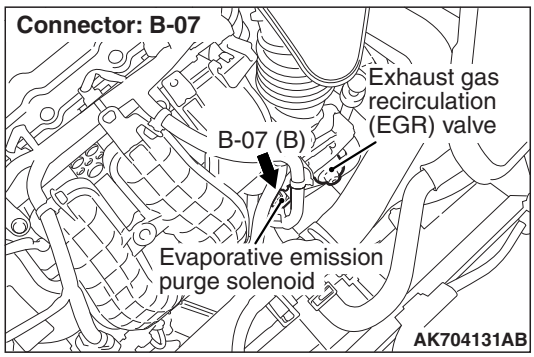
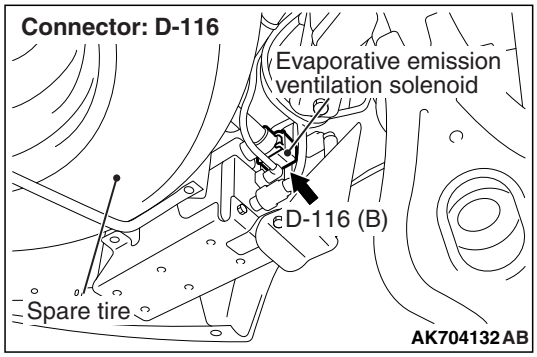




TSB Revision



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)

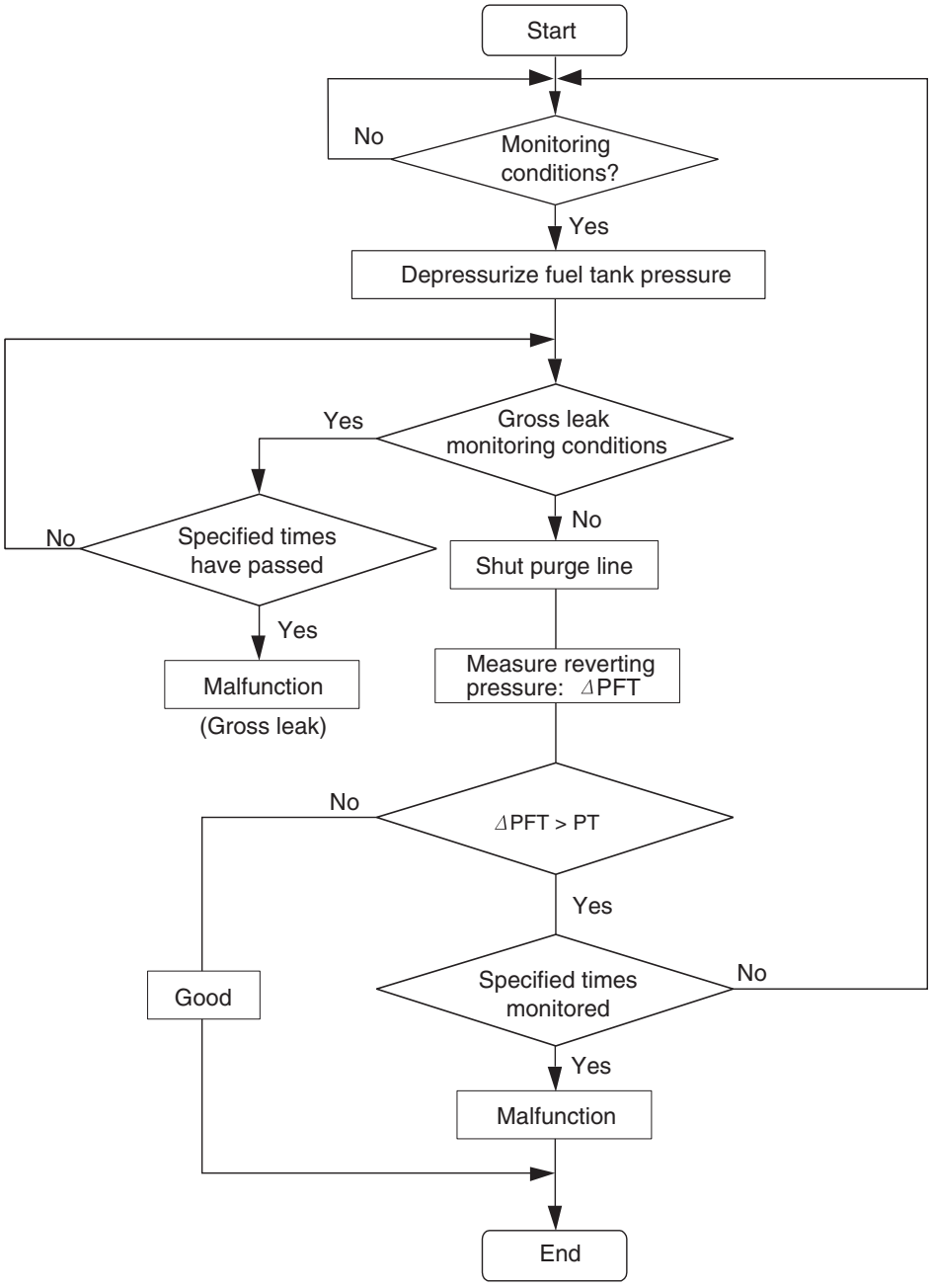
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

Conditions

- Engine coolant temperature is 36°C (97°F) or less when the engine is started.
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- Engine coolant temperature is higher than 20°C (67°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.09 in.Hg).
- Amount of remaining fuel is 40 – 85 percent of capacity.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10°C (14°F)

TSB Revision

- Fuel tank temperature is less than 33°C (91°F).
- Fuel tank differential pressure sensor output voltage is 1.0 – 4.0 volts.
- At least 10 seconds have passed since the last monitor was complete.

Judgement Criterion

- Internal pressure of the fuel tank has changed more than 1,177 – 1,497 Pa (0.177 – 0.217 psi) in 88 seconds after the tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-11.

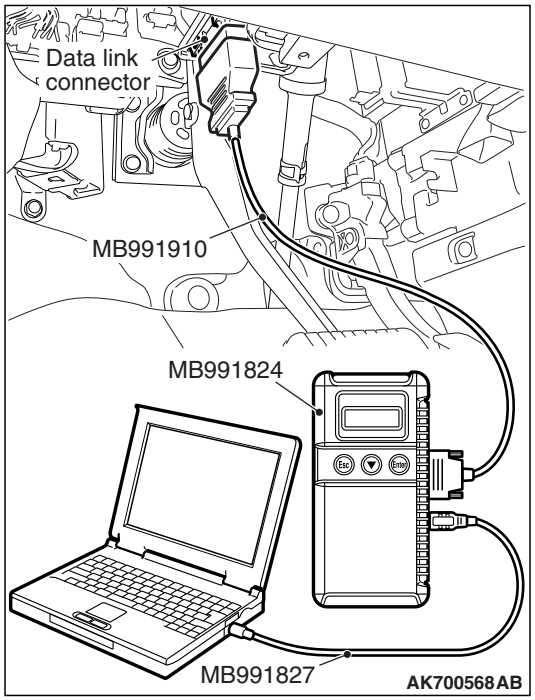
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- 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: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

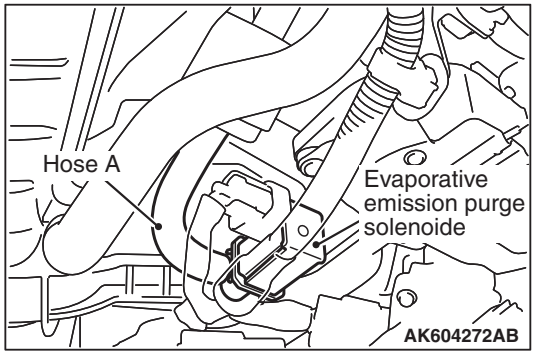
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select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

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

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-49. If no other DTC's have been set, go to Step 2 .

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

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1 .

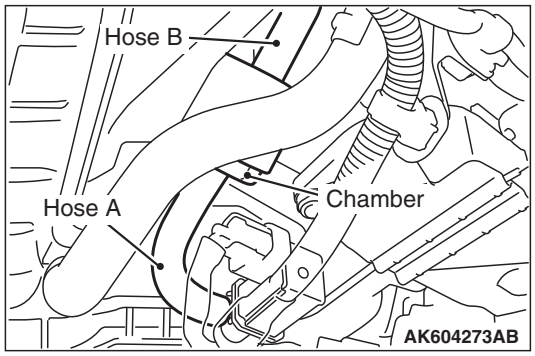


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand pump (pressure-application type) to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand pump (pressure-application type) to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold pressure?

YES : Go to Step 3 .
NO : Replace the evaporative emission purge solenoid. Then go to Step 13 .

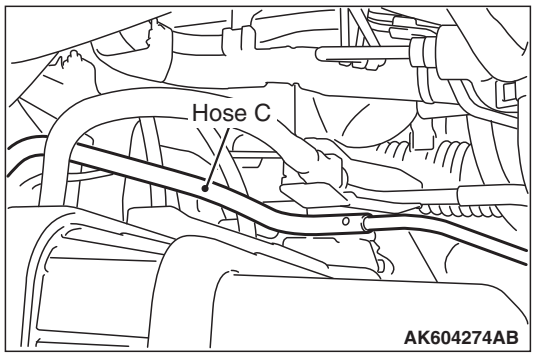


STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4 .
NO : Replace any damaged hose or chamber. Then go to Step 13 .

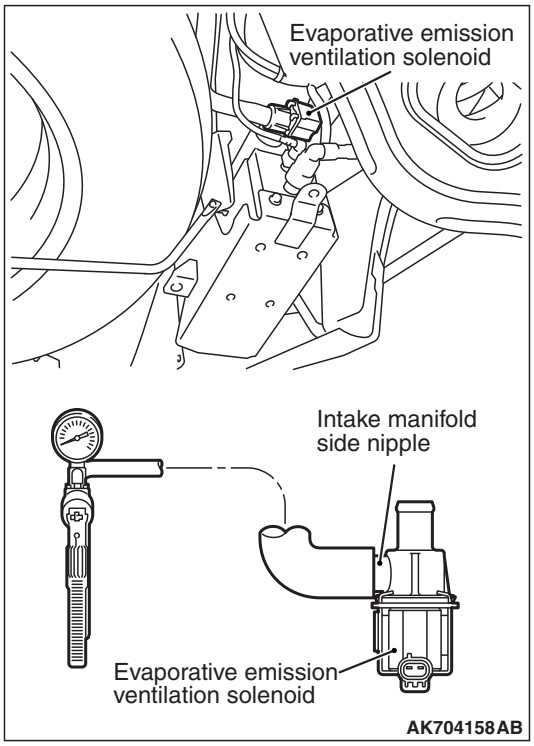


STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5 .
NO : Replace any damaged hose. Then go to Step 13 .



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

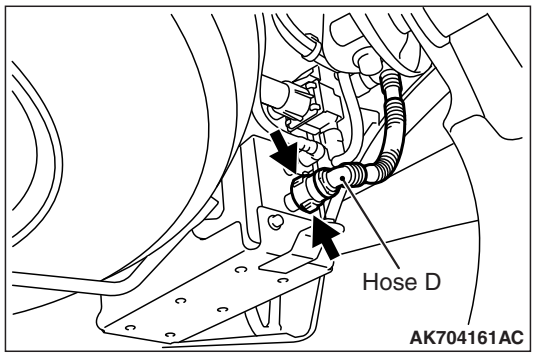
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator testing mode for 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.

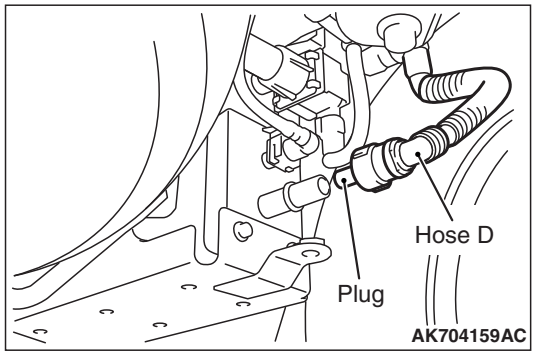
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6 .
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 13 .

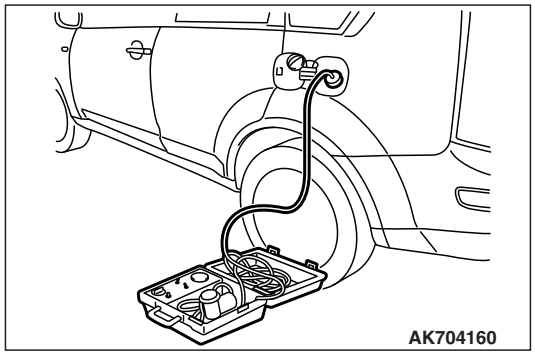
STEP 6. Perform the pressure test on the evaporative emission system.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Install hose D after having installed plug from canister in a nipple part of illustration so that there is not a leak.
(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.

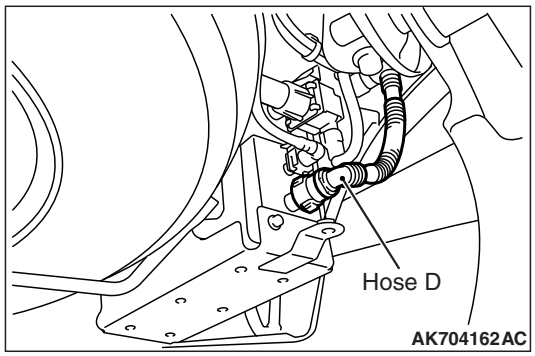
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

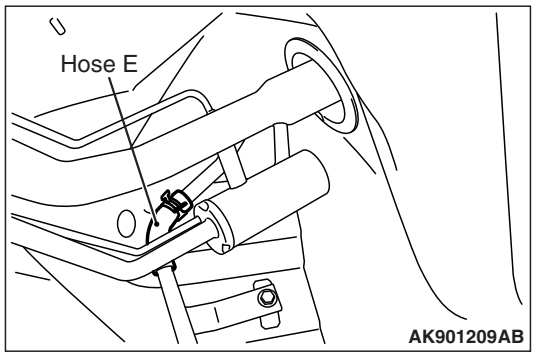
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

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

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

STEP 7. Check for leaks in evaporative emission hoses D and E.





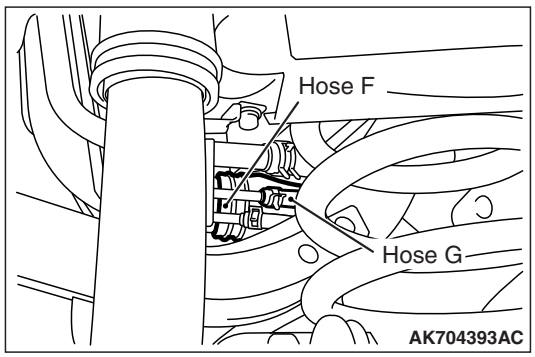
Use a hand vacuum pump to test each hose D and E.

Q: Do the hoses hold vacuum?

YES : Go to Step 8 .

NO : Replace any damaged hose. Then go to Step 13 .

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



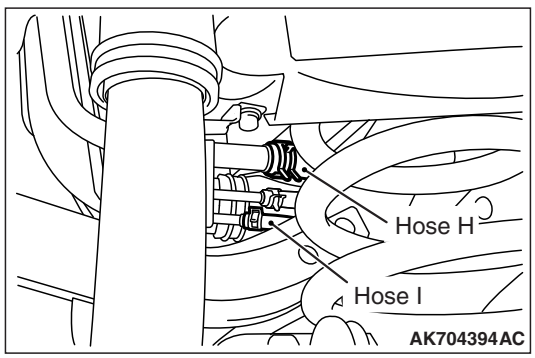
1. Remove the fuel tank assembly
2. Use a hand vacuum pump to test each hose F and G.

Q: Do the hoses hold vacuum?

YES : Go to Step 9 .

NO : Replace any damaged hose. Then go to Step 13 .

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



(1) Remove the fuel tank assembly.

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

Q: Does the hose hold vacuum?

YES : Go to Step 10 .

NO : Replace the hose and reinstall the fuel tank assembly. Then go to Step 13 .

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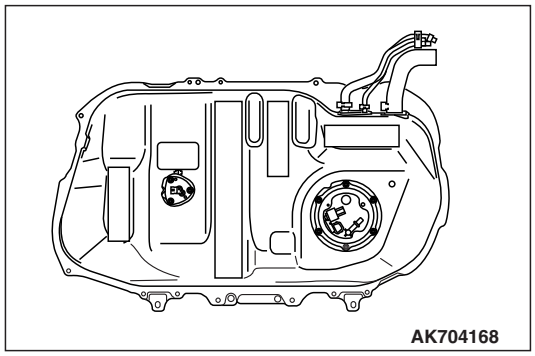
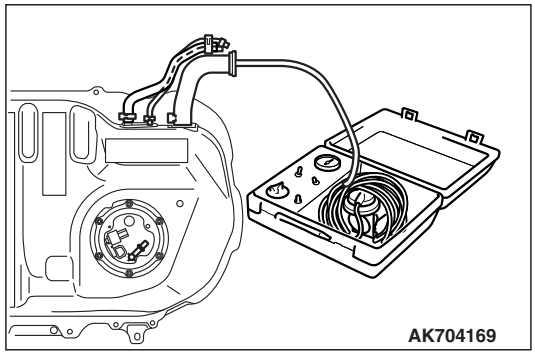
STEP 10. Check for leaks in the fuel tank.


AK704168

(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.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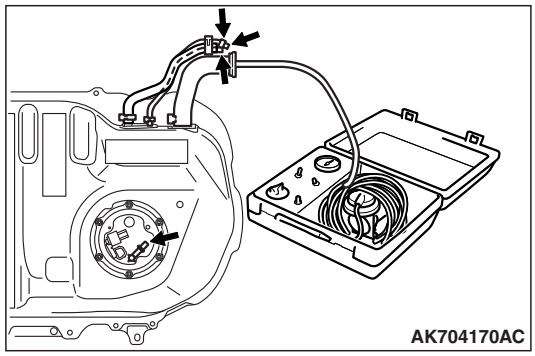
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.


AK704170AC

(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.

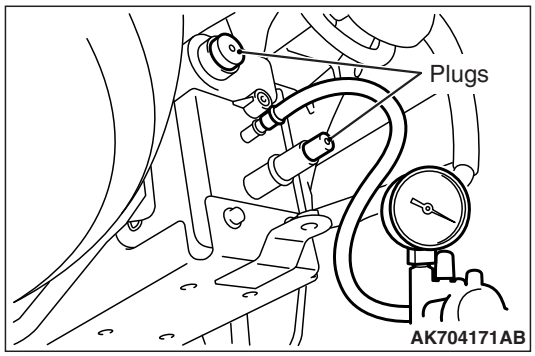
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

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.> : Repair or replace the leaked parts and check again that there are no leaks. Then reinstall the fuel tank. Then go to Step 13 .

YES <When there is a leak from the fuel tank.> : Replace the fuel tank. Go to Step 13 .

NO : When there is no leak, reinstall the fuel tank. Then go to Step 11 .



STEP 11. 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 12 .
NO : Replace the evaporative emission canister. Then go to Step 13 .

STEP 12. 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 "System Test."
(6) Select "Evap Leak Mon."
(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 Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 13 .
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 13 .
NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 12 .

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STEP 13. Perform the OBD-II drive cycle.

(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 6 P.13A-11).
(2) Read the DTC.

Q: Is DTC P0456 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0461: Fuel Level Sensor <FWD> or Fuel Level Sensor (main) <AWD> Circuit Range/performance

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and seconds it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

- Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

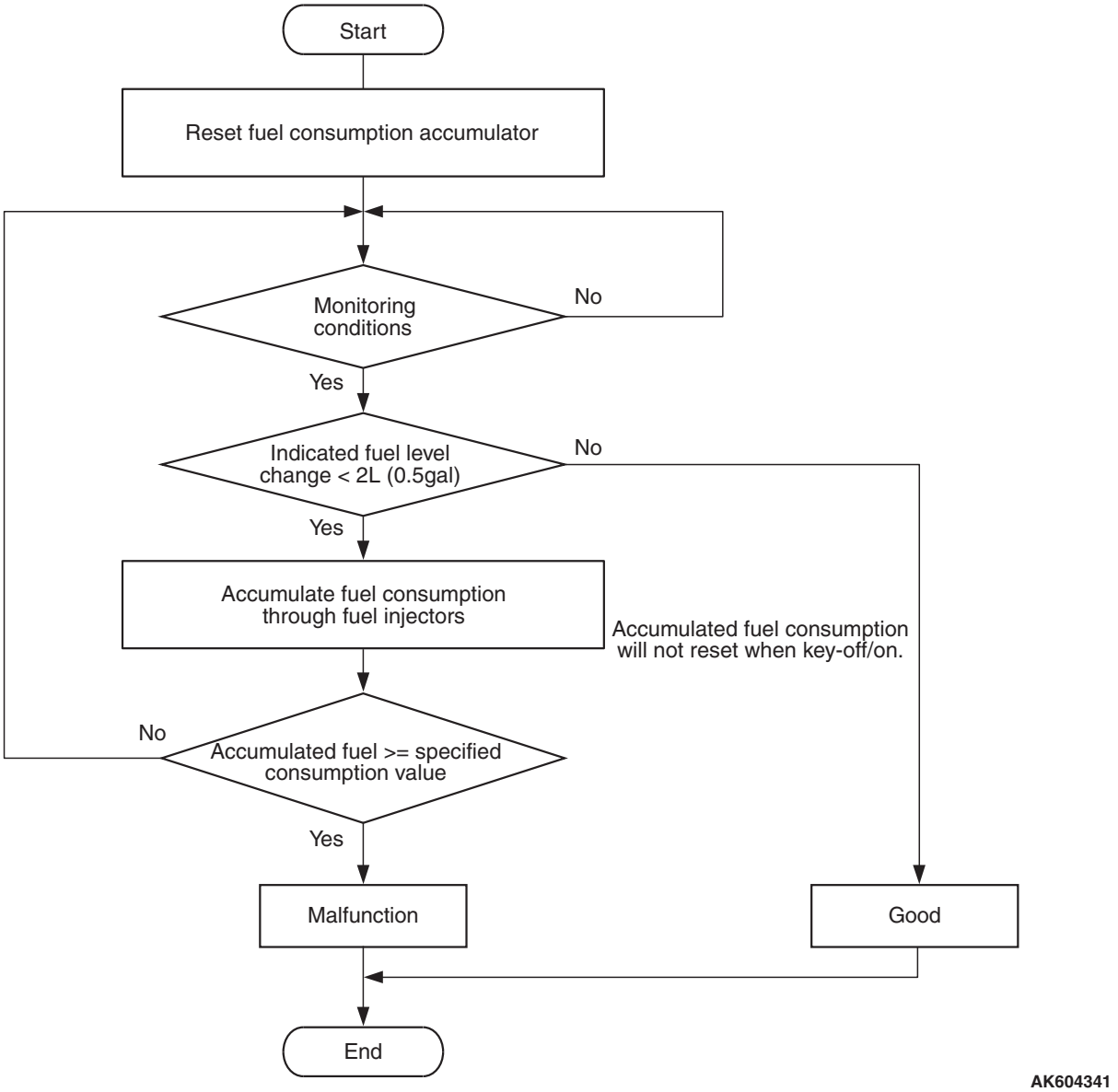
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 20 liters (5.3 gal) <FWD> or 30 liters (7.9 gal) <AWD>, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liters (0.5 gal) or less.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Combination meters assembly failed.
- Fuel level sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

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

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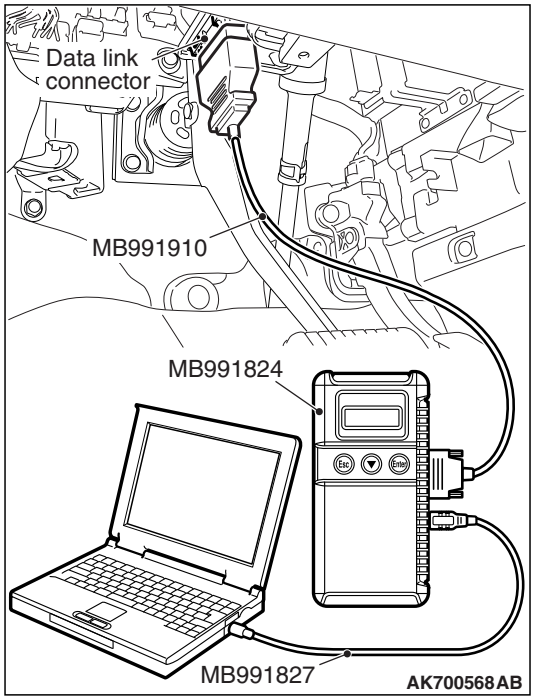
- MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the combination meter 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 combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter-DTC set?

YES : Refer to GROUP 54A, Combination Meter – Diagnosis Trouble Code Chart P.54A-34
NO : Go to Step 2.

STEP 2. 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 P0461 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 3.
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.00-15.

STEP 3. 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 P0461 set?

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

TSB Revision

DTC P0462: Fuel Level Sensor <FWD> or Fuel Level Sensor (main) <AWD> Circuit Low Input

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

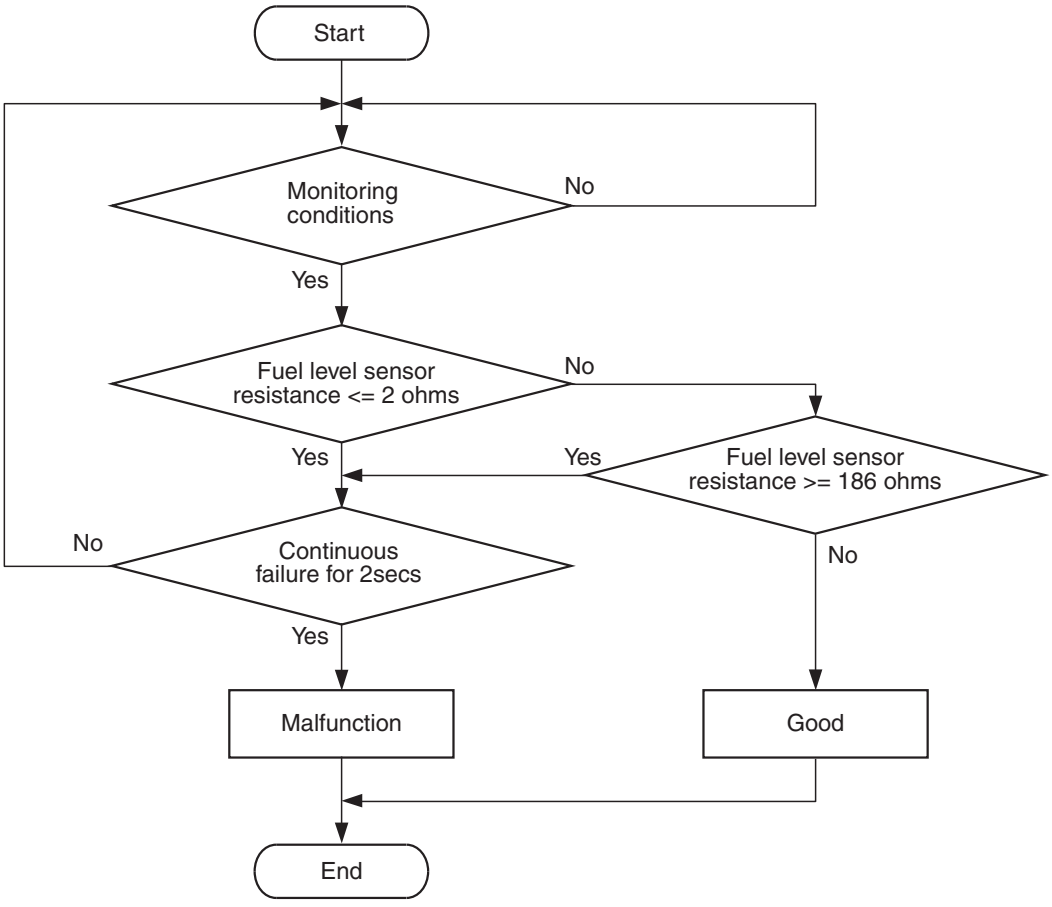
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

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

TSB Revision

Judgement Criterion

- Fuel level sensor resistance has continued to be lower than 2 ohms for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

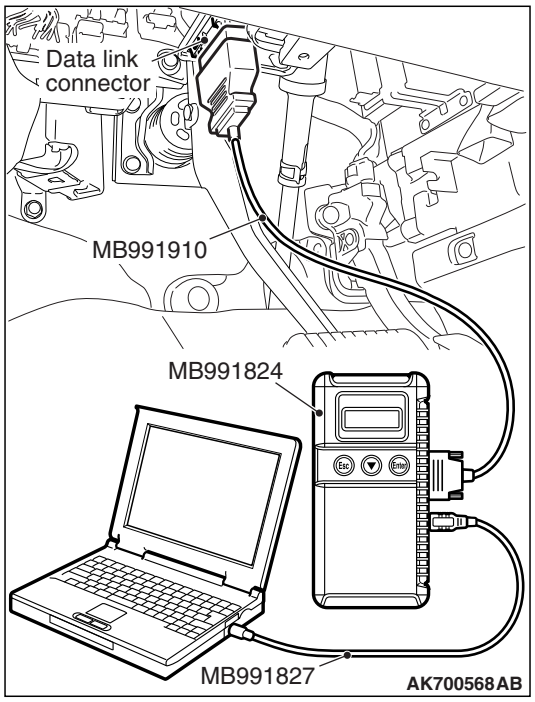
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel level sensor failed.
- Combination meters assembly 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



STEP 1. Using scan tool MB991958, read the combination meter 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 combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter DTC set?

YES : Refer to GROUP 54A, Combination Meter – Diagnosis Trouble Code Chart P.54A-34

NO : Go to Step 2.

STEP 2. 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.13A-11.

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

Q: Is DTC P0462 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 3.

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.00-15.

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.13A-11.

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

Q: Is DTC P0462 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0463: Fuel Level Sensor Circuit High Input

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

An open circuit is detected while monitoring the fuel level sensor output.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

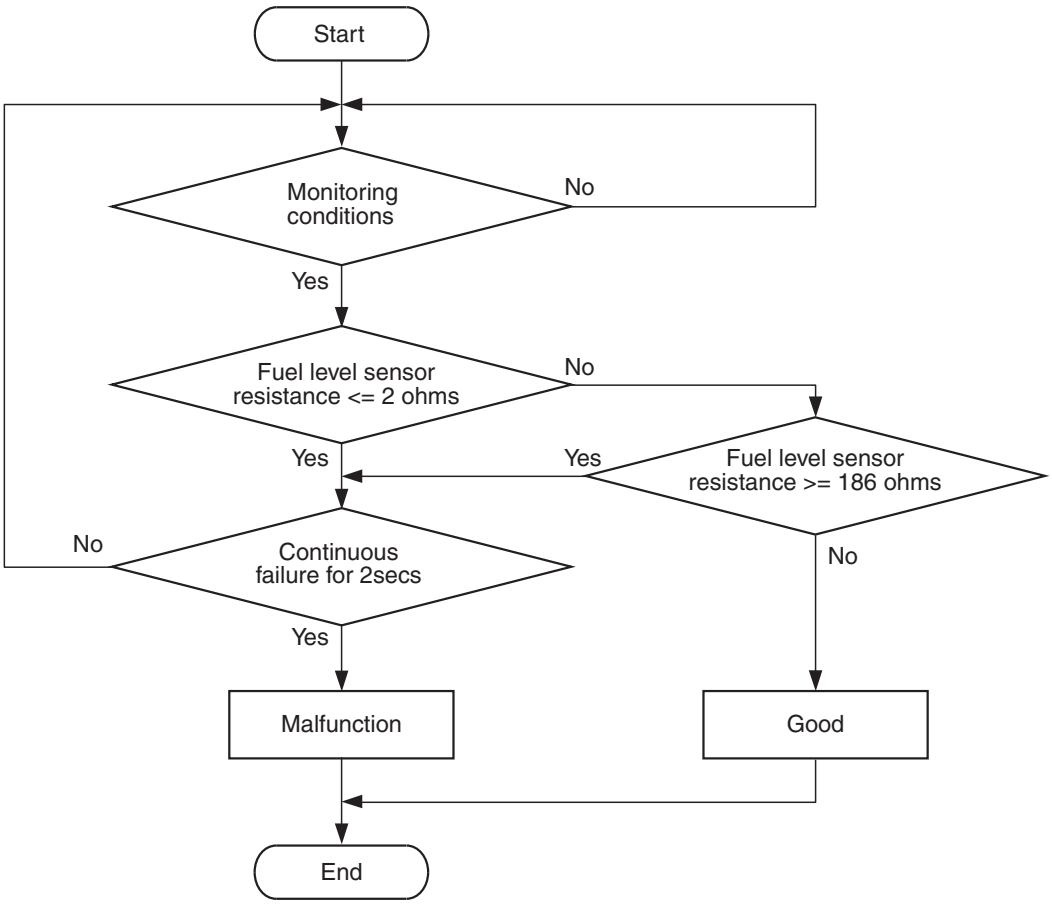
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604342

Check Conditions

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

Judgement Criterion

- Fuel level sensor resistance has continued to be higher than 186 ohms for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 23 P.13A-11.

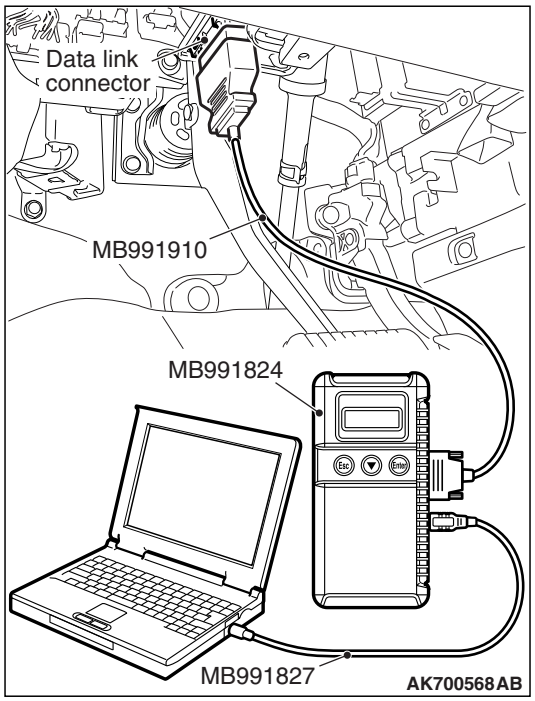
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel level sensor failed.
- Combination meters assembly 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



STEP 1. Using scan tool MB991958, read the combination meter 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 combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter DTC set?

YES : Refer to GROUP 54A, Combination Meter – Diagnosis Trouble Code Chart P.54A-34
NO : Go to Step 2.

STEP 2. 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.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0463 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Code Registration Judgment Table <Vehicles with KOS> P.42B-15 or GROUP 42C, Diagnosis – ID Code Registration Judgment Table <Vehicles with WCM> P.42C-10. Then go to Step 3.
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.00-15.

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.13A-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0463 set?

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

Next>>

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