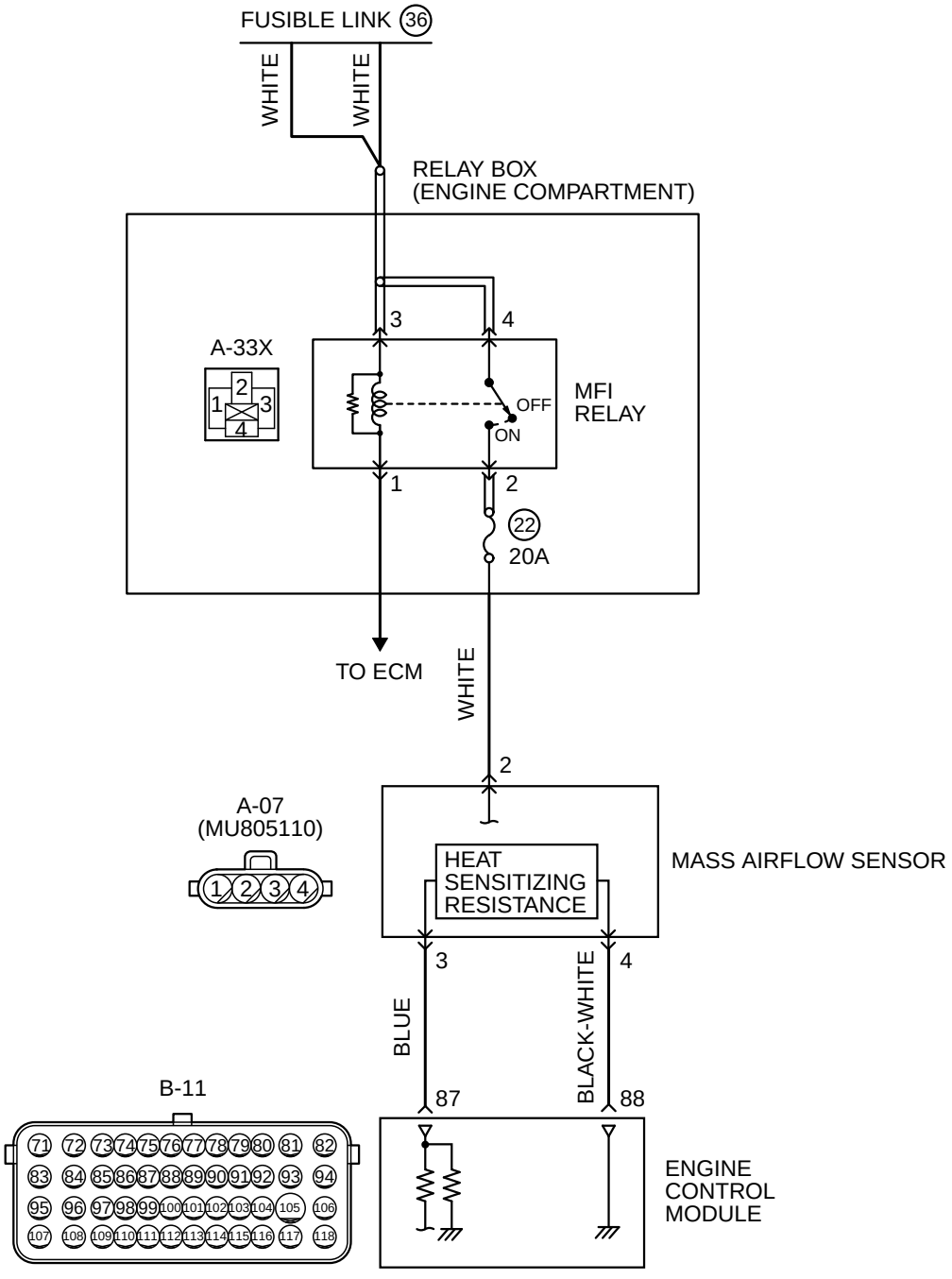
DTC P0101: Mass Airflow Circuit Range/Performance Problem

M11310100170USA0000010000

MASS AIRFLOW SENSOR CIRCUIT



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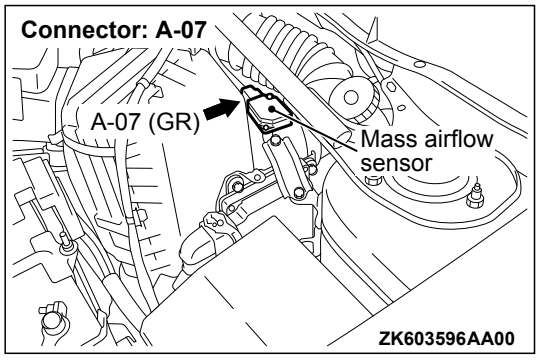
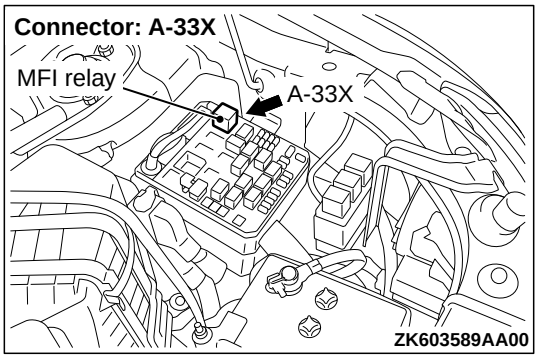
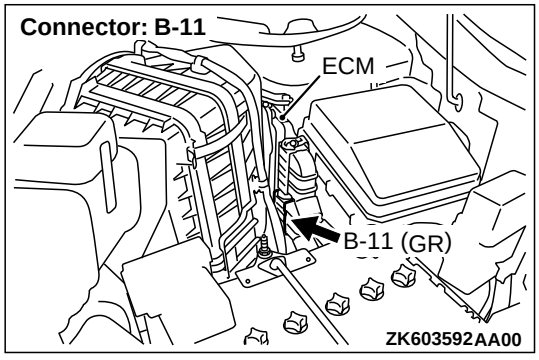






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with mass airflow 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)

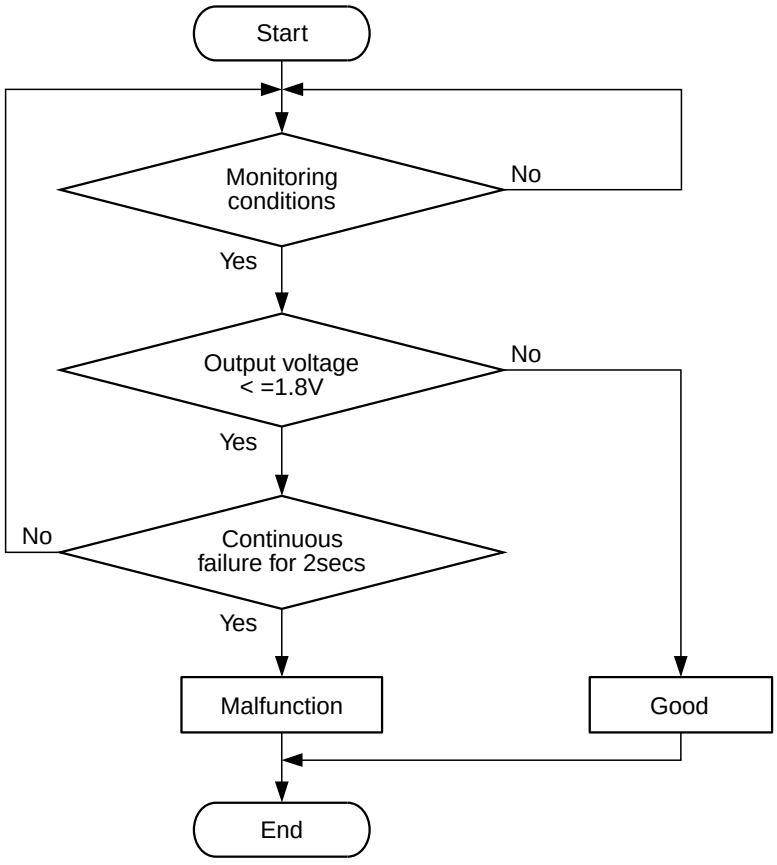
- Not applicable

Sensor (The sensor below is determined to be normal)

- Throttle position sensor

DTC SET CONDITIONS <Range/Performance problem - low input>

Logic Flow Chart



ZK603673 AA00

Check Conditions

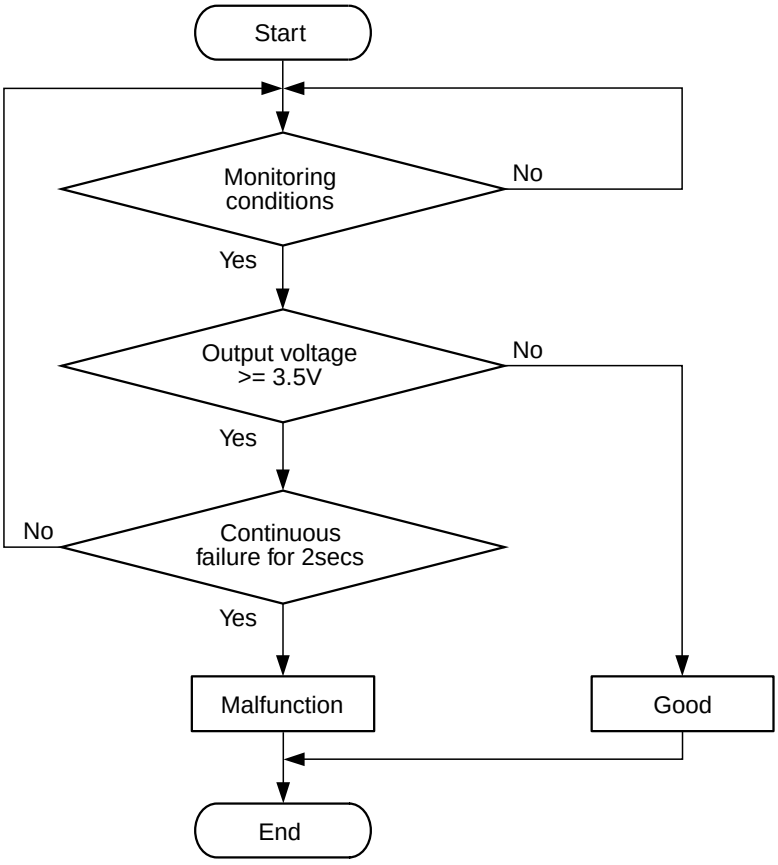
- Throttle position sensor output voltage is 1.5 volt or higher.
- Mass airflow sensor output voltage is 0.2 volt or higher.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 1.8 volts or lower for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem - high input>

Logic Flow Chart



ZK603674AA00

Check Conditions

- Throttle position sensor output voltage is 1.0 volt or lower.
- Mass airflow sensor output voltage is 4.9 volts or lower.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 3.5 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P.13Ab-8.

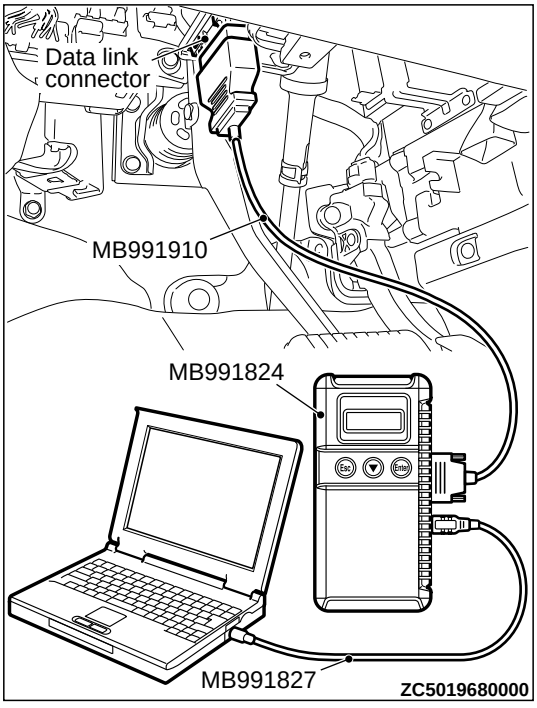
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness 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 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).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(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: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

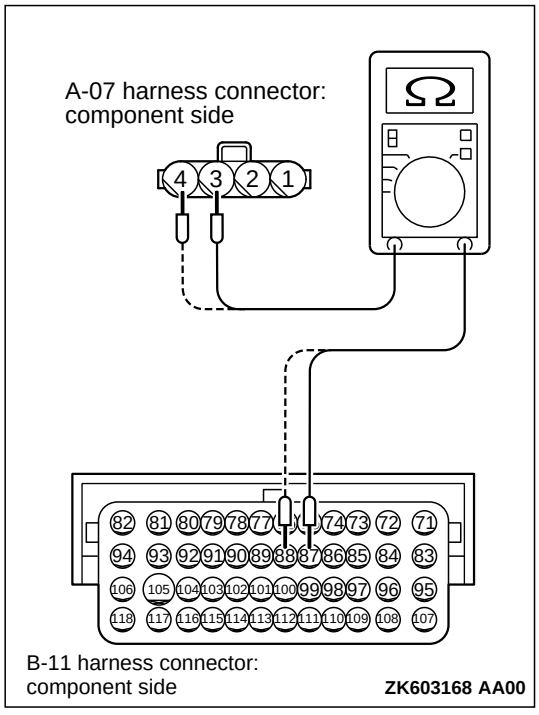
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Check for harness damage between the mass airflow sensor connector A-07 and the ECM connector B-11.

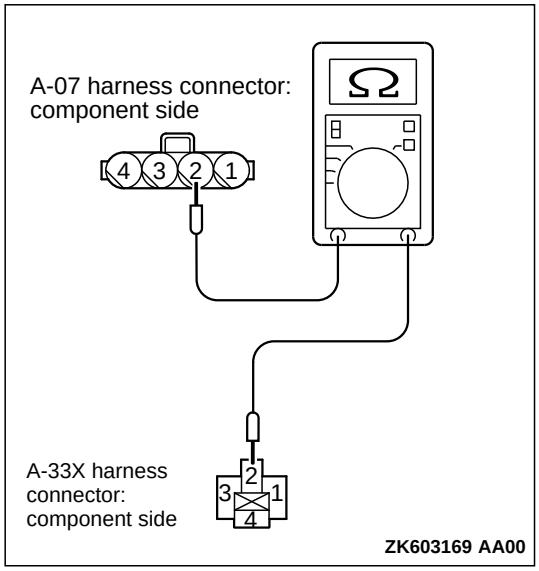
(1) Disconnect the mass airflow sensor connector A-07 and the ECM connector B-11.



(2) Measure the resistance between the mass airflow sensor connector A-07 and the ECM connector B-11.
 a Connector A-07 (terminal No. 3) and Connector B-11 . (terminal No. 87).
 b Connector A-07 (terminal No. 4) and Connector B-11 . (terminal No. 88).
  ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 4.
NO: Repair it. Then go to Step 6.

STEP 4. Check for harness the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor connector A-07 (terminal No. 2).



(1) Disconnect the MFI relay connector A-33X and the mass airflow sensor connector A-07.
(2) Measure the resistance between the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor A-07 (terminal No. 2).
 ▪Should be less than 2 ohms.

Q:Is the measured resistance less than 2 ohms?
YES: Go to Step 5.
NO: Repair it. Then go to Step 6.

STEP 5. Replace the mass airflow sensor.
(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0101 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration

Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO: The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 7 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

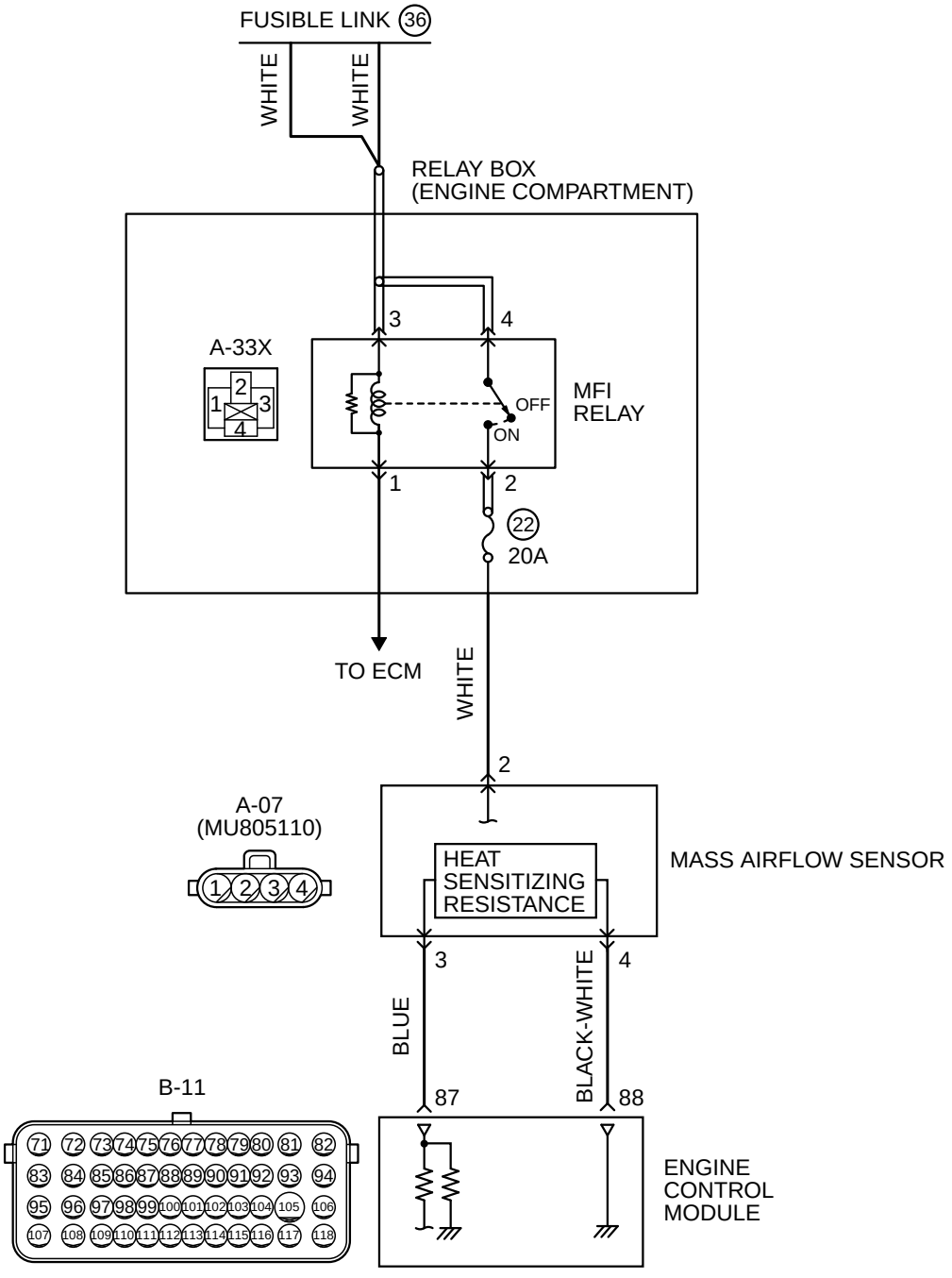
Q:Is DTC P0101 set?

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

DTC P0102: Mass Airflow Circuit Low Input

M11310100171USA0000010000

MASS AIRFLOW SENSOR CIRCUIT



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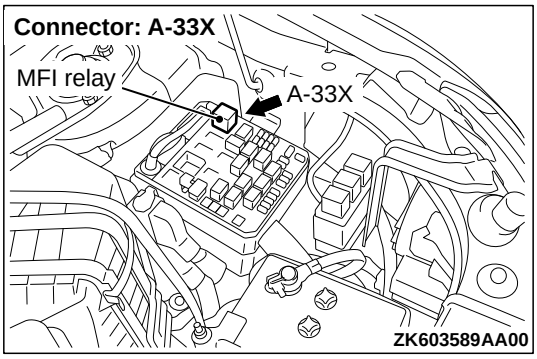
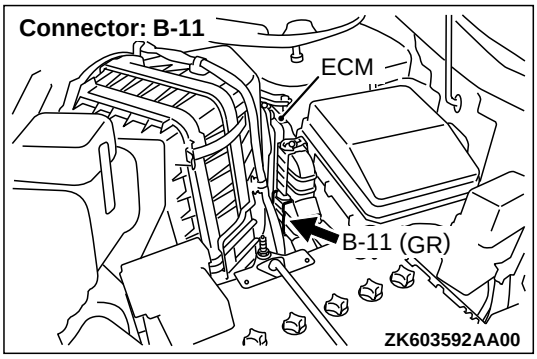
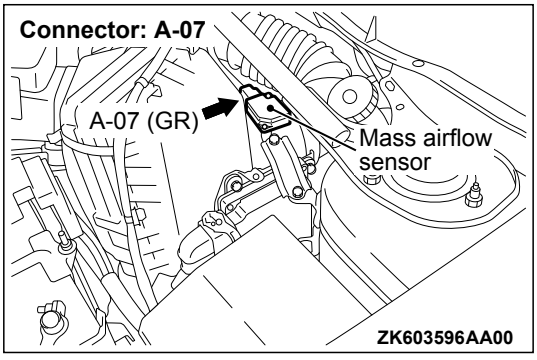






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow 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)

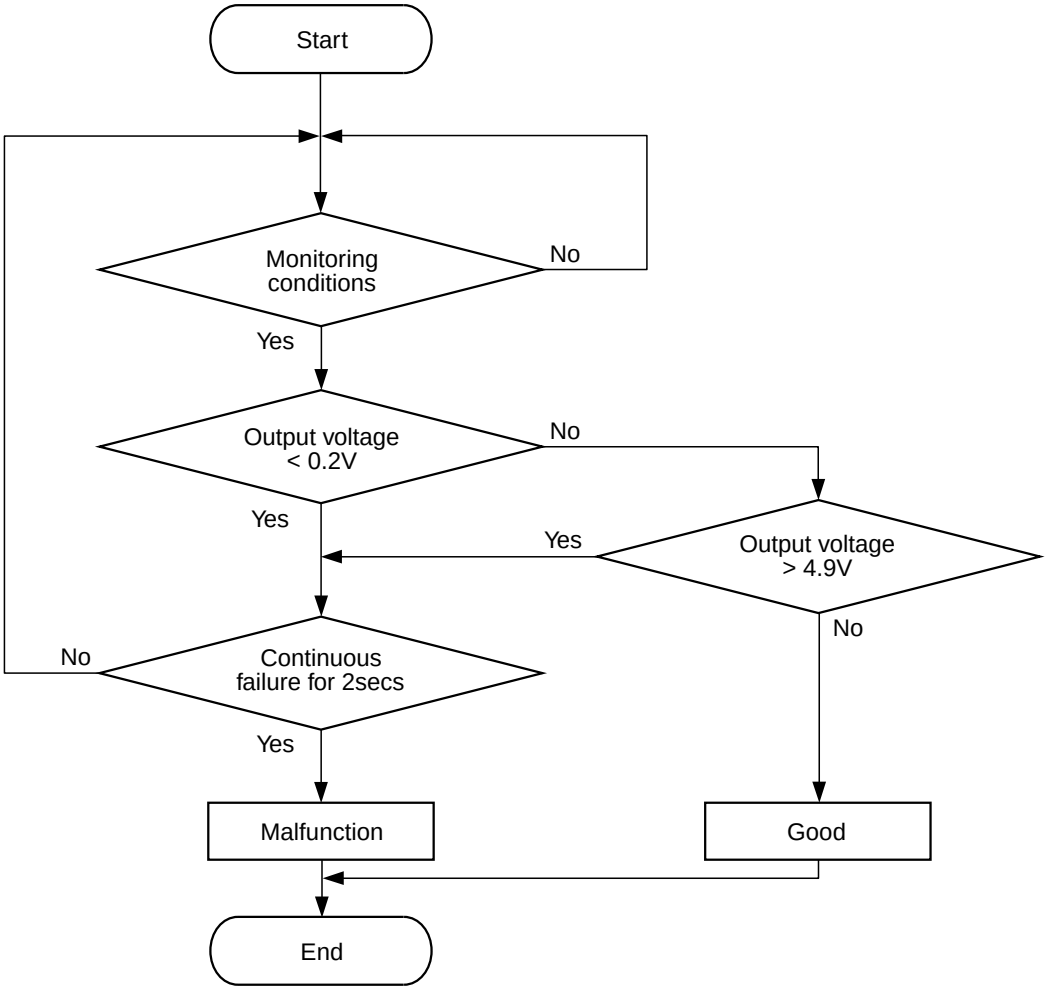
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603676 AA00

Check Conditions

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 0.2 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

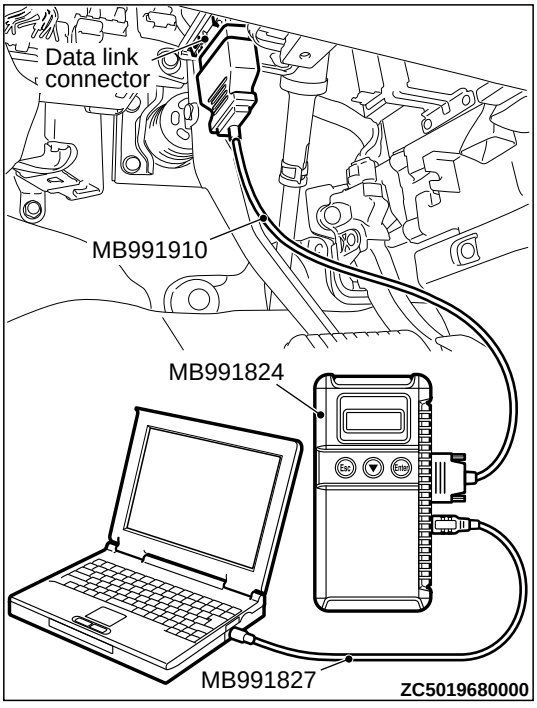
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness 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 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).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(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: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

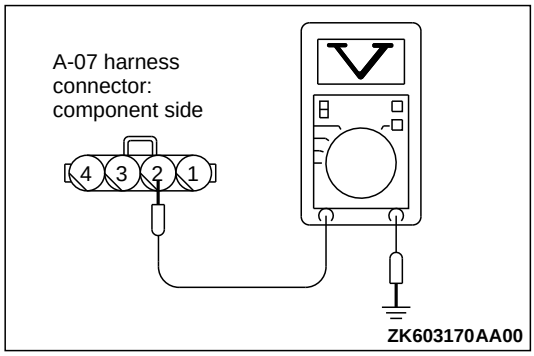
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Measure the power supply voltage at the mass airflow sensor harness side connector A-07.

(1) Disconnect the connector A-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?

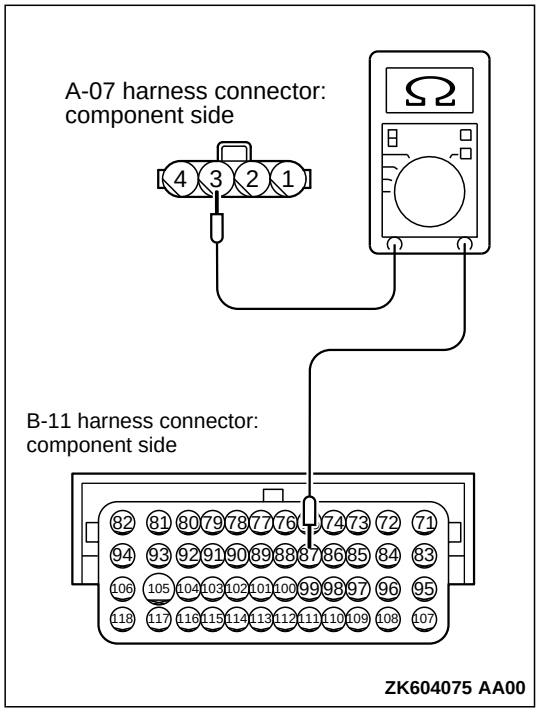
YES: Go to Step 4.

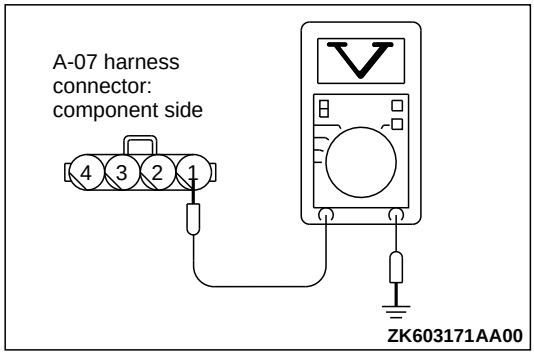
NO: Repair harness wire between the MFI relay connector A-33X (terminal No. 2) and the mass airflow sensor A-07 (terminal No. 2) because of open circuit or short circuit to ground. Then go to step 6.

STEP 4. Check for open circuit or short circuit to ground between the mass airflow sensor connector A-07 and ECM connector B-11.

(1) Disconnect the mass airflow sensor A-07 and the ECM connector B-10.

(2) Measure the resistance between the mass airflow sensor connector A-07 (terminal No. 3) and ECM connector B-11 (terminal No. 87).
- Should be less than 2 ohms.





(3) Check for the continuity between the mass airflow sensor A-07 (terminal No. 3) and ground.
- Not continuity.

Q:Is the harness wire in good condition?

YES: Go to Step 5.

NO: Repair it. Then go to Step 6.

STEP 5. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.

(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.

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

Q:Is DTC P0102 set?

YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

NO: The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.

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

Q:Is DTC P0102 set?

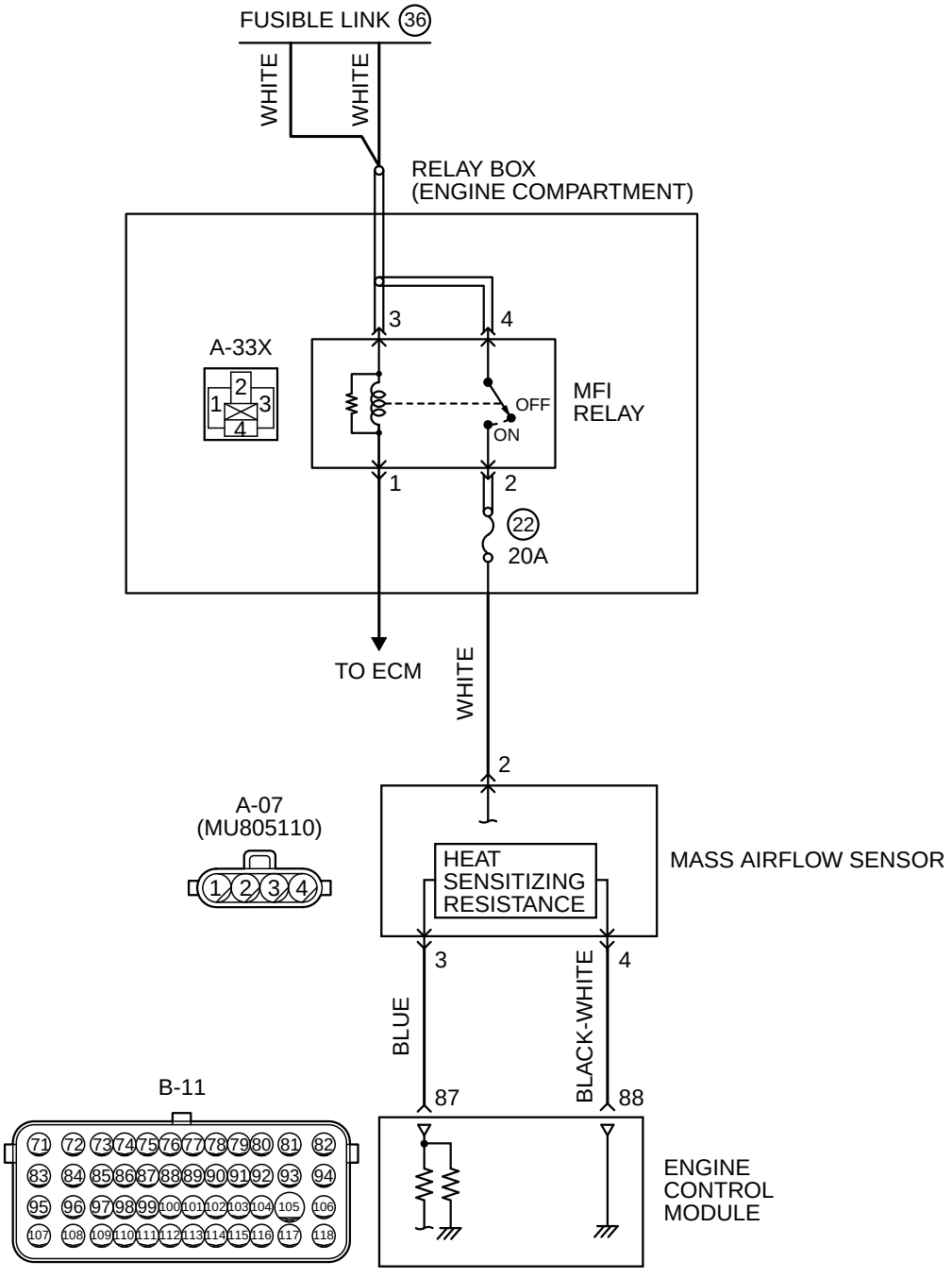
YES: Retry the troubleshooting.

NO: The inspection is complete.

DTC P0103: Mass Airflow Circuit High Input

M11310100172USA0000010000

MASS AIRFLOW SENSOR CIRCUIT



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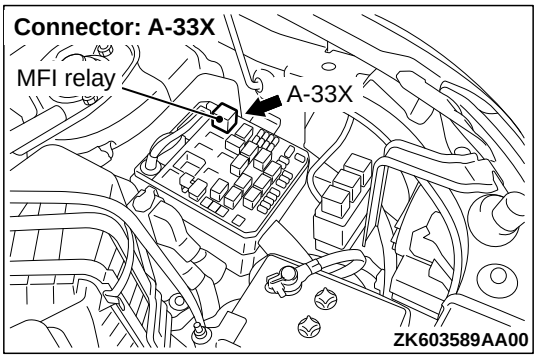
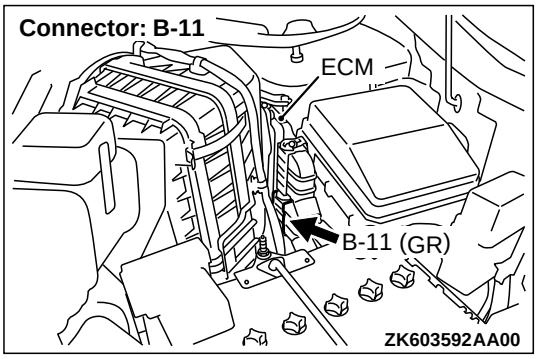
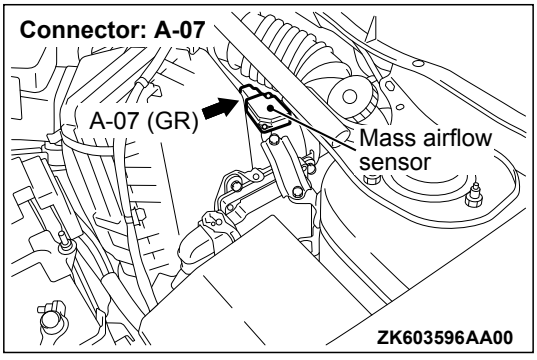






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with mass airflow 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)

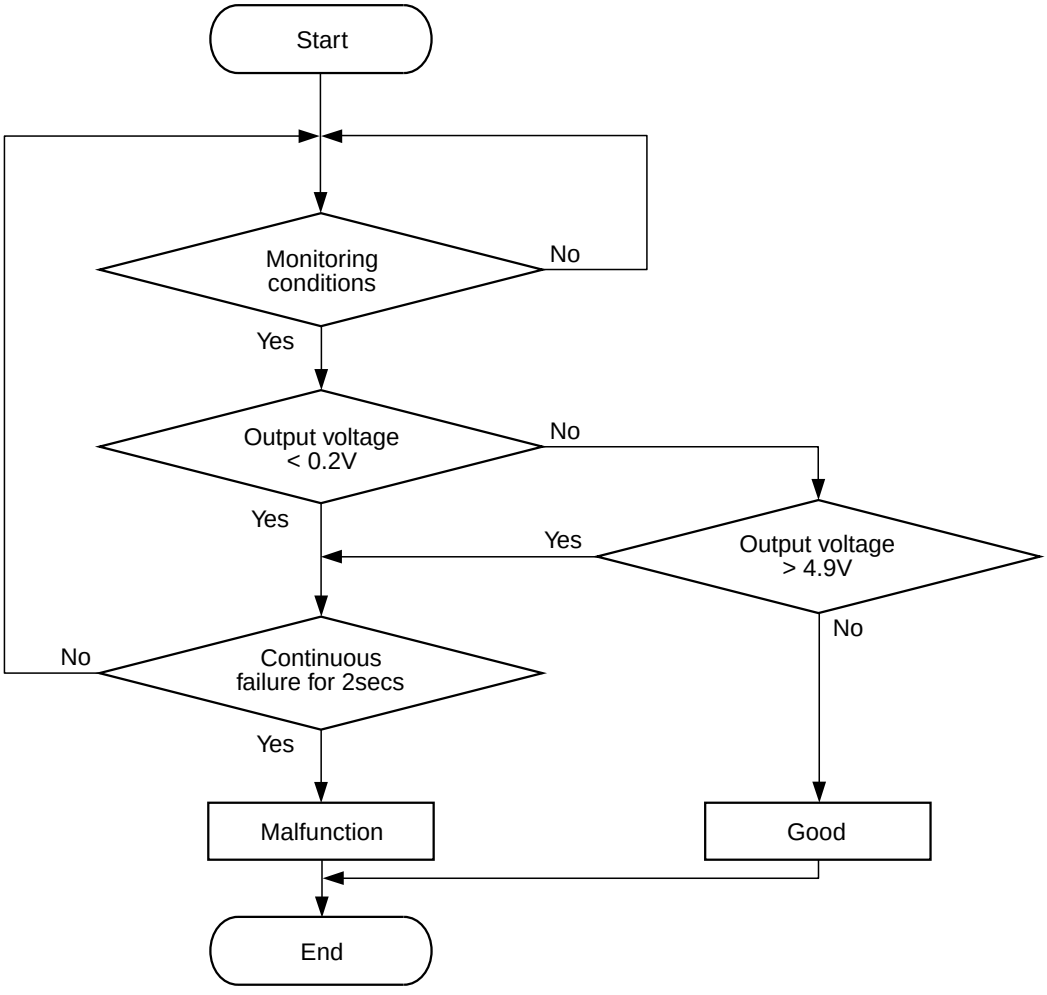
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



ZK603676 AA00

Check Conditions

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be higher than 4.9 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P.13Ab-8.

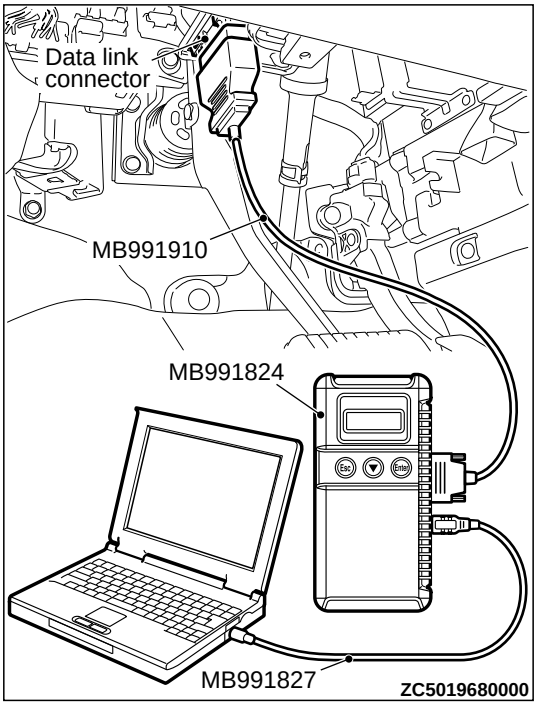
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Connector damage
- Harness 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 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).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(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: Go to Step 2.

STEP 2. Check harness connector A-07 at the mass airflow sensor and harness connector B-11 at the ECM for damage.

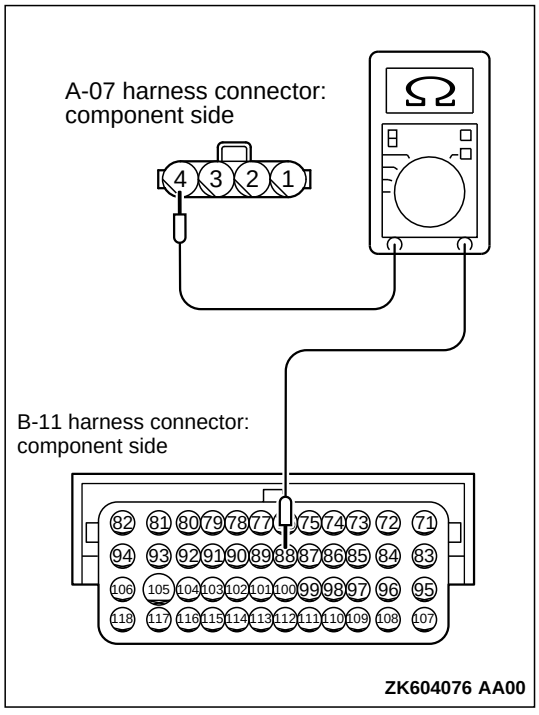
Q:Is the harness connector in good condition?

YES: Go to Step 3.

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

STEP 3. Check for the continuity between the mass airflow sensor connector A-07 and the ECM connector B-11.

(1) Disconnect the mass airflow sensor connector A-07 and the ECM connector B-11.



(2) Check for the continuity between the mass airflow sensor connector A-07 (terminal No. 4) and the ECM connector B-11 (terminal No. 88).
- Should be less than 2 ohms.

Q:Does continuity exist?
YES: Go to Step 4.
NO: Repair it. Then go to step 5.

STEP 4. Replace the mass airflow sensor.
(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(3) Check the diagnostic trouble code (DTC).

Q:Is DTC P0102 set?
YES: Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-12or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO: The inspection is complete.

STEP 5. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function - OBD-II Drive Cycle - Pattern 24 P. 13Ab-8.
(2) Check the diagnostic trouble code (DTC).

Q:Is DTC P0103 set?
YES: Retry the troubleshooting.
NO: The inspection is complete.