DTC P1240: Ignition Angle

TECHNICAL DESCRIPTION

Checks for an abnormal ignition timing retard angle demand signal from the active stability control (ASC).

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- The ignition timing retard angle demand signal is not normal.

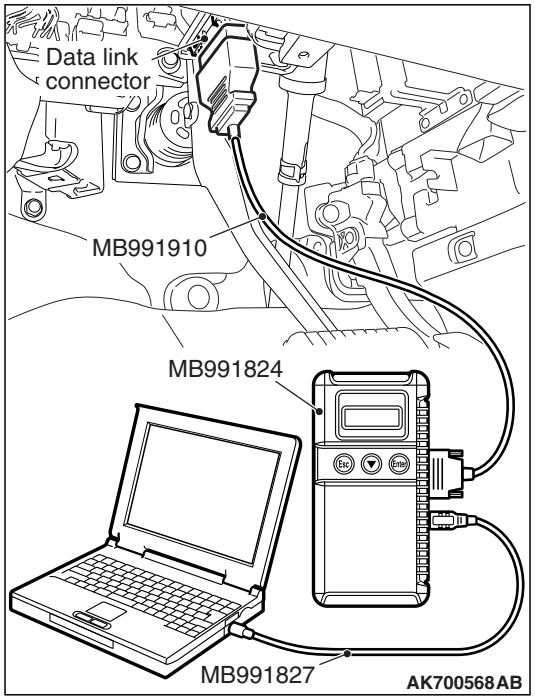
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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 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 ASC-DTC set?

YES : Refer to GROUP 35C, ASC Diagnosis – Diagnosis Code Chart P.35C-18.

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

DTC P1242: Fail Safe Control Monitor

TECHNICAL DESCRIPTION

Monitors the engine speed during fail-safe control.

DTC SET CONDITIONS

Check Condition

- During fail safe control.

Judgment Criterion

- The engine speed is higher than assumed.

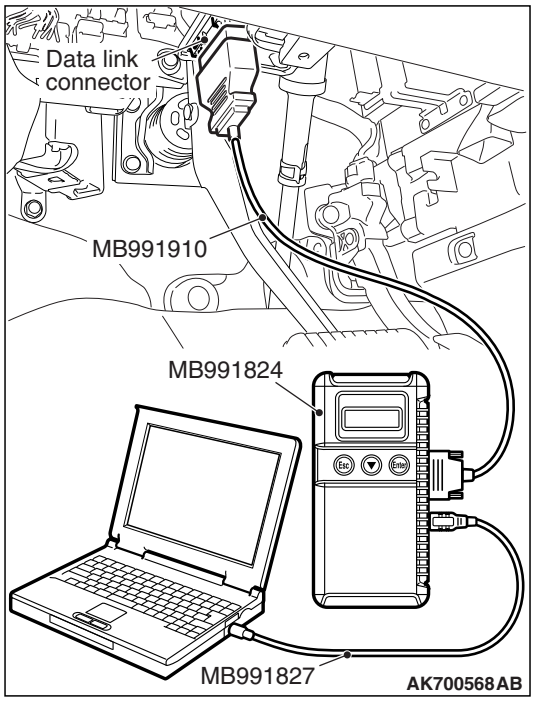
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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 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 P1242 set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2 .

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "LOCK" (OFF) 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 P1242 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P1243: Inquiry/Response Error

TECHNICAL DESCRIPTION

Monitors the computation function of the engine control module.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- ECM can not calculate input data.

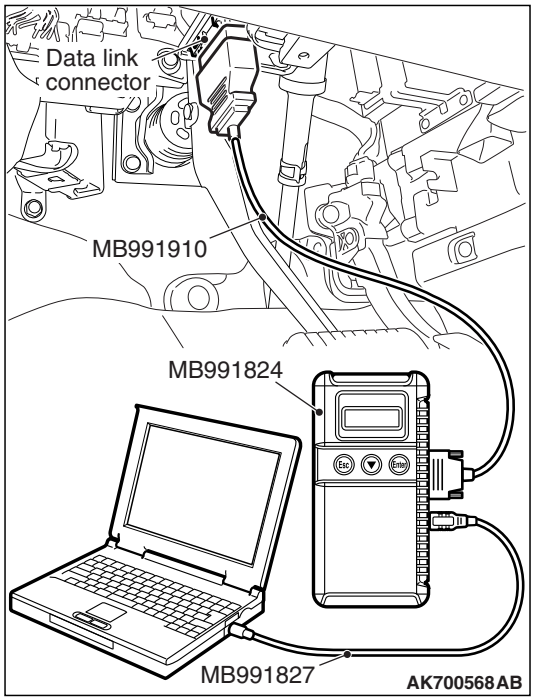
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- 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 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 P1243 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P1247: A/T Plausibility

TECHNICAL DESCRIPTION

Checks for an abnormal signal of transmission control module.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- A torque demand signal from TCM is not normal.

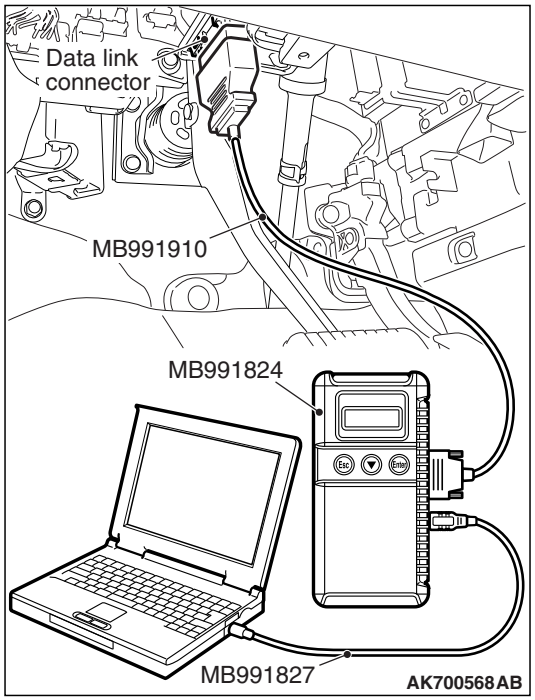
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Automatic transaxle system 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 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 A/T-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T-DTC set?

YES : Refer to GROUP 23C, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Chart P.23C-27.

NO : Go to Step 2 .

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "LOCK" (OFF) 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 P1247 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P1248: AWD Plausibility <AWD>

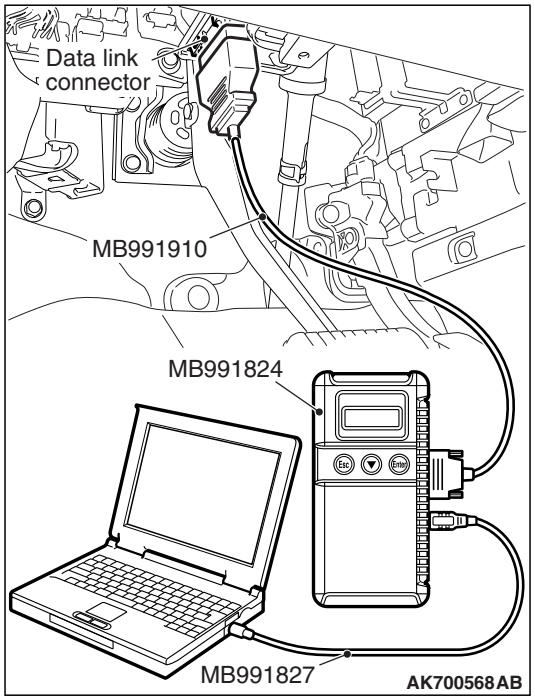
TECHNICAL DESCRIPTION
Checks for an abnormal signal of AWD-ECU.

DTC SET CONDITIONS
Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- The torque reduction requested signal from AWD-ECU is not normal.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- AWD system 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 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 AWD-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the electronic control AWD-DTC set?

YES : Refer to GROUP 27C, Troubleshooting – Diagnosis Code Chart P.27C-11.
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 P1248 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P1506: Idle Control Sytem RPM Lower Than Expected at Low Temperature

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

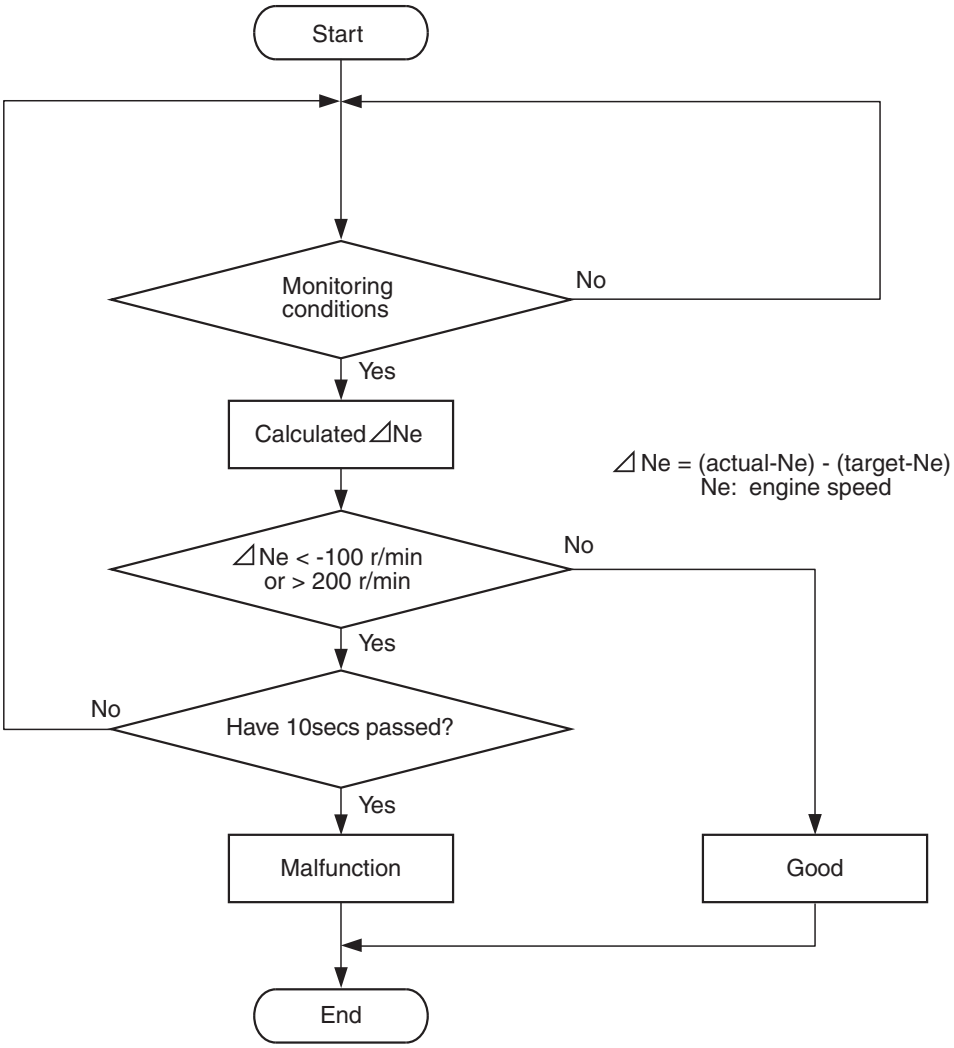
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is between 7°C (45°F) and 41°C (105°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10°C (14°F).
- More than 3 seconds have elapsed from the previous monitoring.
- Target air flow rate is more than 33 g/sec (28 L/sec).

Judgement Criterion

- The actual idle speed is less than the target idle speed by 100 r/min or more for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Throttle valve area is dirty.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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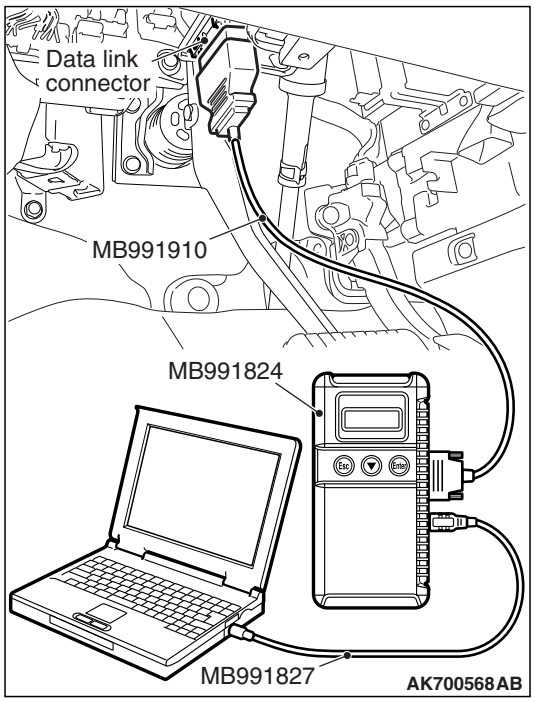
- MB991827: USB Cable
- MB991910: Main Harness A

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

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

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

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

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle Body (Throttle Valve Area) Cleaning P.13B-882. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

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

Q: Is DTC P1506 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 4.
NO : The inspection is complete.

STEP 4. Test the OBD-II drive cycle.

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

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

Q: Is DTC P1506 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1507: Idle Control Sytem RPM Higher Than Expected at Low Temperature

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

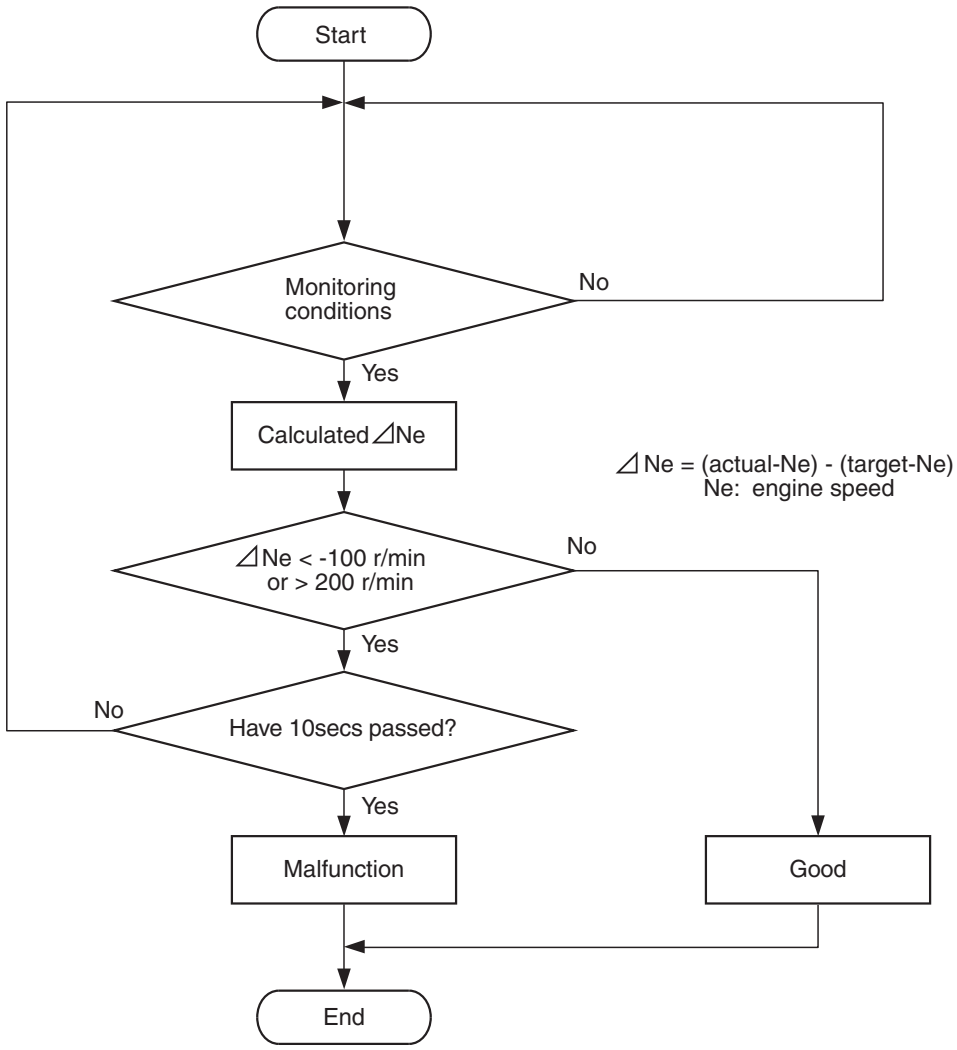
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

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

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Under the closed loop idle speed control.
- Engine coolant temperature is between 7°C (45°F) and 41°C (105°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10°C (14°F).
- More than 3 seconds have elapsed from the previous monitoring.
- Target air flow rate is 0 g/sec (0 L/sec).

Judgement Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 10 seconds.

*: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45°C (113°F).

OBD-II DRIVE CYCLE PATTERN

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

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

- Intake system vacuum leak.
- Throttle body assy failed.
- ECM failed.

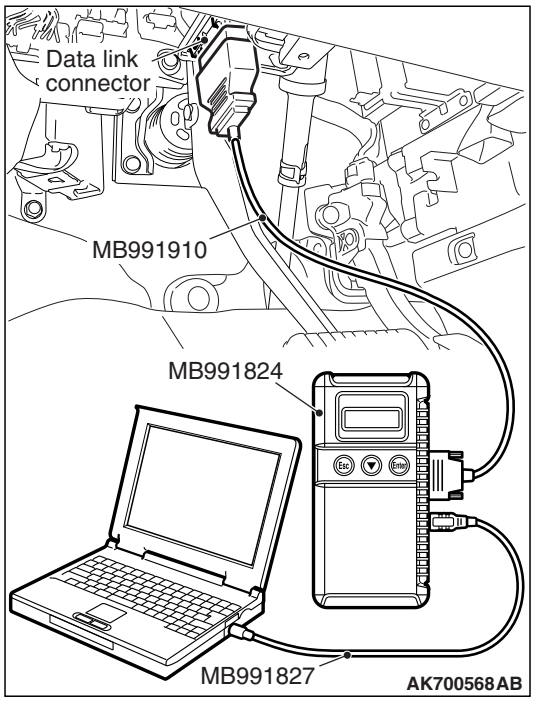
TSB Revision

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

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

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

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

STEP 3. Replace the throttle body assembly.

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

Q: Is DTC P1507 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 4.
NO : The inspection is complete.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

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

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

Q: Is DTC P1507 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1590: TCM to ECM Communication Error in Torque Reduction Request

TECHNICAL DESCRIPTIONS OF MONITOR METHODS

The ECM checks whether the errors in data communications sent by the TCM exist or not.

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)

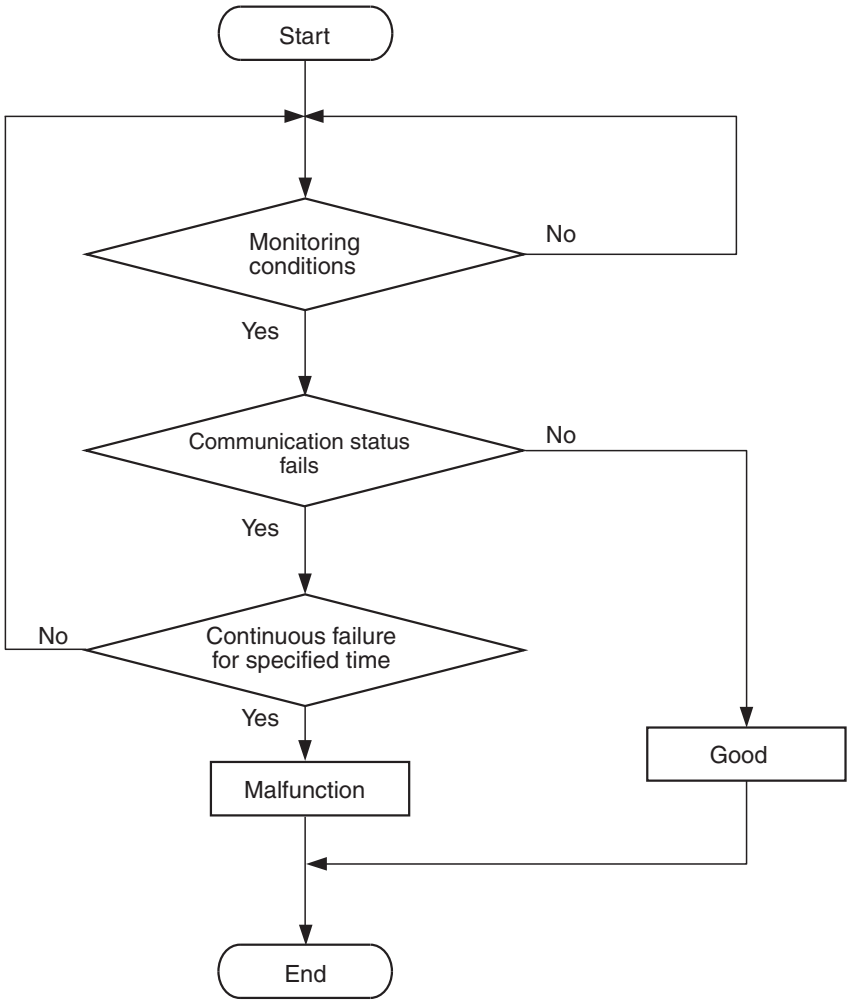
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Lgic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- ECM detects an error in communication between ECM and TCM.

OBD-II DRIVE CYCLE PATTERN

None.

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

- CAN line harness damage or connector damage.
- ECM failed.

DIAGNOSIS

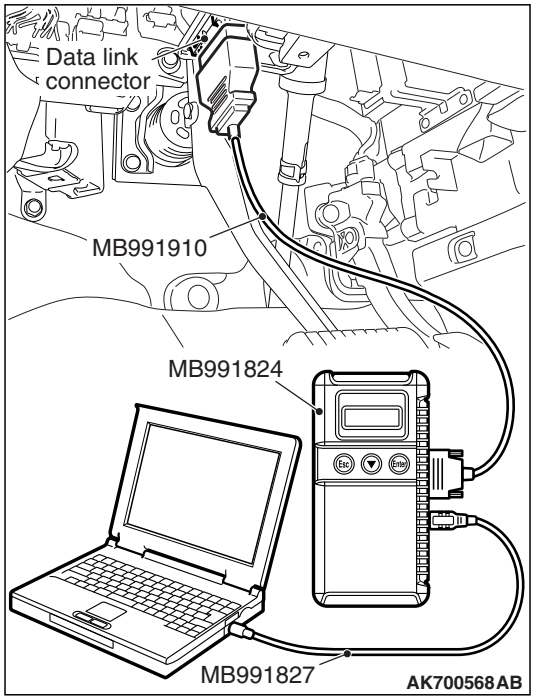
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.

TSB Revision

- MB991827: USB Cable
- MB991910: Main Harness A

STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2 .
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – Can Bus Diagnostics Table P.54C-17.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

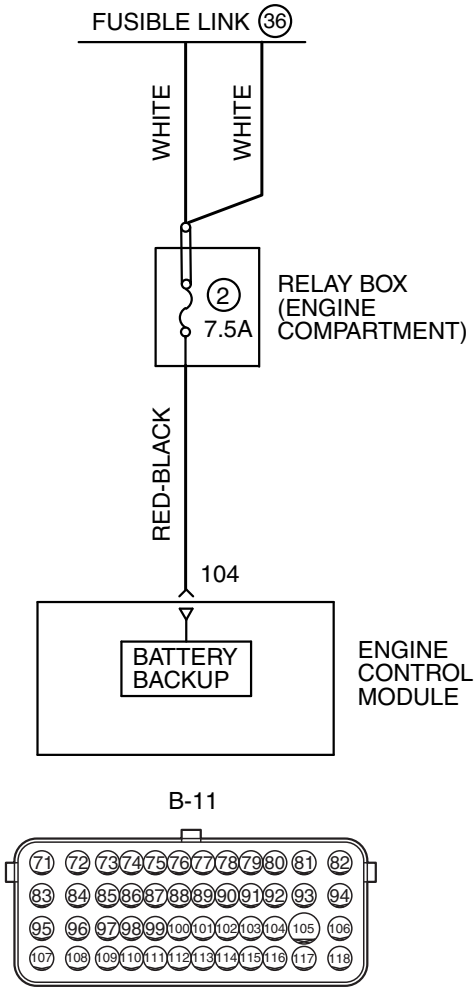
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1590 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P1603: Battery Backup Line Malfunction

BATTERY BACKUP CIRCUIT



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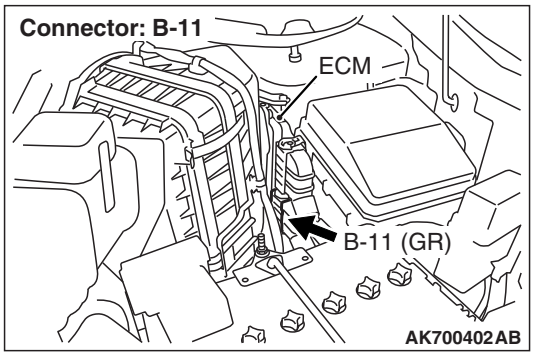


TECHNICAL DESCRIPTION

The ECM checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DESCRIPTIONS OF MONITOR METHODS

Battery backup line voltage is under specified value.

TSB Revision

MONITOR EXECUTION
Continuous

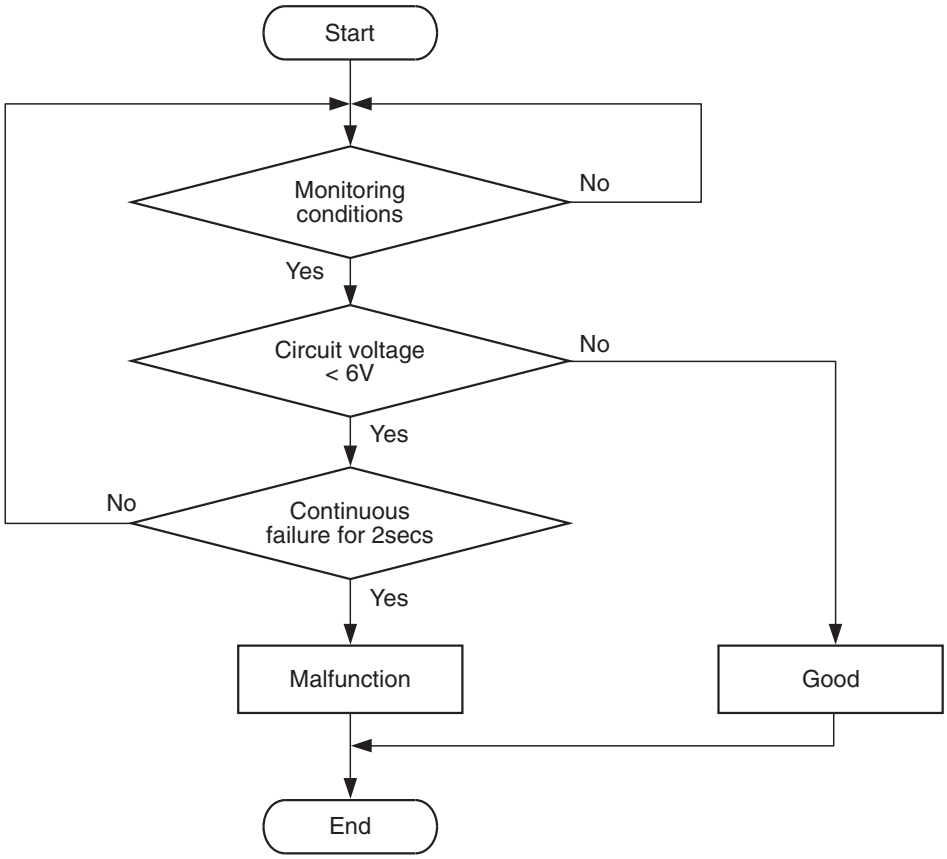
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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
- Engine starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

Judgement Criterion
- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- 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
- MB992110: Power Plant ECU Check Harness

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

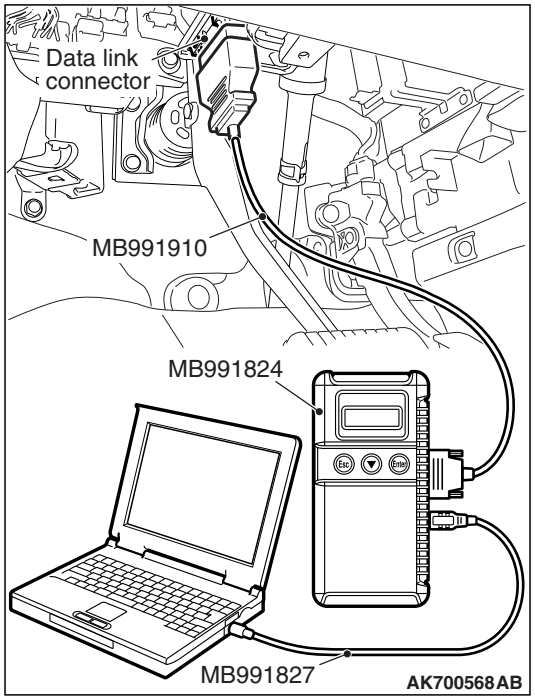
⚠ CAUTION

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.

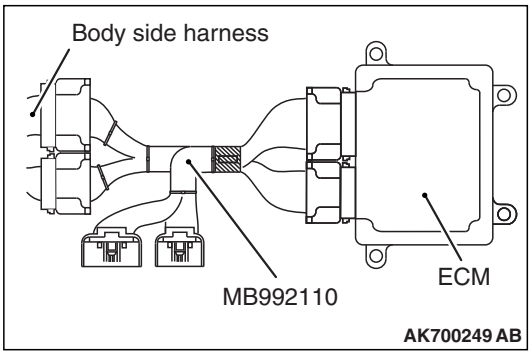
Q: Is DTC P1603 set?

YES : Go to Step 2.
NO : The inspection is complete.



STEP 2. Measure the backup power supply voltage at ECM connector B-11 by using power plant ECU check harness special tool MB992110.

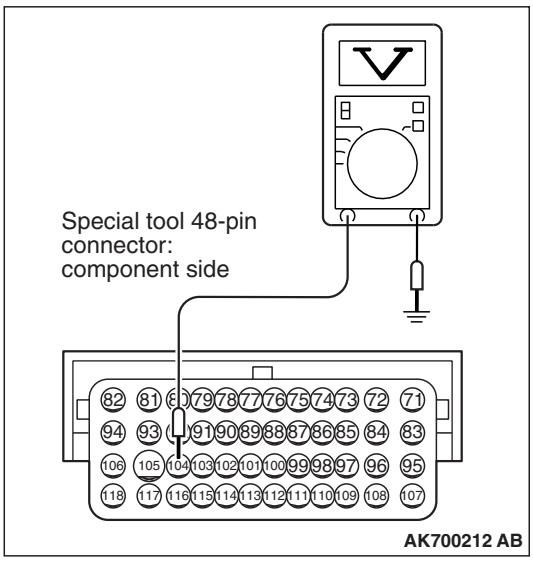
(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

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

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

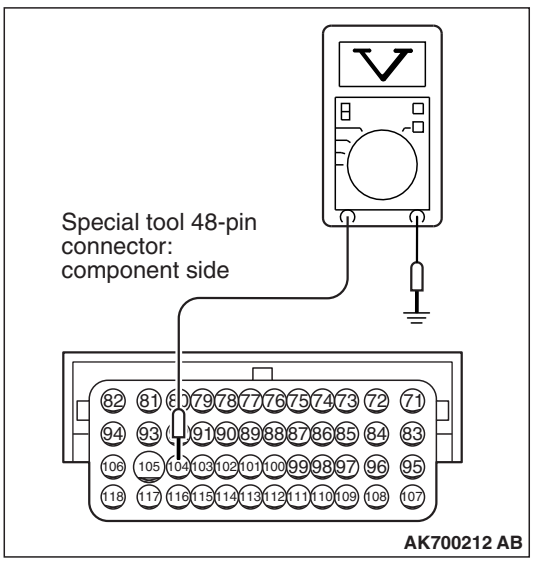


STEP 3. Measure the backup power supply voltage at ECM harness side connector B-11.

(1) Disconnect the ECM connector B-11 and measure at the harness side.
(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 4.
NO : Repair harness wire between battery and ECM connector B-11 (terminal No. 104) because of open circuit or short circuit to ground. 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 : Repair harness wire between battery and ECM connector B-11 (terminal No. 104) because of harness damage. Then go to Step 6.

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

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

Q: Is the harness connector in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1603 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2066: Fuel Level Sensor (sub) Circuit Range/Performance <AWD>

TECHNICAL DESCRIPTION

- The fuel level sensor convents 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

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

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

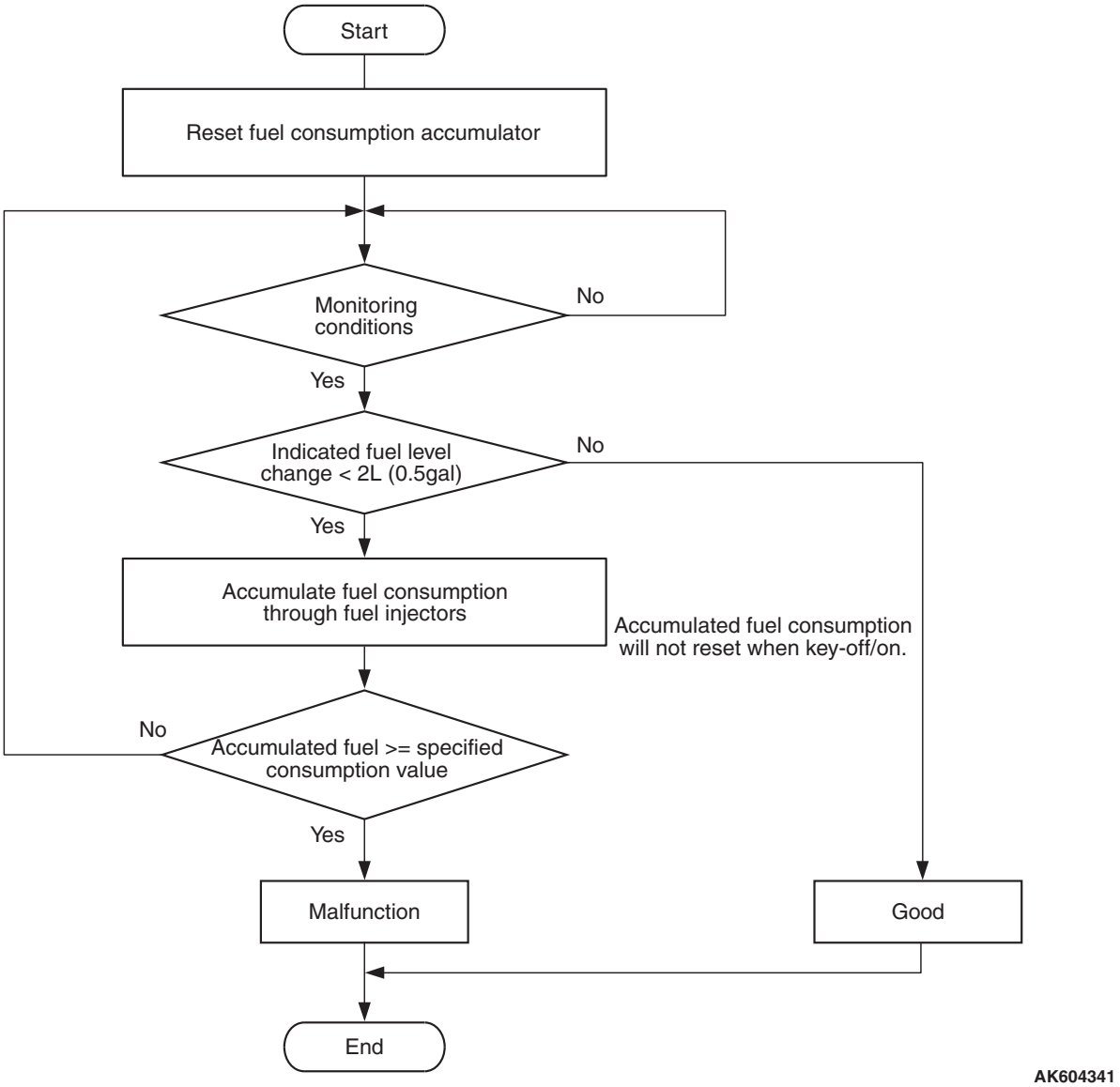
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 30 litters (7.8 gal), the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 litters (0.5 gal) or less.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Fuel pump module or fuel level sensor (sub) 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

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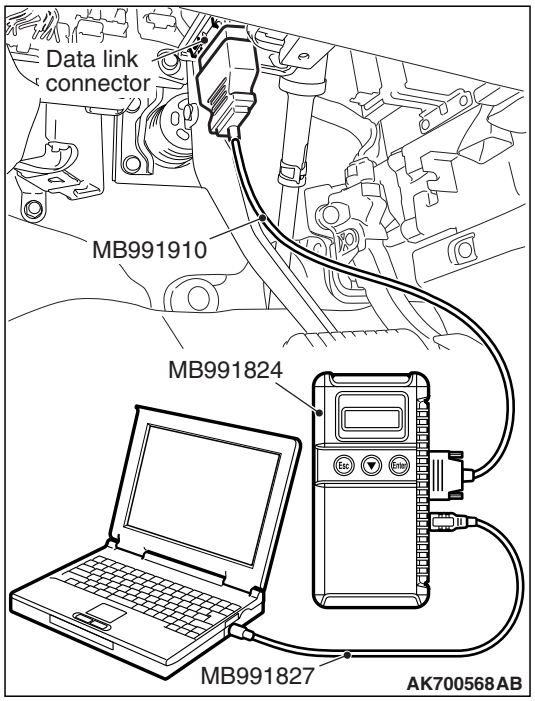


STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ 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 P0461 set?

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

STEP 2. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Refer to GROUP 54A, Combination Meter – Trouble Symptom Chart P.54A-69.

STEP 3. Check the trouble symptoms.

Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operates correctly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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.

STEP 4. Check the fuel level sensor (sub).
Check to see if the fuel level sensor is normal. Refer to GROUP 54A, Combination Meter – On-vehicle Service – Fuel Level Sensor Check P.54A-107.

Q: Is the fuel level sensor (sub) normal?

YES : Go to Step 5.
NO : Replace the fuel level sensor (sub). Then go to Step 6.

STEP 5. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operates correctly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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.

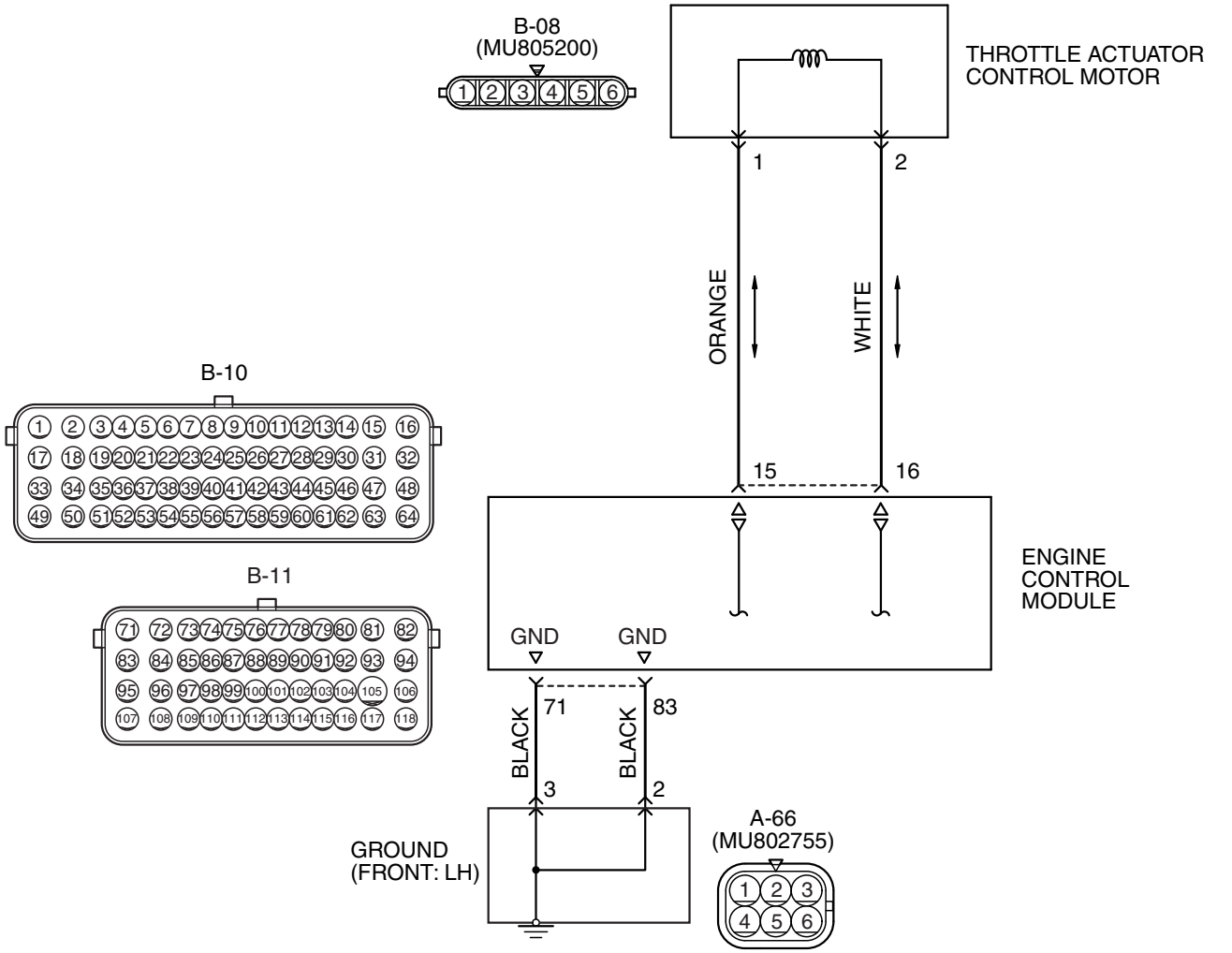
STEP 6. Check the trouble symptoms.
Check that the fuel gauge operates correctly.

Q: Does the fuel gauge operates correctly?

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

DTC P2100: Throttle Actuator Control Motor Circuit (Open)

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



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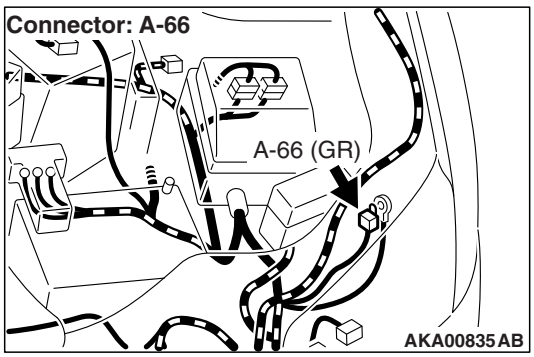

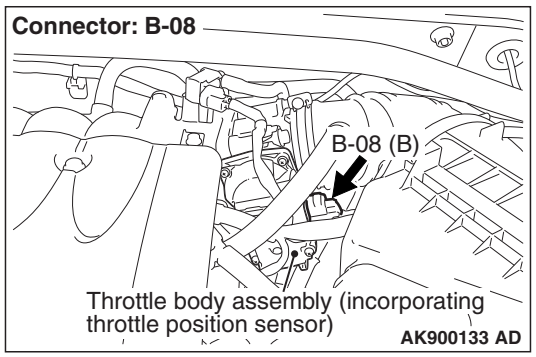

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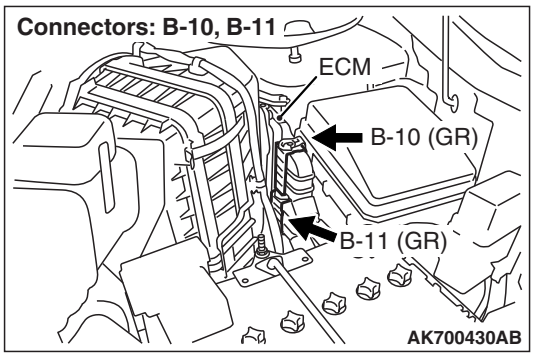


CIRCUIT OPERATION

- Controls the current that is applied from the ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2).

TECHNICAL DESCRIPTION

- ECM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.

DESCRIPTIONS OF MONITOR METHODS

The voltage difference between the throttle position sensor output voltage and the throttle position sensor output at the throttle actuator control motor relay off is smaller than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- The output voltage of the (main) throttle position sensor minus the proposed output voltage becomes 0.1 volt or more.
- The output voltage of the (sub) throttle position sensor minus the proposed output voltage becomes 0.1 volt or more.
- The drive duty of the throttle actuator control motor is 100 percent or more.
- Except while during cranking

or

- Battery positive voltage is higher than 8.3 volts.
- The proposed output voltage minus the output voltage of the (main) throttle position sensor becomes 0.1 volt or more.
- The proposed output voltage minus the output voltage of the (sub) throttle position sensor becomes 0.1 volt or more.
- The drive duty of the throttle actuator control motor is 100 percent or more.
- Except while during cranking

Judgement Criterion

- The output voltage of the throttle position sensor (main) minus the learning value of the middle-opened degree becomes 0.2 volt or less for 0.4 second.

or

- The output voltage of the throttle position sensor (sub) minus the learning value of the middle-opened degree becomes 0.2 volt or less for 0.4 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle actuator control motor 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. Check harness connector B-08 at throttle actuator control motor and harness connector B-10, B-11 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

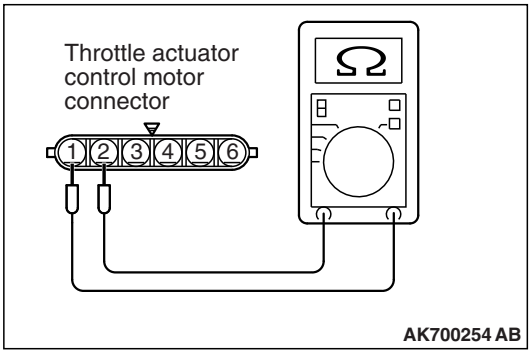
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-08.

(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 – 80 Ω [at 20°C (68°F)]



Q: Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

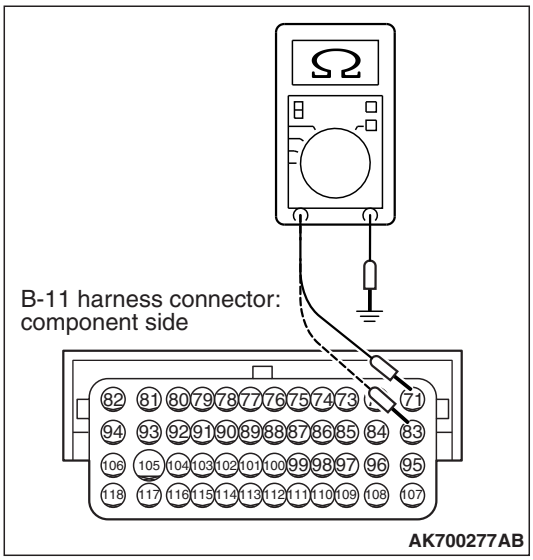
NO : Replace the throttle body assembly. Then go to Step 6.

STEP 3. Check the continuity at ECM harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

(2) Measure the continuity between terminals No. 71, No. 83 and ground.

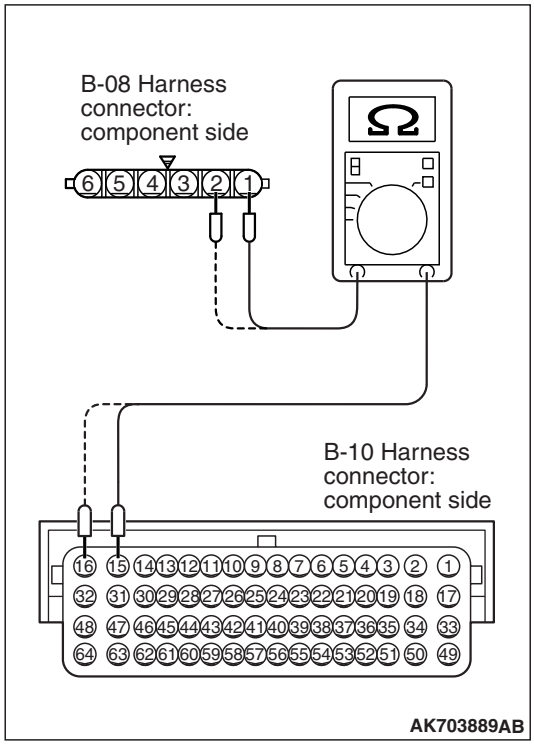
- Should be less than 2 ohms.



Q: Does continuity exist?

YES : Go to Step 4.

NO : Check harness connector A-66 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 ECM connector B-11 (terminals No. 71, No. 83) and ground because of open circuit or harness damage. Then go to Step 6.

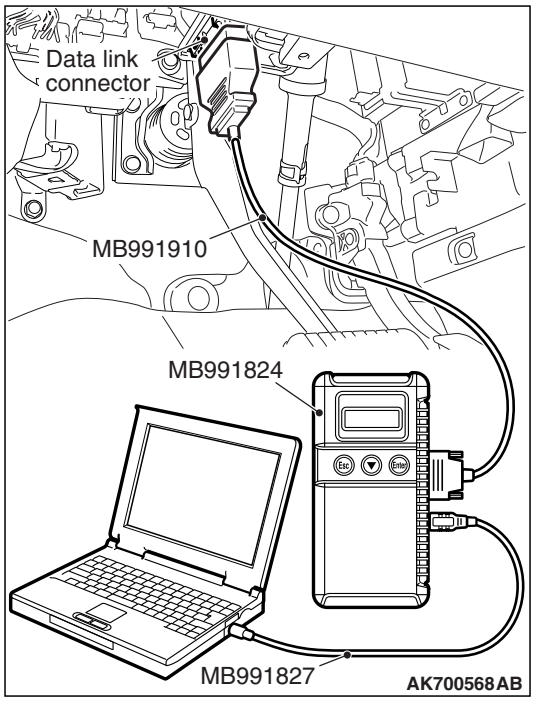


STEP 4. Check for harness damage between throttle actuator control motor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Measure the resistance between B-08 connector and B-10 connector.
  a. Connector B-08 (terminal No. 1) and connector B-10 terminal No. 15).
  b. Connector B-08 (terminal No. 2) and connector B-10 (terminal No. 16).
    - Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

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



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

Q: Is DTC P2100 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

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STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

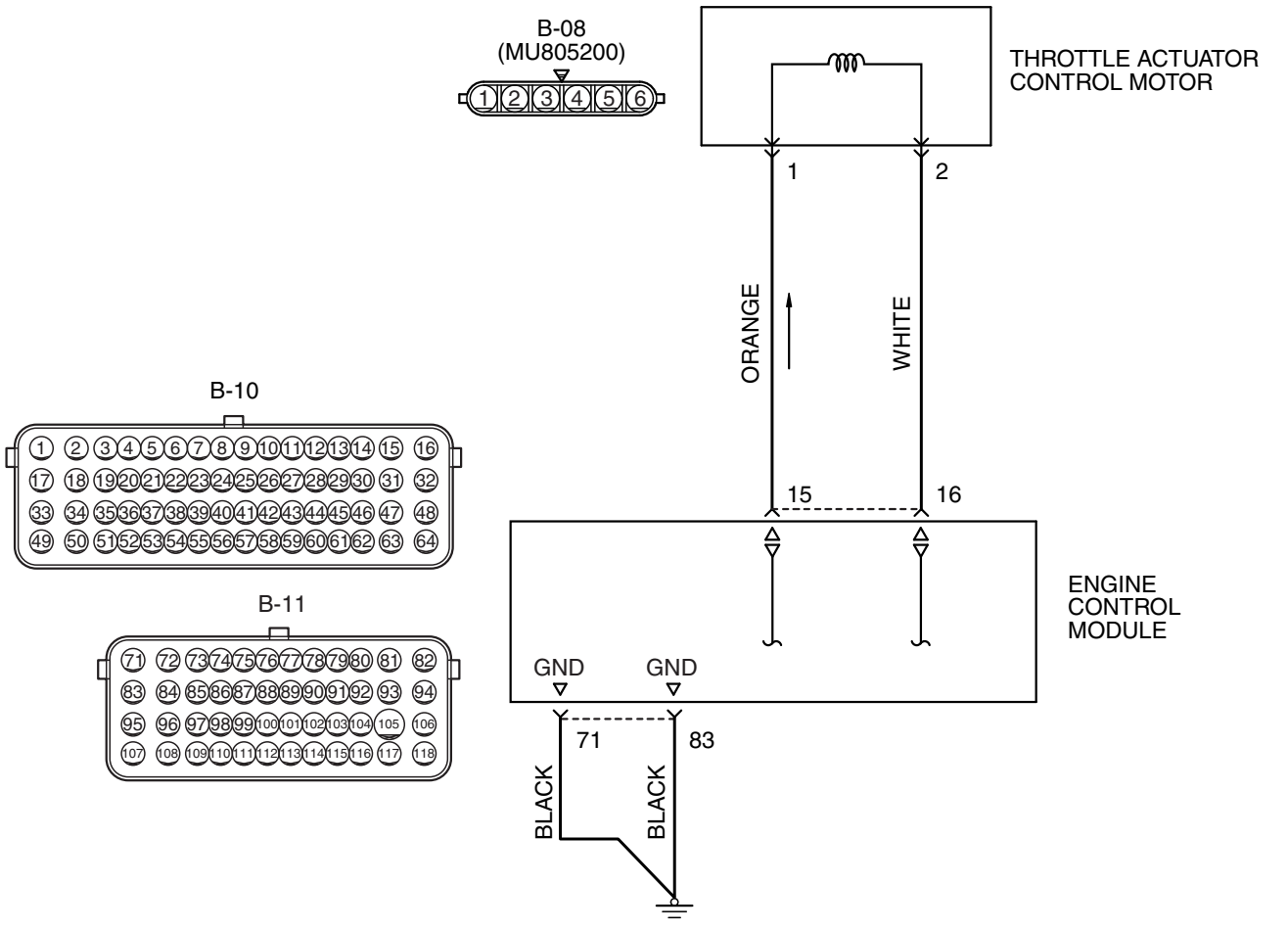
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2100 set?

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

DTC P2101: Throttle Actuator Control Motor Magneto Malfunction

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



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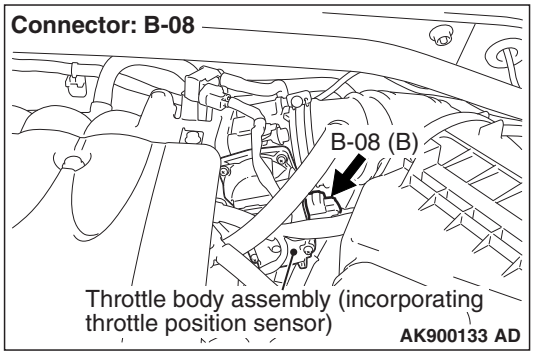
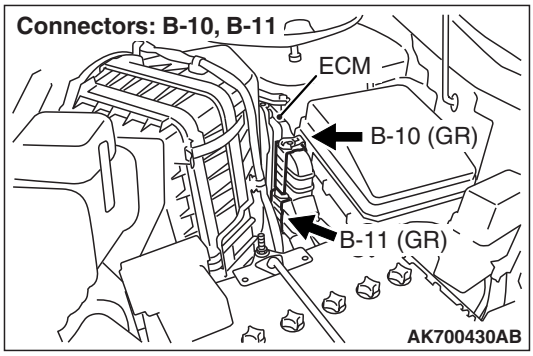




CIRCUIT OPERATION

- Controls the current that is applied from the ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2).

TECHNICAL DESCRIPTION

- ECM check whether the throttle actuator control motor magneto has failed.

DESCRIPTIONS OF MONITOR METHODS

Throttle actuator control motor intelligent power device detects shorted-high/low and overheat of it self.

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

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- The coil current of the throttle actuator control motor is 8 ampere or more for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle actuator control motor failed.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

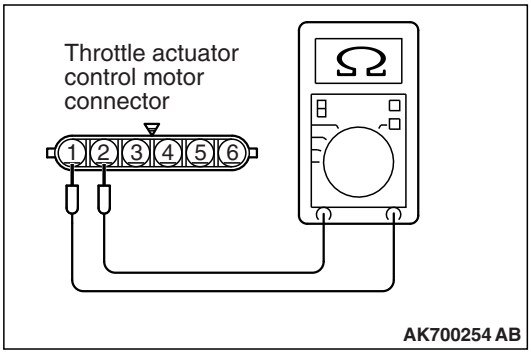
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-08 at throttle actuator control motor 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.



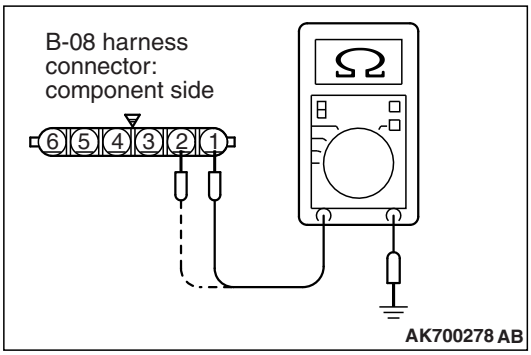
STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-08.
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 – 80 Ω [at 20°C (68°F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20°C (68°F)]?

YES : Go to Step 3.
NO : Replace the throttle body assembly. Then go to Step 5.

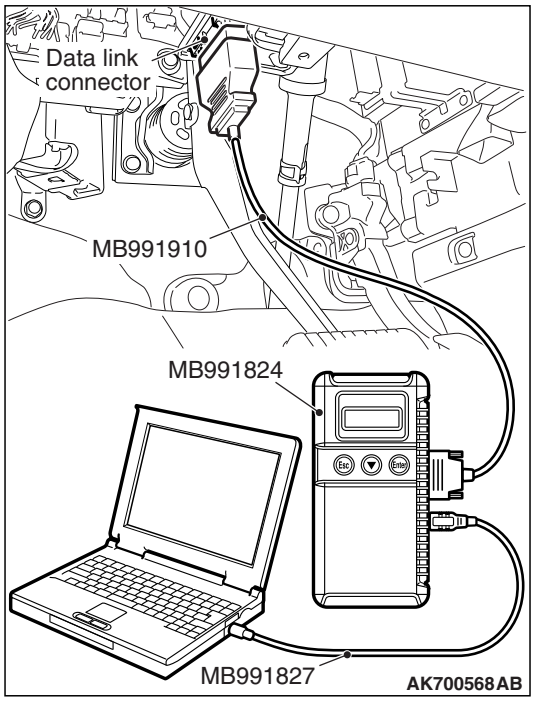


STEP 3. Check for short circuit to ground between throttle actuator control motor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.
(2) Check for the continuity between B-08 connector and ground.
   a. Connector B-08 (terminal No. 1) and ground.
   b. Connector B-08 (terminal No. 2) and ground.
      • Not continuity.

Q: Is the harness wire in good condition?

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



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

Q: Is DTC P2101 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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.

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STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

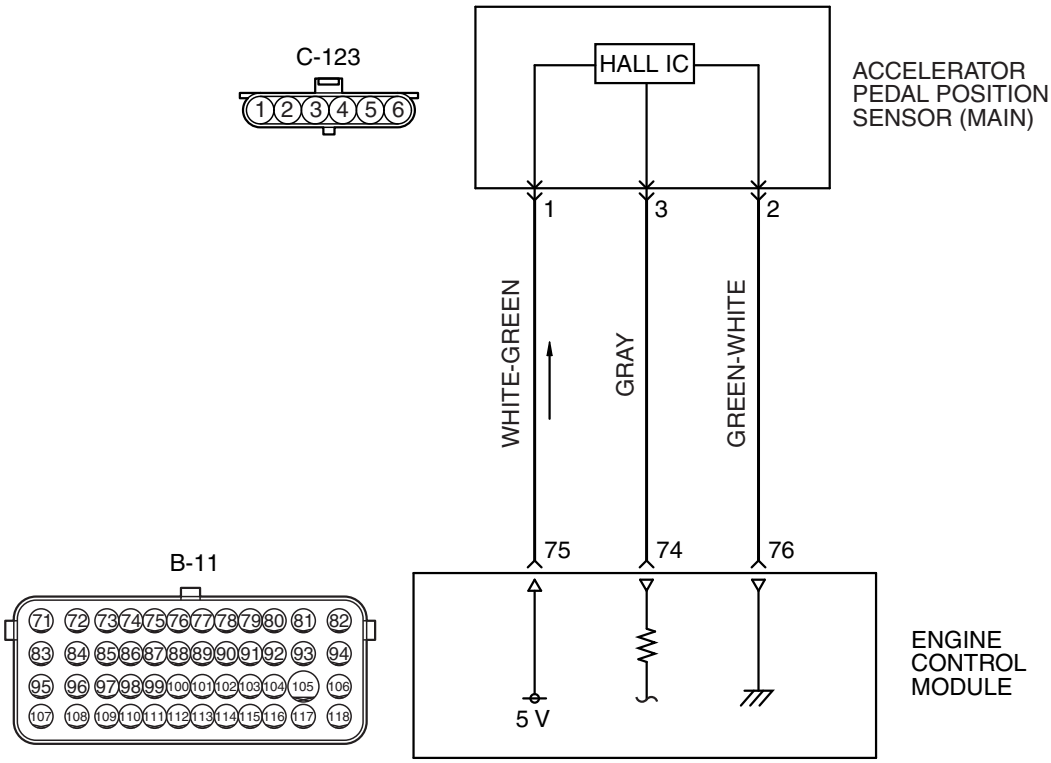
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2101 set?

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

DTC P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



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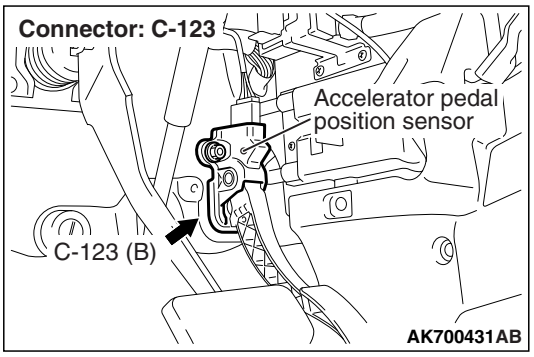
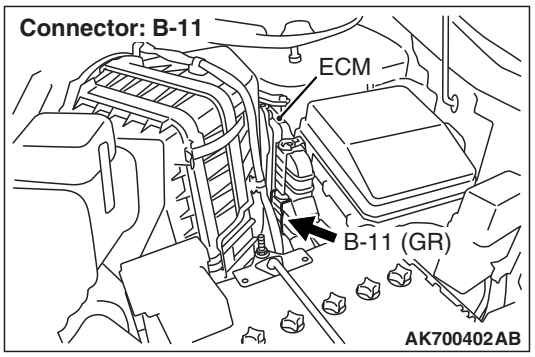




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 74) from the accelerator pedal position sensor (main) output terminal (terminal No. 3).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) 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)

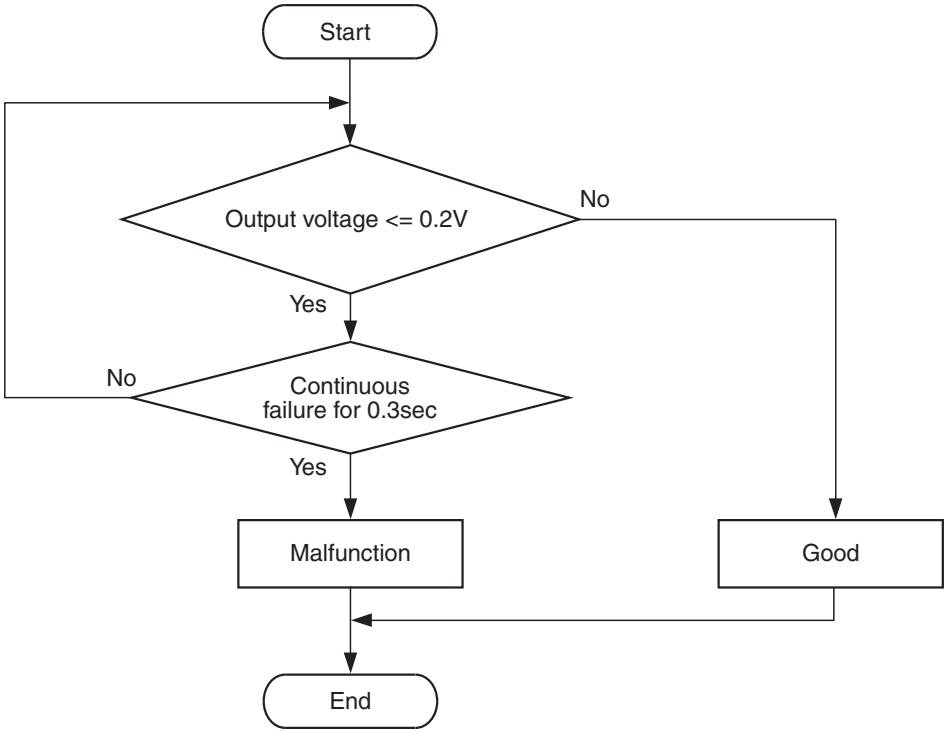
- Not applicable

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
- Accelerator pedal position sensor (main) output voltage is 0.2 volt or less for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN
None.

DIAGNOSIS

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

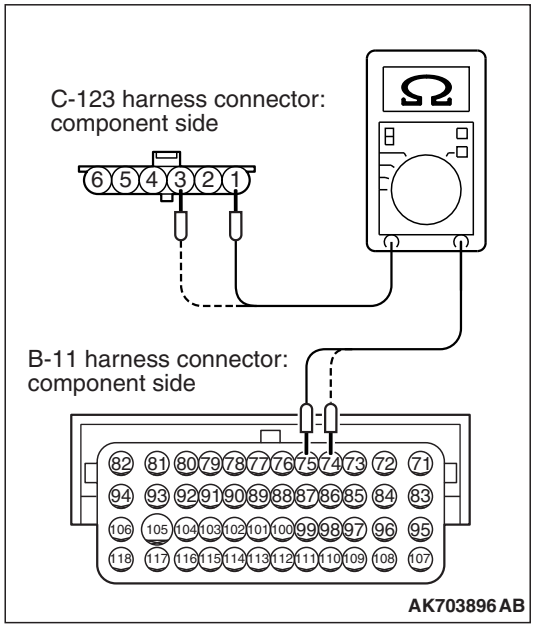
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

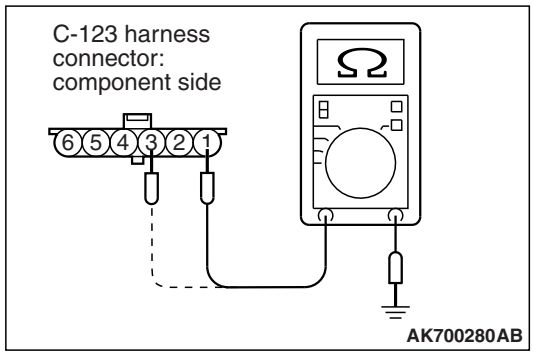
TSB Revision



STEP 2. Check for open circuit or short circuit to ground or harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.

(1) Disconnect the connector C-123 and B-11 measure at the harness side.

(2) Measure the resistance between connector C-123 and connector B-11.
   a. Connector C-123 (terminal No. 1) and connector B-11 (terminal No. 75).
   b. Connector C-123 (terminal No. 3) and connector B-11 (terminal No. 74).
      - Should be less than 2 ohms.

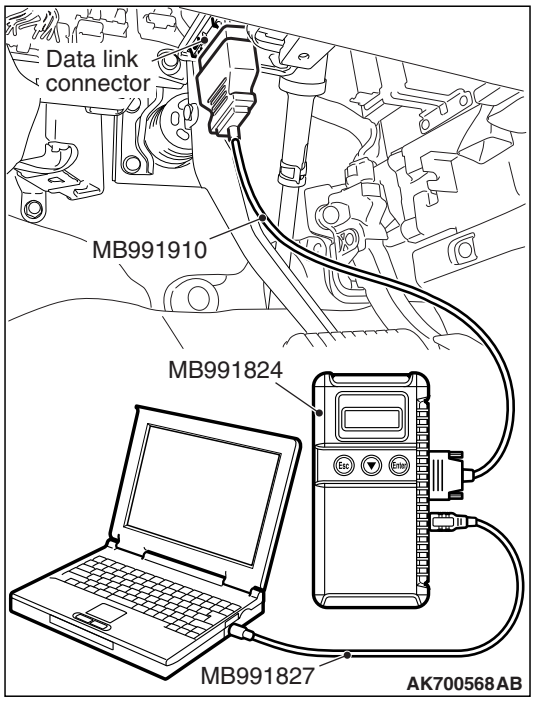


(3) Check for the continuity between connector C-123 and ground.
   a. Connector C-123 (terminal No. 1) and ground.
   b. Connector C-123 (terminal No. 3) and ground.
      - Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 3.

NO : Repair it. Then go to Step 4.



STEP 3. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ 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 11, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.9 and 1.1 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Replace the accelerator pedal position sensor. Then go to Step 4.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

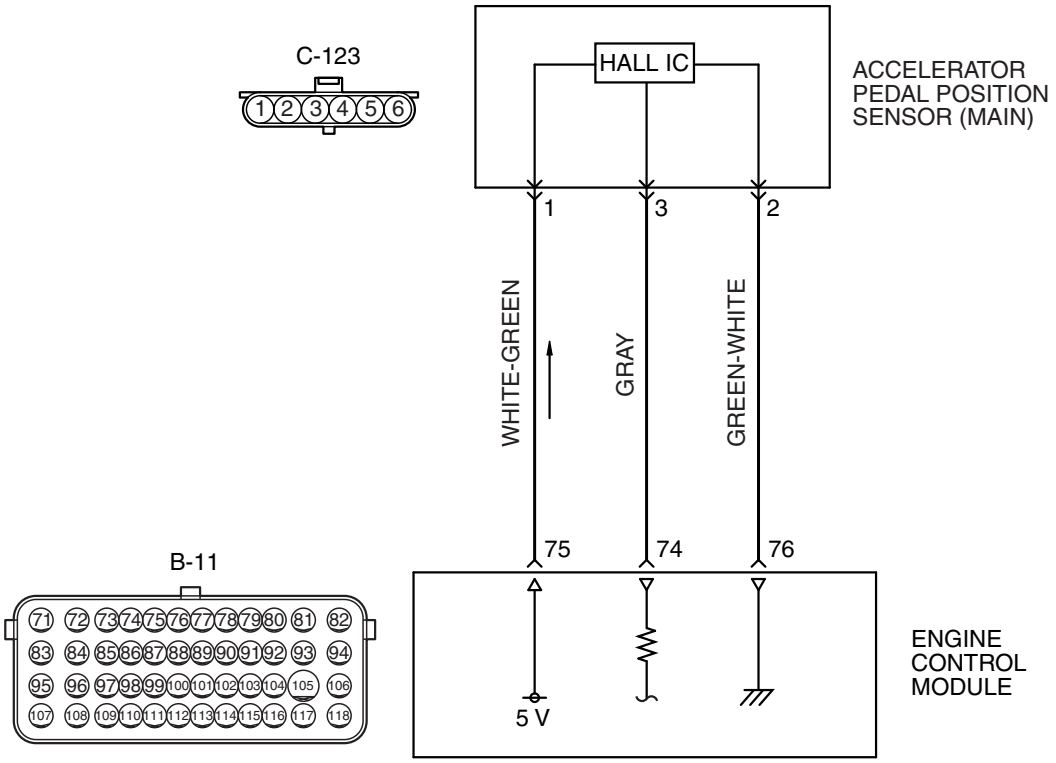
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2122 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2123: Accelerator Pedal Position Sensor (main) Circuit High Input

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



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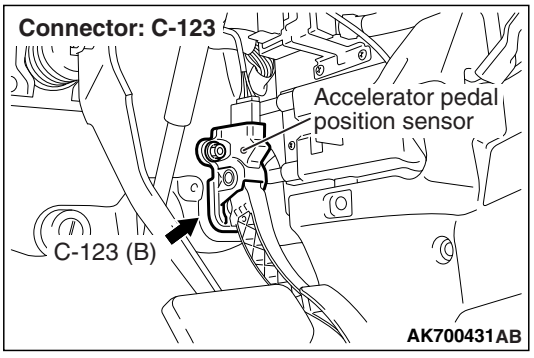
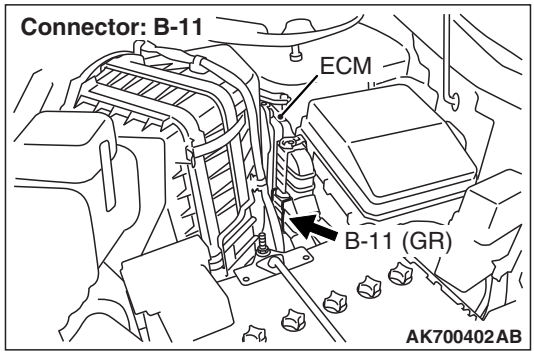




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75).
- A votage that is according to the accelerator opening angle is sent to the ECM (terminal No. 74) from the accelerator pedal position sensor (main) output terminal (terminal No. 3).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) 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)

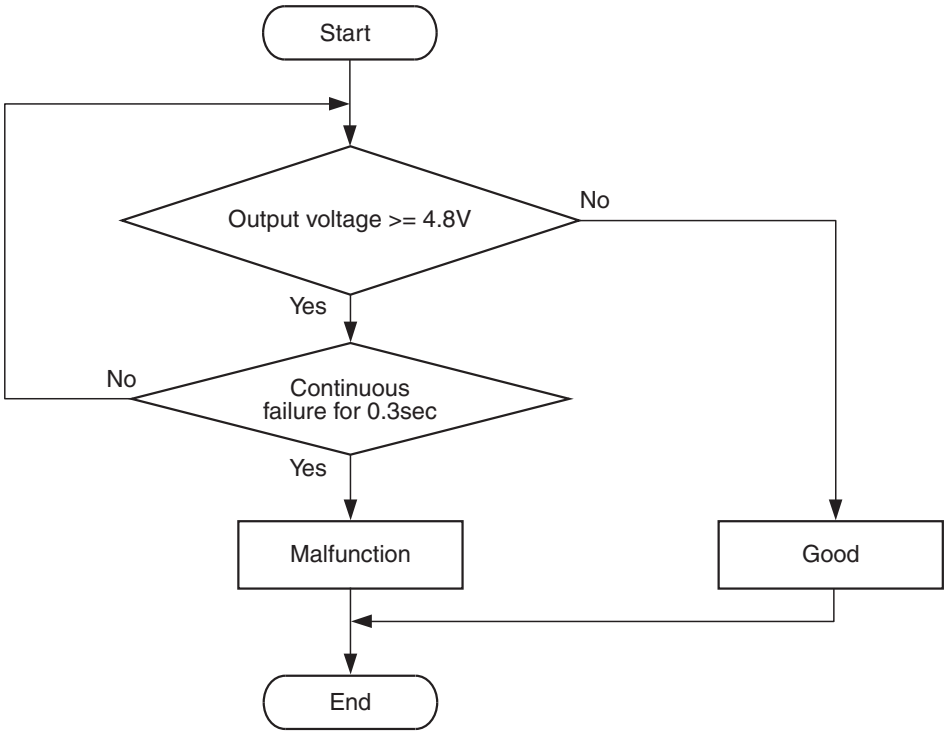
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604360

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage should be 4.8 volts or higher for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

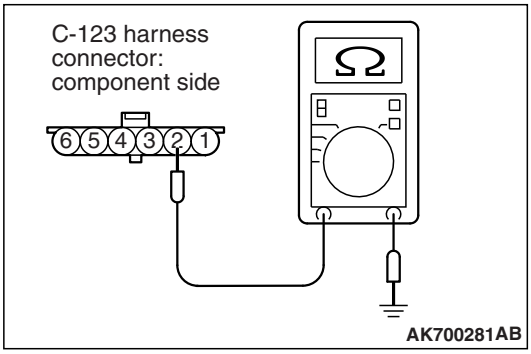
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-123.



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

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

- Should be less than 2 ohms.

Q: Does continuity exist?

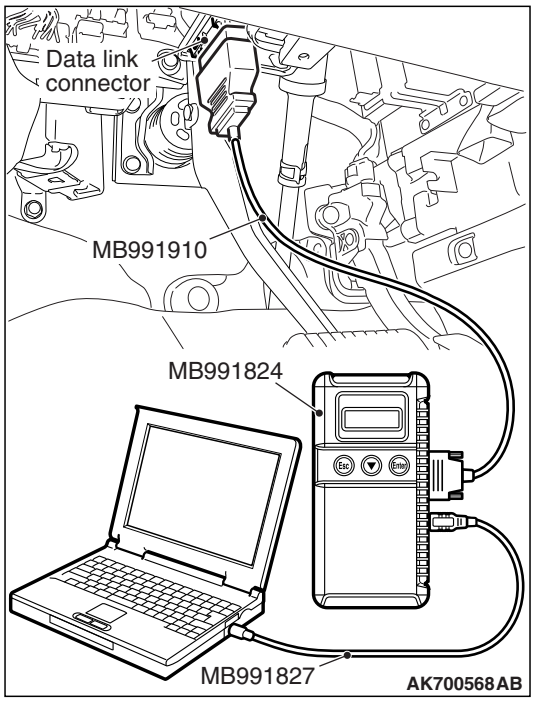
YES : Go to Step 3.

NO : Repair it. Then go to Step 4.

STEP 3. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ 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 11, Accelerator Pedal Position Sensor (main).

- Output voltage is between 0.9 and 1.1 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Replace the accelerator pedal position sensor. Then go to Step 4.

TSB Revision

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

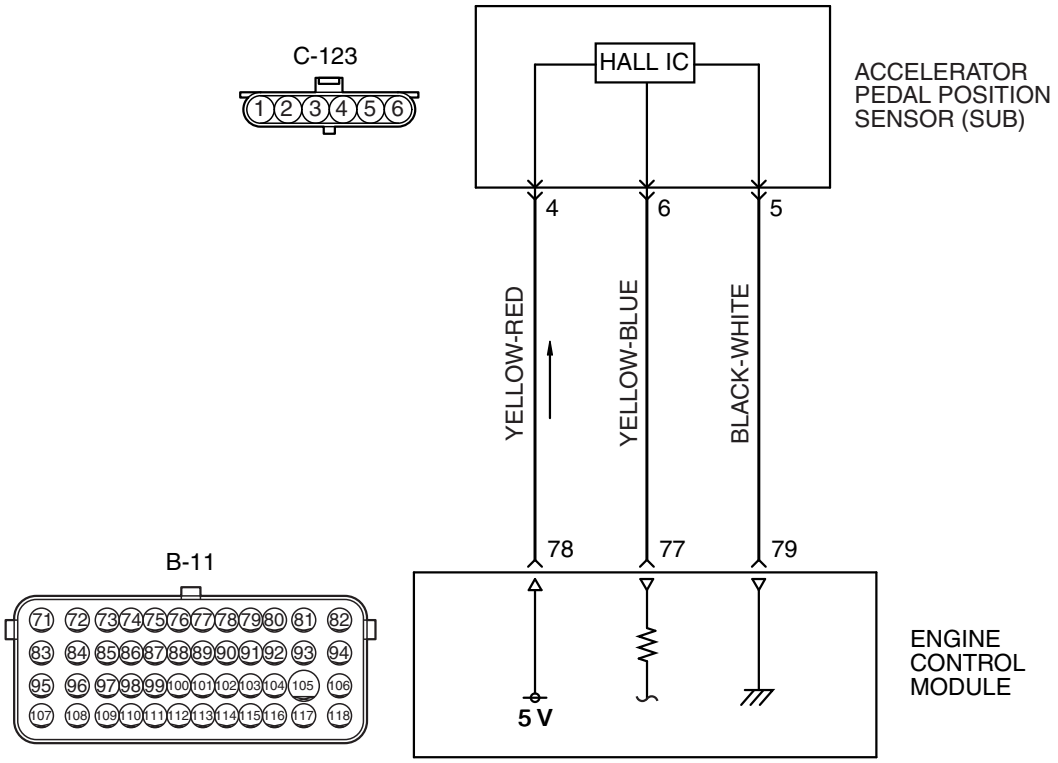
Q: Is DTC P2123 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input

ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



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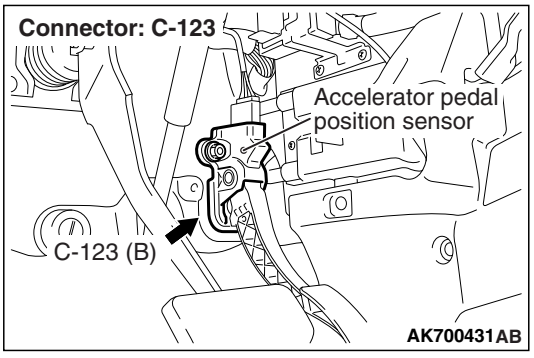
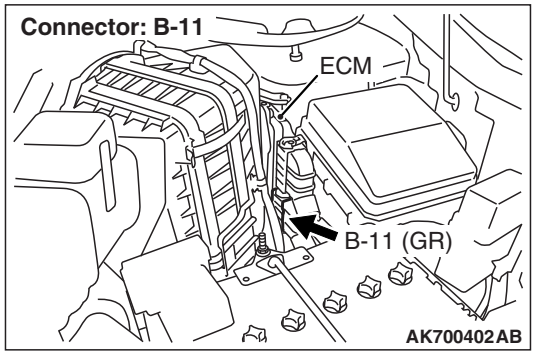




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 77) from the accelerator pedal position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal 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)

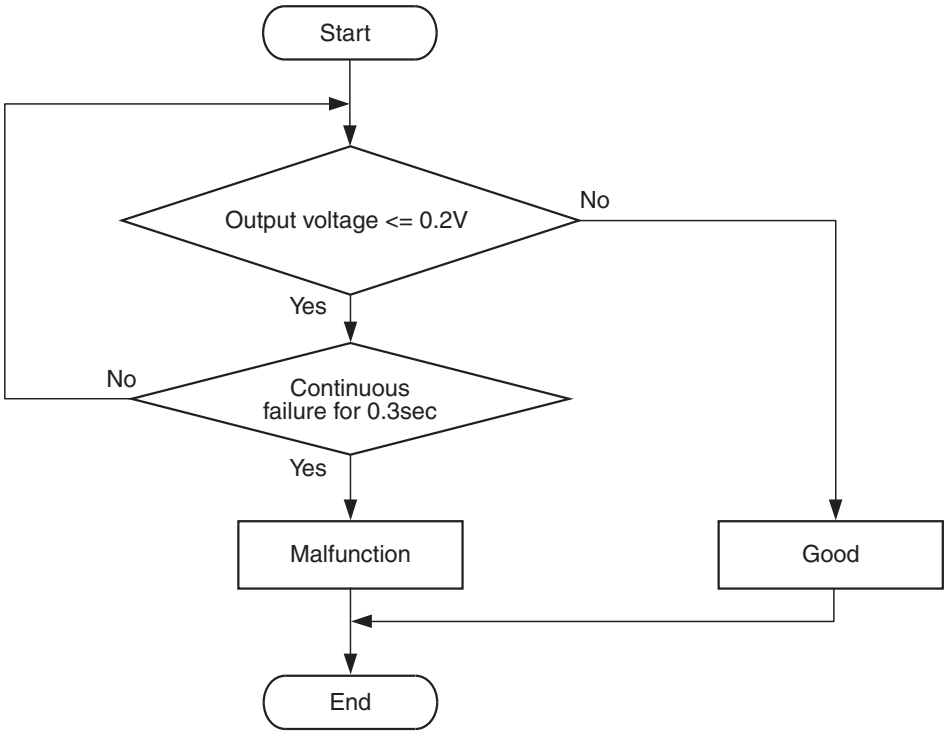
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK800588

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 0.2 volt or less for 0.3 second.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

None.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

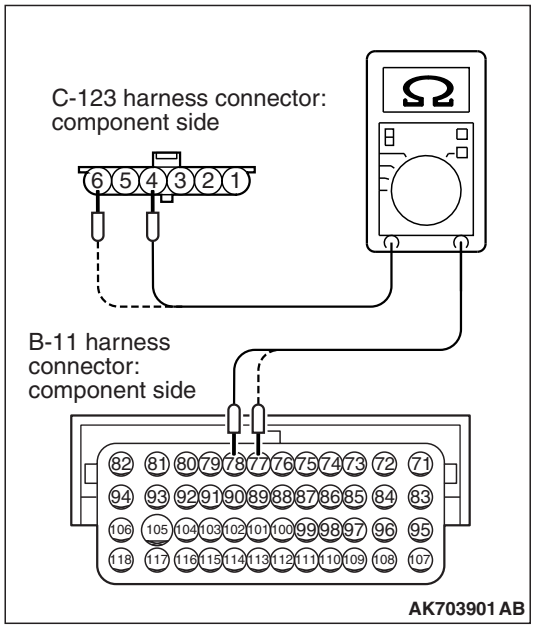
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

STEP 2. Check for open circuit or short circuit to ground or harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.



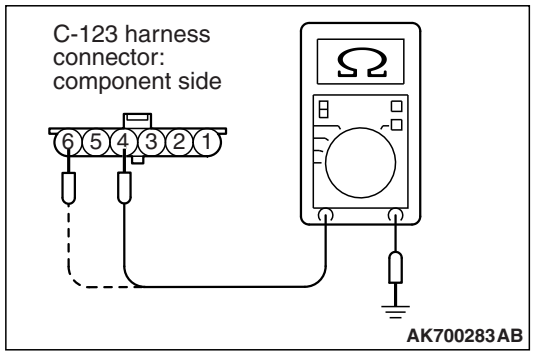
(1) Disconnect the connector C-123 and B-11 measure at the harness side.

(2) Measure the resistance between connector C-123 and connector B-11.

a. Connector C-123 (terminal No. 4) and connector B-11 (terminal No. 78).

b. Connector C-123 (terminal No. 6) and connector B-11 (terminal No. 77).

- Should be less than 2 ohms.



(3) Check for the continuity between connector C-123 and ground.

a. Connector C-123 (terminal No. 4) and ground.

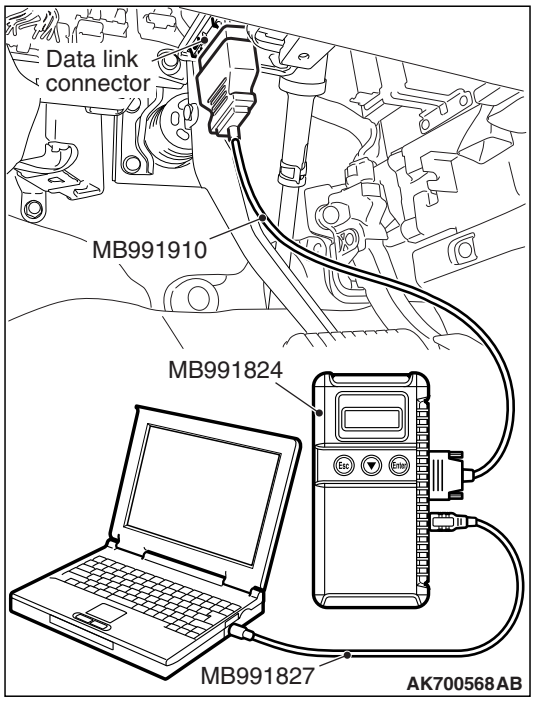
b. Connector C-123 (terminal No. 6) and ground.

- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 3.

NO : Repair it. Then go to Step 4.



STEP 3. Using scan tool MB991958, check data list item 12: Accelerator Pedal 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) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.4 and 0.6 volts when foot is released from accelerator pedal.
- Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Replace the accelerator pedal position sensor. Then go to Step 4.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

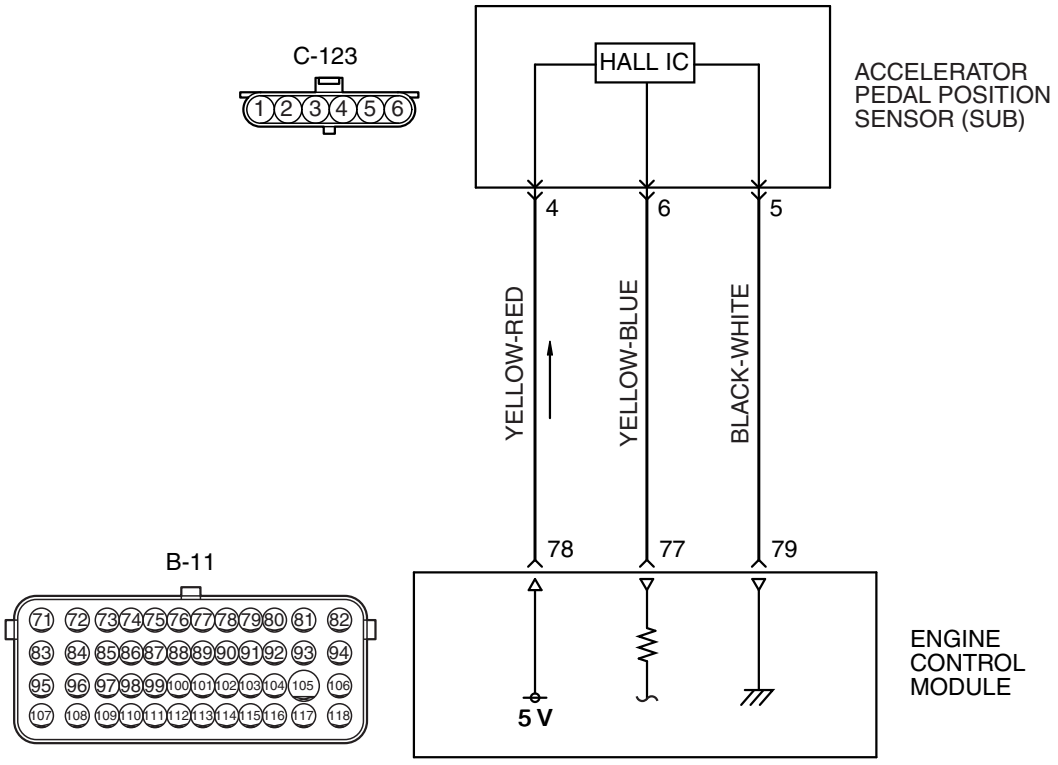
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2127 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2128: Accelerator Pedal Position Sensor (Sub) Circuit High Input

ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



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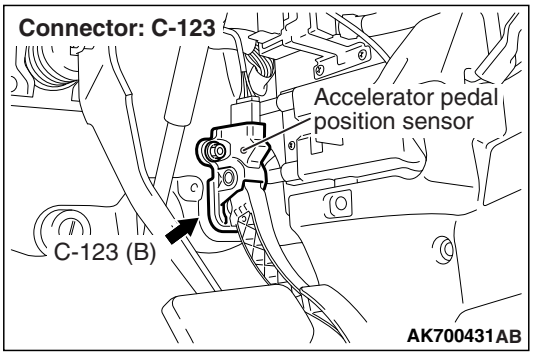
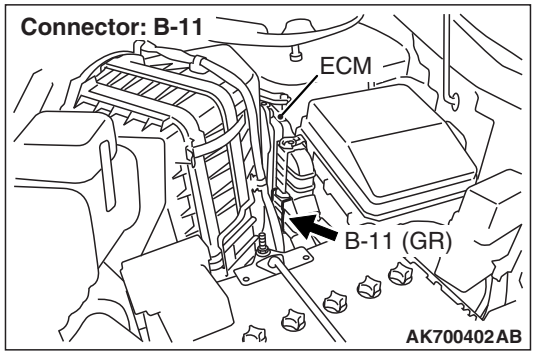




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
- A votage that is according to the accelerator opening angle is sent to the ECM (terminal No. 77) from the accelerator pedal position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal 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)

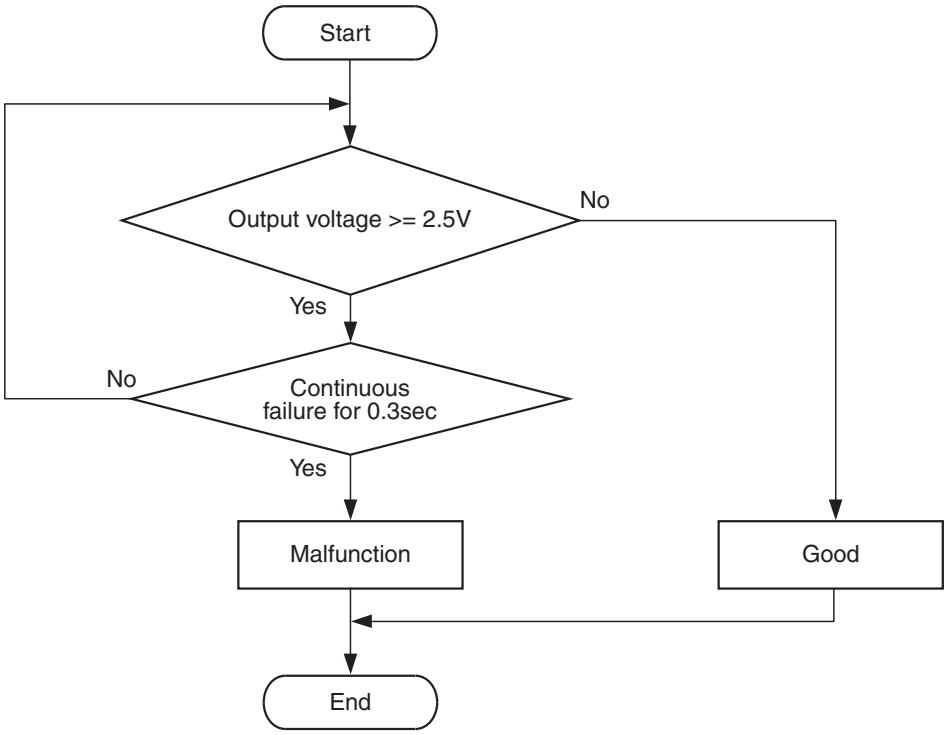
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604340

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 2.5 volts or higher for 0.3 second.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

None.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

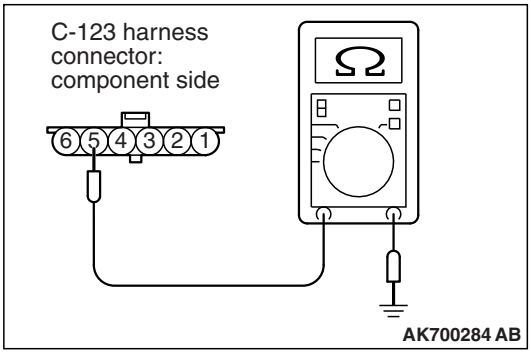
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-123.



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

(2) Measure the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

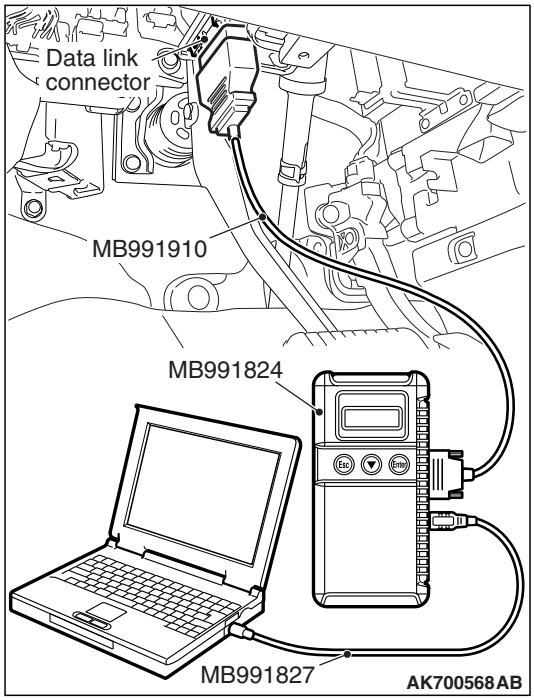
YES : Go to Step 3.

NO : Repair it. Then go to Step 4.

STEP 3. Using scan tool MB991958, check data list item 12: Accelerator Pedal 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) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).

- Output voltage is between 0.4 and 0.6 volts when foot is released from accelerator pedal.
- Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.

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

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Replace the accelerator pedal position sensor. Then go to Step 4.

TSB Revision

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2128 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2135: Throttle Position Sensor (Main and Sub) Range/Performance Problem

THROTTLE POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P0122 – Throttle Position Sensor (Main) Circuit Low Input P.13B-199.
- Refer to DTC P0222 – Throttle Position Sensor (Sub) Circuit Low Input P.13B-393.

CIRCUIT OPERATION

- Refer to DTC P0122 – Throttle Position Sensor (Main) Circuit Low Input P.13B-199.
- Refer to DTC P0222 – Throttle Position Sensor (Sub) Circuit Low Input P.13B-393.

TECHNICAL DESCRIPTION

- ECM checks the throttle position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between throttle position sensor (main) and throttle position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

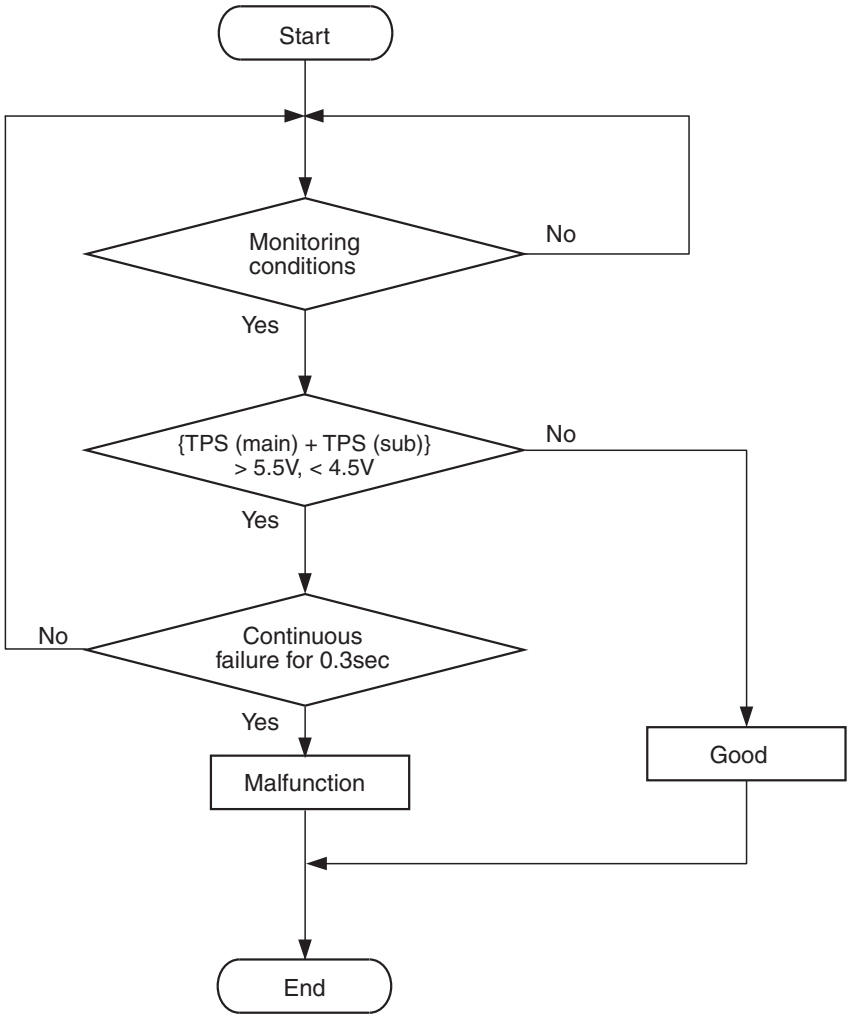
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



AK604362

Check Conditions

- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.

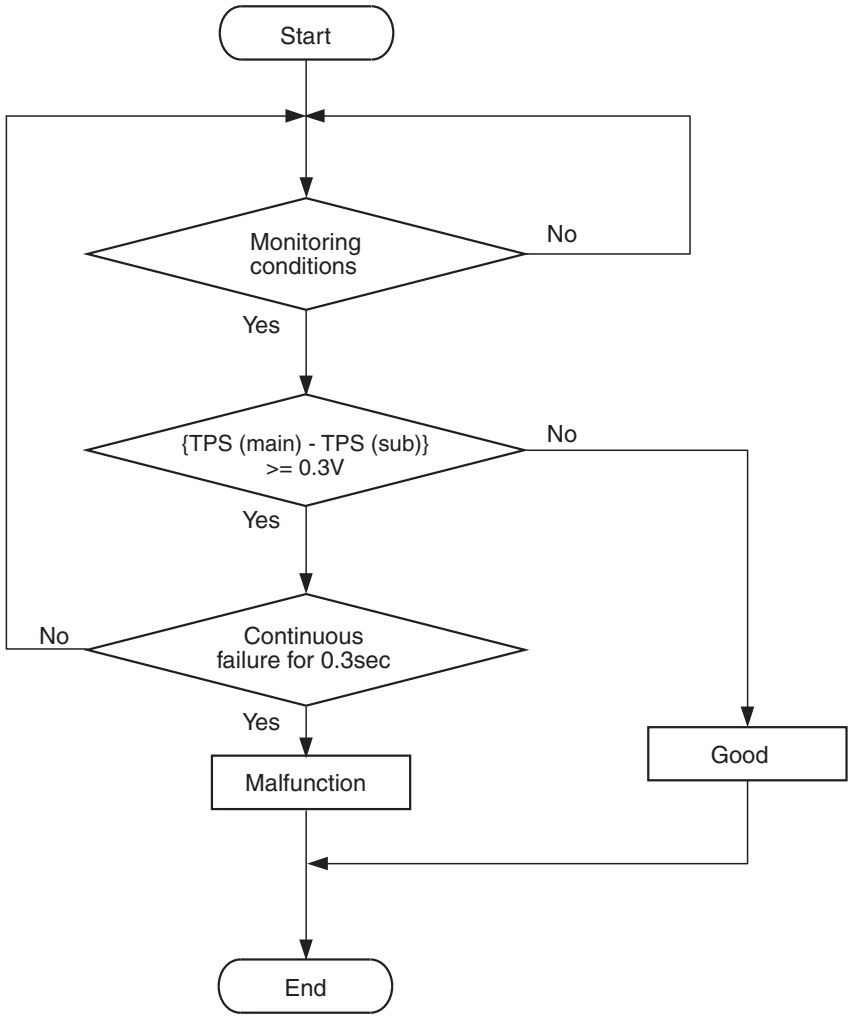
Judgement Criterion

- For 0.3 second, the sum of the output voltage of the (main and sub) throttle position sensors is 4.5 volts or less, or 5.5 volts or more.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



AK604361

Check Conditions

- The target opening degree of the throttle valve is 0.9 V or less.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.
- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- The difference between V1 and V2 is more than 0.3 volt for 0.3 second.
  V1: Throttle position sensor (main) output voltage.
  V2: Throttle position sensor (sub) output voltage subtracted from 5 volts.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Throttle position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

TSB Revision

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 B-08 at throttle position 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 4.

STEP 2. Check for harness damage between throttle position sensor connector B-08 and ECM connector B-10.

(1) Disconnect the connector B-08 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-08 and connector B-10.

a. Connector B-08 (terminal No. 3) and connector B-10 (terminal No. 13).

b. Connector B-08 (terminal No. 4) and connector B-10 (terminal No. 10).

c. Connector B-08 (terminal No. 5) and connector B-10 (terminal No. 12).

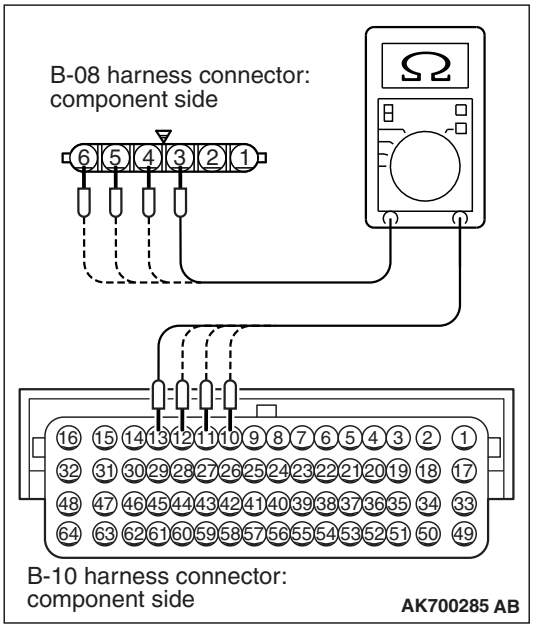
d. Connector B-08 (terminal No. 6) and connector B-10 (terminal No. 11).

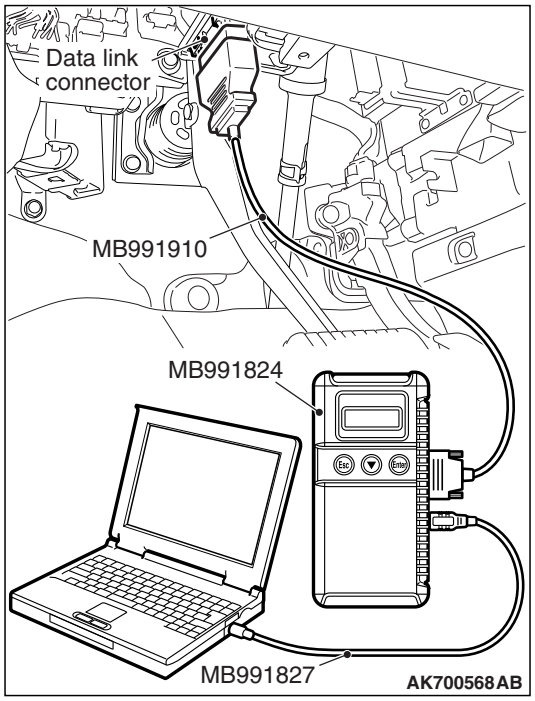
- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 3.

NO : Repair it. Then go to Step 4.





STEP 3. Using scan tool MB991958, check data list.

⚠ 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) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 13: Throttle Position Sensor (main).
  b. Item 15: Throttle Position Sensor (sub).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

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

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC again.
(3) Depress the accelerator pedal fully for a few seconds.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Check the DTC.

Q: Is DTC P2135 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2138: Accelerator Pedal Position Sensor (main and sub) Range/Performance Problem

ACCELERATOR PEDAL POSITION SENSOR (MAIN AND SUB) RANGE/PERFORMANCE CIRCUIT

- Refer to DTC P2122 – Accelerator Pedal Position Sensor (Main) Circuit Low Input P.13B-670.
- Refer to DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit Low Input P.13B-679.

CIRCUIT OPERATION

- Refer to DTC P2122 – Accelerator Pedal Position Sensor (Main) Circuit Low Input P.13B-670.
- Refer to DTC P2127 – Accelerator Pedal Position Sensor (Sub) Circuit Low Input P.13B-679.

TECHNICAL DESCRIPTION

- ECM checks the accelerator pedal position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between accelerator pedal position sensor (main) and accelerator pedal position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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

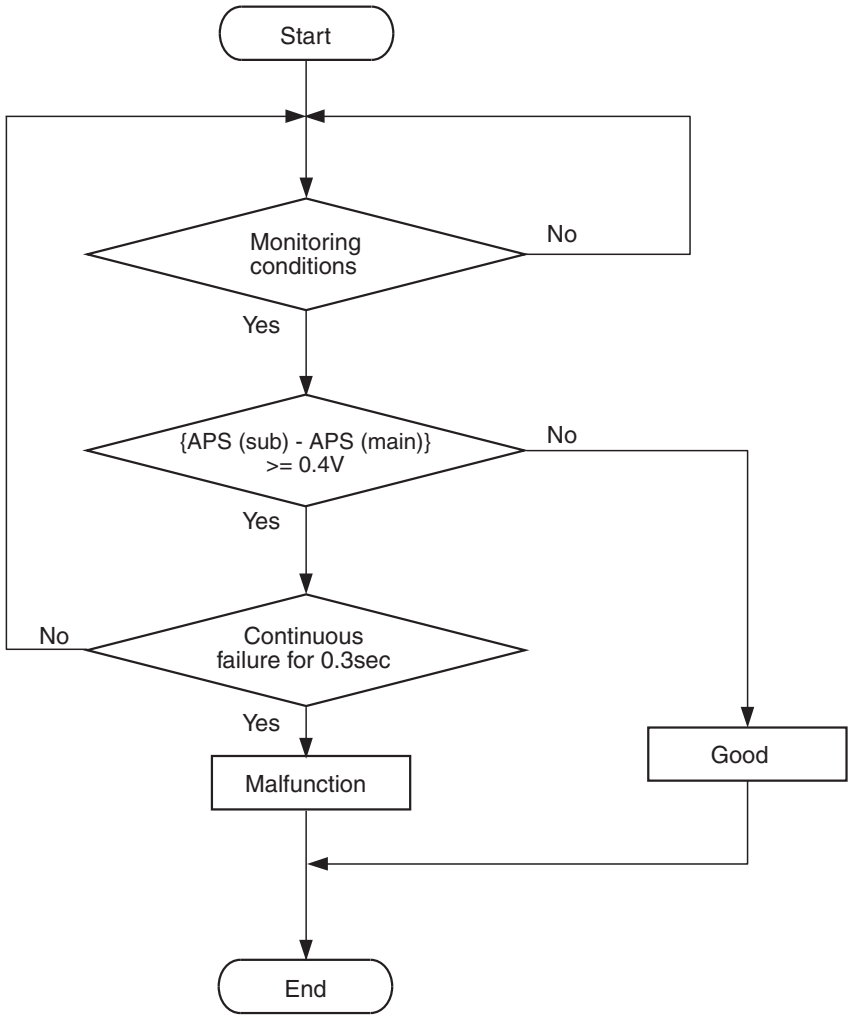
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS Range/Performance problem -relation between main and sub

Logic Flow Chart



AK604363

Check Condition

- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

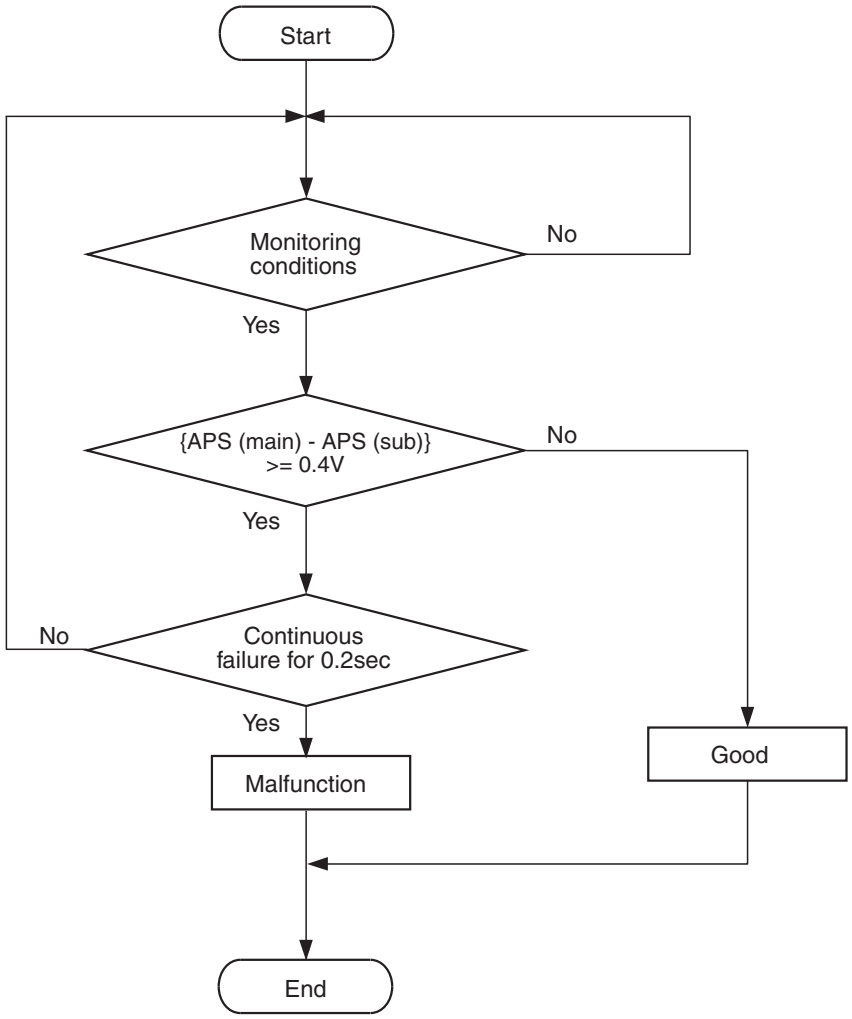
- The accelerator pedal position sensor (main) output voltage subtracted from the accelerator pedal position sensor (sub) output voltage is more than 0.4 volt for 0.3 second.

NOTE: The accelerator pedal position sensor voltage used for the judgement is converted into the accelerator pedal position sensor voltage for the internal processing by the ECM.

TSB Revision

DTC SET CONDITIONS Range/Performance problem -relation between main and sub

Logic Flow Chart



AK604364

Check Condition

- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

- The accelerator pedal position sensor (sub) output voltage subtracted from the accelerator pedal position sensor (main) output voltage is more than 0.4 volt for 0.2 second.

  NOTE: The accelerator pedal position sensor voltage used for the judgement is converted into the accelerator pedal position sensor voltage for the internal processing by the ECM.

OBD-II DRIVE CYCLE PATTERN

None.

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

- Accelerator pedal position sensor failed.
- Connector damage.
- Harness damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

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

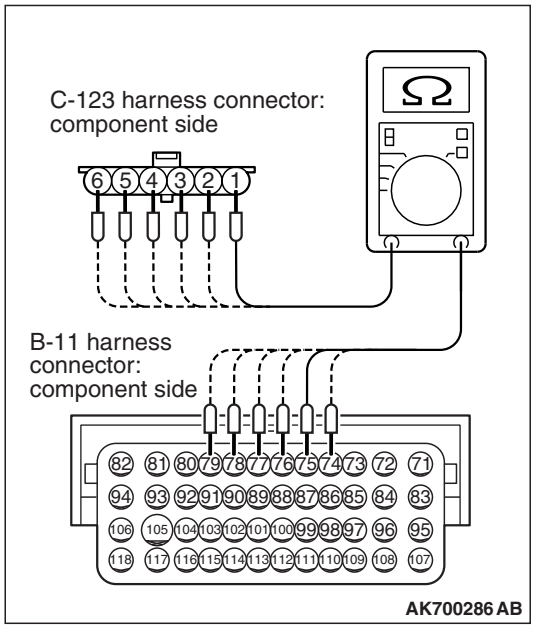
STEP 1. Check harness connector C-123 at accelerator pedal position sensor and harness connector B-11 at ECM for damage.

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 4.

STEP 2. Check for harness damage between accelerator pedal position sensor connector C-123 and ECM connector B-11.



(1) Disconnect the connector C-123 and B-11 measure at the harness side.

(2) Measure the resistance between connector C-123 and connector B-11.

a. Connector C-123 (terminal No. 1) and connector B-11 (terminal No. 75).

b. Connector C-123 (terminal No. 2) and connector B-11 (terminal No. 76).

c. Connector C-123 (terminal No. 3) and connector B-11 (terminal No. 74).

d. Connector C-123 (terminal No. 4) and connector B-11 (terminal No. 78).

e. Connector C-123 (terminal No. 5) and connector B-11 (terminal No. 79).

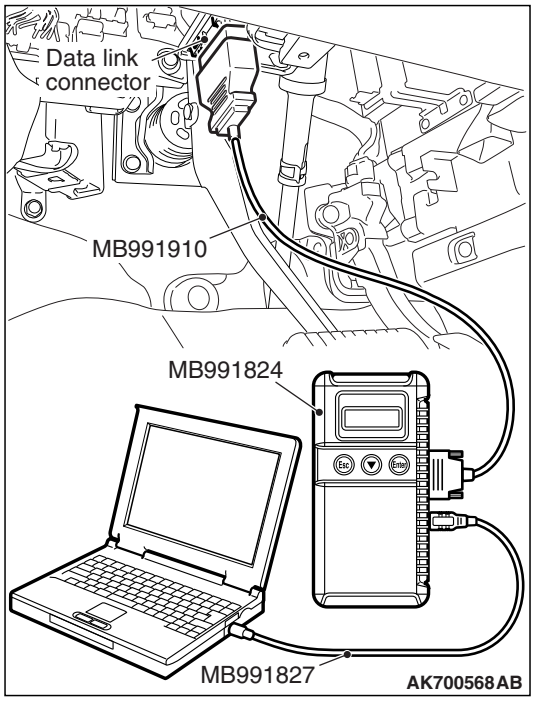
f. Connector C-123 (terminal No. 6) and connector B-11 (terminal No. 77).

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 3.

NO : Repair it. Then go to Step 4.



STEP 3. Using scan tool MB991958, check data list.

⚠ 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) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 11: Accelerator Pedal Position Sensor (main).
  b. Item 12: Accelerator Pedal Position Sensor (sub).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

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

STEP 4. 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 P2138 set?

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

DTC P2195: Heated Oxygen Sensor Inactive (bank 1, sensor 1)

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the right bank heater oxygen sensor (front).
- If the right bank heated oxygen sensor (front) has deteriorated, corrections will be made by the right bank heated oxygen sensor (rear).
- DTC P2195 becomes stored in memory if a failure is detected in the right bank heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Right bank heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) 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)

- Heated oxygen sensor (front) heater monitor
- Misfire monitor

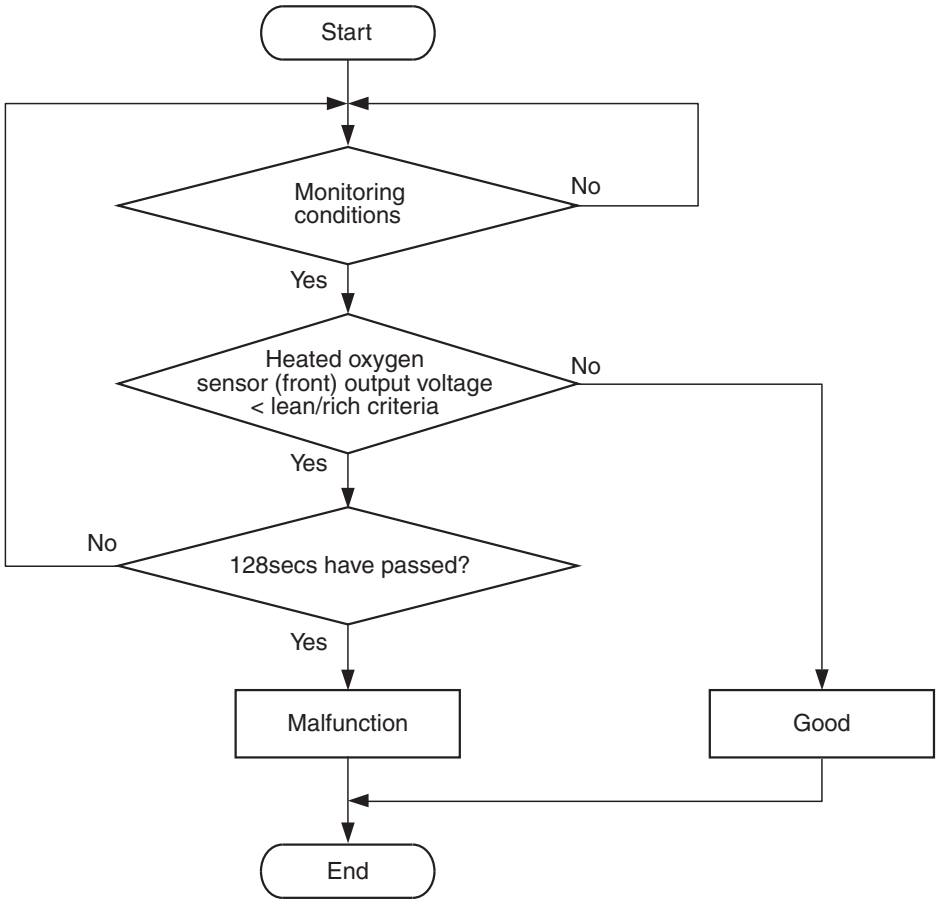
Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK604365

Check Conditions

- More than 350 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is 7°C (45°F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than –10°C (14°F)

Judgment Criterion

- Right bank heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

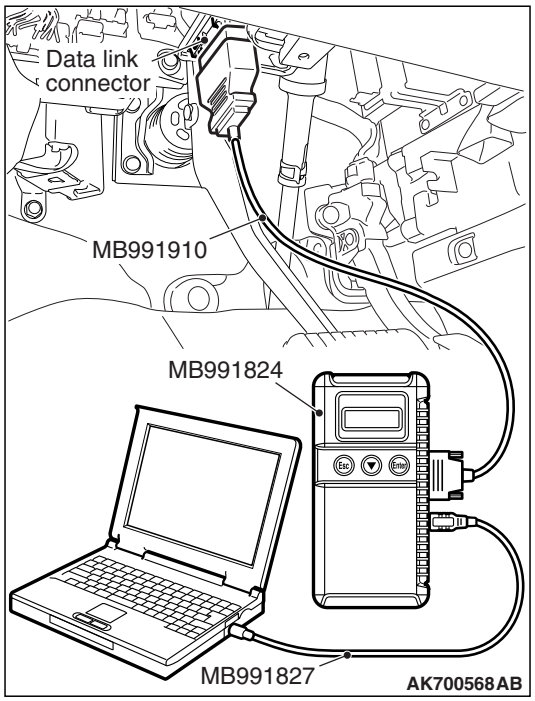
- Right bank heated oxygen sensor (front) deteriorated.
- Connector damage.
- Harness damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

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

TSB Revision



STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ 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 AC, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
- Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

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

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Replace it. Then go to Step 3.

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 21 P.13B-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 21 P.13B-11.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

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

TSB Revision

DTC P2197: Heated Oxygen Sensor Inactive (bank 2, sensor 1)

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the left bank heater oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the left bank heated oxygen sensor (rear).
- DTC P2197 becomes stored in memory if a failure is detected in the left bank heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Left bank heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) 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)

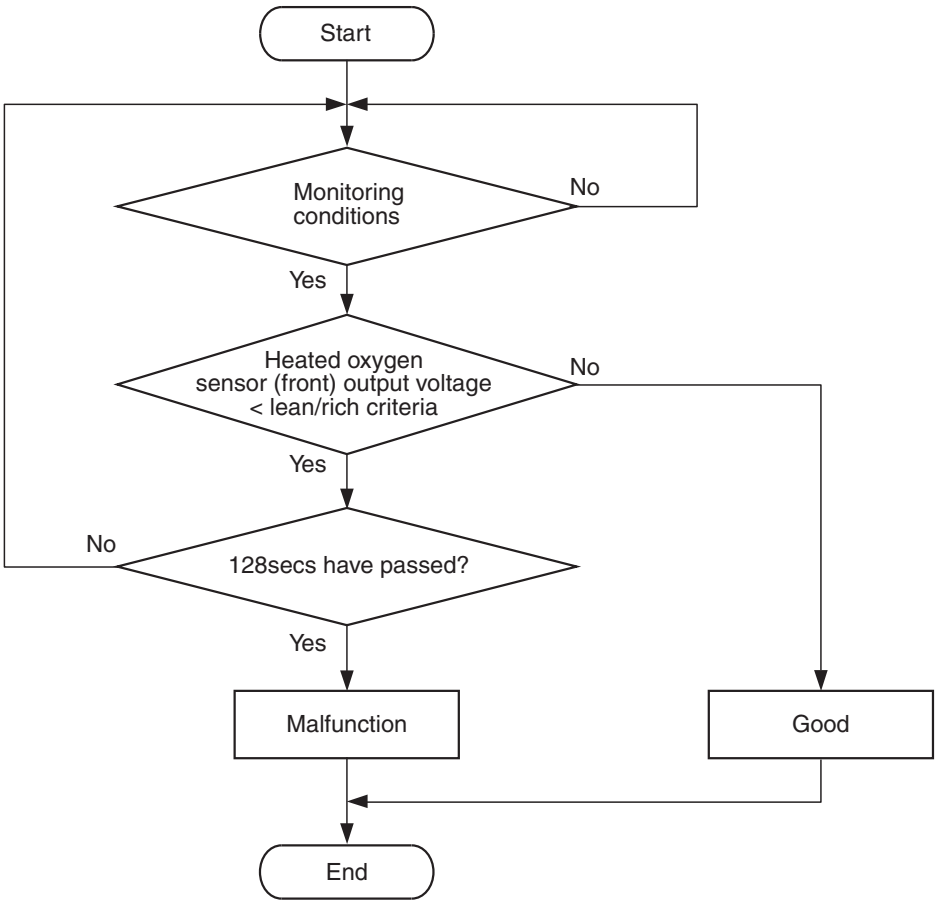
- Heated oxygen sensor (front) heater monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604365

TSB Revision

Check Conditions

- More than 350 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is 7°C (45°F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than –10°C (14°F)

Judgment Criterion

- Left bank heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Left bank heated oxygen sensor (front) deteriorated.
- 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 AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

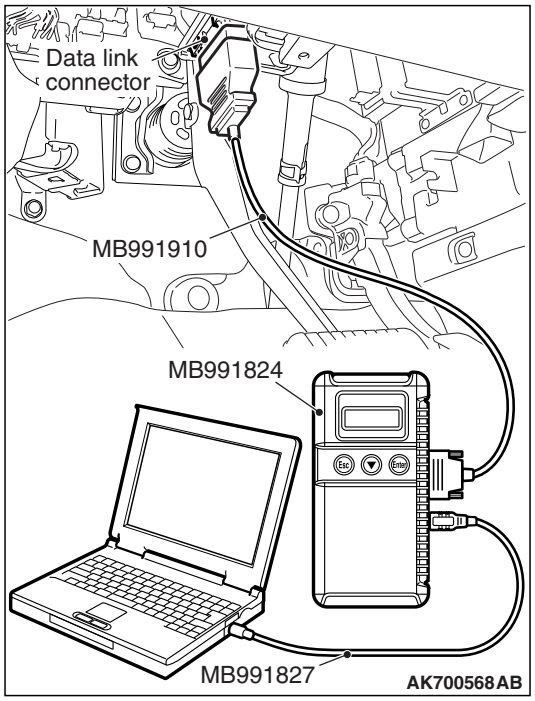
⚠ CAUTION

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 AE, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Replace it. Then go to Step 3.



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 21 P.13B-11.

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

Q: Is DTC P2197 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 21 P.13B-11.

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

Q: Is DTC P2197 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2228: Barometric Pressure Circuit Low Input

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure 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)

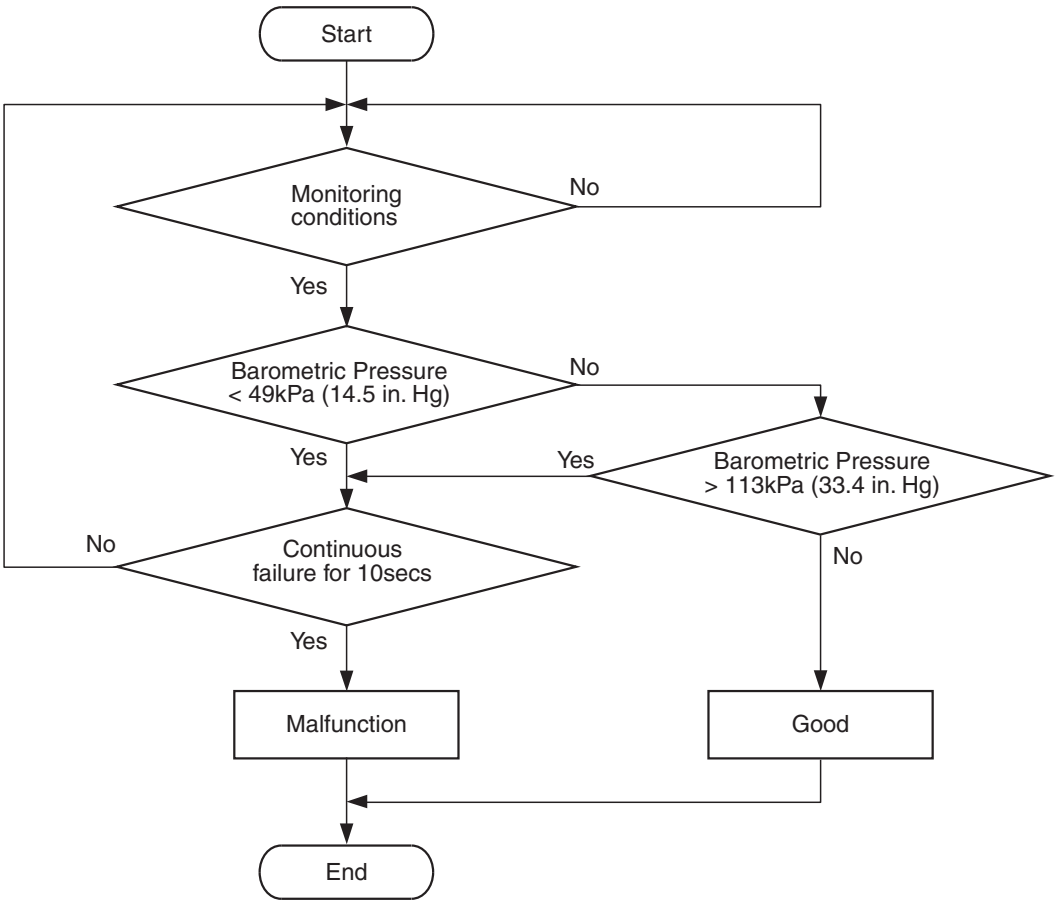
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604366

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 6 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 49 kPa (14.5 in.Hg) or lower (approximately 15,000 feet above sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- 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

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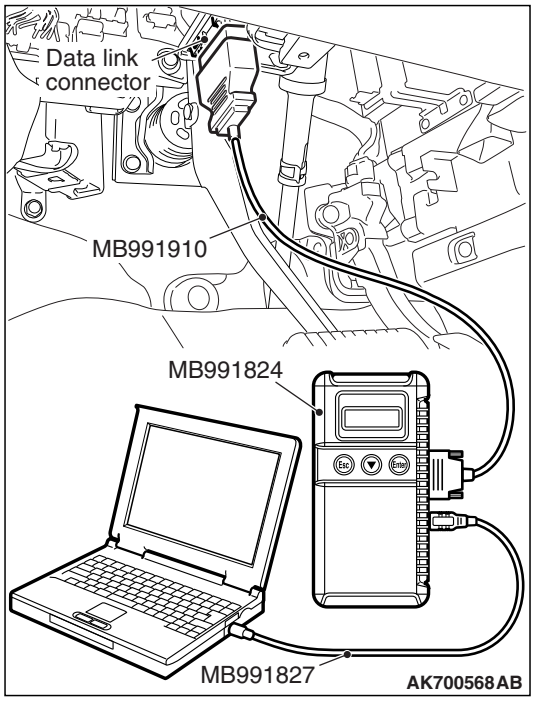


STEP 1. Test the OBD-II drive cycle.

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

Q: Is DTC P02228 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2229: Barometric Pressure Circuit High Input

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure 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)

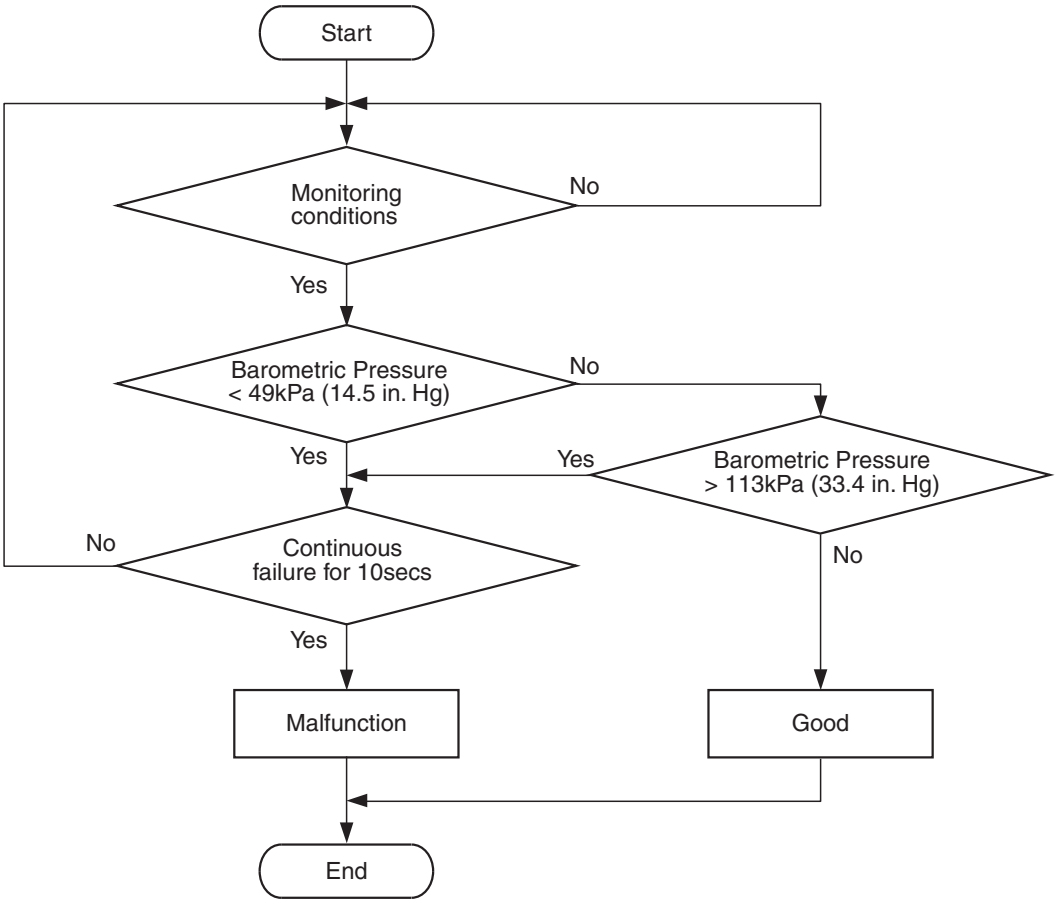
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604366

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 6 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 113 kPa (33.4 in.Hg) or higher (approximately 4,000 ft below sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- 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

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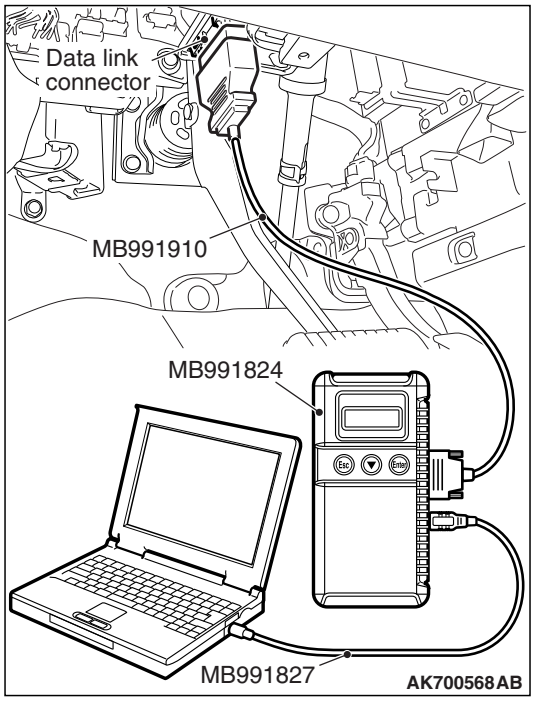


STEP 1. Test the OBD-II drive cycle.

⚠ 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.

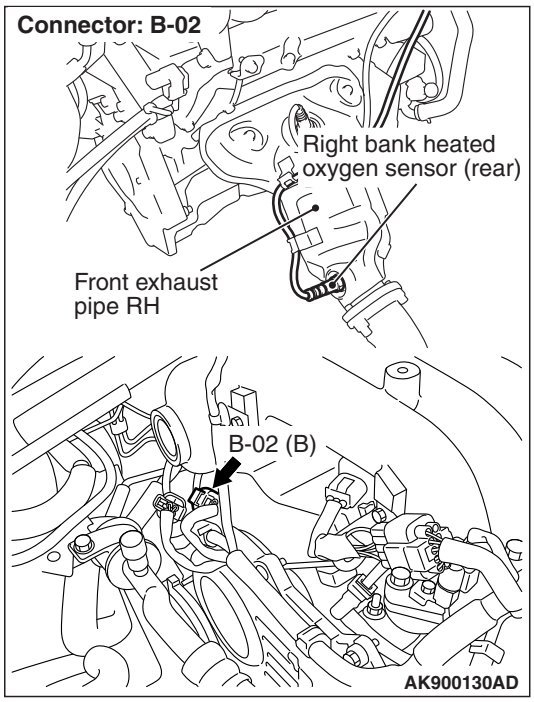
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle – Pattern 22 P.13B-11.
(4) Check the diagnosis trouble code (DTC).

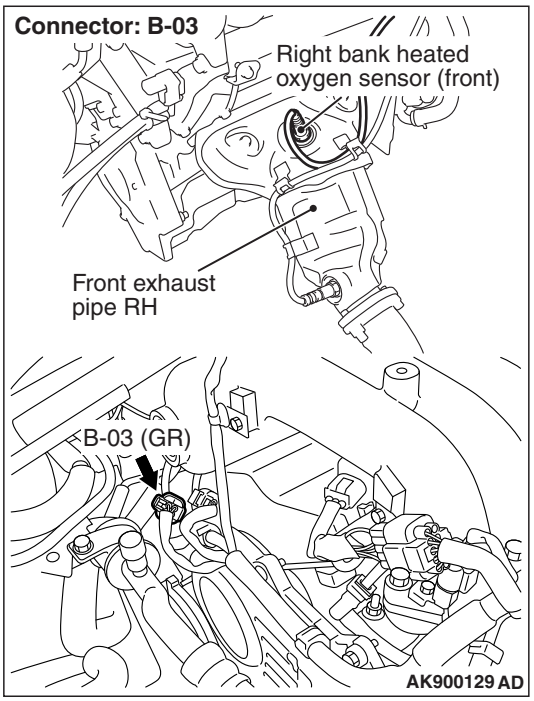
Q: Is DTC P02229 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

DTC P2252: Heated Oxygen Sensor Offset Circuit Low Voltage





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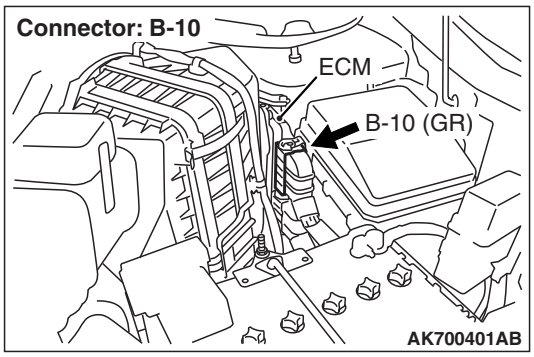

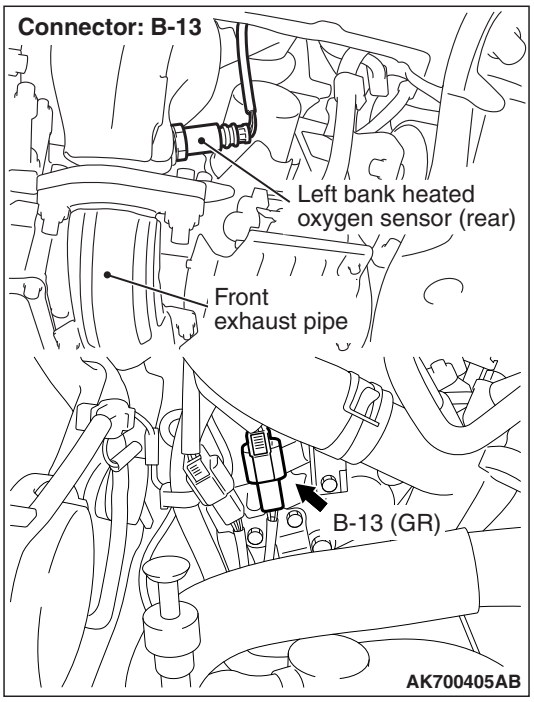

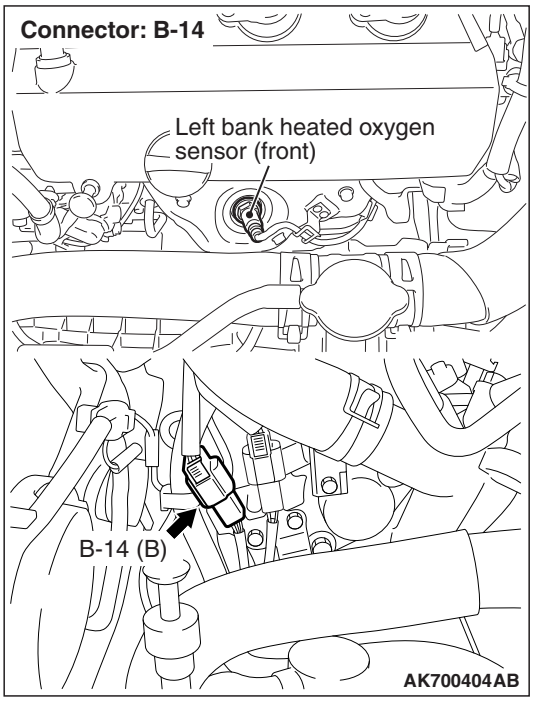

HEATED OXYGEN SENSOR OFFSET CIRCUIT LOW VOLTAGE CIRCUIT

Refer to DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-222.
Refer to DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-244.
Refer to DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-263.
Refer to DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-284.

CIRCUIT OPERATION

Refer to DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-222.
Refer to DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-244.
Refer to DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-263.
Refer to DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-284.

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The ECM checks for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is under 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

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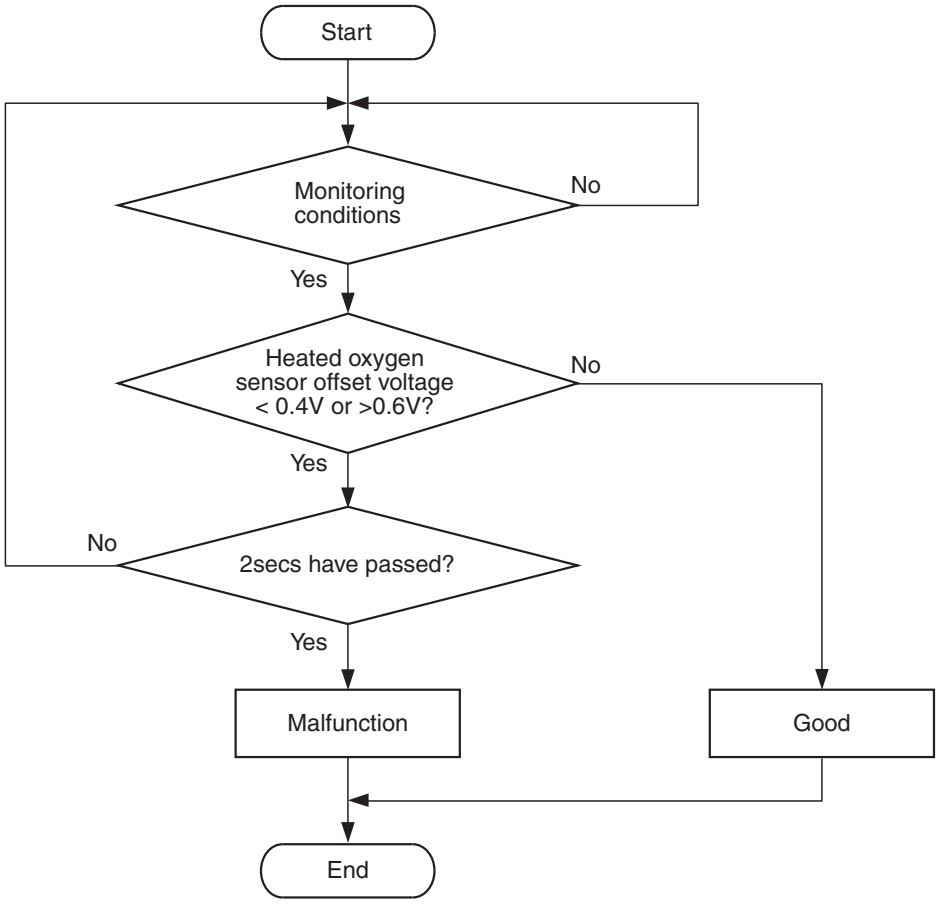
Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITION

Logic Flow Chart



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

Judgement Criterion
- Heated oxygen sensor offset voltage is lower than 0.4 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Right bank heated oxygen sensor (front) failed.
- Right bank heated oxygen sensor (rear) failed.
- Left bank heated oxygen sensor (front) failed.
- Left bank heated oxygen sensor (rear) failed.
- Shorted right bank heated oxygen sensor (front) circuit or connector damage.
- Shorted right bank heated oxygen sensor (rear) circuit or connector damage.
- Shorted left bank heated oxygen sensor (front) circuit or connector damage.
- Shorted left bank heated oxygen sensor (rear) circuit or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

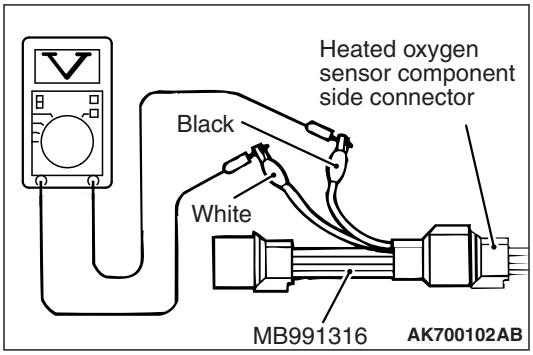
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991316: Test Harness
- MD998464: Test Harness

STEP 1. Check harness connector B-03 at right bank heated oxygen sensor (front), harness connector B-02 at right bank heated oxygen sensor (rear), harness connector B-14 at left bank heated oxygen sensor (front), harness connector B-13 at left bank heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q: Are the harness connectors in good condition?

YES : Go to Step 2.

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



STEP 2. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool MB991316 to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

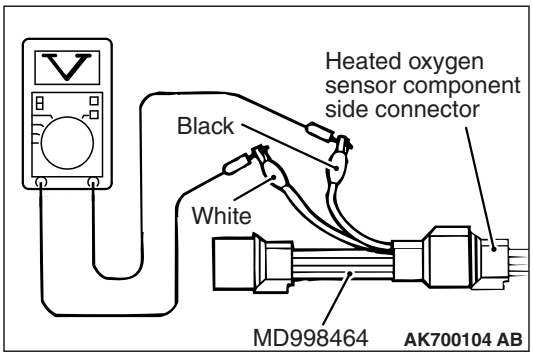
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

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

YES : Go to Step 3.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 11.



STEP 3. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool MD998464 to the connector on the left bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

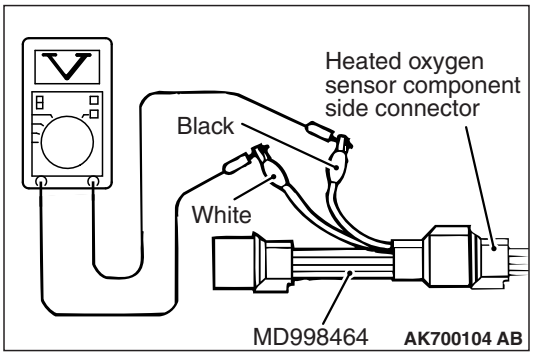
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

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

YES : Go to Step 4.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 11.



STEP 4. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and connect test harness special tool MD998464 to the connector on the right bank 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 (31 mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed
- Drive with wide open throttle
- Engine: 3,500 r/min or more

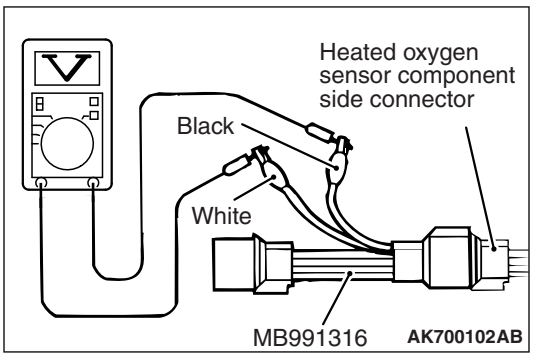
Standard value: 0.6 – 1.0 V

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated 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 : Go to Step 5.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 11.



STEP 5. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-13 and connect test harness special tool MB991316 to the connector on the left bank 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 (31 mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed
- 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 heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio.

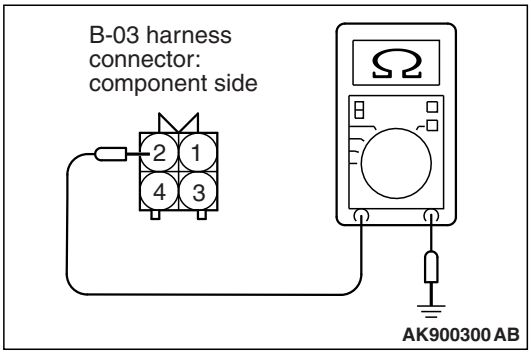
NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

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

YES : Go to Step 6.

NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 11.

STEP 6. Check for short circuit to ground between the right bank heated oxygen sensor (front) connector B-03 and the ECM connector B-10.



(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and the ECM connector B-10.

(2) Check for the continuity between the right bank heated oxygen sensor (front) connector B-03 (terminal No. 2) and ground.

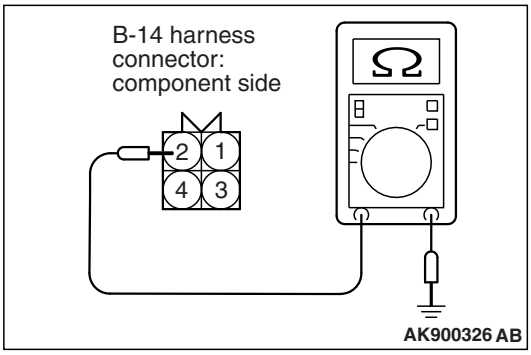
- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

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

STEP 7. Check for short circuit to ground between the left bank heated oxygen sensor (front) connector B-14 and the ECM connector B-10.



(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and the ECM connector B-10.

(2) Check for the continuity between the left bank heated oxygen sensor (front) connector B-14 (terminal No. 2) and ground.

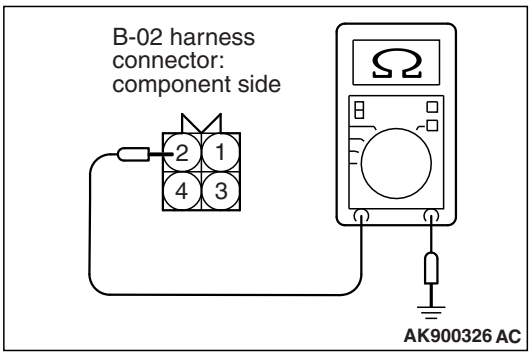
- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

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

STEP 8. Check for short circuit to ground between the right bank heated oxygen sensor (rear) connector B-02 and the ECM connector B-10.



(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and the ECM connector B-10.

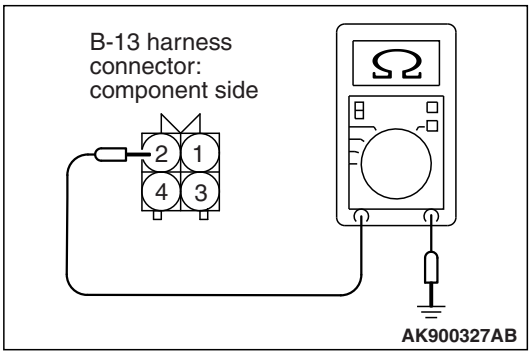
(2) Check for the continuity between the right bank heated oxygen sensor (rear) connector B-02 (terminal No. 2) and ground.

- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 9 .

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



STEP 9. Check for short circuit to ground between the left bank heated oxygen sensor (rear) connector B-13 and the ECM connector B-10.

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-13 and the ECM connector B-10.
(2) Check for the continuity between the left bank heated oxygen sensor (rear) connector B-13 (terminal No. 2) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 10 .
NO : Repair it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 10. Check the trouble symptoms.

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

Q: Is DTC P2252 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : 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.

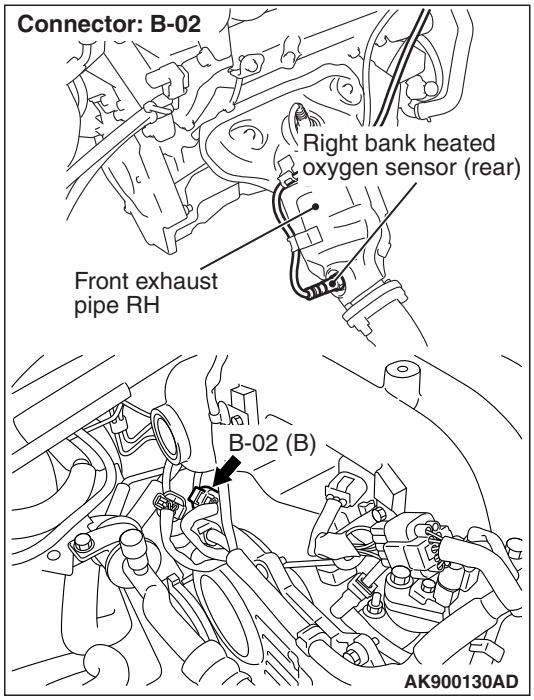
STEP 11. Test the OBD-II drive cycle.

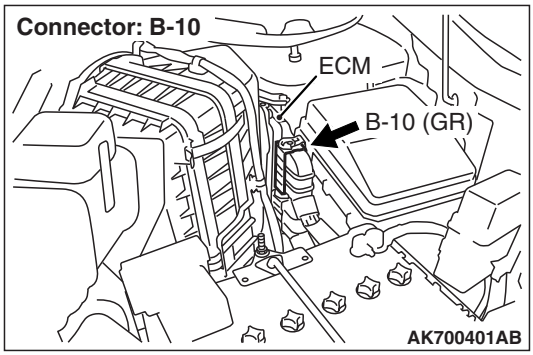
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function – OBD-II Drive Cycle Pattern 22 P.13B-11.
(2) Check the diagnostic trouble code (DTC).

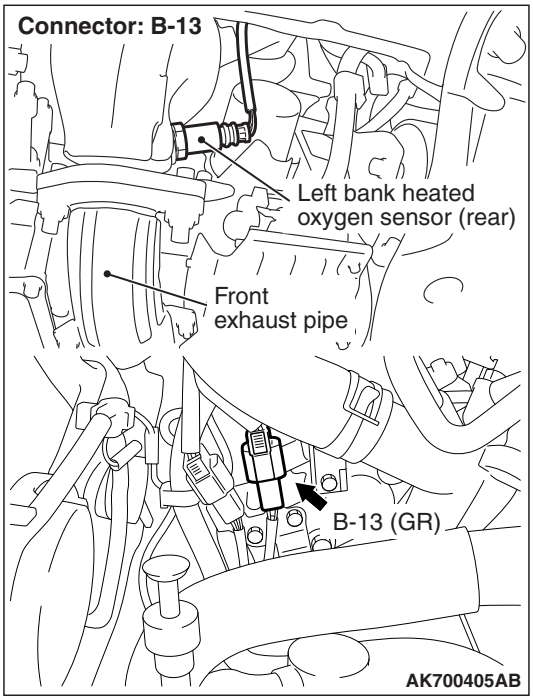
Q: Is DTC P2252 set?

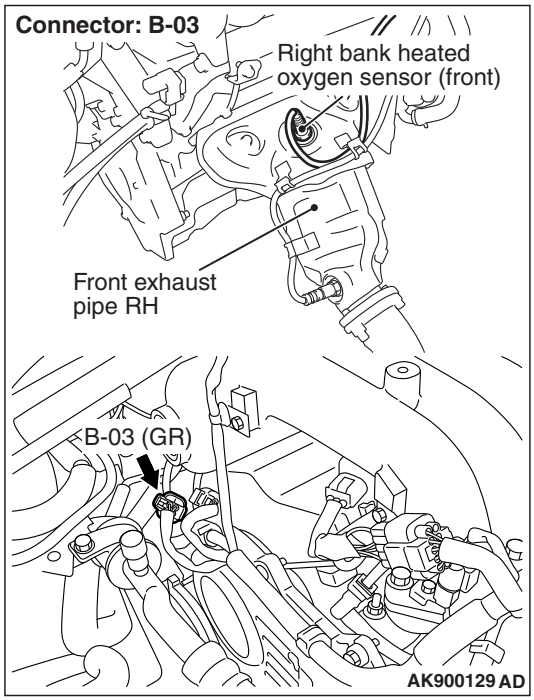
YES : Retry the troubleshooting.
NO : The inspection is complete.

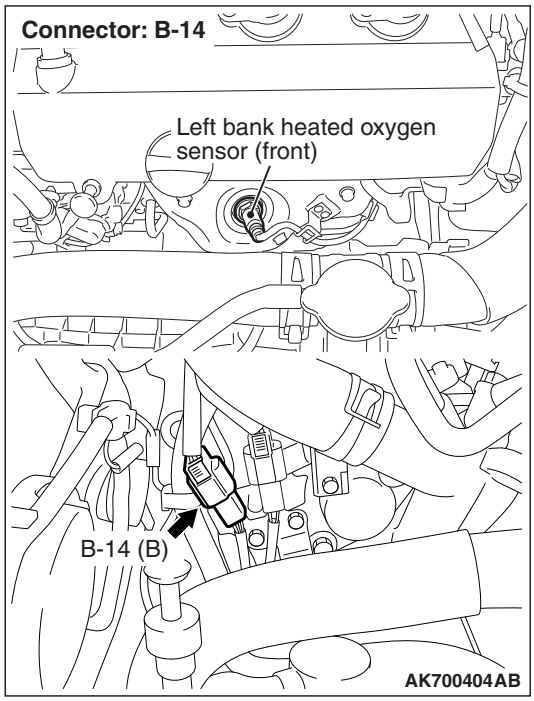
DTC P2253: Heated Oxygen Sensor Offset Circuit High Voltage











HEATED OXYGEN SENSOR OFFSET CIRCUIT HIGH VOLTAGE CIRCUIT

Refer to DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-222.
Refer to DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-244.
Refer to DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-263.
Refer to DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-284.

CIRCUIT OPERATION

Refer to DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-222.
Refer to DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-244.
Refer to DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-263.
Refer to DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-284.

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The ECM check for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is under 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)

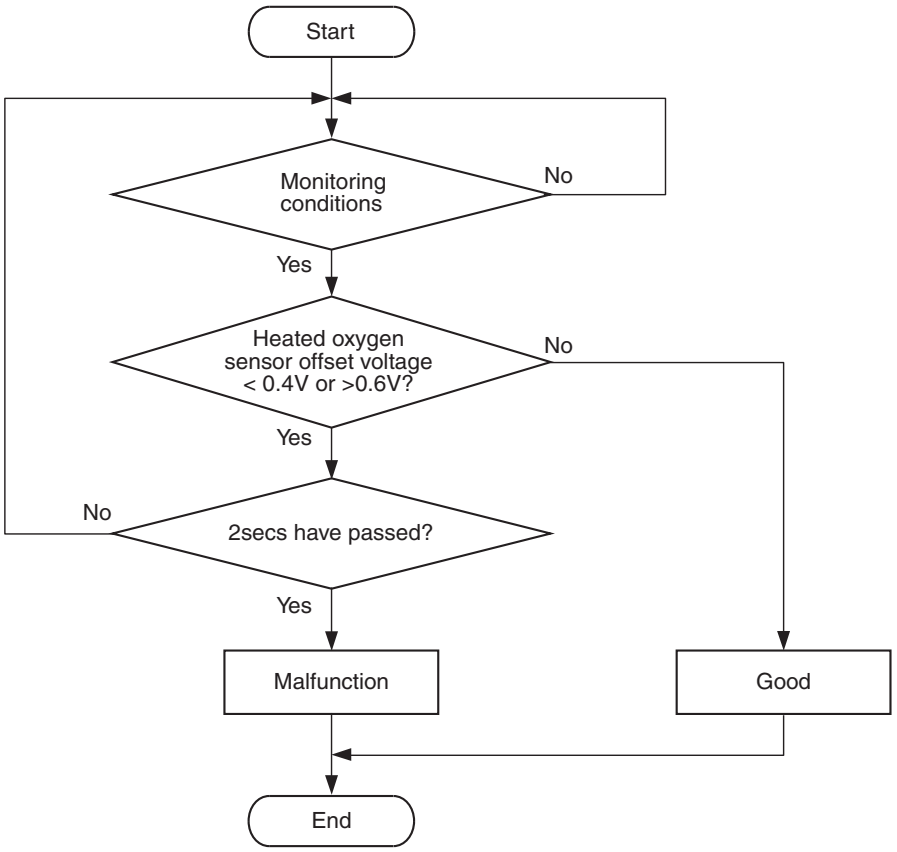
- Not applicable

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

- Heated oxygen sensor offset voltage is higher than 0.6 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

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

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

- Right bank heated oxygen sensor (front) failed.
- Right bank heated oxygen sensor (rear) failed.
- Left bank heated oxygen sensor (front) failed.
- Left bank heated oxygen sensor (rear) failed.
- Shorted right bank heated oxygen sensor (front) circuit or connector damage.
- Shorted right bank heated oxygen sensor (rear) circuit or connector damage.
- Shorted left bank heated oxygen sensor (front) circuit or connector damage.
- Shorted left bank heated oxygen sensor (rear) 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
- MB991316: Test Harness
- MD998464: Test Harness

TSB Revision

STEP 1. Check harness connector B-03 at right bank heated oxygen sensor (front), harness connector B-02 at right bank heated oxygen sensor (rear), harness connector B-14 at left bank heated oxygen sensor (front), harness connector B-13 at left bank heated oxygen sensor (rear) and harness connector B-10 at ECM for damage.

Q: Are the harness connectors in good condition?

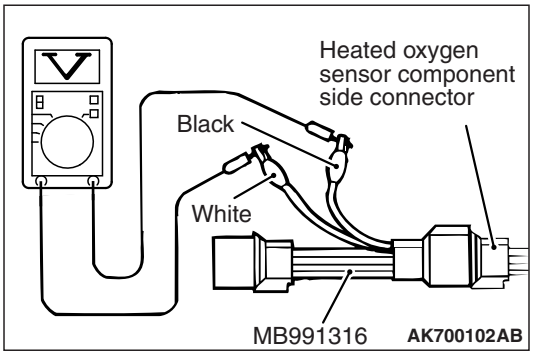
YES : Go to Step 2.

NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 2. Check the right bank heated oxygen sensor (front).

(1) Disconnect the right bank heated oxygen sensor (front) connector B-03 and connect test harness special tool MB991316 to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V



⚠ CAUTION

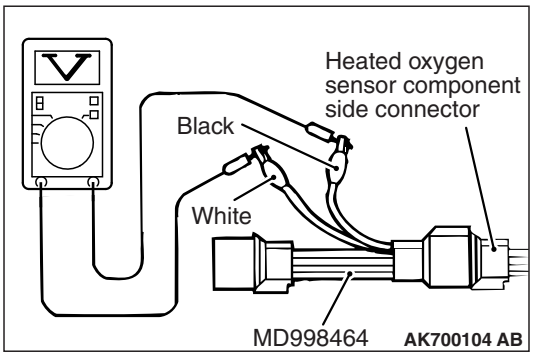
- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

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

YES : Go to Step 3.

NO : Replace the right bank heated oxygen sensor (front). Then go to Step 19.



STEP 3. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-14 and connect test harness special tool MD998464 to the connector on the left bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80°C (176°F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

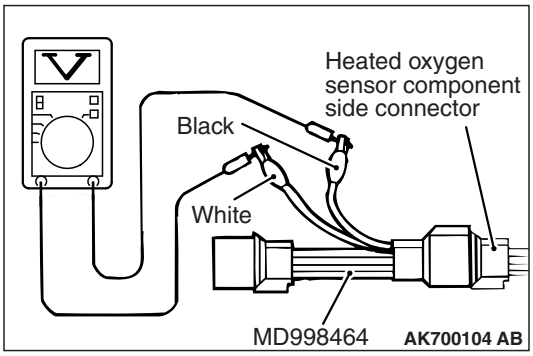
⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

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

YES : Go to Step 4.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 19.



STEP 4. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-02 and connect test harness special tool MD998464 to the connector on the right bank 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 (31 mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed
- Drive with wide open throttle
- Engine: 3,500 r/min or more

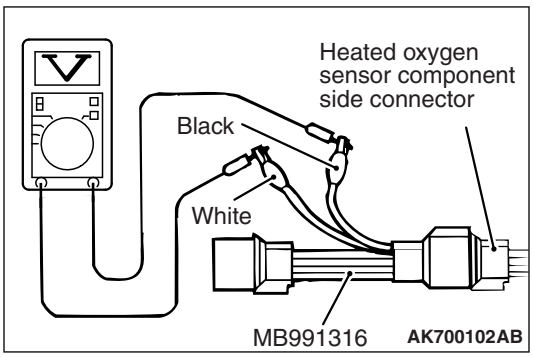
Standard value: 0.6 – 1.0 V

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the heated 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 : Go to Step 5.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 19.



STEP 5. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-13 and connect test harness special tool MB991316 to the connector on the left bank 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 (31 mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed
- 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 heated oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio.

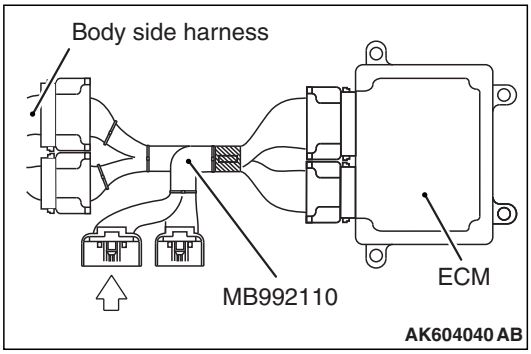
NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

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

YES : Go to Step 6.

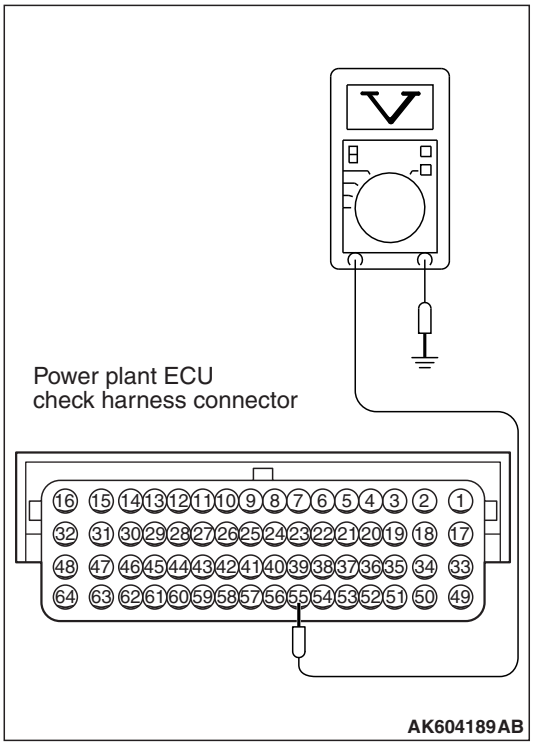
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 19.

STEP 6. 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. 55 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 : Go to Step 7.

STEP 7. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-03 (terminal No. 2) and ECM connector B-10 (terminal No. 55).

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 19.

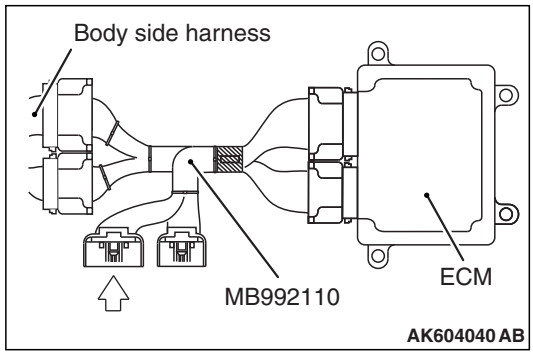
STEP 8. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-03 (terminal No. 4) and ECM connector B-10 (terminal No. 54).

Q: Is the harness wire in good condition?

YES : Go to Step 18.
NO : Repair it. Then go to Step 19.

STEP 9. 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.

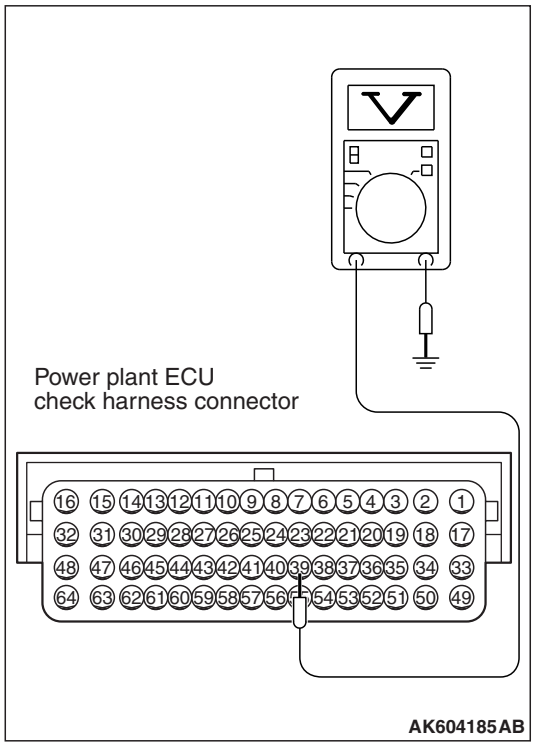


(3) Measure the voltage between terminal No. 39 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(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 12.
NO : Go to Step 10.



STEP 10. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-14 (terminal No. 2) and ECM connector B-10 (terminal No. 39).

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 19.

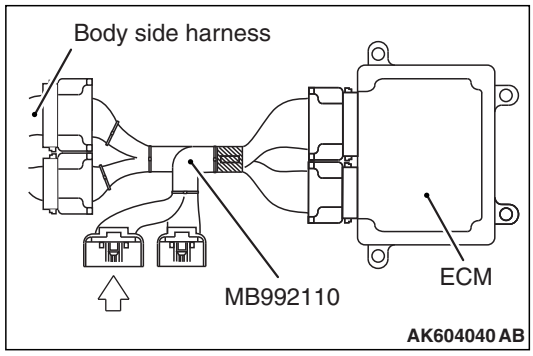
STEP 11. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-14 (terminal No. 4) and ECM connector B-10 (terminal No. 38).

Q: Is the harness wire in good condition?

YES : Go to Step 18.
NO : Repair it. Then go to Step 19.

STEP 12. 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.

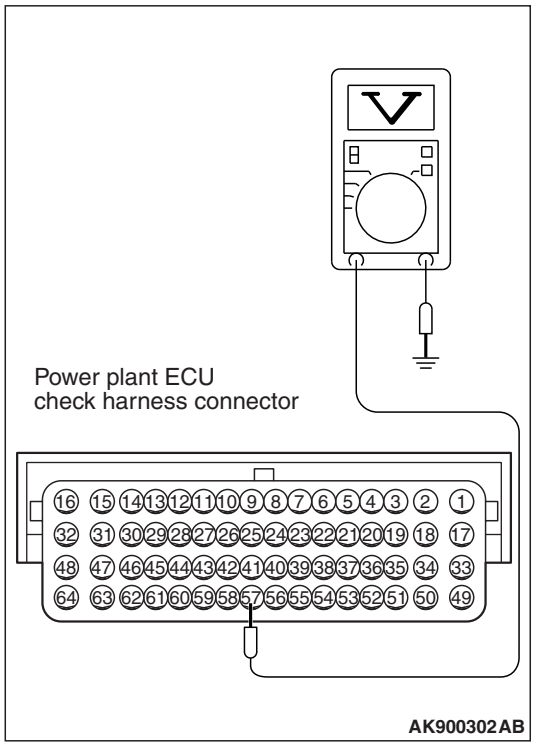


(3) Measure the voltage between terminal No. 57 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(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 15.
NO : Go to Step 13.



STEP 13. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-02 (terminal No. 2) and ECM connector B-10 (terminal No. 57).

Q: Is the harness wire in good condition?

YES : Go to Step 14.
NO : Repair it. Then go to Step 19.

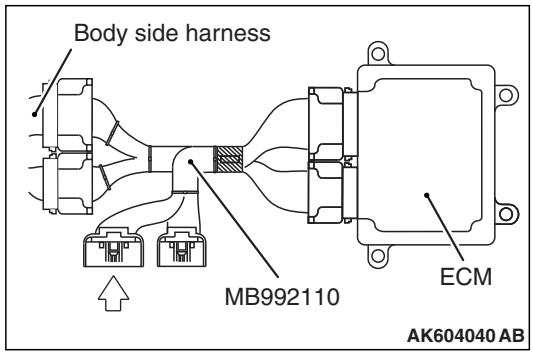
STEP 14. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-02 (terminal No. 4) and ECM connector B-10 (terminal No. 56).

Q: Is the harness wire in good condition?

YES : Go to Step 18.
NO : Repair it. Then go to Step 19.

STEP 15. 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.

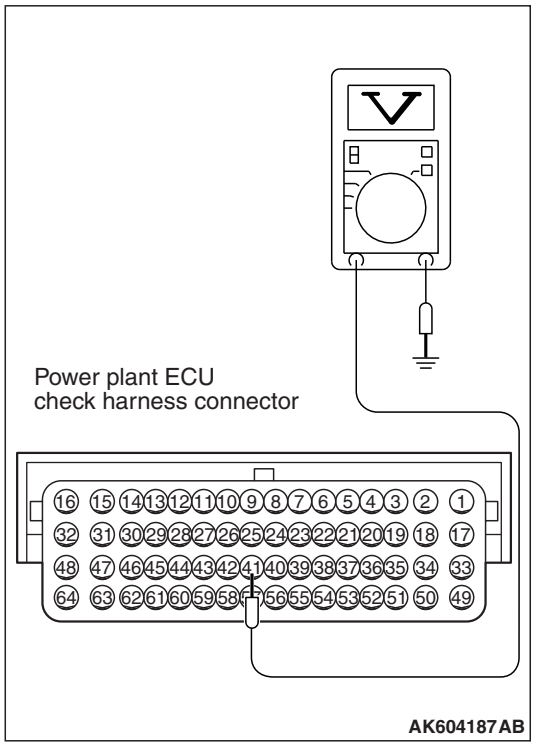


(3) Measure the voltage between terminal No. 41 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(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 18.
NO : Go to Step 16.



STEP 16. Check for short circuit to power supply between left bank heated oxygen sensor (rear) connector B-13 (terminal No. 2) and ECM connector B-10 (terminal No. 41).

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 short circuit to power supply between left bank heated oxygen sensor (rear) connector B-13 (terminal No. 4) and ECM connector B-10 (terminal No. 40).

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 trouble symptoms.

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

Q: Is DTC P2253 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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.

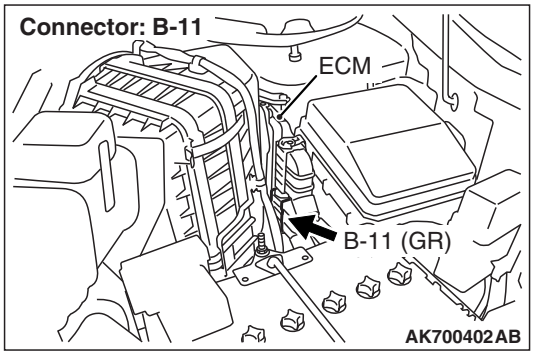
STEP 19. Test the OBD-II drive cycle.

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

Q: Is DTC P2253 set?

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

DTC P2530: Ignition Switch Run Position Circuit



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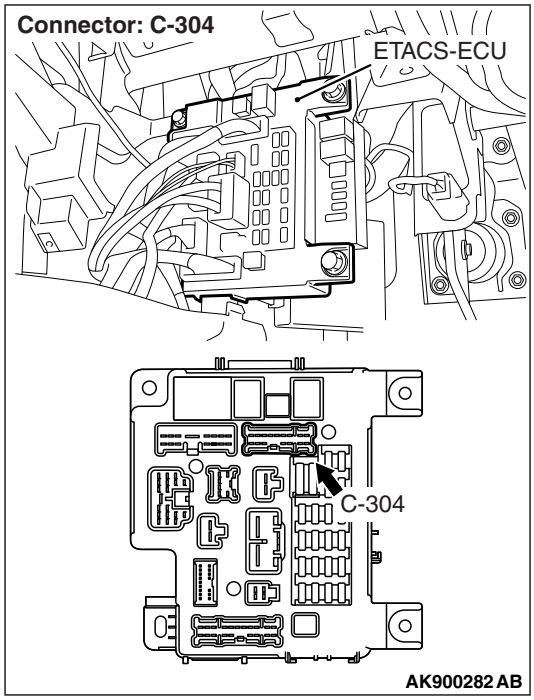


IGNITION SWITCH-IG CIRCUIT

- Refer to Inspection Procedure 21 – Power Supply System and Ignition Switch-IG System P.13B-804.

CIRCUIT OPERATION

- When the ignition switch is turned on, the ignition switch ON signal is input into the ECM (terminal No. 92) and also into the ETACS-ECU.

TECHNICAL DESCRIPTION

- The ECM compares the ignition switch ON signal sent from the ignition switch with ignition switch information sent from ETACS-ECU. The ECM checks for the abnormality.

DTC SET CONDITIONS

Check Condition

- Ignition switch: "ON" → "LOCK" (OFF)

Judgment Criterion

- While the ignition switch ON signal is input into the ECM, the ignition switch information, sent from the ETACS-ECU via CAN, is turned to OFF from ON. This allows the CAN to be stopped.

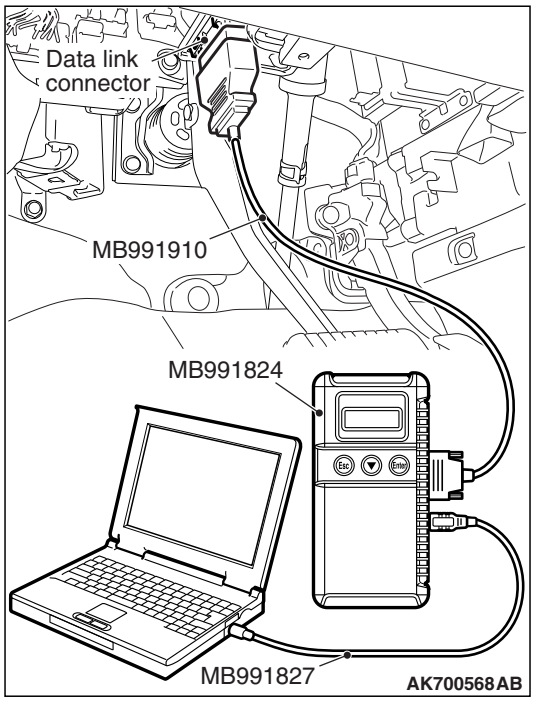
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Shorted ignition switch-IG circuit or connector damage.
- CAN system failed.
- ETACS-ECU failed.
- ECM failed.

DIAGNOSIS

Required Special Tool:

- 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, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 7.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ETACS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ETACS-DTC set?

YES : Refer to GROUP 54A, ETACS – Diagnostic Trouble Code Chart P.54A-732.
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 to go to Step 7.

STEP 4. Check for short circuit to power supply between ETACS-ECU connector C-304 (terminal No. 10) and ECM connector B-11 (terminal No. 92).

Q: Is the harness wire in good condition?

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

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch ON and "LOCK" (OFF), and then leave it in the "LOCK" (OFF) position for more than 10 seconds. Place the ignition switch in the ON position again.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2530 set?

YES : 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 ETACS-ECU.

(1) Replace the ETACS-ECU.
(2) Turn the ignition switch ON and "LOCK" (OFF), and then leave it in the "LOCK" (OFF) position for more than 10 seconds. Place the ignition switch in the ON position again.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2530 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch ON and "LOCK" (OFF), and then leave it in the "LOCK" (OFF) position for more than 10 seconds. Place the ignition switch in the ON position again.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2530 set?

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

DTC U0001: Bus Off

⚠ CAUTION

- **If the ECM output the DTC U0001, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions

- Always

Judgement Criterion

- Bus off error detected

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

- CAN line harness damage or connector damage.

DIAGNOSIS

Required Special Tools:

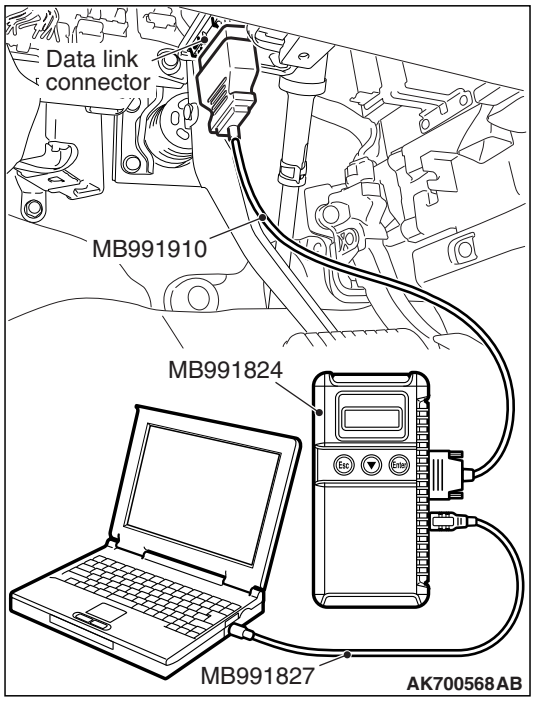
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch the "LOCK" (OFF) position.



Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 3.

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 U0001 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). 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 U0001 set?

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

DTC U0101: Transmission Control Module Time-Out

⚠ CAUTION
- **If the ECM output the DTC U0101, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS
There is no data from TCM for the specified time.
(TCM detect communication error with ECM.)

MONITOR EXECUTION
Continuous

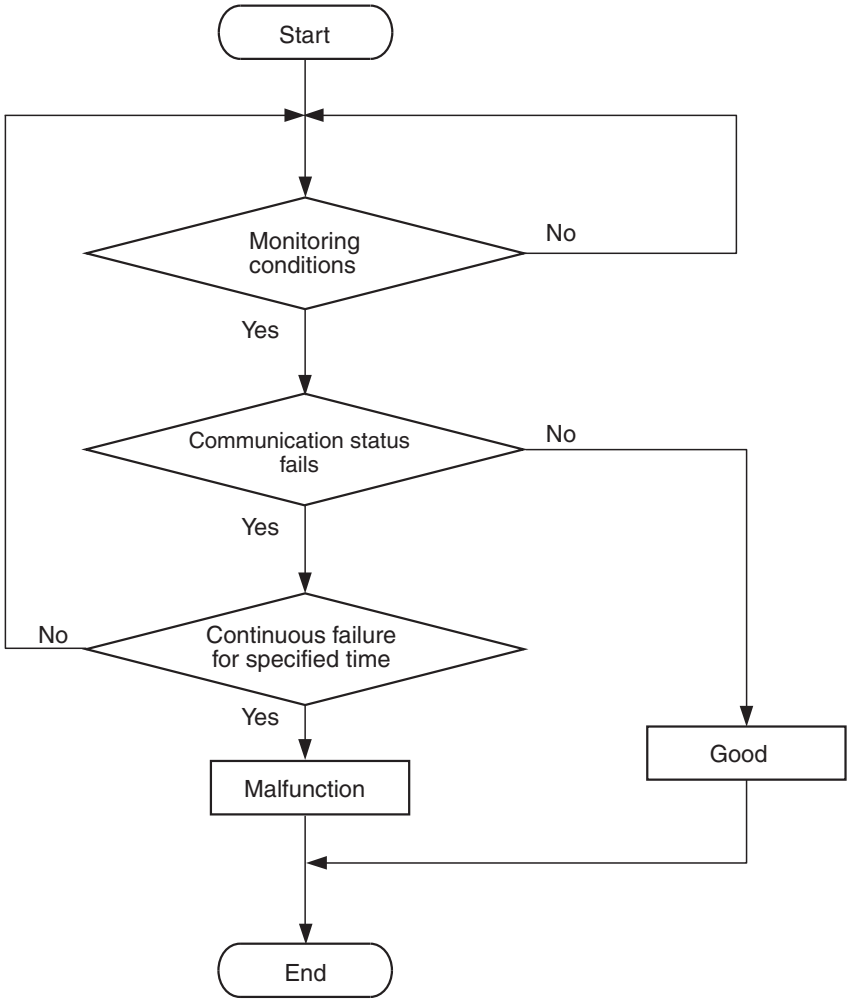
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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 10 and 16.5 volts.

Judgement Criterion

- Unable to receive TCM signals through the CAN bus line 4 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

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

- CAN line 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

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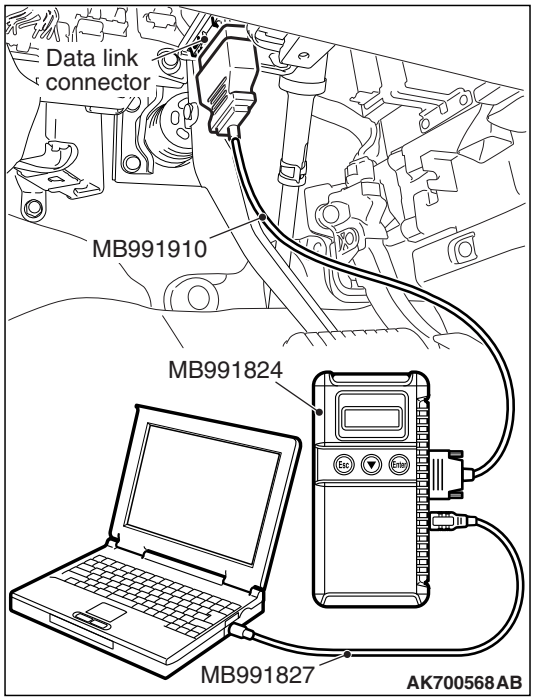

STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the TCM-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CVT-DTC set?

YES : Refer to GROUP 23A, Diagnosis – Diagnosis Code Chart P.23A-29.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Check that the other ECU performing CAN communication with TCM sets DTC No. U0101. Refer to GROUP 54C, CAN Communication-related DTC (U-code) table P.54C-220.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

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

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Replace the TCM. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and TCM. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and TCM. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

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

DTC U0114: AWD-ECU Time-Out <AWD>

⚠ CAUTION
- **If the ECM output the DTC U0114, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- After 2 seconds have passed since the ignition switch was turned to "ON" position.
- Battery positive voltage is 10 volts or higher.

Judgement Criterion
- Unable to receive AWD-ECU signals through the CAN bus line for 4 seconds.

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COMMENT

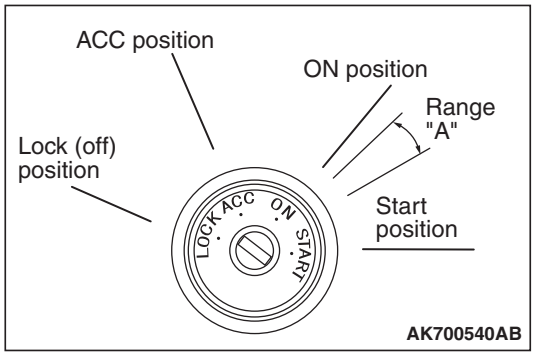
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the AWD-ECU on the CAN bus line, a failure in the AWD-ECU power supply system, a failure in the AWD-ECU, or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and AWD-ECU, and a failure in the AWD-ECU power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, ECM stores DTC U0114 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, Explanation About The Scan Tool (M.U.T.-III) Can Bus Diagnostics P.54C-10).

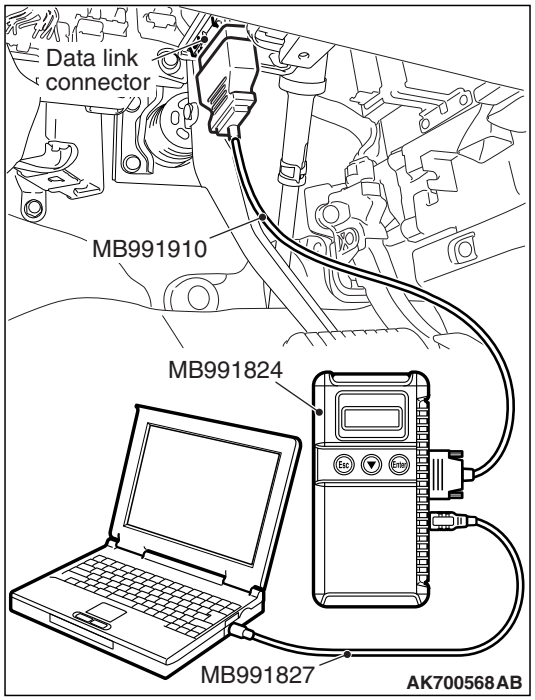
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the AWD-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the AWD-DTC set?

YES : Refer to GROUP 27C, Diagnosis – Diagnostic Trouble Code Chart P.27C-11.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Check that the other ECU performing CAN communication with AWD-ECU sets DTC No. U0114. Refer to GROUP 54C, CAN Communication-related DTC (U-code) table P.54C-220.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0114 set?

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

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0114 set?

YES : Replace the AWD-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and AWD-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0114 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and AWD-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0114 set?

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

DTC U0121: ABS-ECU/ASC-ECU Time-out

⚠ CAUTION
- **If the ECM output the DTC U0121, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- Battery positive voltage is 10 volts or higher.
- After 2 seconds have passed since the ignition switch was turned to "ON" position.

Judgement Criterion
- Unable to receive ABS-ECU/ASC-ECU signals through the CAN bus line for 4 seconds.

TSB Revision

COMMENT

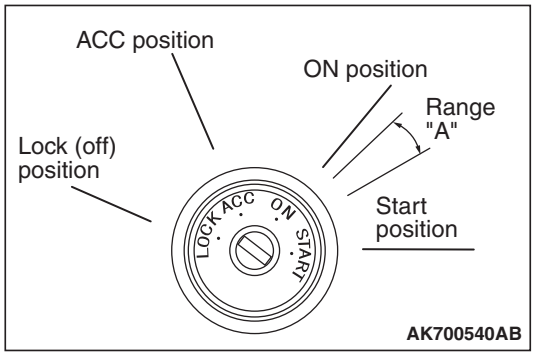
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the ABS-ECU/ASC-ECU on the CAN bus line, a failure in the ABS-ECU/ASC-ECU power supply system, a failure in the ABS-ECU/ASC-ECU, or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and ABS-ECU/ASC-ECU, and a failure in the ABS-ECU/ASC-ECU power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, ECM stores DTC U0121 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, Explanation About The Scan Tool (M.U.T.-III) Can Bus Diagnostics P.54C-10).

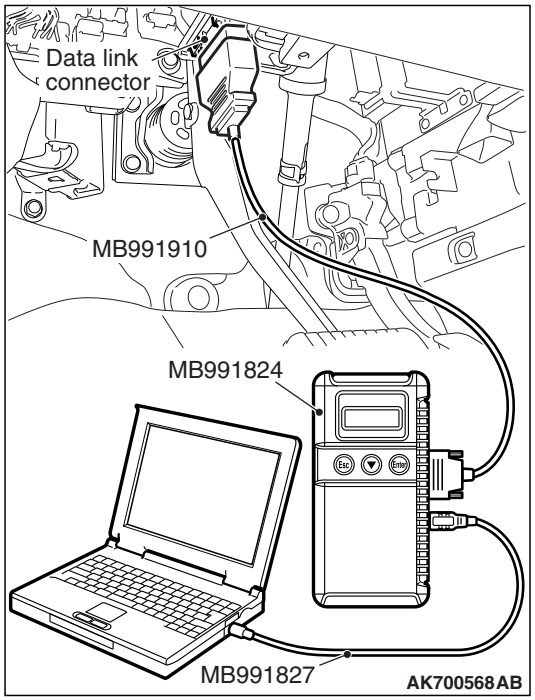
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ASC-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ASC-DTC set?

YES : Refer to GROUP 35C, Diagnosis – Diagnostic Trouble Code Chart P.35C-18.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Check that the other ECU performing CAN communication with ASC-ECU sets DTC No. U0121. Refer to GROUP 54C, CAN Communication-related DTC (U code) table P.54C-220.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

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

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Replace the ASC-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ASC-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ASC-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

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

DTC U0141: ETACS-ECU Time-Out

⚠ CAUTION
- **If the ECU output the DTC U0141, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS
There is no data from ETACS-ECU for the specified time. (ETACS-ECU also detect communication error with ECM.)

MONITOR EXECUTION
Continuous

TSB Revision

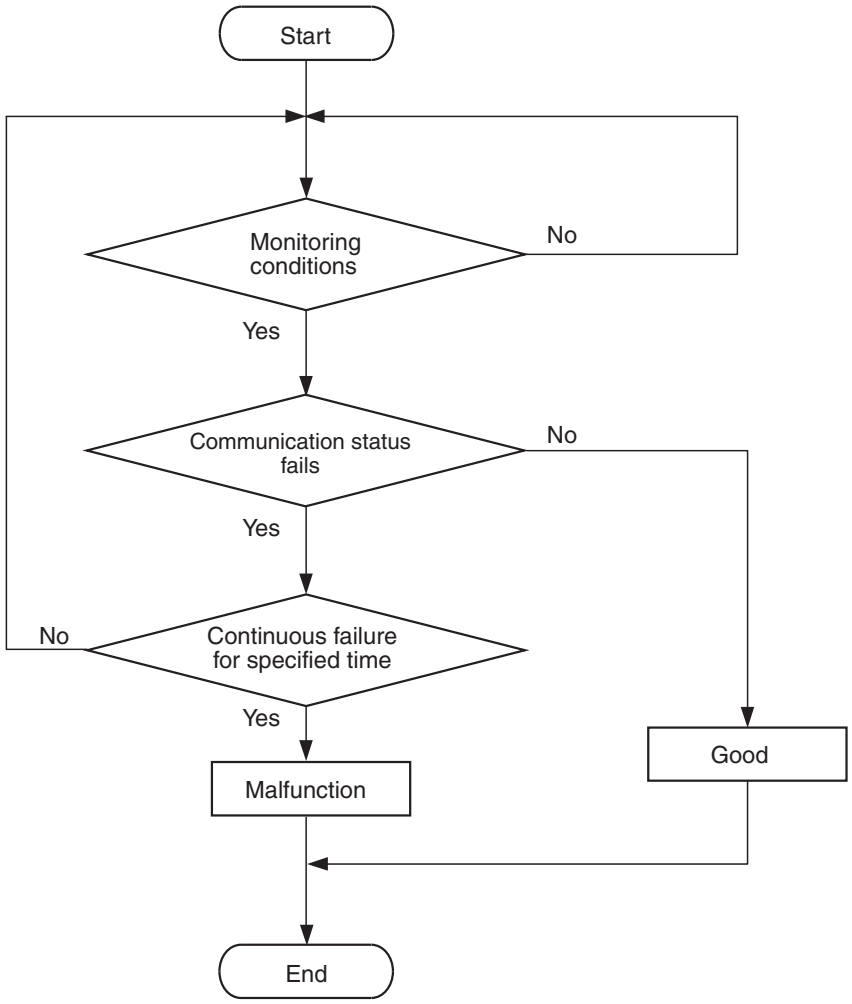
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

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
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion
- Unable to receive ETACS-ECU signals through the CAN bus line for 4 seconds.

COMMENT

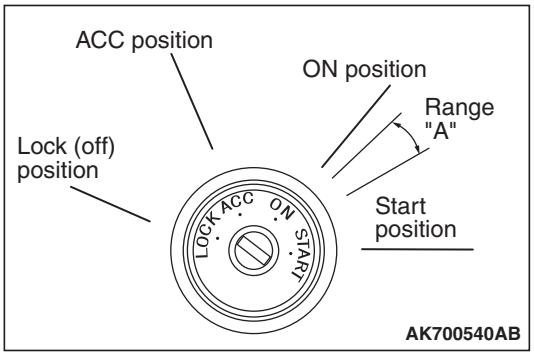
Current Trouble
- Some of the possible causes are a harness or connector damage between the ECM and the ETACS-ECU on the CAN bus line, a failure in the ETACS-ECU power supply system, a failure in the ETACS-ECU, or a failure in the ECM.

TSB Revision

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and ETACS-ECU, and a failure in the ETACS power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, ECM stores DTC U0141 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00,How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, Explanation About The Scan Tool (M.U.T.-III) Can Bus Diagnostics P.54C-10).

OBD-II DRIVE CYCLE PATTERN

None.

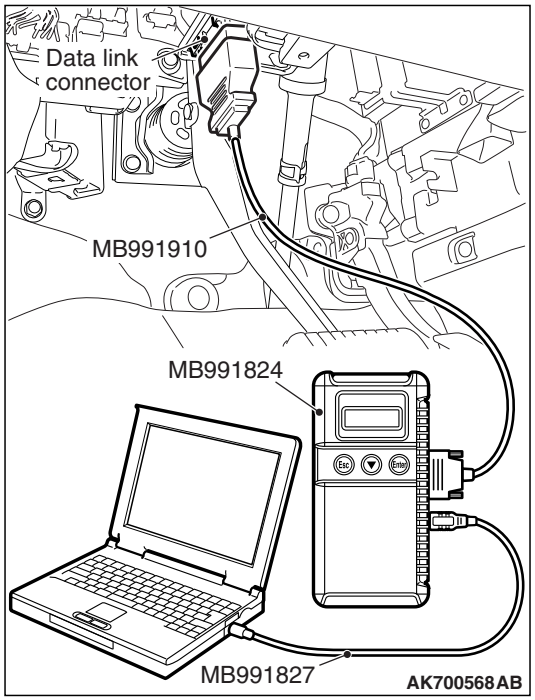
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ETACS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ETACS-DTC set?

YES : Refer to GROUP 54A, ETACS – Diagnostic Trouble Code Chart P.54A-732.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Check that the other ECU performing CAN communication with ETACS-ECU sets DTC No. U0141. Refer to GROUP 54C, CAN Communication-related DTC (U-code) table P.54C-220.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

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

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Replace the ETACS-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

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

DTC U0167: KOS-ECU/WCM Communication Error

⚠ CAUTION
- **If the ECM output the DTC U0167, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- Ignition switch is "ON" position.
- Battery positive voltage is 8 volts or higher.

Judgement Criterion
- Unable to receive KOS-ECU/WCM (immobilizer-ECU) signals through the CAN bus line.

TSB Revision

COMMENT

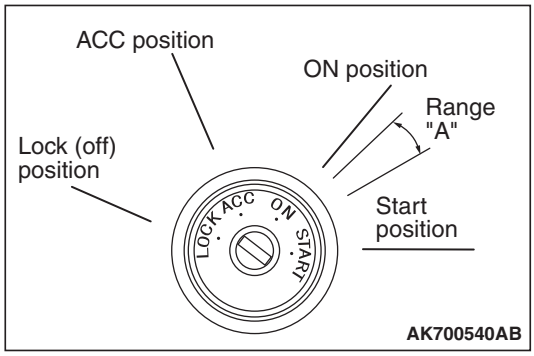
Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the KOS-ECU/WCM on the CAN bus line, a failure in the KOS-ECU/WCM power supply system, a failure in the KOS-ECU/WCM, or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and KOS-ECU/WCM, and a failure in the KOS-ECU/WCM power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, ECM stores DTC U0167 (the past trouble).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00,How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, Explanation About The Scan Tool (M.U.T.-III) Can Bus Diagnostics P.54C-10).

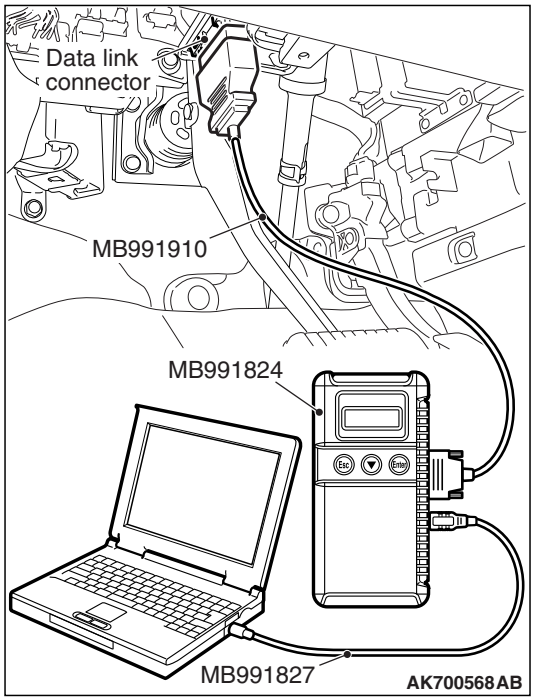
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line 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



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 4.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the immobilizer-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer-DTC set?

YES : Refer to GROUP 42B, Diagnosis – Diagnostic Trouble Code Chart <Vehicles with KOS> P.42B-35 or GROUP 42C, Diagnosis – Diagnostic Trouble Code Chart <Vehicles with WCM> P.42C-18.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC U0167 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 4.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and KOS-ECU/WCM (immobilizer-ECU). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

TSB Revision

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0167 set?

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

DTC U0415: Invalid Data Received from ASC-ECU <Vehiles with ASC>

⚠ CAUTION
- **If the ECM output the DTC U0415, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- After 5 seconds have passed since the ignition switch was turned to "ON" position.
- While engine is running.

Judgement Criterion
- When the communication error is judged between the ECM and the ASC-ECU.

COMMENT

Current Trouble
- Some of the possible causes are a harness or connector damage between the ECM and the ASC-ECU on the CAN bus line, a failure in the ASC-ECU power supply system, a failure in the ASC-ECU, or a failure in the ECM.

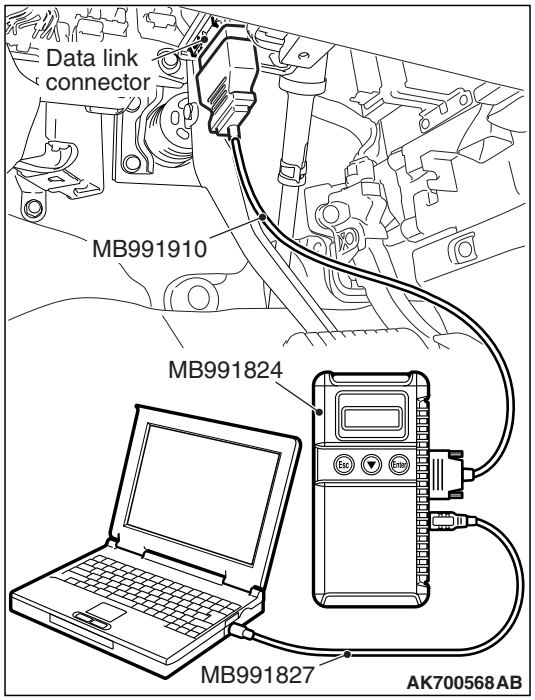
Past Trouble
- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and ASC-ECU, and a failure in the ASC-ECU power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble P.00-17).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus [Refer to GROUP 54C, Explanation about the Scan Tool (M.U.T.-III) CAN Bus Diagnostics P.54C-10].

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- CAN line harness damage or connector damage.
- ASC-ECU failed.
- ECM failed.

DIAGNOSIS

Required Special Tool:
- 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, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 4.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ASC-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ASC-DTC set?

YES : Refer to GROUP 35C, Diagnosis – Diagnostic Trouble Code Chart P.35C-18.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0415 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 4.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ASC-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0415 set?

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

DTC U1180: Combination Meter Time-Out

⚠ CAUTION
- **If the ECM output the DTC U1180, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS
There is no data from combination meter for the specified time. (combination meter also detect communication error with ECM.)

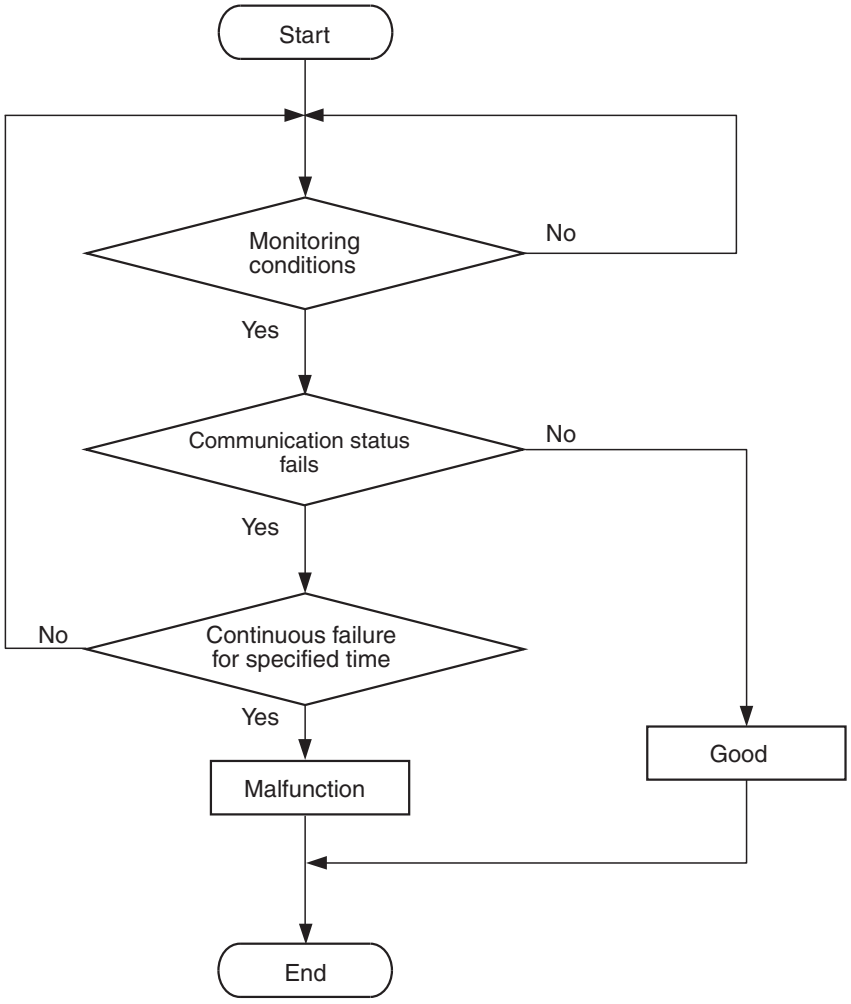
MONITOR EXECUTION
Continuous

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



AK604369

Check Conditions

- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive combination meter signals through the CAN bus line for 4 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

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

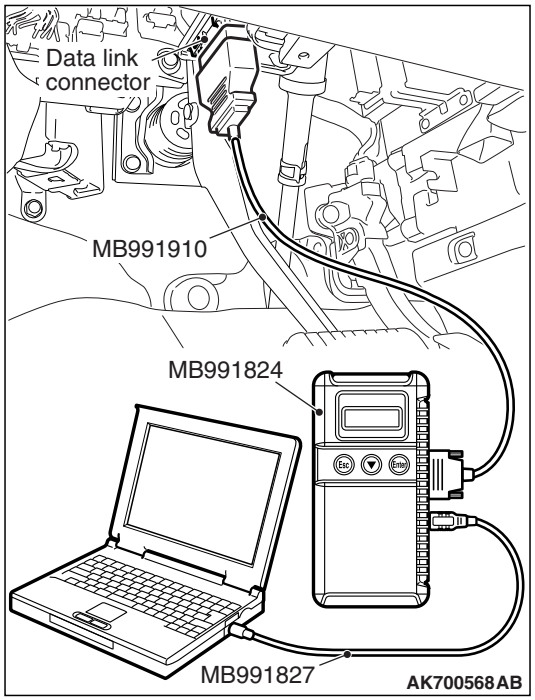
- CAN line harness damage or connector damage.

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. Using scan tool MB991958, diagnose CAN bus line.

⚠ 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) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Diagnosis – CAN Bus Diagnostics Table P.54C-17. Then go to Step 4.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the combination meter-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter-DTC set?

YES : Refer to GROUP 54A, Combination Meter – Diagnostic Trouble Code Chart P.54A-34.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

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

Q: Is DTC U1180 set?

YES : Replace the ECM (Refer to, Removal and Installation P.13B-903). Then go to Step 4.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and combination meter. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

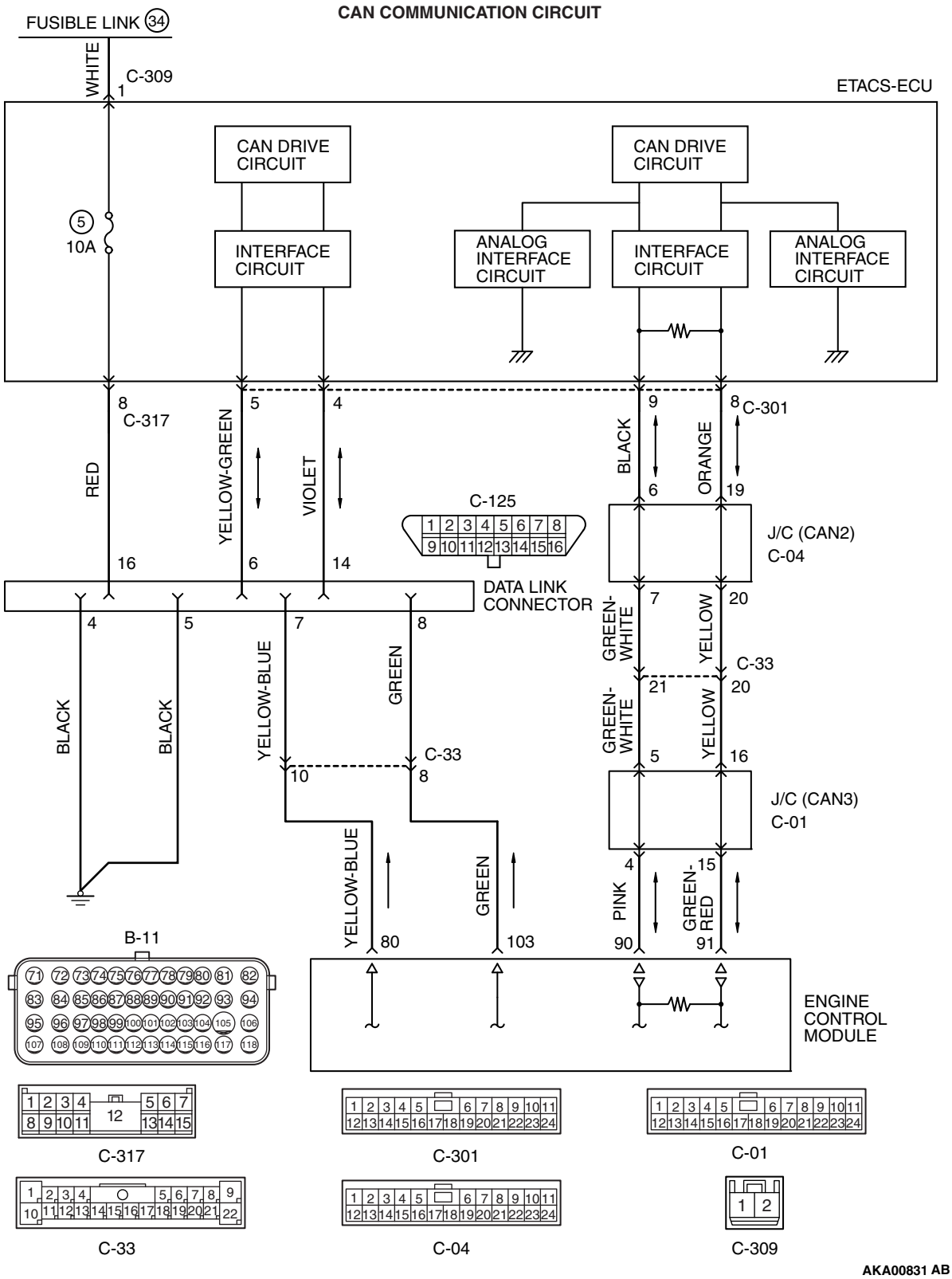
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1180 set?

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

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Scan Tool Communication with ECM Is Not Possible.



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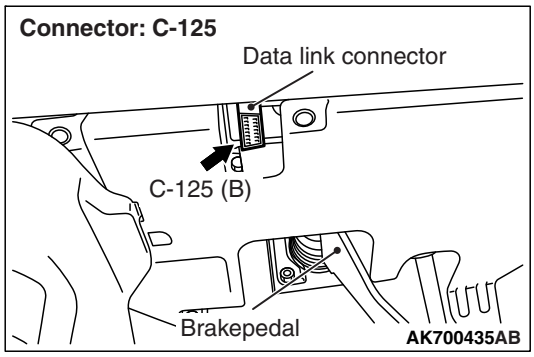

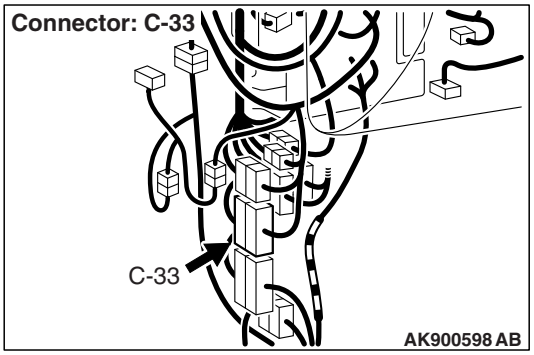

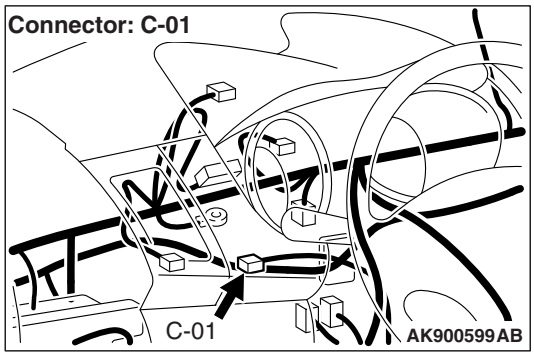

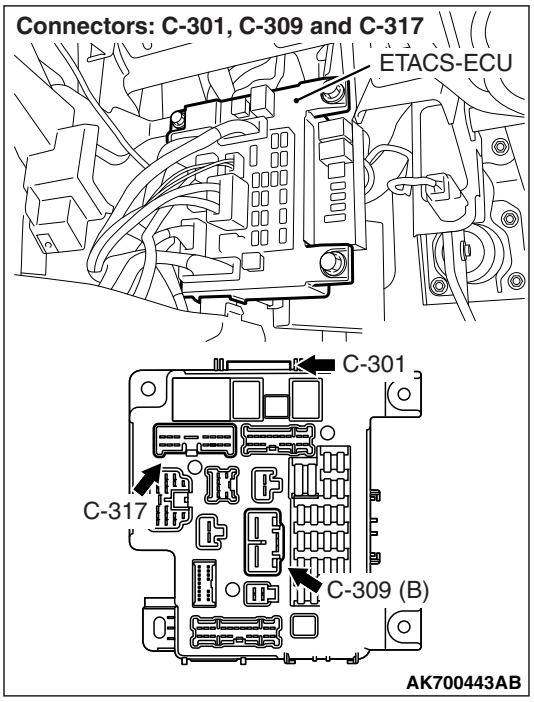

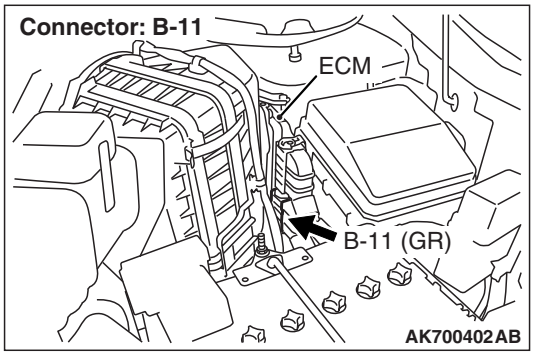

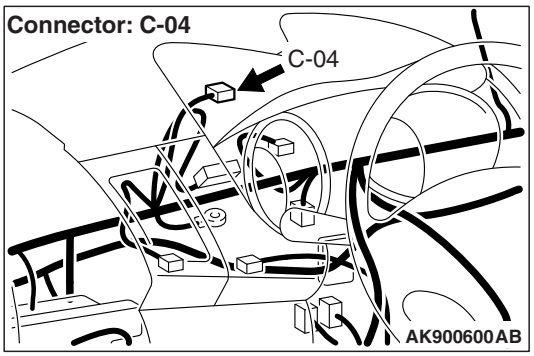

CIRCUIT OPERATION

- Battery voltage is applied to the diagnosis connector (terminal No. 16).
- The diagnosis connector (terminal No. 4 and No. 5) is grounded to the vehicle body.

COMMENT

- When the communication between M.U.T.-III and ECM is impossible, it can be suspected that the CAN bus line, power supply circuit of the diagnosis connector, and/or grounding circuit are defective.
- Communication can not be achieved either, if a wrong vehicle type is selected on M.U.T.-III.

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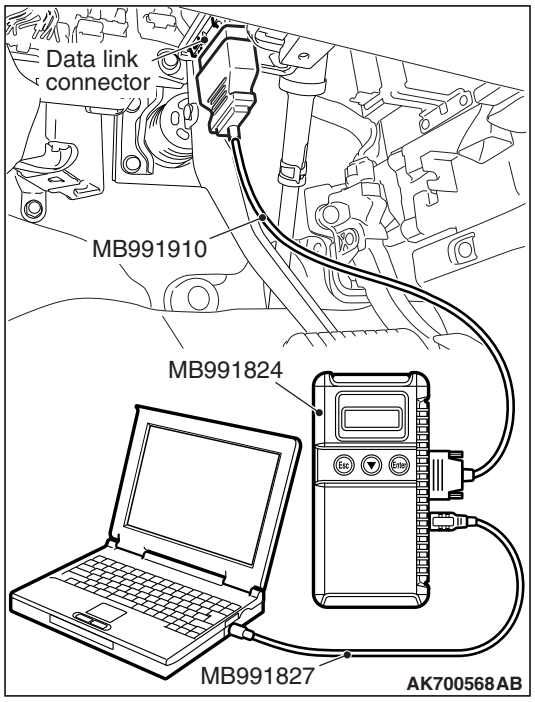
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the data link connector.
- Open/short circuit or poor contact in the data link connector.
- Malfunction of the CAN communication.
- Malfunction of the scan tool.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable



STEP 1. Check the vehicle communication interface (V.C.I.) MB991824 operations.

(1) Connect the Scan tool to the data link connector.
(2) When the power of V.C.I. is turned to ON, the indicator lamp of the V.C.I. illuminates in green.
  - The indicator lamp of the V.C.I. illuminates in green.

Q: Is the indicator lamp of the V.C.I. illuminates in green?

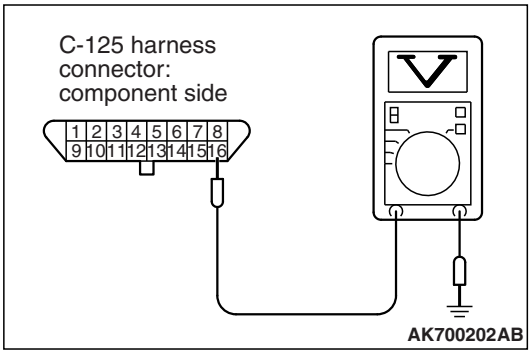
YES : Go to Step 2.
NO : Use scan tool, perform CAN bus line diagnosis.

STEP 2. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
  - The voltage should be 8 volts or more.

Q: Is the measured voltage 8 volts or more?

YES : Go to Step 3.
NO : Check the battery. Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-7. Then confirm that the malfunction symptom is eliminated.



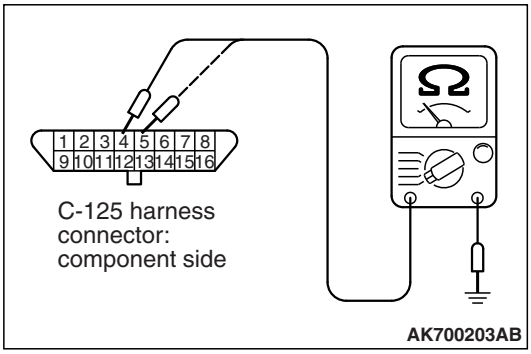
STEP 3. Measure the power supply voltage at data link connector C-125.

(1) Measure voltage between terminal No. 16 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 4.

NO : Repair an open circuit between ETACS-ECU connector C-317 (terminal No. 8) and data link connector C-125 (terminal No. 16). Then confirm that the malfunction symptom is eliminated.



STEP 4. Check the continuity at data link connector C-125.

(1) Check for the continuity between terminal No. 4, No. 5 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Check and replace the scan tool. Then confirm that the malfunction symptom is eliminated.

NO : Repair an open circuit or harness damage between data link connector C-125 (terminal No. 4, No. 5) and ground. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 2: The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) Does Not Illuminate Right after the Ignition Switch Is Turned to the "ON" Position.

CIRCUIT OPERATION

- The combination meter causes the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) to illuminate immediately after the ignition switch is turned to the "ON" position occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp).
- Open or shorted malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

STEP 1. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should illuminate immediately after the ignition switch is turned to the "ON" position.

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

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminate?

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 combination meter.

INSPECTION PROCEDURE 3: The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) Remains Illuminated and Never Goes Out.

COMMENT

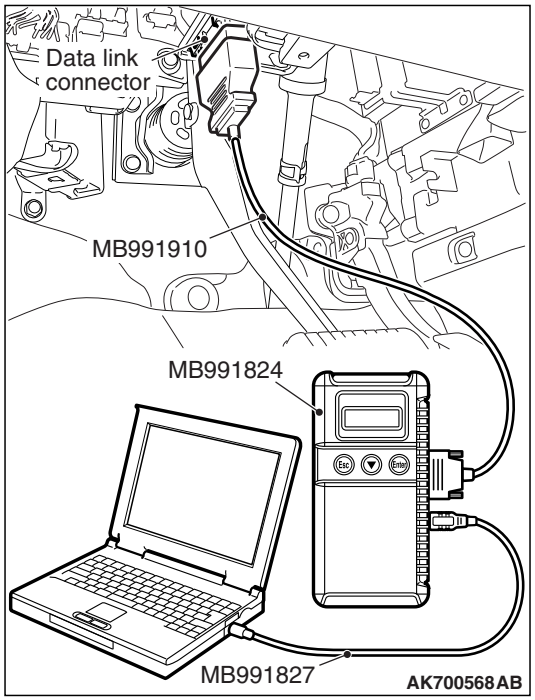
- In cases such as the above, the cause is probably that the ECM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed below has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Short in the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

Required Special Tools:
- 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should go out when 5 seconds have passed after the ignition switch was turned to the "ON" position.

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

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) go out?

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 combination meter.

INSPECTION PROCEDURE 4: Cranks, Won't Start

Cranks, Won't Start Circuit

- Refer to INSPECTION PROCEDURE 24 – Ignition Circuit System P.13B-823.

CIRCUIT OPERATION

- Refer to INSPECTION PROCEDURE 24 – Ignition Circuit System P.13B-823.

COMMENT

- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

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TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the immobilizer system.
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Contaminated fuel.
- Malfunction of the ECM.

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).

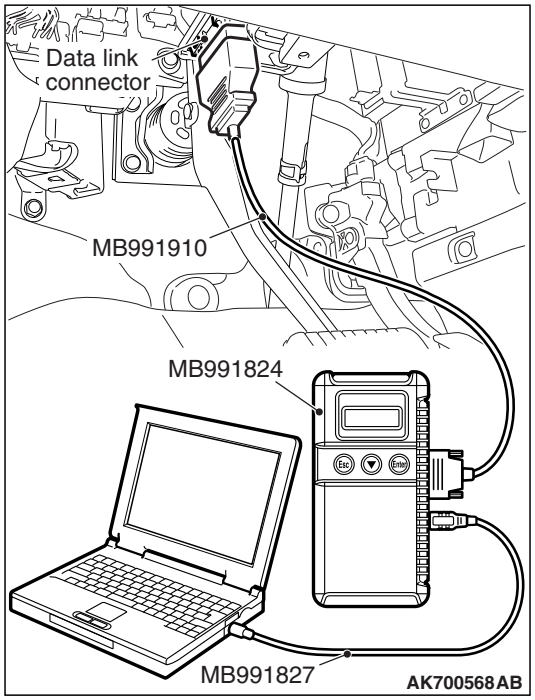
⚠ CAUTION

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 after cranking the engine for at least 2 sec.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.



STEP 2. Check harness connector A-24X at injector relay for damage.

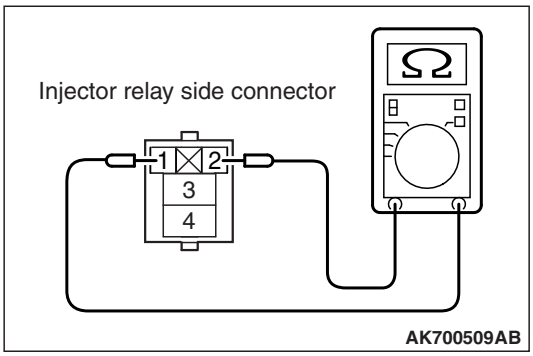
Q: Is the connector in good condition?

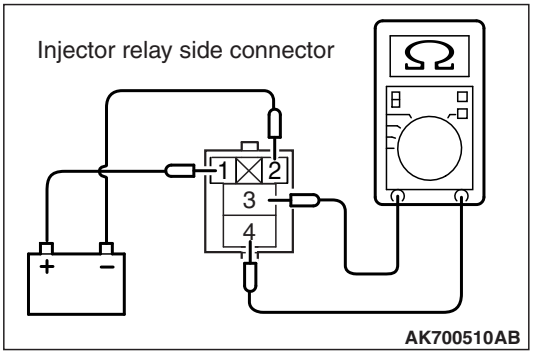
YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the injector relay.

(1) Remove the injector relay.

(2) Check for continuity between the injector relay terminals 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 terminals No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the MFI relay.

Q: Is the measured resistance within the specified range?

YES : Go to Step 4.

NO : Replace the injector relay. Then confirm that the malfunction symptom is eliminated.

STEP 4. Measure the power supply voltage at injector relay harness side connector A-24X.

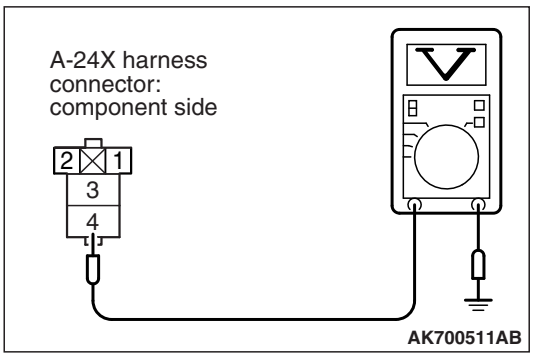
(1) Disconnect the connector A-24X and measure at the harness side.

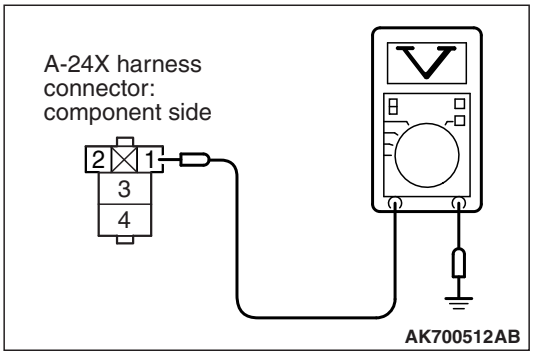
(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.

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

YES : Go to Step 5.

NO : 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 harness damage. Then confirm that the malfunction symptom is eliminated.





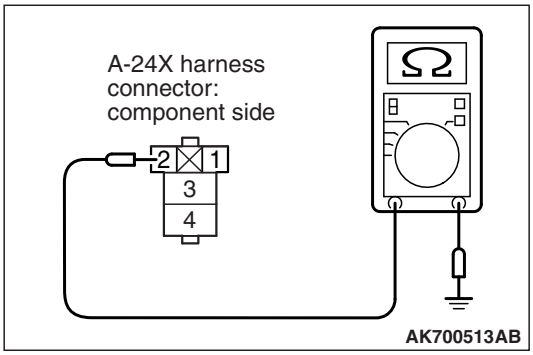
STEP 5. Measure the power supply voltage at injector relay harness side connector A-24X.

(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.

(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 : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 10) and injector relay connector A-24X (terminal No. 1) because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 6. 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.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.
NO : Repair harness wire between injector relay connector A-24X (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
a. Item 1: Power Supply Voltage (at cranking).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 9: Fuel pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 9.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

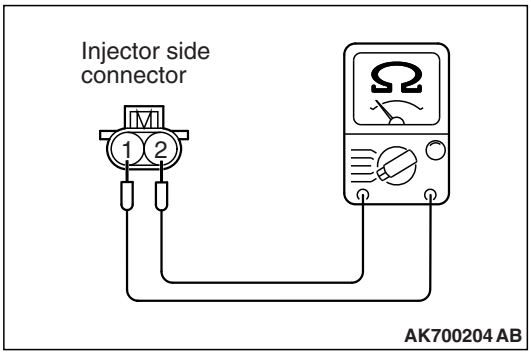
Q: Is the fuel pressure normal?

YES : Go to Step 10.
NO : Check the following items, and repair or replace the defective items.
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

STEP 10. Check the left bank injector resistance.

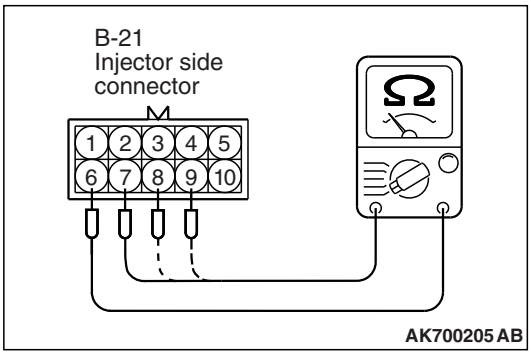
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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



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

YES : Go to Step 11.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

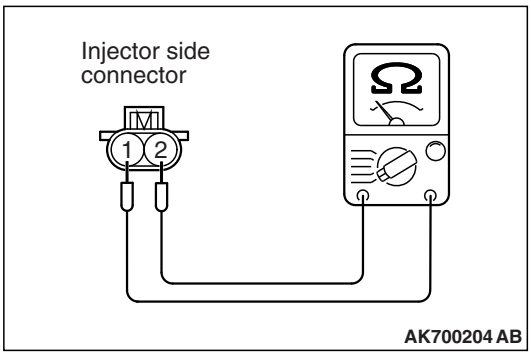


STEP 11. Check the right bank injector resistance at intermediate connector B-21.

(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
  a. Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
  b. Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
  c. Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
  - Resistance should be between 10.5 and 13.5 ohms [at 20°C (68°F)].

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

YES : Go to Step 14.
NO : Go to Step 12.



STEP 12. Check the right bank injector resistance.

(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 11.
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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 13.
NO : Replace the injector. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check harness connector B-101, B-103, B-104 at right bank injector for damage.

(1) Check the injector connector, which deviates from the standard value at Step 11.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check harness connector B-21 at intermediate connector 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 confirm that the malfunction symptom is eliminated.

STEP 15. Check harness connector B-10 at ECM and harness connector B-115, B-116, B-120 at left bank injector 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 confirm that the malfunction symptom is eliminated.

STEP 16. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.

(2) Measure the resistance between injector connector and ECM connector.

a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.

b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.

c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.

d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.

e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.

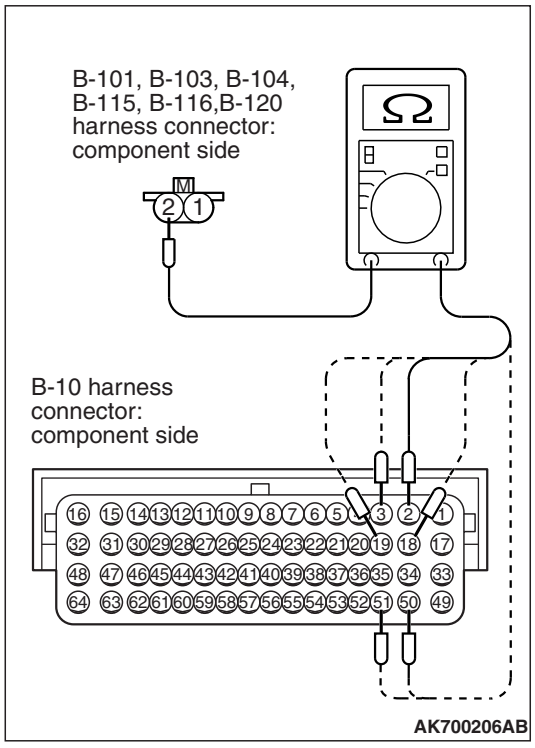
f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 17.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 17. Check the ignition system.

(1) Connect the timing light to terminal No. 1 of the ignition coil connector B-01, B-04, B-05, B-15, B-18 or B-19 in order.
(2) Crank the engine.
- The timing light flashes.

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

Q: Does the timing light flash?

YES : Go to Step 18.
NO : Refer to INSPECTION PROCEDURE 24 – Ignition Circuit System P.13B-823.

STEP 18. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 19.

STEP 19. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 20.

STEP 20. Check the compression pressure.

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

Q: Is the compression pressure normal?

YES : Go to Step 21.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 21. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
a. Check if the injectors are clogged.
b. Check if fuel is contaminated.

Then confirm that the malfunction symptom is eliminated.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 5: Starts Up and Dies.

COMMENT

- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the EGR system
- Contaminated fuel.
- Malfunction of the ECM.

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 if the EGR valve sounds during initialization.

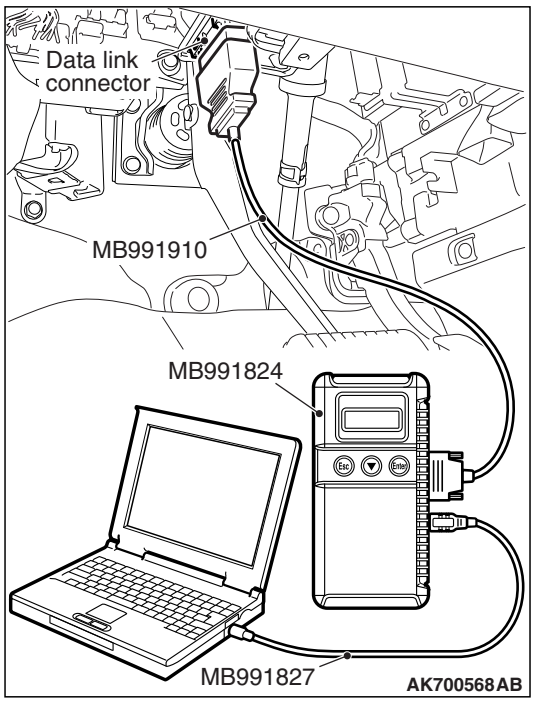
Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.

STEP 2. 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 set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 1: Power Supply Voltage (at Cranking)
   b. Item 6: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 9: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

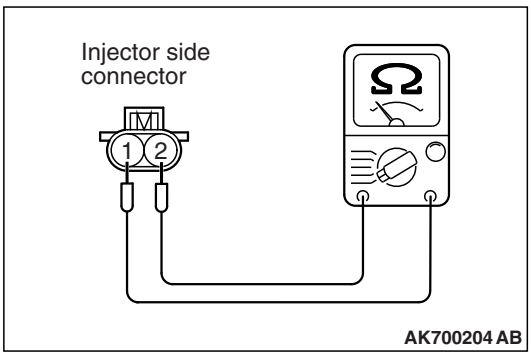
Q: Is the ignition timing normal?

YES : Go to Step 6.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the left bank injector resistance.

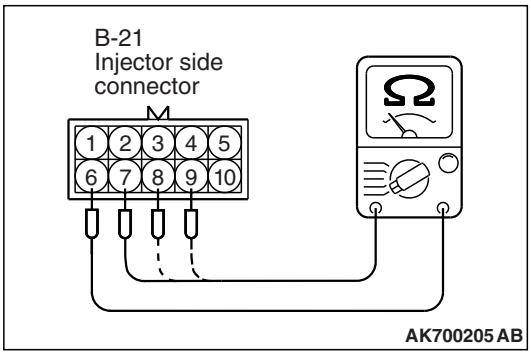
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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 7.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

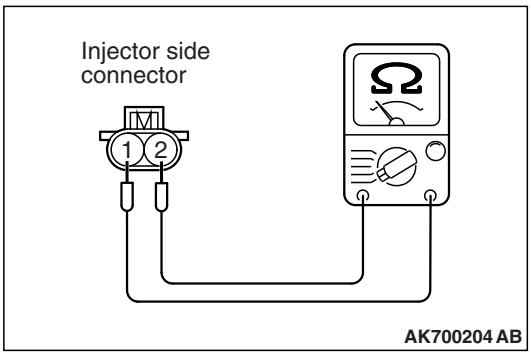


STEP 7. Check the right bank injector resistance at intermediate connector B-21.

(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
   b. Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
   c. Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
   - Resistance should be between 10.5 and 13.5 ohms [at 20°C (68°F)].

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

YES : Go to Step 10.
NO : Go to Step 8.



STEP 8. Check the right bank injector resistance.

(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 7.
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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 confirm that the malfunction symptom is eliminated.

STEP 9. Check harness connector B-101, B-103, B-104 at right bank injector for damage.

(1) Check the injector connector, which deviates from the standard value at Step 7.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check harness connector B-21 at intermediate connector 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 confirm that the malfunction symptom is eliminated.

STEP 11. Check harness connector B-115, B-116, B-120 at left bank injector 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 confirm that the malfunction symptom is eliminated.

STEP 12. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.

(2) Measure the resistance between injector connector and ECM connector.

a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.

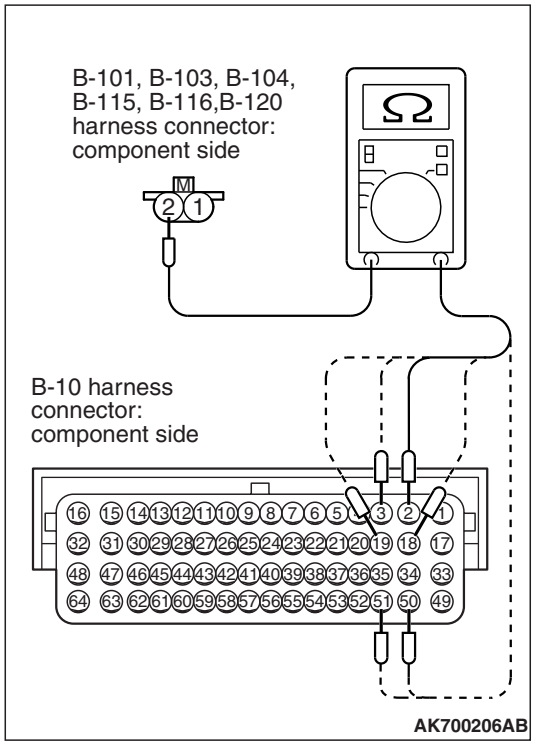
b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.

c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.

d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.

e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.

f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.



Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 13.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 14.

NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 15.

STEP 15. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 16.

STEP 16. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check fuel lines for clogging.
b. Check if fuel is contaminated.
c. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 6: Hard Starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the EGR system
- Contaminated fuel.
- Malfunction of the ECM.

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 if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

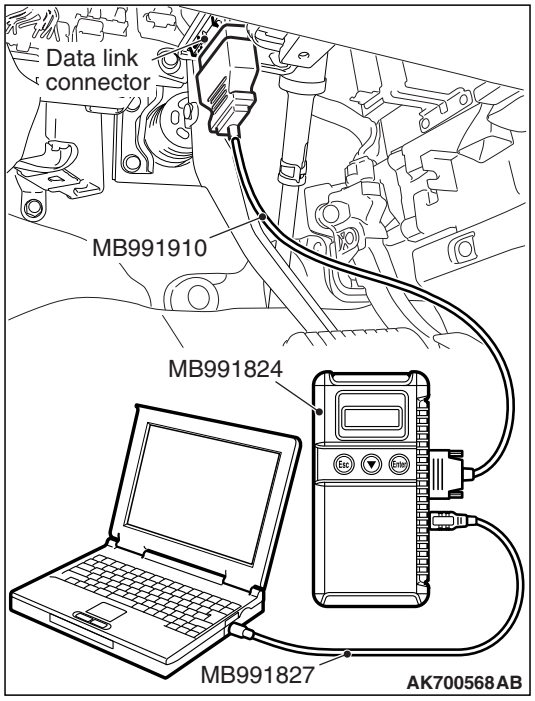
YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.

STEP 2. 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 the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.

NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list.

(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 1: Power Supply Voltage (at Cranking)
   b. Item 6: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 9: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 6.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Check the following items, and repair or replace the defective items.
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

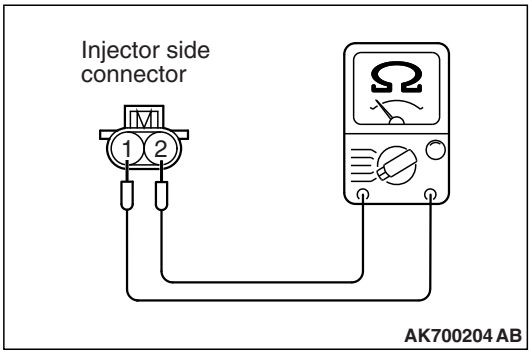
STEP 7. Check the left bank injector resistance.

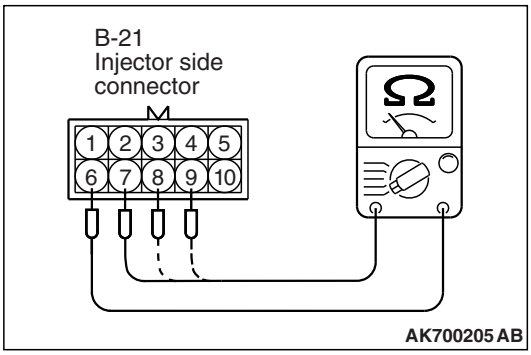
(1) Disconnect the left bank injector connector B-115, B-116, B-120.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

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

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

YES : Go to Step 8.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.



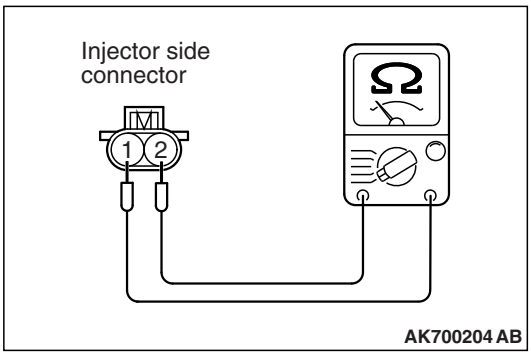


STEP 8. Check the right bank injector resistance at intermediate connector B-21.

(1) Disconnect the intermediate connector B-21.
(2) Measure the resistance between each male connector side terminal.
  a. Measure the resistance between terminal No. 6 and No. 7 at No. 1 cylinder injector.
  b. Measure the resistance between terminal No. 6 and No. 8 at No. 3 cylinder injector.
  c. Measure the resistance between terminal No. 6 and No. 9 at No. 5 cylinder injector.
  - Resistance should be between 10.5 and 13.5 ohms [at 20°C (68°F)].

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

YES : Go to Step 11.
NO : Go to Step 9.



STEP 9. Check the right bank injector resistance.

(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 8.
(3) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 – 13.5 Ω [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 10.
NO : Replace the injector. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check harness connector B-101, B-103, B-104 at right bank injector for damage.

(1) Check the injector connector, which deviated from the standard value listed in Step 8.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check harness connector B-21 at the intermediate connector 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 confirm that the malfunction symptom is eliminated.

STEP 12. Check harness connector B-10 at ECM and harness connector B-115, B-116, B-120 at the left bank injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.

(2) Measure the resistance between injector connector and ECM connector.

a. Injector connector B-101 (terminal No. 2) and ECM connector B-10 (terminal No. 2) at No. 1 cylinder injector.

b. Injector connector B-120 (terminal No. 2) and ECM connector B-10 (terminal No. 3) at No. 2 cylinder injector.

c. Injector connector B-103 (terminal No. 2) and ECM connector B-10 (terminal No. 18) at No. 3 cylinder injector.

d. Injector connector B-116 (terminal No. 2) and ECM connector B-10 (terminal No. 19) at No. 4 cylinder injector.

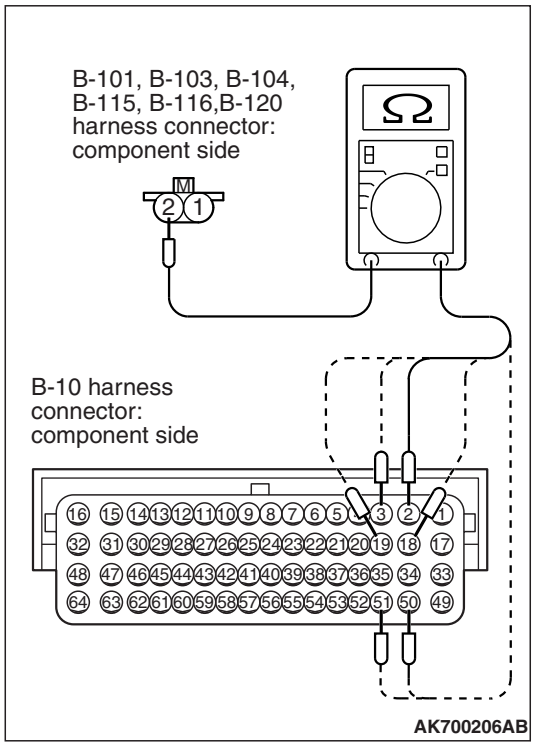
e. Injector connector B-104 (terminal No. 2) and ECM connector B-10 (terminal No. 50) at No. 5 cylinder injector.

f. Injector connector B-115 (terminal No. 2) and ECM connector B-10 (terminal No. 51) at No. 6 cylinder injector.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 14.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 14. Check the ignition system.

(1) Connect the timing light to terminal No. 3 of the ignition coil connector B-01, B-04, B-05, B-15, B-18 or B-19 in order.
(2) Crank the engine.
- The timing light flashes.

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

Q: Does the timing light flash?

YES : Go to Step 15.
NO : Refer to INSPECTION PROCEDURE 24 – Ignition Circuit System P.13B-823.

STEP 15. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 16.

STEP 16. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 17.

STEP 17. Check the compression pressure.

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

Q: Is the compression pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check if fuel is contaminated.
b. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 7: Unstable Idle (rough idle, hunting).

COMMENT

- In cases such as the above, the cause is probably the air/fuel mixture. Other systems affecting idle quality include the ignition system and compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the purge control system
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Malfunction of the charging system.
- Vacuum leak.
- Contaminated fuel.
- Malfunction of the ECM.

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. Check if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.

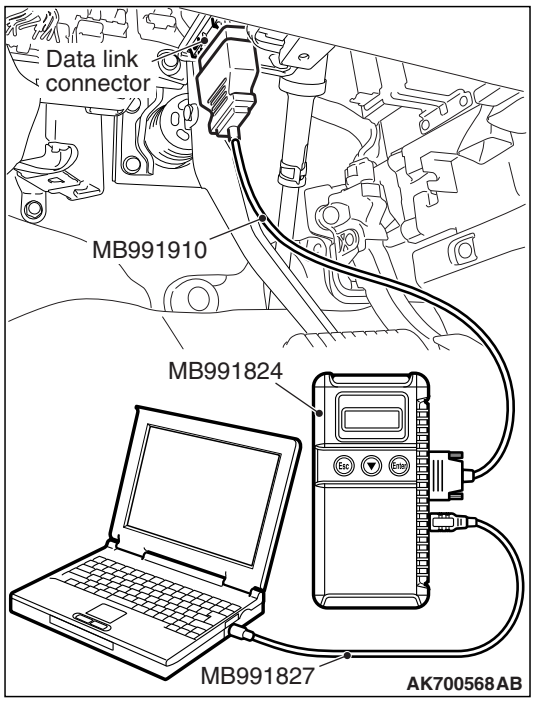
STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC)

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch is 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 1: Injector.
   b. Item 10: Evaporative emission purge solenoid
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 5: Intake Air Temperature Sensor.
   b. Item 6: Engine Coolant Temperature Sensor.
   c. Item 10: Mass Airflow Sensor
   d. Item 76: A/C Switch
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

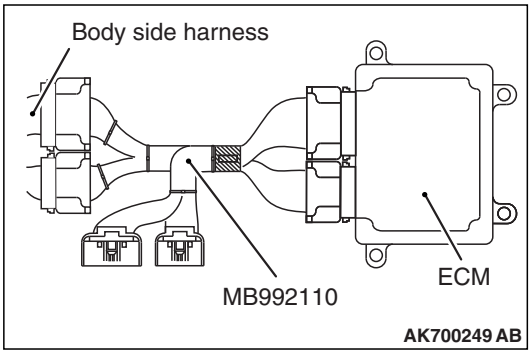
YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?

YES : Go to Step 7.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

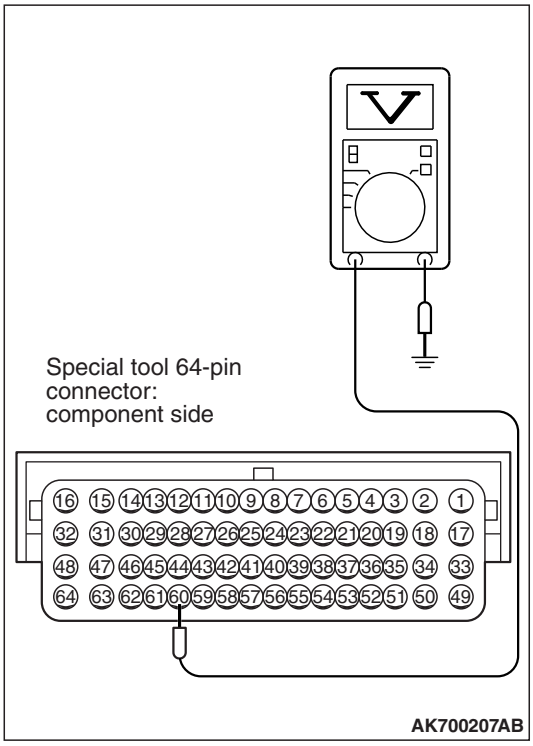


STEP 7. Measure the voltage at ECM connector B-10 by using check harness special tool MB992110.

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

(2) Start the engine and run at idle.

NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



(3) Measure the voltage between terminal No. 60 and ground.
   a. Engine: warming up
   b. Radiator fan: stopped
   c. Headlight switch: OFF to ON
   d. Rear defogger switch: OFF to ON
   e. Stoplight switch: OFF to ON
      - Voltage rises.

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

Q: Is the harness measured voltage within the specified range?

YES : Go to Step 8.

NO : Replace the generator. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 9.

STEP 9. Check the ignition coil.

(1) Remove the intake manifold.

(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 10.

TSB Revision

STEP 10. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Go to Step 11.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Go to Step 12.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the purge control system.
Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Purge Control System Check (Purge Flow Check) P.17-77.

Q: Is the purge control system normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
b. Check if fuel is contaminated.
c. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 8: Idle speed is high (improper idle speed).

COMMENT

- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the engine coolant temperature sensor signal.
- Malfunction of the accelerator pedal position sensor (main) signal.
- Malfunction of the accelerator pedal position sensor (sub) signal.
- Malfunction of the A/C switch signal.
- Malfunction of the power steering pressure switch signal.
- Malfunction of the purge control system.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

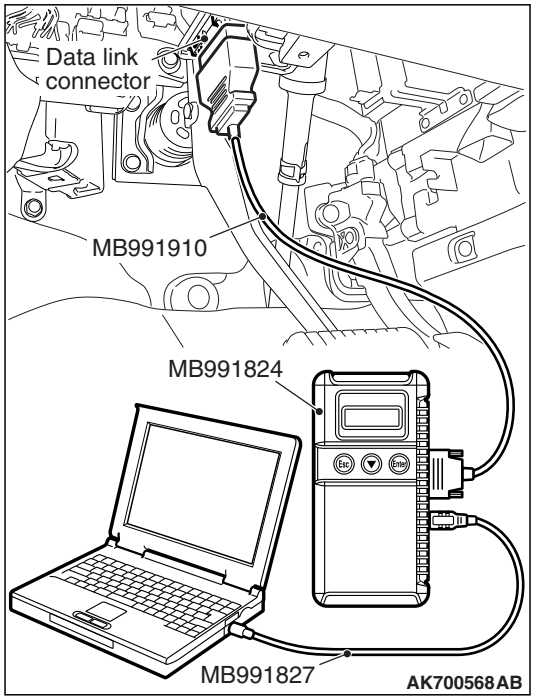
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

- 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 6: Engine Coolant Temperature Sensor.
   b. Item 11: Accelerator pedal position sensor (main)
   c. Item 12: Accelerator pedal position sensor (sub)
   d. Item 76: A/C switch
   e. Item 83: Power steering pressure switch
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-78.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 9: Idle Speed Is Low (improper idle speed).

COMMENT

- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the engine coolant temperature sensor signal.
- Malfunction of the torque converter.
- Malfunction of the ECM.

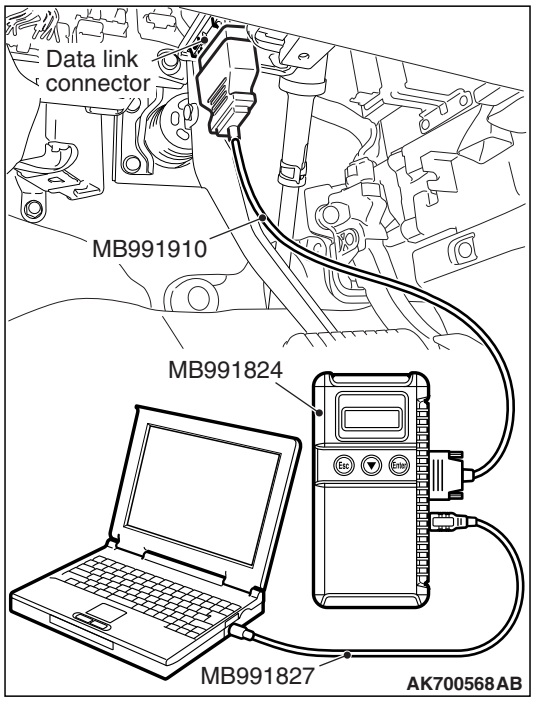
DIAGNOSIS

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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 6: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to GROUP 23C, Automatic Transaxle Diagnosis – Torque Converter Stall Test P.23C-24.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

TSB Revision

INSPECTION PROCEDURE 10: When the engine is cold, it stalls at idle (die out).

COMMENT

- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Improper engine oil viscosity
- Malfunction of the ECM.

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 if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.

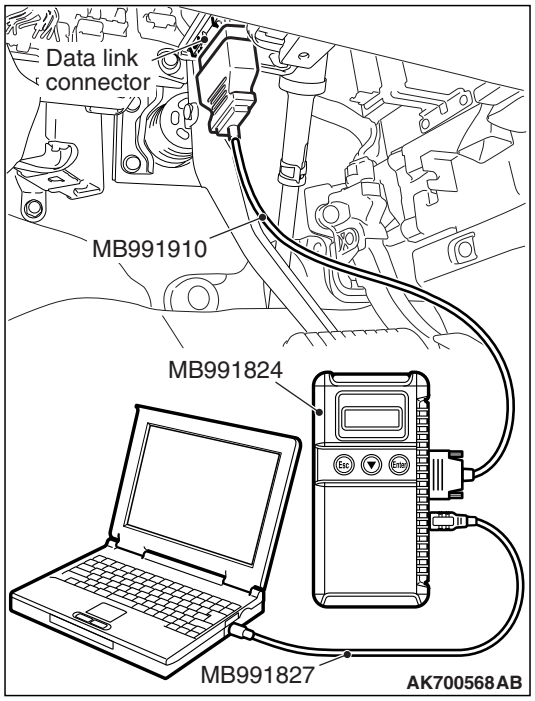
STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, check actuator test.
(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
  a. Item 1: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?
YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 6: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.
Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?
YES : Go to Step 6.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?
YES : Go to Step 7.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?
YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 9.

STEP 9. Check the compression pressure.

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

Q: Is the compression pressure normal?

YES : Check the engine oil viscosity. Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 11: When the Engine Is Hot, It Stalls at Idle (die out).

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a connector damage.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

DIAGNOSIS

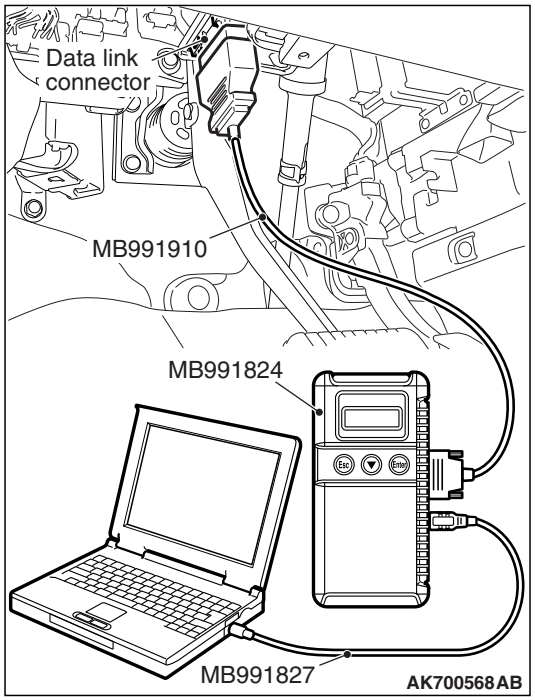
Required Special Tools:

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

STEP 1. Check if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.



STEP 2. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 1: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 5: Intake Air Temperature Sensor.
   b. Item 6: Engine Coolant Temperature Sensor.
   c. Item 13: Throttle position sensor (main).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the ignition timing.
Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?

YES : Go to Step 7.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 9.

STEP 9. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Go to Step 11.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Engine stall reproduction test.

Q: Is it easy to reproduce the engine stall?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
b. Check if fuel is contaminated.
c. Check if the injectors are clogged.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
Then confirm that the malfunction symptom is eliminated.

NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.
a. Crankshaft position sensor signal.
b. Mass airflow sensor signal.
c. Injector drive signal.
d. Primary and secondary ignition signal.
e. Fuel pump drive signal.
f. ECM power supply voltage.
Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 12: The Engine Stalls when Accelerating (pass out).

COMMENT

- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

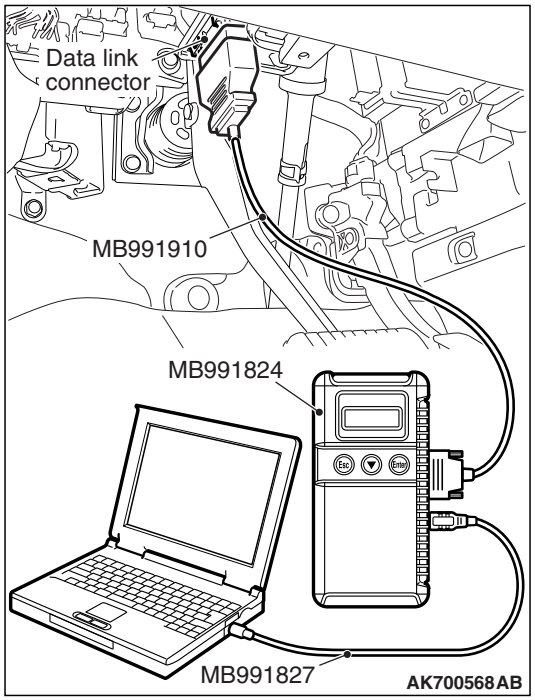
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.



STEP 2. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
  a. Item 10: Evaporative Emission Purge Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 5.

STEP 5. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 6.

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STEP 6. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 13: The engine stalls when decelerating.

COMMENT

- Abnormal air/fuel ratio or other similar defects due to insufficient intake air volume and defective EGR system is suspected to be the causes.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

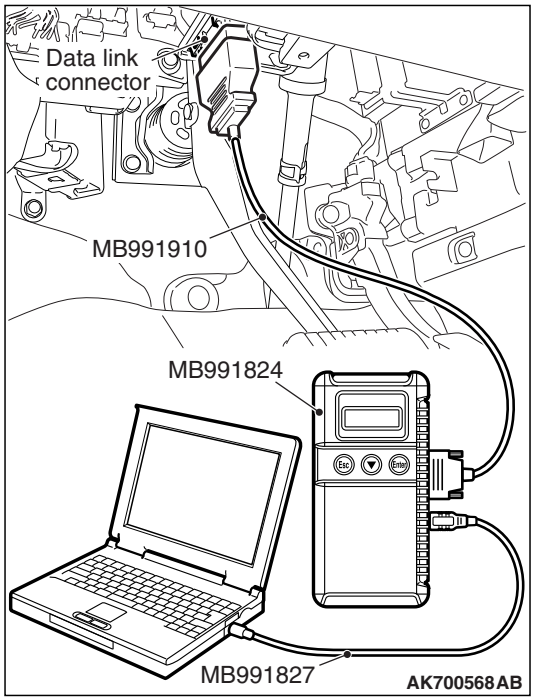
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.



STEP 2. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.

STEP 3. Engine stall reproduction test.

Q: Does the engine stall during the decrease in engine speed after running?

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

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13B-858.
   a. Item 10: Evaporative Emission Purge Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Using scan tool MB991958, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 13: Throttle Position Sensor (main).
   b. Item 15: Throttle Position Sensor (sub).
   c. Item 11: Accelerator Pedal Position Sensor (main).
   d. Item 12: Accelerator Pedal Position Sensor (sub).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?
YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?
YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Check the ignition coil. Refer to GROUP 16, Ignition System – Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 14: Hesitation, sag, stumble, Poor acceleration or Surge.

COMMENT
- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system.
- Improper operation of the PCV valve.
- Vacuum leak.
- Clogged air cleaner.
- Clogged exhaust system.
- Increased resistance to the transmission drive
- Malfunction of the ECM.

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 if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

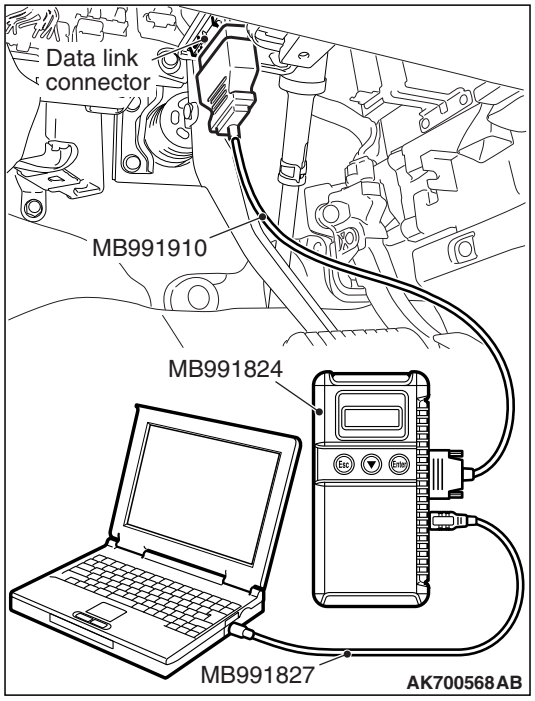
YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.

STEP 2. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.

NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Refer to Actuator Test Reference Table P.13B-858.
  a. Item 1: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are thy operating properly?

YES : Go to Step 4.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the ignition timing.

(1) Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?

YES : Go to Step 5.

NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

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STEP 5. Using scan tool MB991958, check data list and actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 5: Intake Air Temperature Sensor.
   b. Item 6: Engine Coolant Temperature Sensor.
   c. Item 13: Throttle Position Sensor (main).
   d. Item 15: Throttle Position Sensor (sub).
   e. Item 11: Accelerator Pedal Position Sensor (main).
   f. Item 12: Accelerator Pedal Position Sensor (sub).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 9.

STEP 9. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
b. Clogged air cleaner.
c. Clogged exhaust system.
d. Check if fuel is contaminated.
e. Check if the injectors are clogged.
f. Check if the foreign materials (water, kerosene, etc.) got into fuel.
g. Increased resistance to the transmission drive
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 15: Acceleration shock.

COMMENT

- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

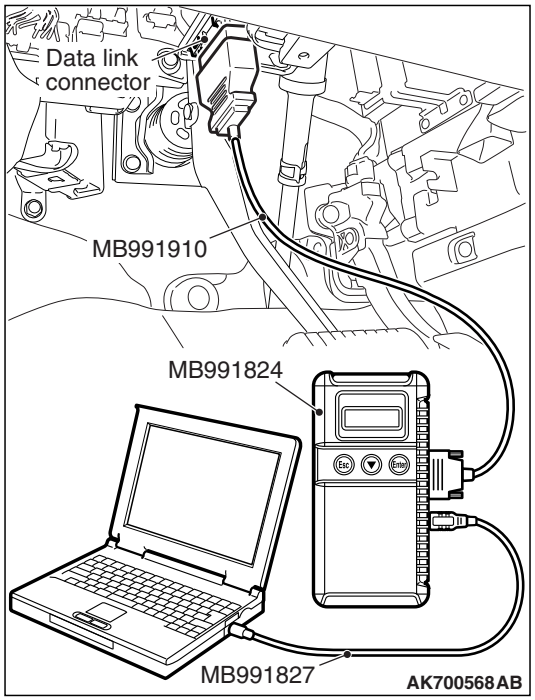
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the ECM.

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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Check the spark plugs.

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

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 3.

STEP 3. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Check for occurrence of ignition leak. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 16: Knocking

COMMENT

- Incases such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Defective knock sensor.
- Incorrect heat value of the spark plug.
- Poor compression.

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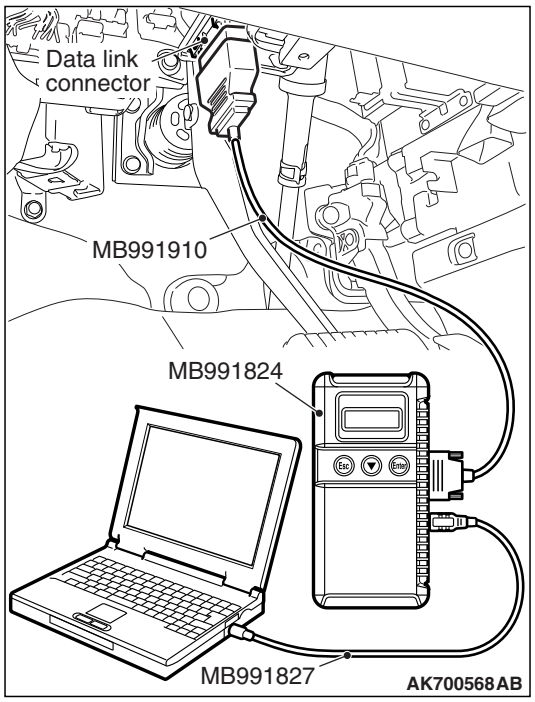
- Malfunction of the ECM.

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 the 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 32: Knock retard.
(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 P0327 – Knock Sensor Circuit Low (Bank 1) P.13B-430, DTC P0328 – Knock Sensor Circuit High (Bank 1) P.13B-433, DTC P0332 – Knock Sensor Circuit Low (Bank 2) P.13B-437, DTC P0333 – Knock Sensor Circuit High (Bank 2) P.13B-441.

STEP 3. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 4.

STEP 4. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Check the following items, and repair or replace the defective items.

a. Check if fuel is contaminated.

b. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 17: Too high CO and HC concentration when idling

COMMENT

- Abnormal air/fuel ratio is suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system.
- Improper operation of the PCV valve.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

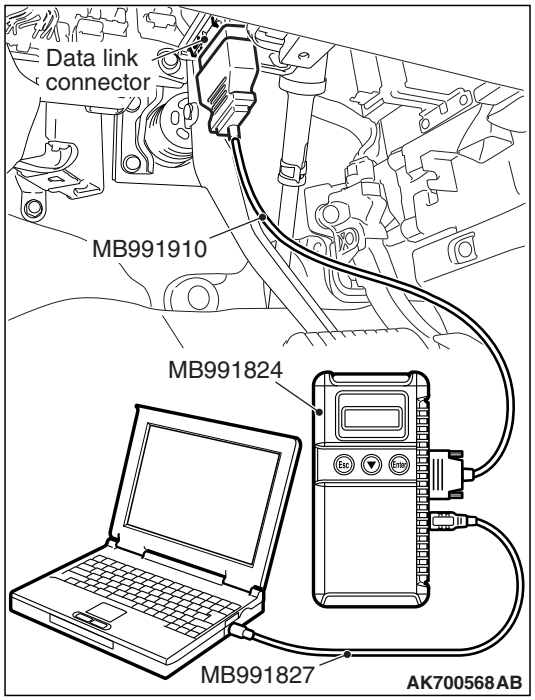
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (Stepper Motor) Check P.17-81.



STEP 2. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 3.

STEP 3. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check for installed conditions of the timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 6: Engine Coolant Temperature Sensor.
  b. Item 5: Intake Air Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pressure.

Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

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STEP 6. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 7.

STEP 7. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Go to Step 9.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the purge control system.
Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Purge Control System Check (Purge Flow Check) P.17-77.

Q: Is the purge control system normal?

YES : Check the following items, and repair or replace the defective items.
a. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 18: Transient, Mass Emission Tailpipe Test Failure.

COMMENT

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system.
- Deteriorated catalyst.

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 the exhaust gas with the engine at normal operating temperature.

Q: Was the exhaust gas checked with engine warmed sufficiently?

YES : Go to Step 2.
NO : Check it again after enough warm up.

STEP 2. Check the following items.

(1) Check the following items.
   a. Check all vacuum hoses and connectors.
   b. Check electrical wires and connectors for obvious problems.

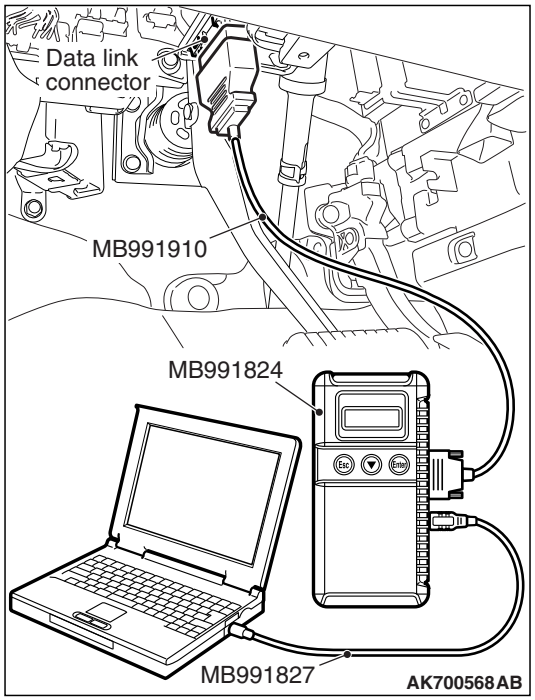
Q: Are they normal?

YES : Go to Step 3.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the driveability.

Q: Is the driveability normal?

YES : Go to Step 4.
NO : Refer to Symptom Chart P.13B-55.



STEP 4. 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Go to Step 5.

STEP 5. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-13.

Q: Is the ignition timing normal?

YES : Go to Step 6.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 6. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-836.
   a. Item 6: Engine Coolant Temperature Sensor.
   b. Item 5: Intake Air Temperature Sensor.
   c. Item AC: Heated Oxygen Sensor Bank 1, Sensor 1 (right front)
   d. Item AE: Heated Oxygen Sensor Bank 2, Sensor 1 (left front)
   e. Item BB: Barometric Pressure Sensor
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 7.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

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STEP 7. Using scan tool MB991958, check data list item AD: Heated oxygen sensor bank 1, sensor 2 (right 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 bank 1, sensor 2 (right rear).
  a. Transaxle: 2 nd
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages 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 : Go to Step 8.
NO : Refer to P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-244, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-250, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13B-254, DTC P0140 – Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 2) P.13B-259.

STEP 8. Using scan tool MB991958, check data list item AF: Heated oxygen sensor bank 2, sensor 2 (left rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AF, Heated Oxygen Sensor bank 2, sensor 2 (left rear).
  a. Transaxle: 2 nd
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - 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 : Go to Step 9.
NO : Refer to P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-284, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-290, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13B-294, DTC P0160 – Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 2) P.13B-299.

STEP 9. Check the EGR system.
Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – General Information (Exhaust Gas Recirculation System) P.17-80.

Q: Is the EGR system normal?

YES : Go to Step 10.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the fuel pressure.
Refer to On-vehicle Service – Fuel Pressure Test P.13B-883.

Q: Is the fuel pressure normal?

YES : Go to Step 11.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the spark plugs.
Refer to GROUP 16, Ignition System – On-vehicle Service – Spark Plug Check And Cleaning P.16-45.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 12.

STEP 12. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 13.

STEP 13. Check the compression pressure.
Refer to GROUP 11C, On-vehicle Service – Compression Pressure Check P.11C-18.

Q: Is the compression pressure normal?

YES : Go to Step 14.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the positive crankcase ventilation valve.
Refer to GROUP 17, Emission Control – Positive Crankcase Ventilation System – Positive Crankcase Ventilation System Check P.17-74.

Q: Is the positive crankcase ventilation valve?

YES : Go to Step 15.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 15. Check the purge control system.

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Purge Control System Check (Purge Flow Check) P.17-77.

Q: Is the purge control system normal?

YES : Go to Step 16.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 16. Check the following items.

(1) Check the following items.

a. Check the injectors for fuel leakage.

b. Check if the injectors are clogged.

Q: Are there any abnormalities?

YES : Replace it. Then confirm that the malfunction symptom is eliminated. Then confirm that the malfunction symptom is eliminated.

NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 19: Purge Flow Test of the Evaporative Emission Canister Failure.

COMMENT

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

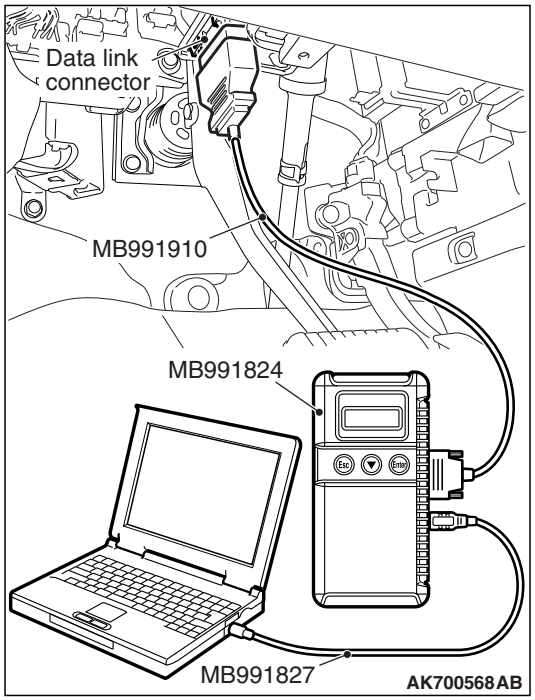
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tools:

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



STEP 1. Using scan tool MB991958, 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 any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13B-50.
NO : Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Purge Control System Check (Purge Flow Check) P.17-77.

INSPECTION PROCEDURE 20: Pressure Test of the Evaporative System Failure

COMMENT

- The test fails if there is a leak from the fuel tank or vapor line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Loose fuel tank filler tube cap.
- Broken seal in fuel tank, vapor line evaporative emission canister.

DIAGNOSIS

STEP 1. Check the evaporative emission purge solenoid.
Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-78.

Q: Is the evaporative emission purge solenoid normal?

YES : Go to Step 2.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the evaporative emission ventilation solenoid.

Refer to GROUP 17, Emission Control – Evaporative Emission Control System – Evaporative Emission Ventilation Solenoid Check P.17-80.

Q: Is the evaporative emission ventilation solenoid normal?

YES : Check the following items, and repair or replace the defective items.

a. Check for leaks from the vapor line or evaporative emission canister.

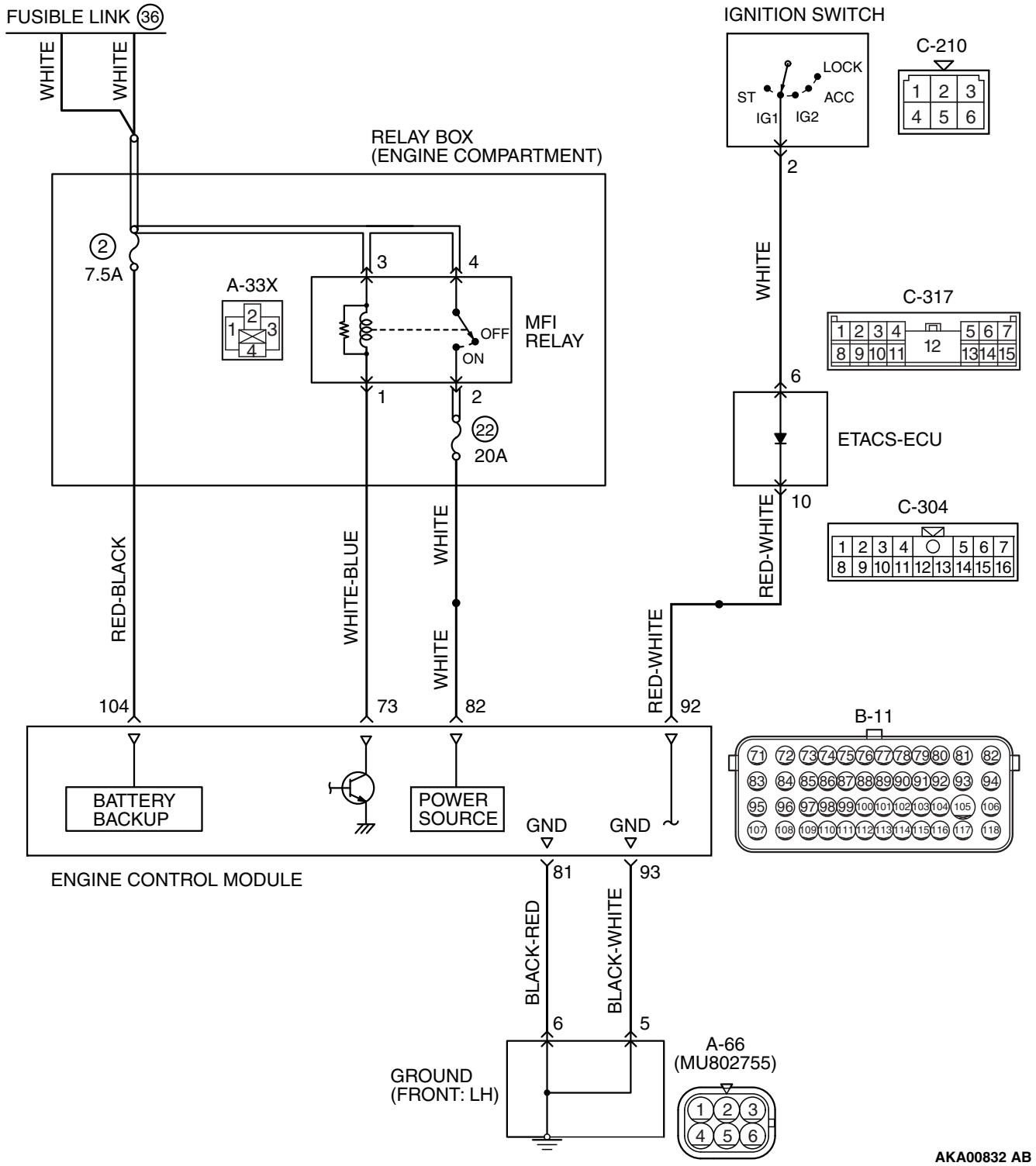
b. Check for leaks from the fuel tank.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 21: Power supply system and ignition switch - IG system.

POWER SUPPLY AND IGNITION SWITCH-IG CIRCUIT



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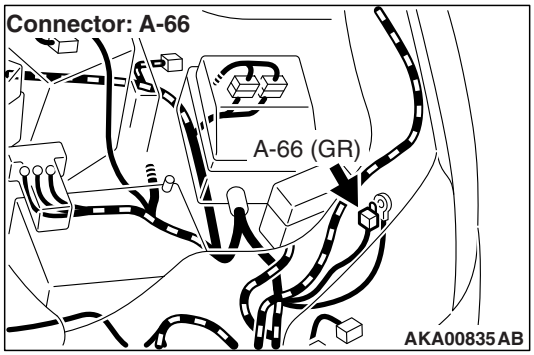

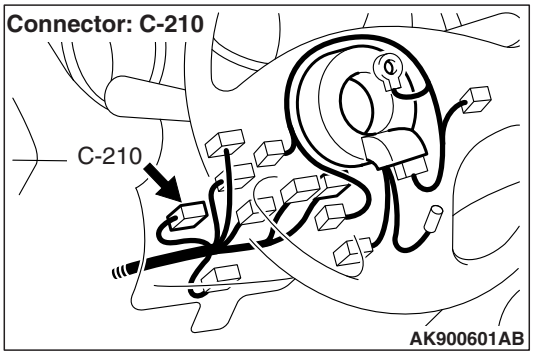

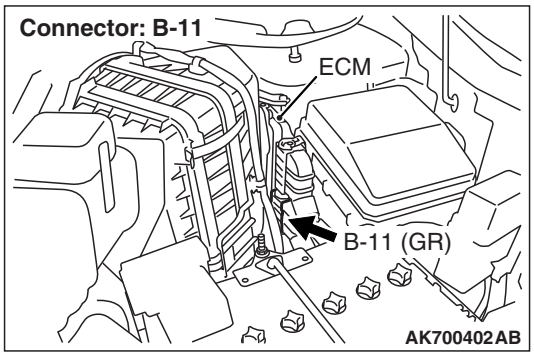

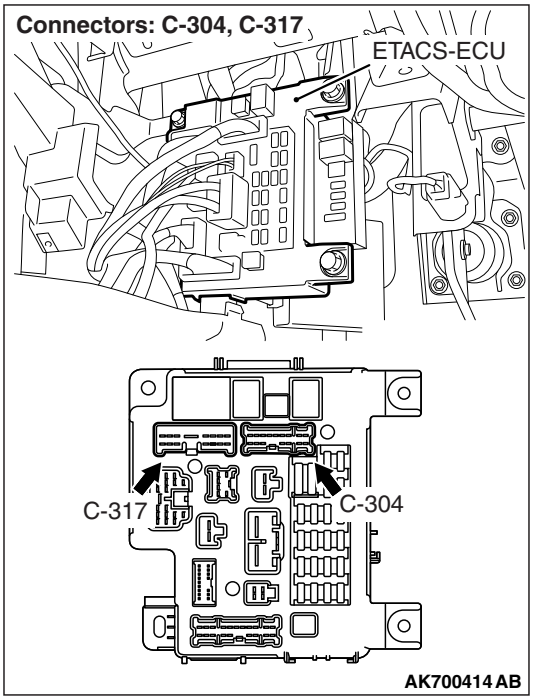

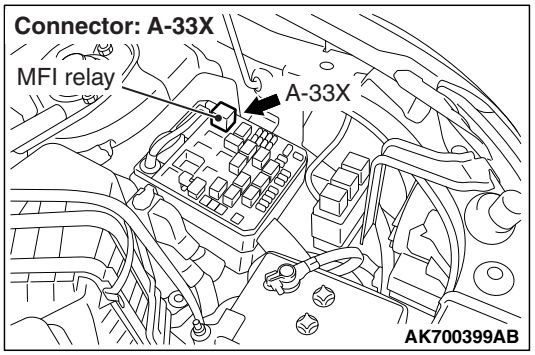

CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals No. 3, No. 4).
- When the ignition switch is turned to the "ON" position, battery positive voltage is applied to the ECM (terminal No. 92). When battery positive voltage is applied, the ECM turns the power transistor in the ECM "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" the battery positive voltage is supplied to the ECM (terminals No. 82) from the MFI relay (terminal No. 2).
- A battery positive voltage is constantly supplied to the ECM (terminal No. 104) as the backup power.
- The ECM (terminals No. 81, No. 93) is grounded to the vehicle body.

COMMENT

- When the ignition switch "ON" signal is input into the ECM via ETACS-ECU, the ECM turns "ON" the MFI relay. This causes battery positive voltage to be supplied to the ECM, sensor and actuator.

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

- Malfunction of the ignition switch.
- Malfunction of the MFI relay.
- Improper connector contact, open circuit or short-circuit harness wire.
- Malfunction of the ECM.

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DIAGNOSIS

STEP 1. Check harness connector A-33X at MFI relay and harness connector B-11 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

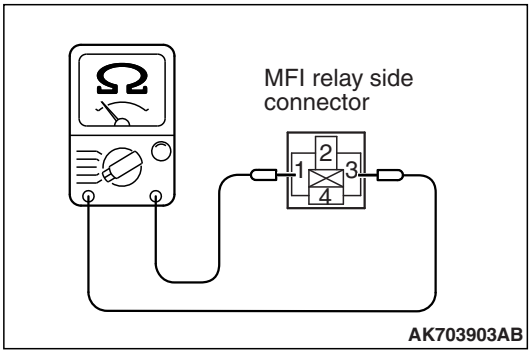
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

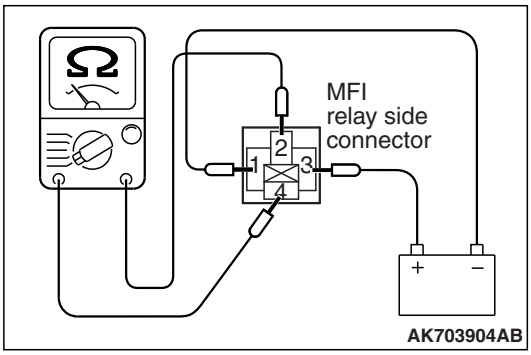
STEP 2. Check the MFI relay.

(1) Remove the MFI relay.

(2) Check for continuity between the MFI relay terminals No. 1 and No. 3.

- There should be continuity.





(3) Use jumper wires to connect MFI relay terminal No. 3 to the positive battery terminal and terminal No. 1 to the negative battery terminal.

(4) Check for continuity between the MFI relay terminals No. 2 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

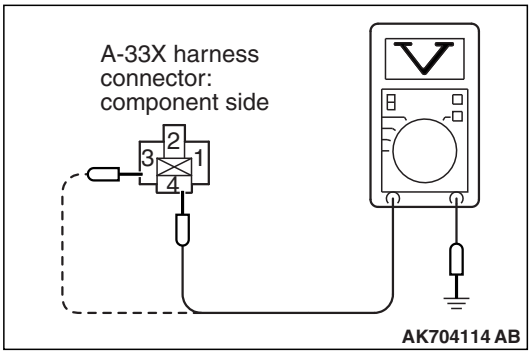
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the MFI relay.

Q: Is the measured resistance within the specified range?

YES : Go to Step 3.

NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.



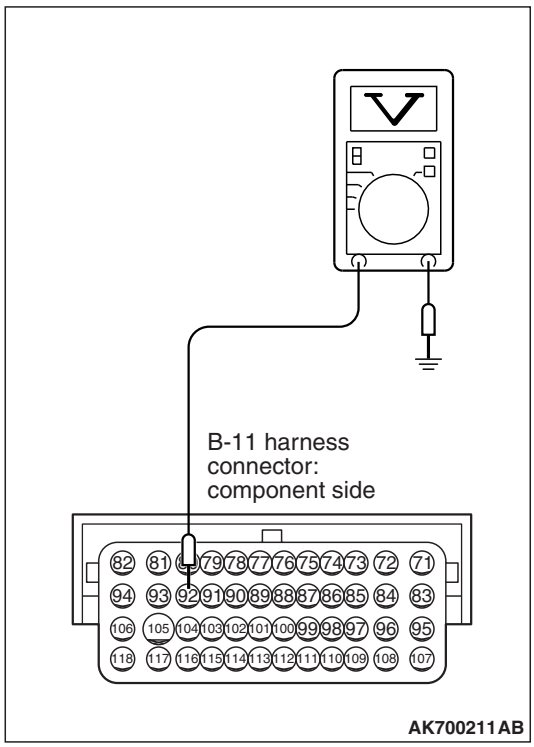
STEP 3. Measure the power supply voltage at MFI relay harness side connector A-33X.

(1) Disconnect the connector A-33X and measure at the harness side.
(2) Measure the voltage between terminals No. 3, No. 4 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 4.

NO : Repair harness wire between fusible link (36) and MFI relay connector A-33X (terminal No. 3, No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 4. Measure the ignition switch-IG signal voltage at ECM harness side connector B-11.

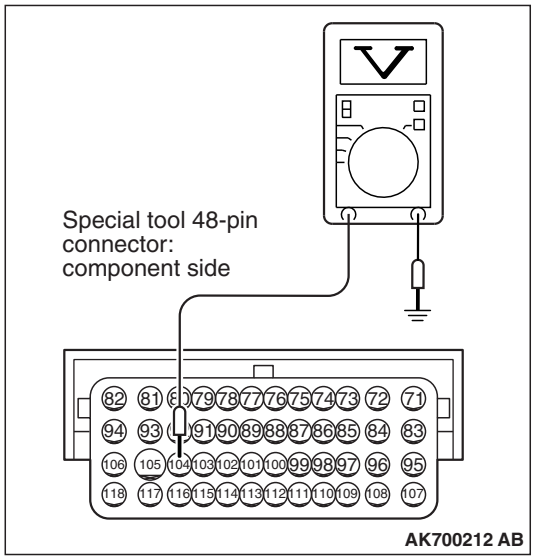
(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 92 and ground.
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 5.

NO : Check harness connectors C-304 and C-317 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-210 (terminal No. 2) and ECM connector B-11 (terminal No. 92) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 5. Measure the backup power supply voltage at ECM harness side connector B-11.

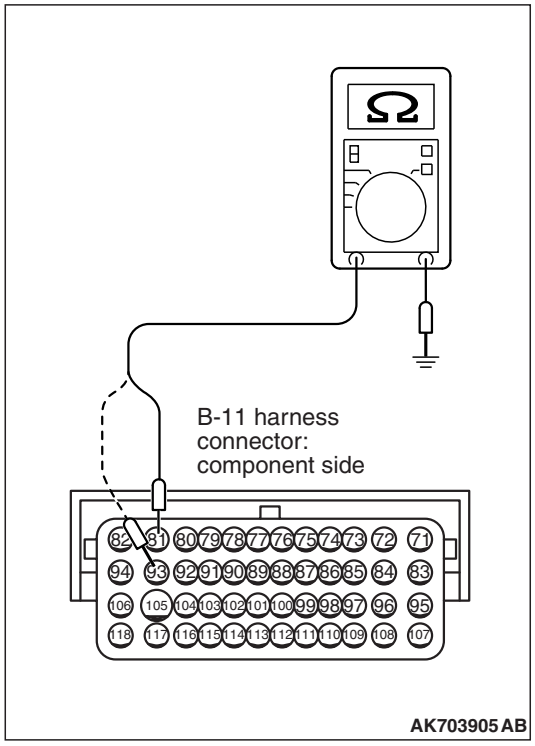
(1) Disconnect the connector B-11 and measure at the harness side.

(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 6.

NO : Repair harness wire between relay box (fuse 2) and ECM connector B-11 (terminal No. 104) because of short circuit. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for continuity at ECM harness side connector B-11.

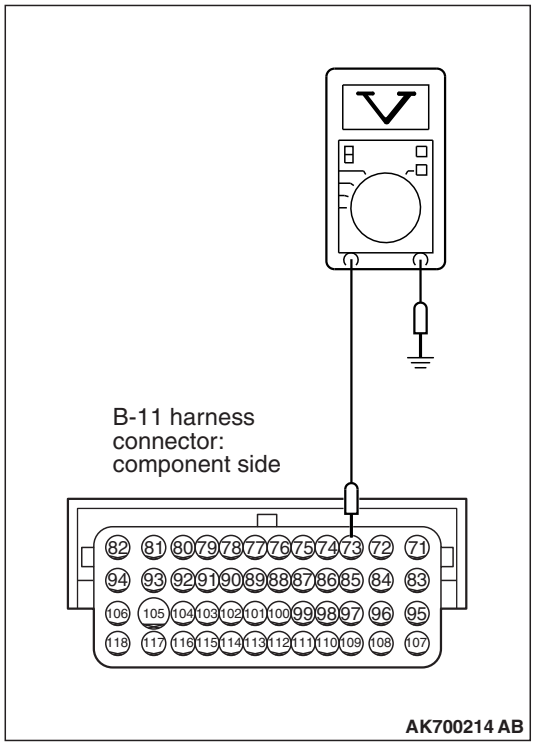
(1) Disconnect the connector B-11 and measure at the harness side.

(2) Check for the continuity between terminals (No. 81, No. 93) and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.

NO : Check harness connector A-66 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 ECM connector B-11 (terminal No. 81, No. 93) and ground because of open circuit and harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 7. Measure the power supply voltage at ECM harness side connector B-11.

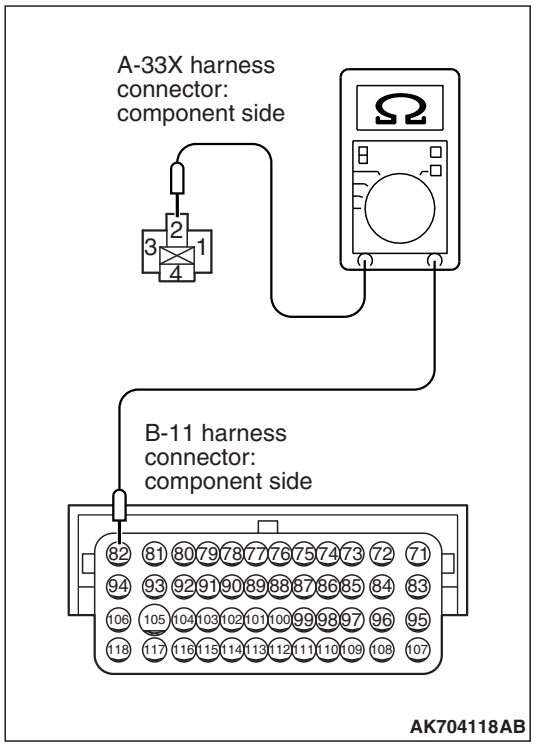
(1) Disconnect the connector B-11 and measure at the harness side.

(2) Measure the voltage between terminal No. 73 and ground.
- Voltage should be battery positive voltage.

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

YES : Go to Step 8.

NO : Repair harness wire between MFI relay connector A-33X (terminal No. 1) and ECM connector B-11 (terminal No. 73) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for open circuit and harness damage between MFI relay connector A-33X (terminal No. 2) and ECM connector B-11 (terminal No. 82).

(1) Disconnect the connector A-33X and B-11 measure at the harness side.

(2) Measure the resistance between connector A-33X (terminal No. 2) and connector B-11 (terminal No. 82).
- Should be less than 2 ohms.

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 Codes 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 confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

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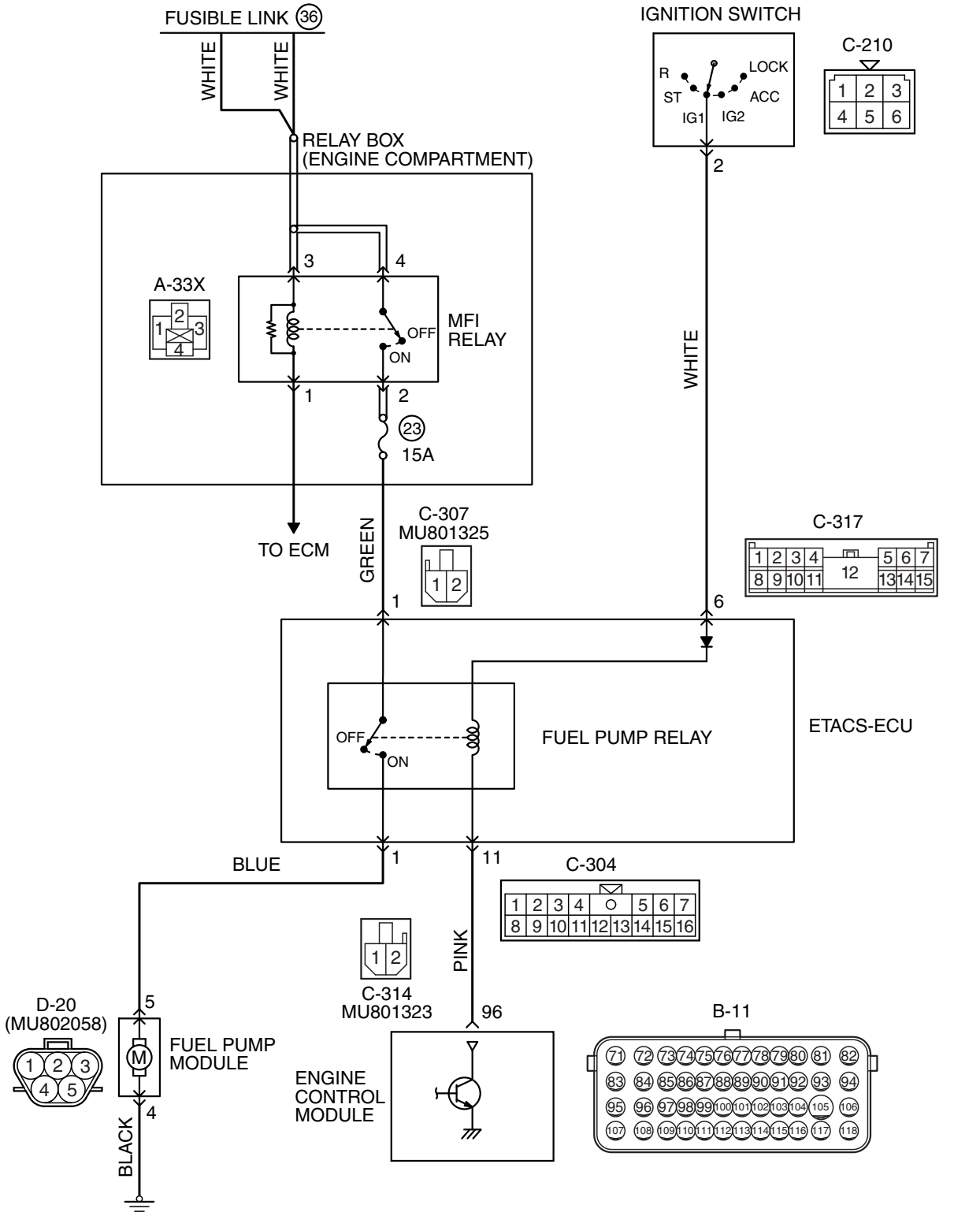
INSPECTION PROCEDURE 22: Fuel pump system.

FUEL PUMP CIRCUIT



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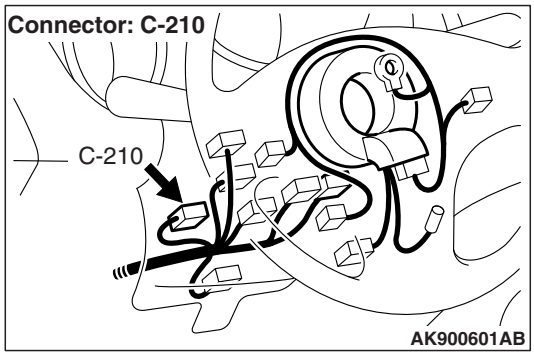

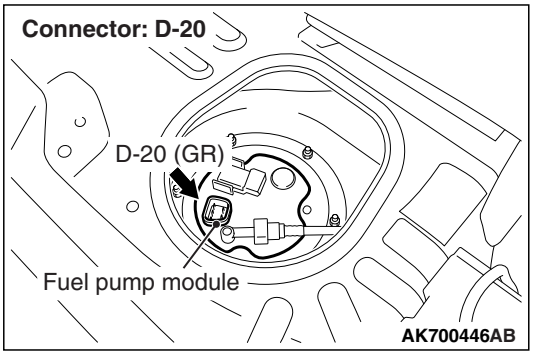

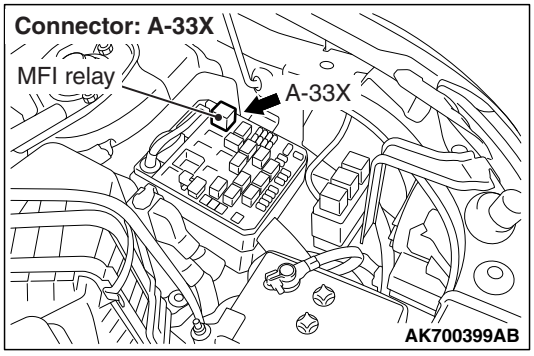

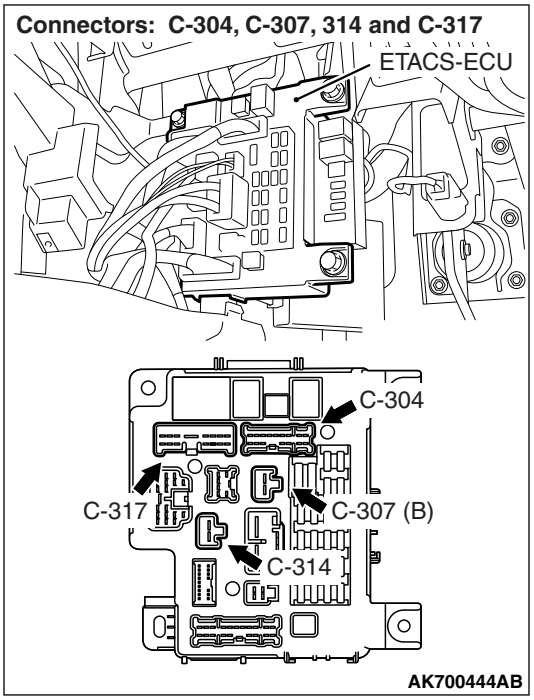

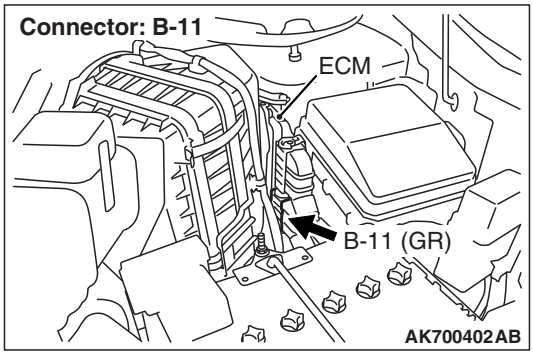

CIRCUIT OPERATION

- The fuel pump drive power is supplied from MFI relay (terminal No. 2) to fuel pump relay (C-307 ETACS-ECU connector terminal No. 1) in the ETACS-ECU.
- The battery positive voltage is applied by the ignition switch to the fuel pump coil (C-317 ETACS-ECU connector terminal No. 6) in the ETACS-ECU. The ECM turns "ON" the relay by turning "ON" the power transistor in the unit so as to conduct power to the fuel pump relay coil (via the C-304 ETACS-ECU connector terminal No. 11).
- When the fuel pump relay is turned "ON", the battery positive voltage will be supplied from the fuel pump relay (C-314 ETACS-ECU connector terminal No. 1) to the fuel pump.

COMMENT

- When the ignition switch ON signal is inputted into the ECM, the ECM turns ON the fuel pump relay. This causes the battery voltage to be supplied to the fuel pump.

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

- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circulated harness wire.
- Malfunction of the ECM.

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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

STEP 1. Check harness connector C-304, C-307, C-314 and C-317 at MFI relay for damage.

Q: Is the 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 confirm that the malfunction symptom is eliminated.

STEP 2. Check the fuel pump relay.

Refer to On-vehicle Service – Fuel Pump Relay Continuity Check P.13B-887.

Q: Is the measured resistance normal?

YES : Go to Step 3.

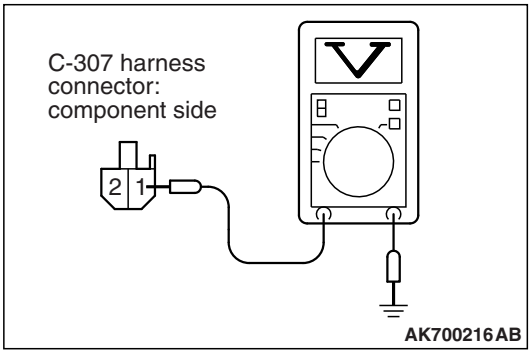
NO : Replace the fuel pump relay. Then confirm that the malfunction symptom is eliminated.

STEP 3. Measure the power supply voltage at ETACS-ECU harness side connector C-307.

(1) Disconnect the connector C-307 and measure at the harness side.

(2) Measure the voltage between terminal No. 1 and ground.

- Voltage should measure battery positive voltage.



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

YES : Go to Step 4.

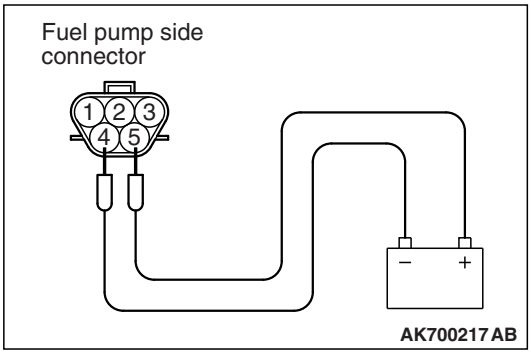
NO : Repair harness wire between relay box and ETACS-ECU connector C-307 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check connector D-20 at fuel pump for damage.

Q: Is the 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 confirm that the malfunction symptom is eliminated.

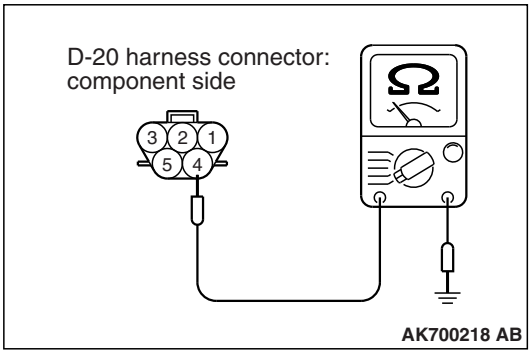


STEP 5. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-20.
(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 6.
NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for continuity at fuel pump 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. 4 and ground.
- Should be less than 2 ohms.

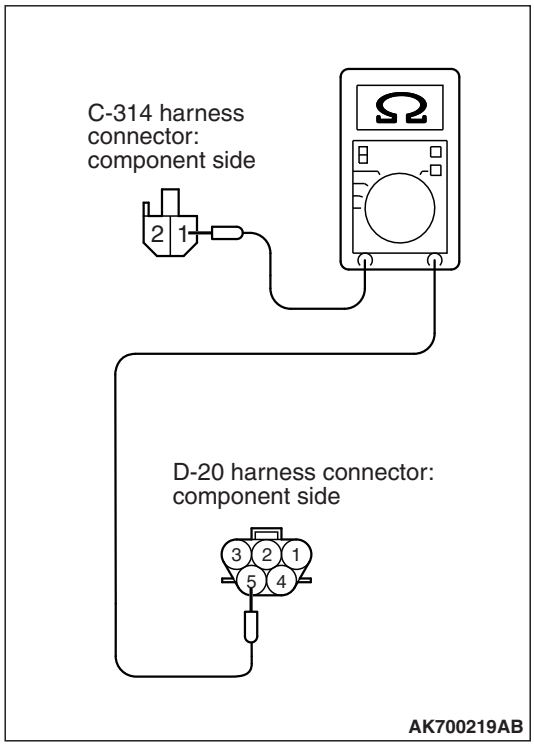
Q: Does continuity exist?

YES : Go to Step 7.
NO : Repair harness wire between fuel pump connector D-20 (terminal No. 4) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

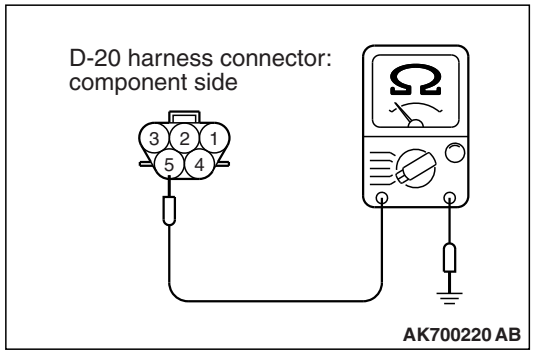
STEP 7. Check for open circuit and short circuit to ground and harness damage between ETACS-ECU connector C-314 (terminal No. 1) and fuel pump connector D-20 (terminal No. 5).

(1) Disconnect the connector C-314 and D-20 measure at the harness side.

(2) Measure the resistance between connector C-314 (terminal No. 1) and connector D-20 (terminal No. 5).
- Should be less than 2 ohms.



(3) Check for the continuity between connector D-20 (terminal No. 5) and ground.
- Not continuity.



Q: Is the harness wire in good condition?

YES : Go to Step 8.

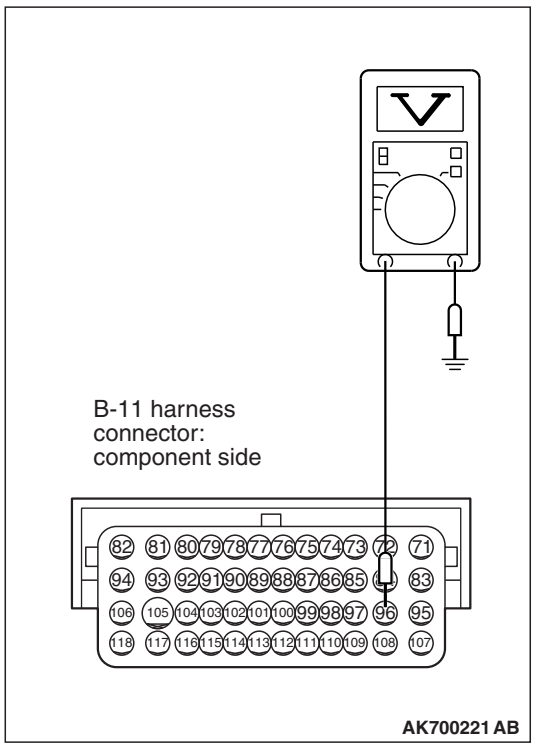
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check connector B-11 at ECM for damage.

Q: Is the 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 confirm that the malfunction symptom is eliminated.



STEP 9. Measure the power supply voltage at ECM connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 96 and ground.
- Voltage should be battery positive voltage.

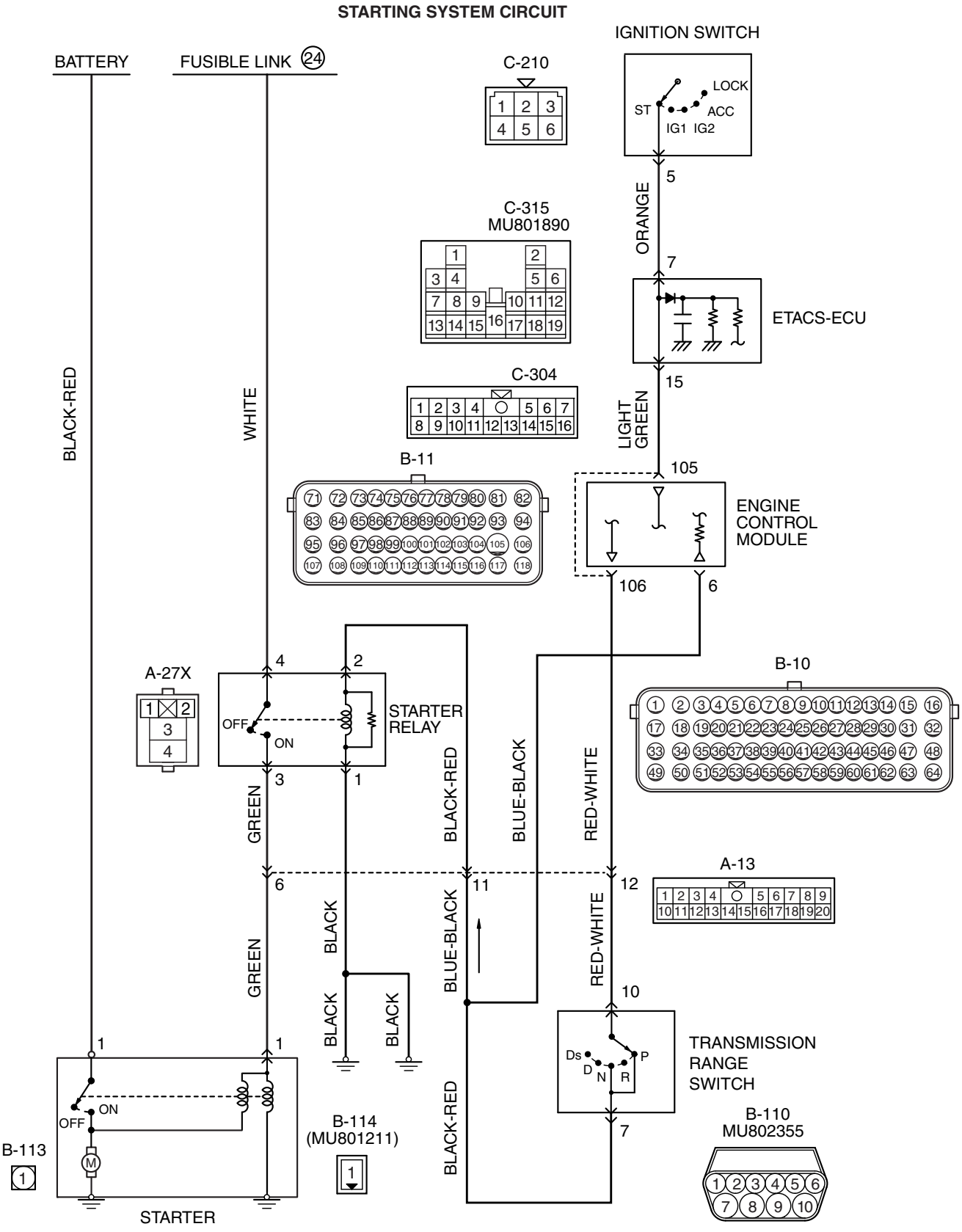
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 11) and ECM connector B-11 (terminal No. 96) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 23: Ignition Switch-ST System and Transmission Range Switch System



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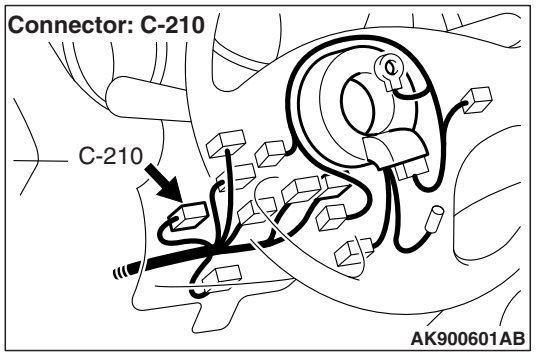

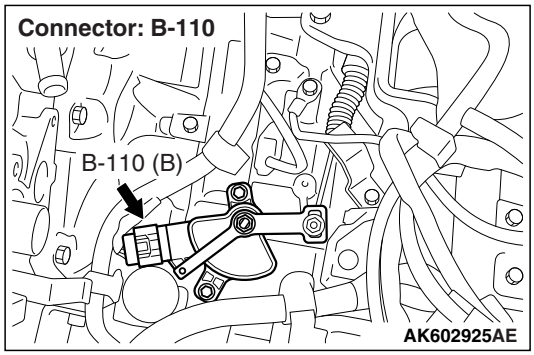

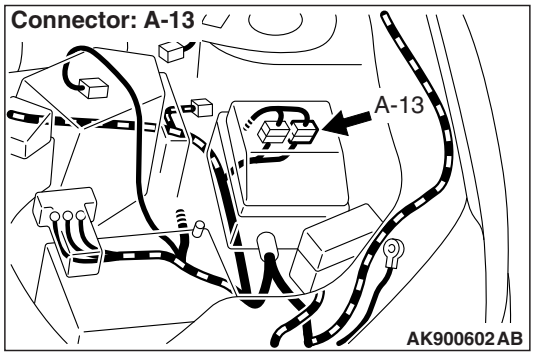

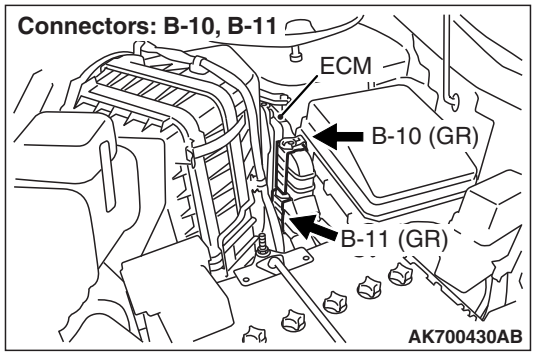

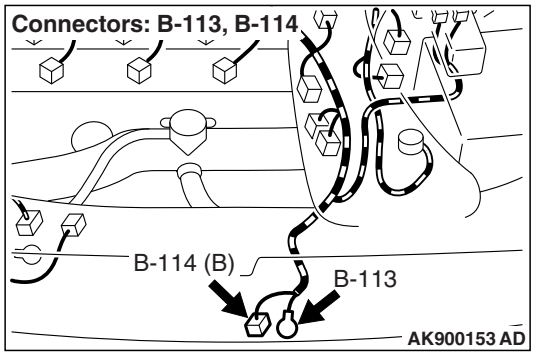

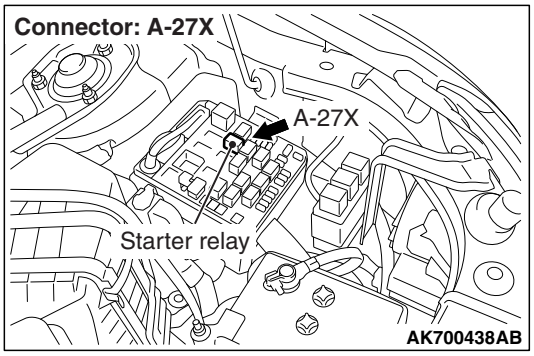

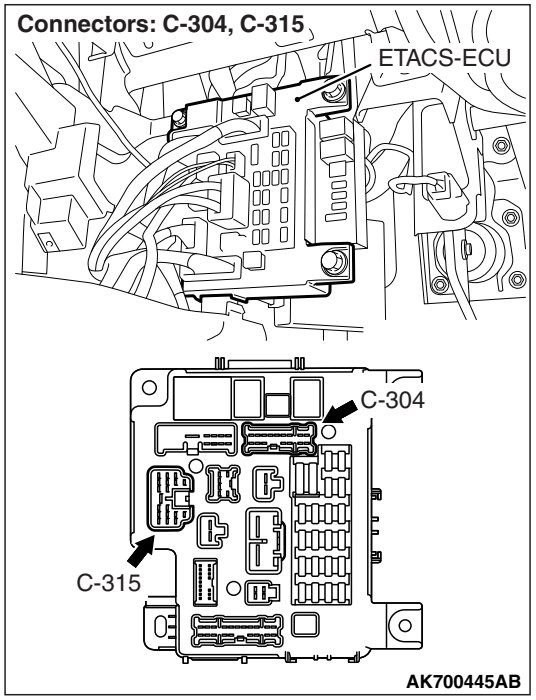

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CIRCUIT OPERATION

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to starter relay coil. With this, the starter relay turns "ON" the battery positive voltage is supplied to the starter motor (terminal No. 1) from the battery.

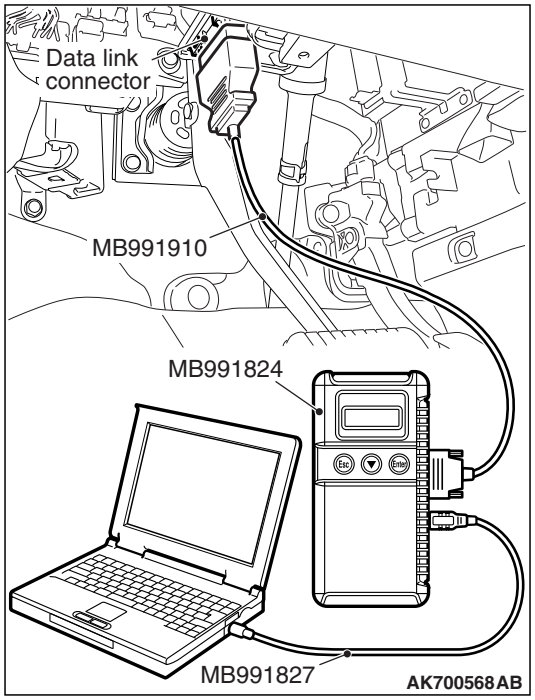
COMMENT

- Faulty starting system and the related circuit are suspected to be the causes.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Battery failed
- Malfunction of the starter motor relay.
- Malfunction of the starter motor.
- Open circuit or short circuit in the starting system or the related circuit or poor contact in the connectors
- Malfunction of the transmission range switch.
- Malfunction of the ECM

DIAGNOSIS



STEP 1. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to Data List Reference Table P.13B-836.
  a. Item 79: Cranking signal.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 15) and ECM connector B-11 (terminal No. 105) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-110 at transmission range switch and harness connector B-11 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the transmission range switch.

Refer to GROUP 23C, On-vehicle Service – Essential Service – Transmission Range Switch Check P.23C-269.

Q: Are there any abnormalities?

YES : Repair or replace it. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 4.

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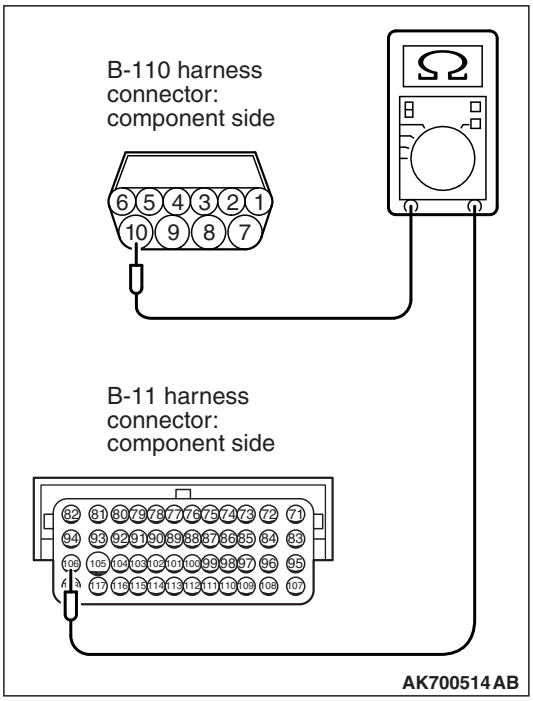
STEP 4. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-110 and ECM connector B-11.

(1) Disconnect the connector B-110 and B-11 measure at the harness side.

(2) Measure the resistance between connector B-110 (terminal No. 10) and connector B-11 (terminal No. 106).
- Should be less than 2 ohms.

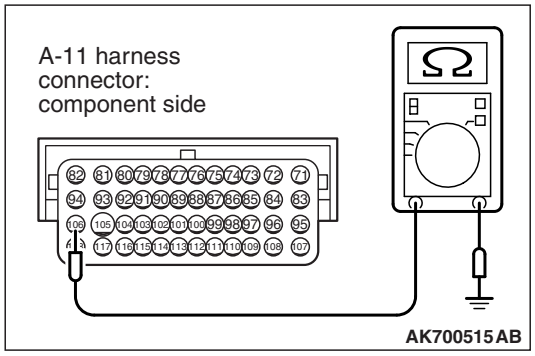


(3) Check for the continuity between connector B-11 (terminal No. 106) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



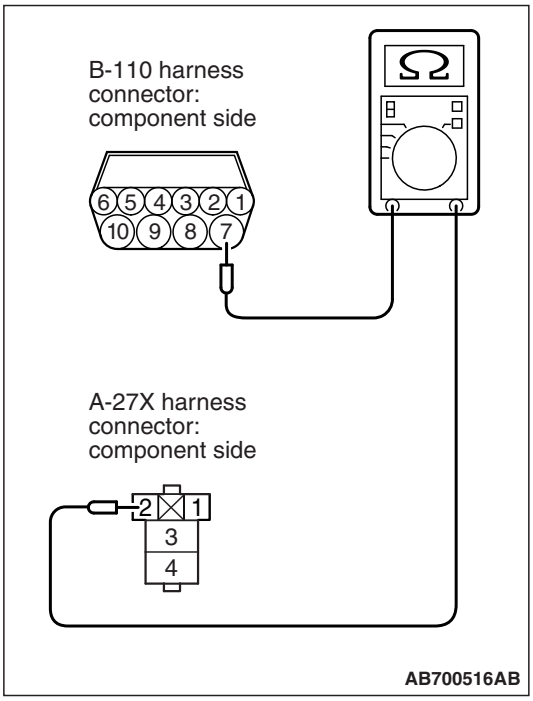
STEP 5. Check harness connector A-27X at starter relay.

Q: Is the connector in good condition?

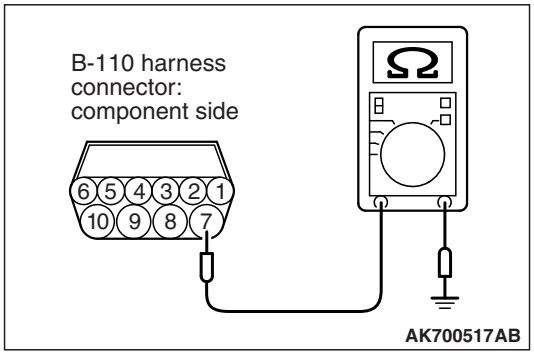
YES : Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-110 and starter relay connector A-27X.



(1) Disconnect the connector B-110 and A-27X measure at the harness side.
(2) Measure the resistance between connector B-110 (terminal No. 7) and connector A-27X (terminal No. 2).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-110 (terminal No. 7) and ground.
- Not continuity.

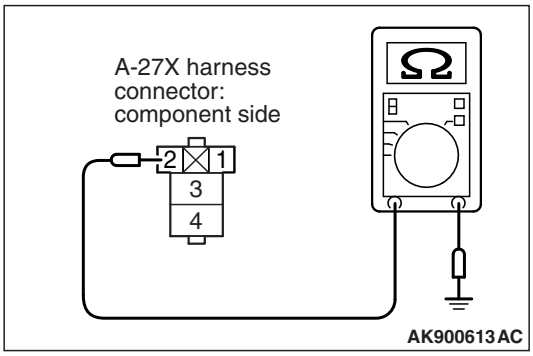
Q: Is the harness wire in good condition?

YES : Then go to Step 7.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

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 confirm that the malfunction symptom is eliminated.

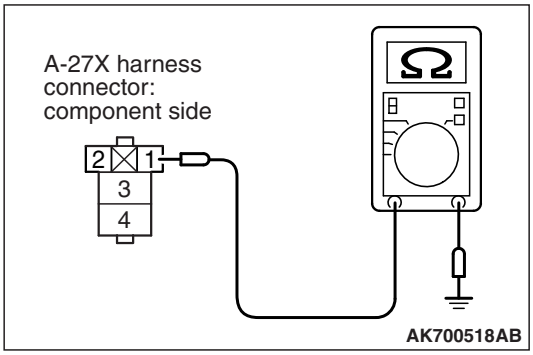


STEP 8. Check for short circuit to ground or harness damage between ECM connector B-10 and starter relay connector A-27X.

(1) Disconnect the B-10 and A-27X.
(2) Check for the continuity between connector A-27X (terminal No. 2) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

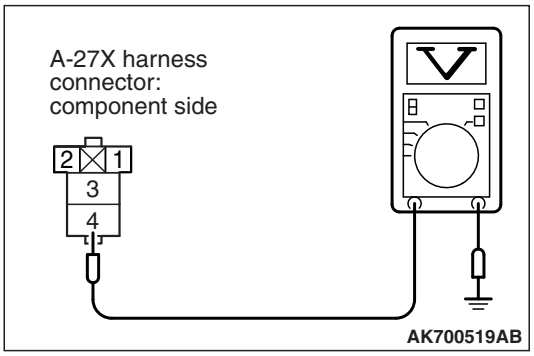


STEP 9. Check for open circuit or harness damage between starter relay connector A-27X and ground.

(1) Disconnect the connector A-27X and ground at the harness side.
(2) Measure the resistance between connector A-27X (terminal No. 1) and ground.
- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Then go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

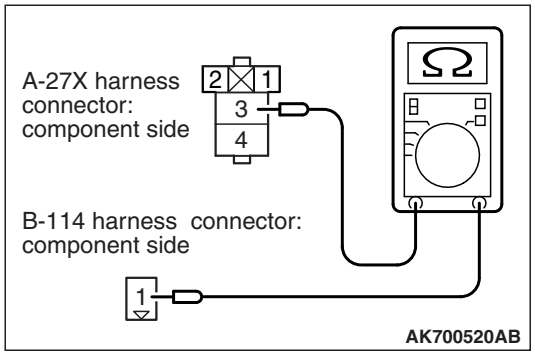


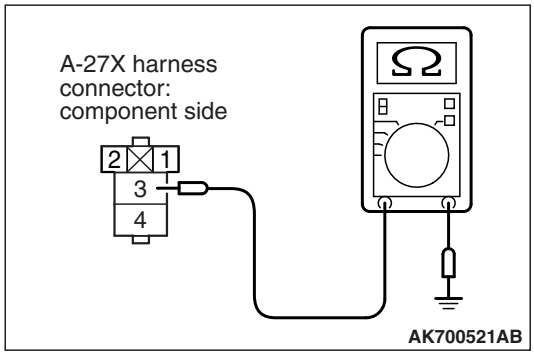
STEP 10. Measure the power supply voltage at starter relay connector A-27X.

(1) Disconnect the connector A-27X measure at the harness side.
(2) 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 11.
NO : Repair harness wire between starter relay connector A-27X (terminal No. 4) and fusible link (24) because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 11. Check for open circuit or short circuit to ground or harness damage between starter relay connector A-27X and starter motor connector B-114.

(1) Disconnect the connector A-27X and B-114 measure at the harness side.

(2) Measure the resistance between connector A-27X (terminal No. 3) and connector B-114 (terminal No. 1).
- Should be less than 2 ohms.

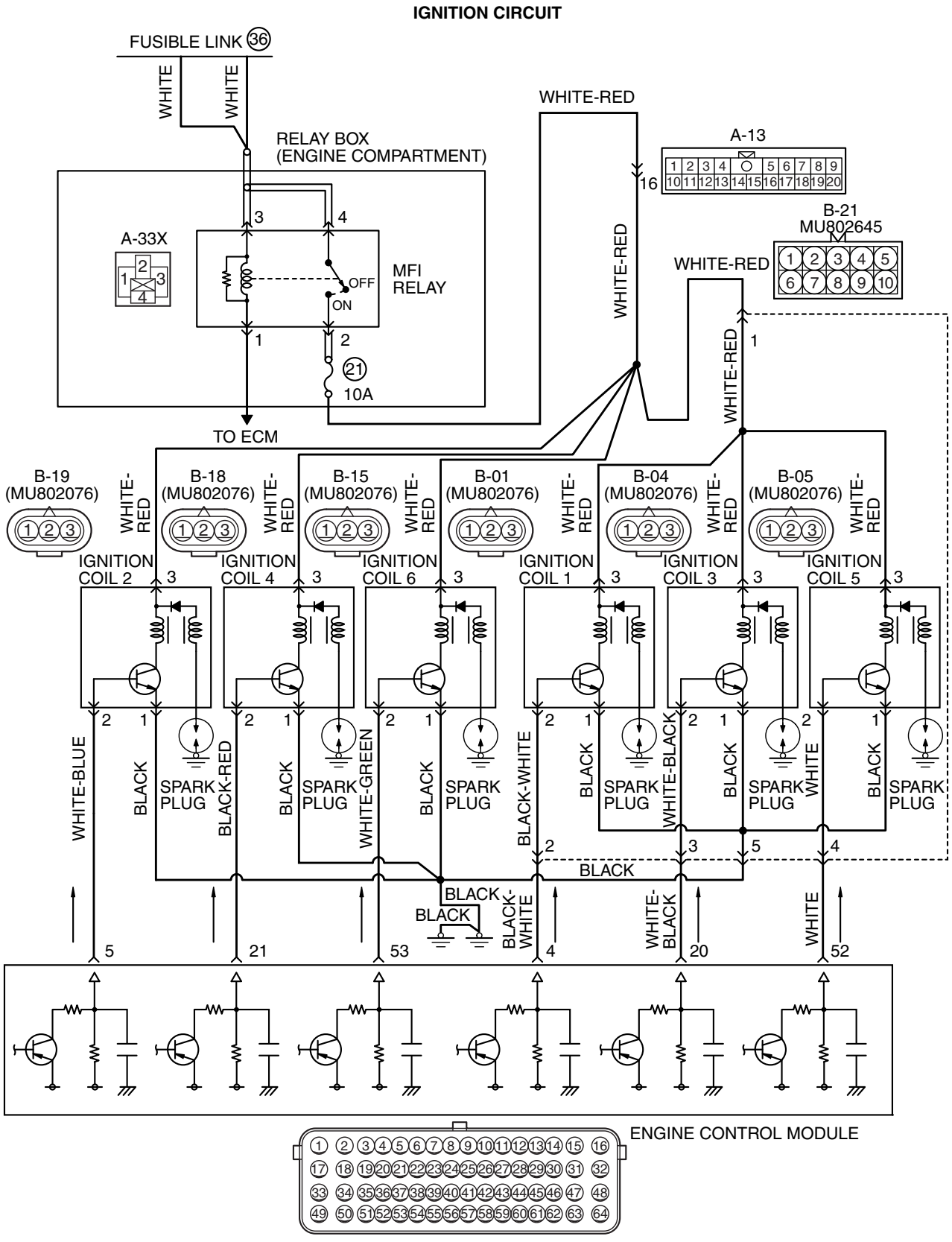
(3) Check for the continuity between connector A-27X (terminal No. 3) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Replace the starter motor. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 24: Ignition Circuit System.



B-10

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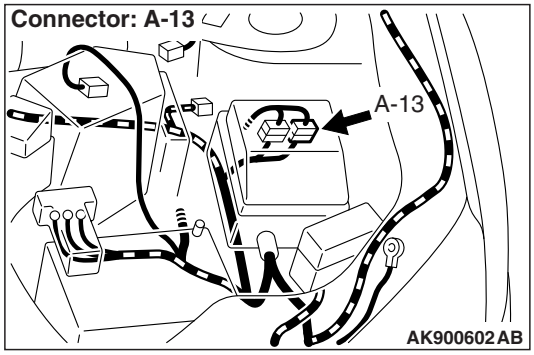
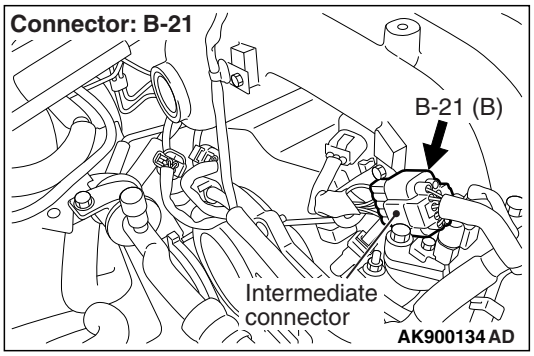
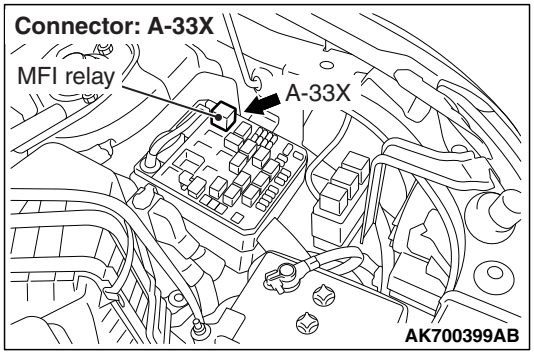
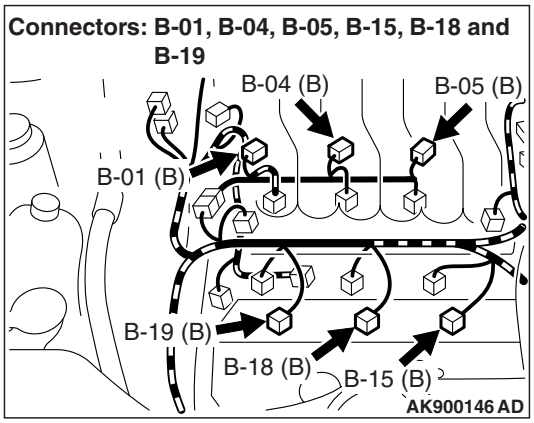
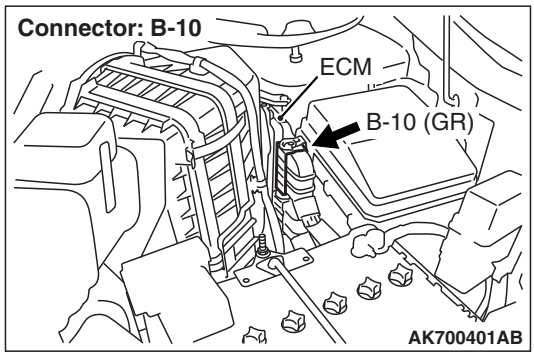










CIRCUIT OPERATION

- The battery positive voltage is applied from the MFI relay (terminal No. 2) to the ignition coil (terminal No.3) and is grounded to the vehicle body via the ignition coil (terminal No.1).
- A power voltage of 12 V is applied to the ignition coil (terminal No. 2) from the ECM (terminal No. 4, No. 5, No. 20, No. 21, No. 52 and No. 53).

COMMENT

- When the ECM turn the power transistor in the unit to OFF, the battery positive voltage is applied to the power transistor in the ignition coil, resulting that the power transistor is ON. And, when the ECM turns the power transistor in the unit to ON, the power transistor in the ignition coil will be turned OFF.
- When the power transistor in the ignition coil is turned to ON with any signal from the ECM, the primary voltage will be applied through the ignition coil.When the power transistor in the ignition coil is turned OFF, the primary current is blocked and high voltage is generated in the secondary coil.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Improper connector contact, open circuit or short-circuit harness wire.
- Malfunction of the ECM.

TSB Revision

DIAGNOSIS

STEP 1. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System – On-vehicle Service – Ignition Coil Check P.16-44.

Q: Are there any abnormalities?

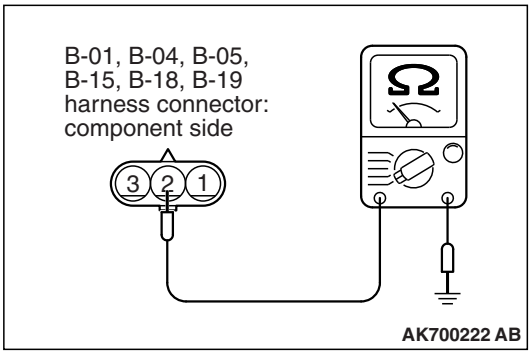
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 2.

STEP 2. Check harness connectors harness connector B-10 at ECM and harness connector A-33X at MFI relay and B-01, B-04, B-05, B-15, B-18, B-19 at ignition coil 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 confirm that the malfunction symptom is eliminated.

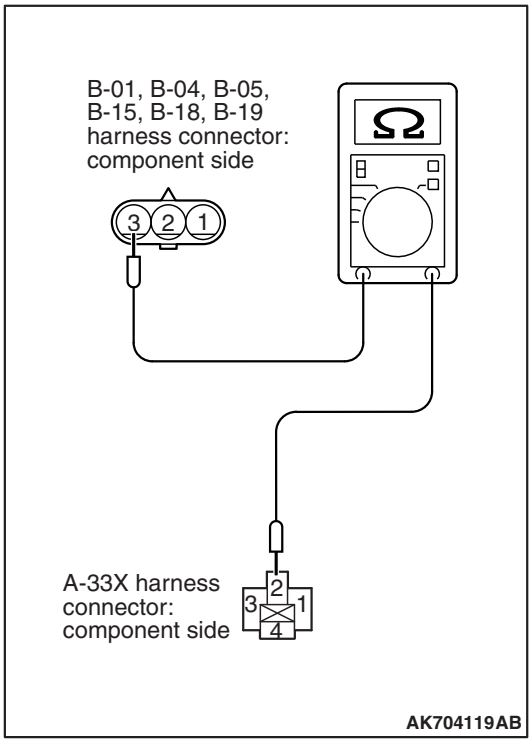
STEP 3. Check the continuity at ignition coil connectors B-01, B-04, B-05, B-15, B-18, B-19.



(1) Disconnect the connector B-01, B-04, B-05, B-15, B-18 and B-19 measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 4.
NO : Check the connector B-21 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 ignition coil connector ignition coil connectors B-01, B-04, B-05, B-15, B-18 and B-19 (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 4. Check for open circuit and harness damage between MFI relay connector and ignition coil connector.

NOTE: Check harness after checking intermediate connectors A-13 and B-21. If intermediate connectors are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the MFI relay connector and ignition coil connector.

(2) Measure the resistance between MFI relay connector and ignition coil connector.

a. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-01 (terminal No. 3) at ignition coil 1.

b. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-19 (terminal No. 3) at ignition coil 2.

c. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-04 (terminal No. 3) at ignition coil 3.

d. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-18 (terminal No. 3) at ignition coil 4.

e. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-05 (terminal No. 3) at ignition coil 5.

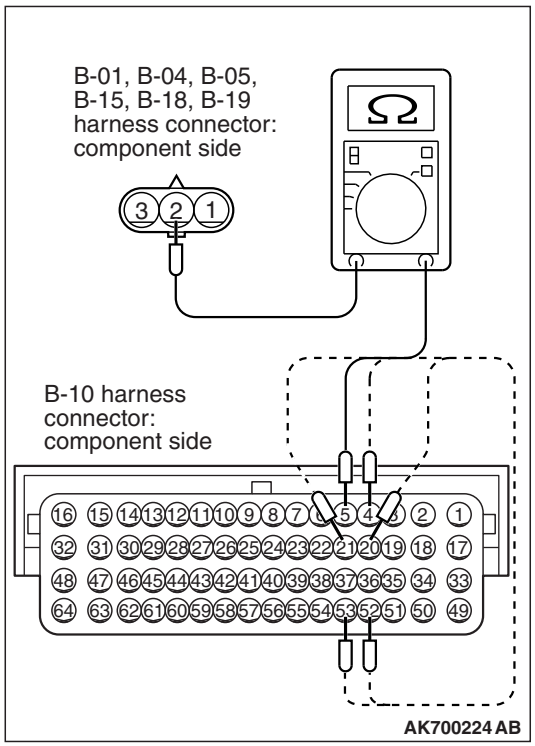
f. MFI relay connector A-33X (terminal No. 2) and ignition coil connector B-15 (terminal No. 3) at ignition coil 6.

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 5.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



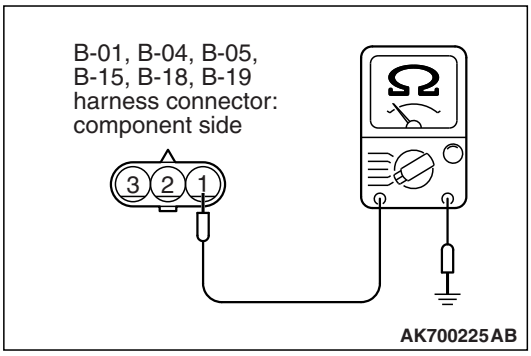
STEP 5. Check for open circuit and harness damage between ignition coil connector and ECM connector.

NOTE: Check harness after checking intermediate connector B-21. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the ignition coil connector and ECM connector.
(2) Measure the resistance between ignition coil connector and ECM connector.
   a. Ignition coil connector B-01 (terminal No. 2) and ECM connector B-10 (terminal No. 4) at ignition coil 1.
   b. Ignition coil connector B-19 (terminal No. 2) and ECM connector B-10 (terminal No. 5) at ignition coil 2.
   c. Ignition coil connector B-04 (terminal No. 2) and ECM connector B-10 (terminal No. 20) at ignition coil 3.
   d. Ignition coil connector B-18 (terminal No. 2) and ECM connector B-10 (terminal No. 21) at ignition coil 4.
   e. Ignition coil connector B-05 (terminal No. 2) and ECM connector B-10 (terminal No. 52) at ignition coil 5.
   f. Ignition coil connector B-15 (terminal No. 2) and ECM connector B-10 (terminal No. 53) at ignition coil 6.
      - Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 6.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for short circuit to ground between ignition coil connector and ECM connector.

NOTE: Check harness after checking intermediate connectors A-13 and B-21. If intermediate connectors are damaged, repair or replace it.

Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the ignition coil connector and ECM connector.

(2) Check for the continuity between ignition coil connector and ground.

a. Ignition coil connector B-01 (terminal No. 1) and ground at ignition coil 1.

b. Ignition coil connector B-19 (terminal No. 1) and ground at ignition coil 2.

c. Ignition coil connector B-04 (terminal No. 1) and ground at ignition coil 3.

d. Ignition coil connector B-18 (terminal No. 1) and ground at ignition coil 4.

e. Ignition coil connector B-05 (terminal No. 1) and ground at ignition coil 5.

f. Ignition coil connector B-15 (terminal No. 1) and ground at ignition coil 6.

- Not continuity.

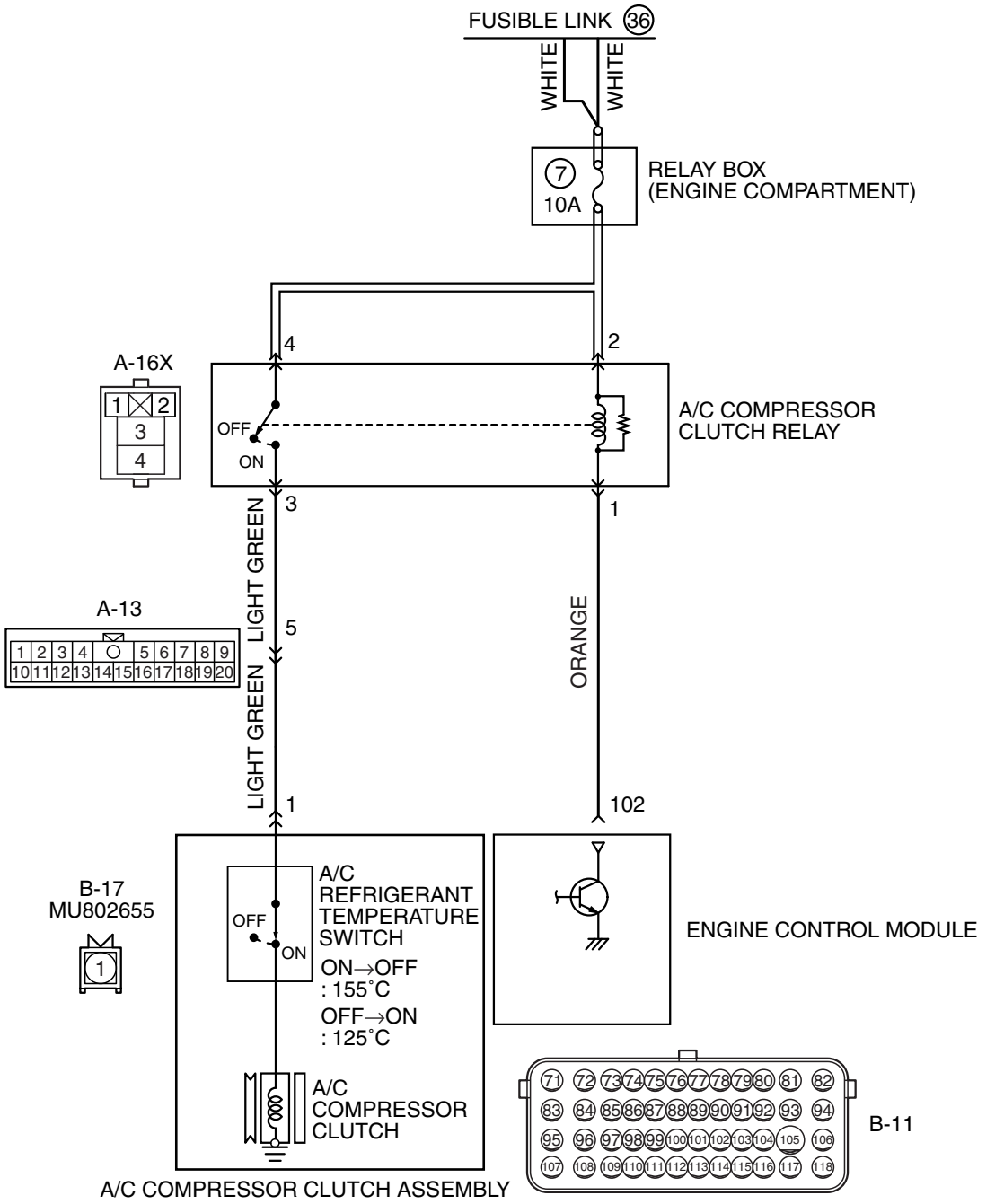
Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 25: A/C system.

A/C COMPRESSOR CLUTCH RELAY CIRCUIT



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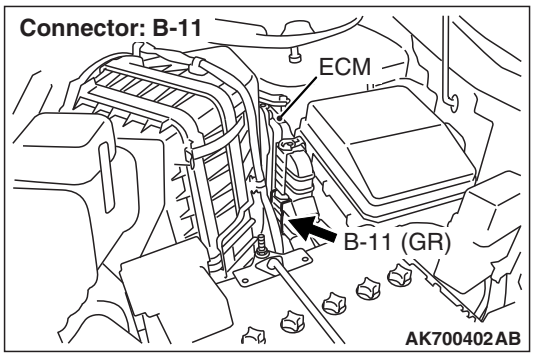
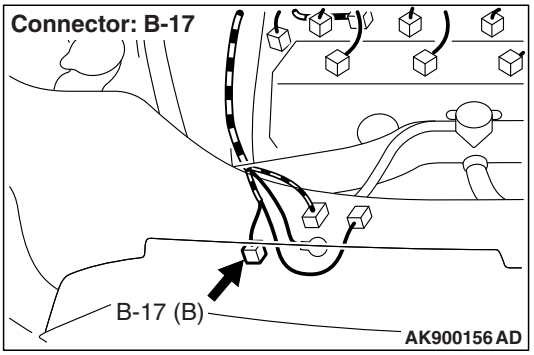
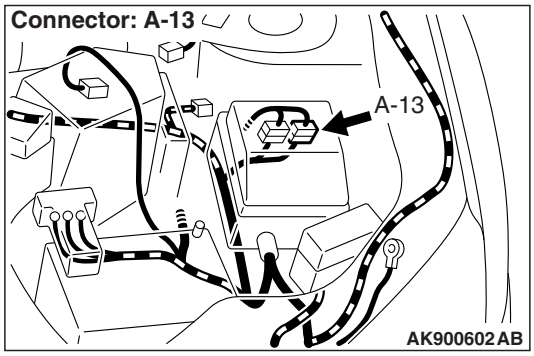
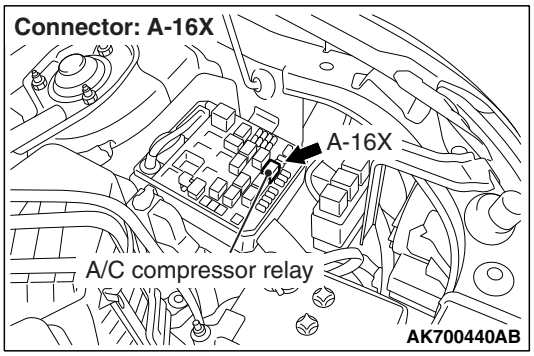








CIRCUIT OPERATION

- When the A/C switch ON signal is input into the ECM, the ECM turns ON the A/C compressor relay. This causes battery positive voltage to be supplied to the A/C compressor and the magnet latch actuates.

COMMENT

- When the A/C is "ON" the ECM turns "ON" the power transistor in the ECM. The ECM delays A/C engagement momentarily while it increases idle r/min. Then the A/C compressor clutch relay coil will be energized.

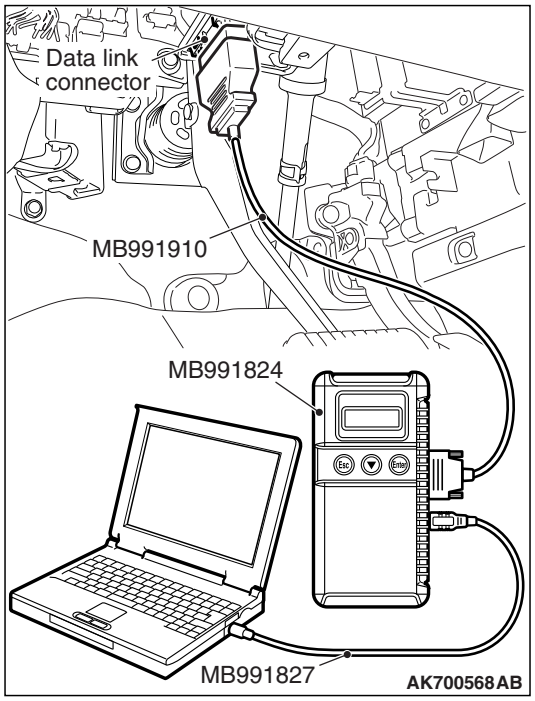
With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch operates.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Using scan tool MB991958, check data list item.



⚠ CAUTION

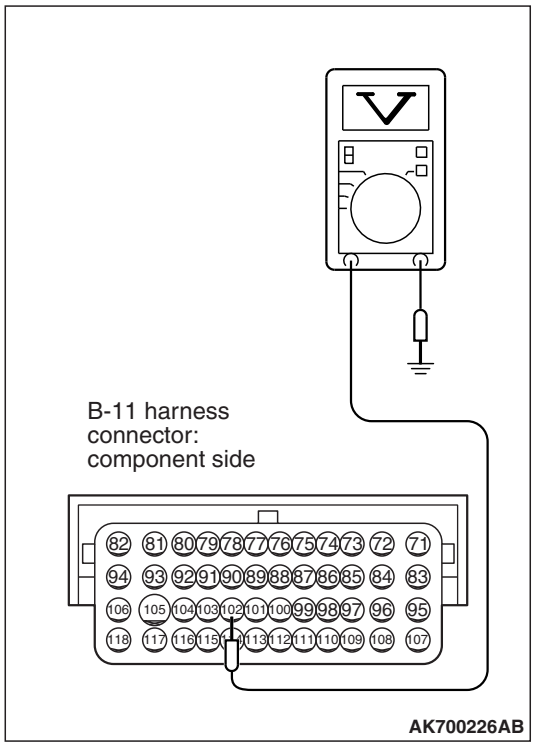
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data List.
Refer to Data List Reference Table P.13B-836.
a. Item 93: A/C compressor relay.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 2.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the circuit at ECM connector B-11.



(1) Disconnect the connectors B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 102 and ground.
• Voltage should be battery positive voltage.
(4) Using a jumper wire, connect terminal No. 102 to ground.
• A/C compressor clutch relay should turn "ON".
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, Diagnosis – ID Codes 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 : Refer to GROUP 55A, Manual A/C Diagnosis – Heater, Air Conditioning and Ventilation Diagnostic Troubleshooting Strategy P.55A-6, or GROUP 55B, Auto A/C Diagnosis – Automatic A/C Troubleshooting Strategy P.55B-4.

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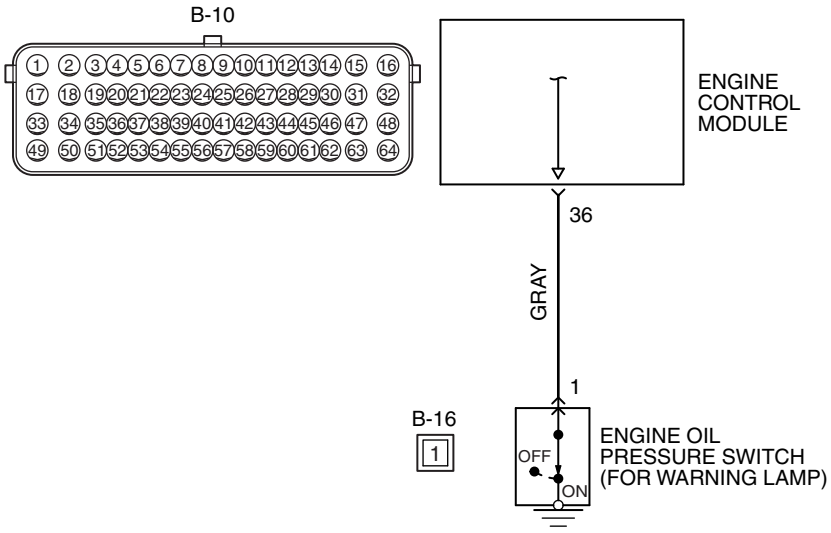
INSPECTION PROCEDURE 26: Engine oil pressure switch (for warning lamp) System

ENGINE OIL PRESSURE SWITCH (FOR WARNING LAMP) CIRCUIT



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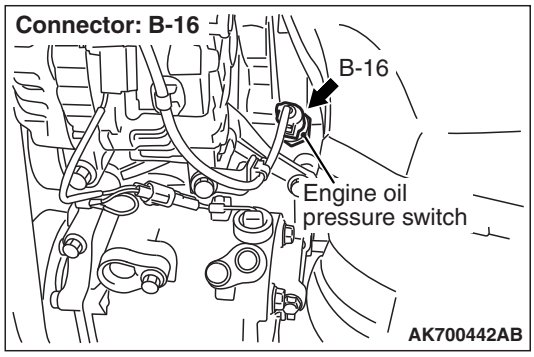

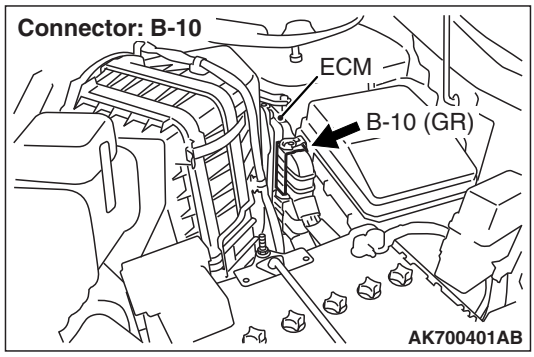

CIRCUIT OPERATION

- Battery voltage is applied to the oil pressure switch (terminal No. 1) from the engine-ECU (terminal No. 36).

COMMENT

- Detect the engine oil pressure conditions and enter the result into the ECM. After starting the engine if the oil pressure rises to higher than the given pressure, the engine oil pressure switch turns OFF. Under this condition the ECM sends the command of turning off the oil warning lamp to the combination meter via CAN.

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

- Engine oil pressure switch failed.
- Improper connector contact, open circuit or short-circuit harness wire.
- 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

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STEP 1. Check harness connector B-16 at engine oil pressure switch 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 confirm that the malfunction symptom is eliminated.

STEP 2. Measure the power supply voltage at engine oil pressure switch connector B-16.

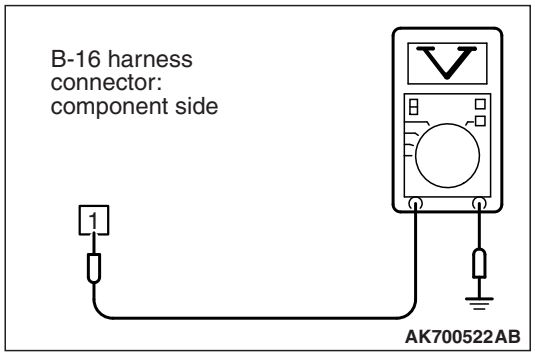
(1) Disconnect the connector B-16 measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- The voltage should equal battery positive voltage.

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

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

YES : Go to Step 5.

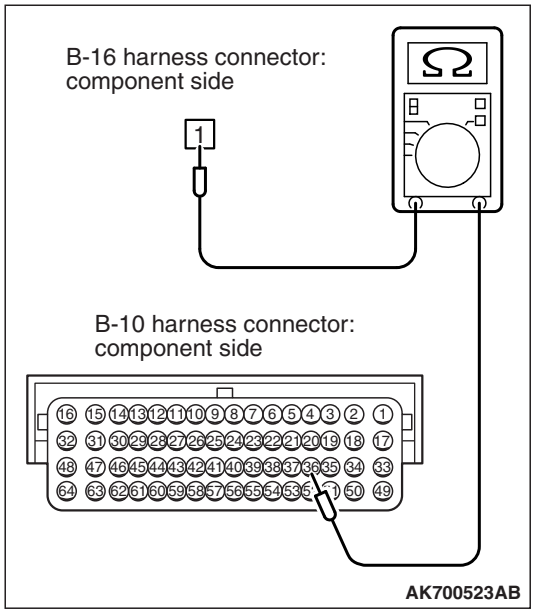
NO : Go to Step 3.

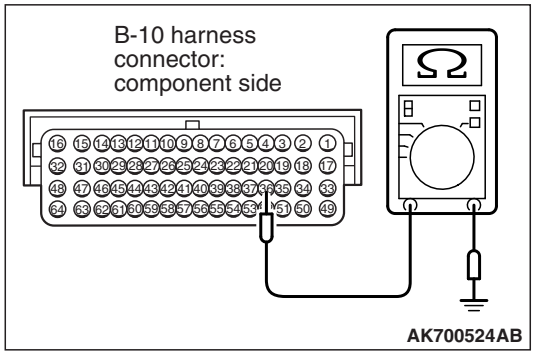


STEP 3. Check for open circuit or short circuit to ground or harness damage between engine oil pressure switch connector B-16 and ECM connector B-10.

(1) Disconnect the connector B-16 and B-10 measure at the harness side.

(2) Measure the resistance between connector B-16 (terminal No. 1) and connector B-10 (terminal No. 36).
- Should be less than 2 ohms.



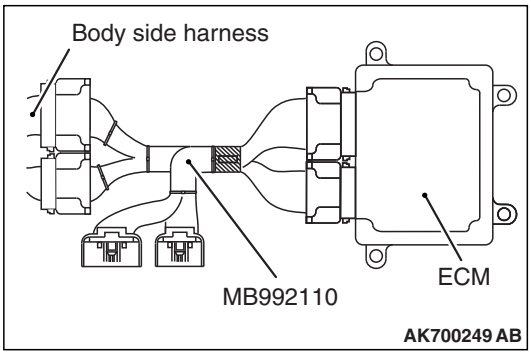


(3) Check for the continuity between connector B-10 (terminal No. 36) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

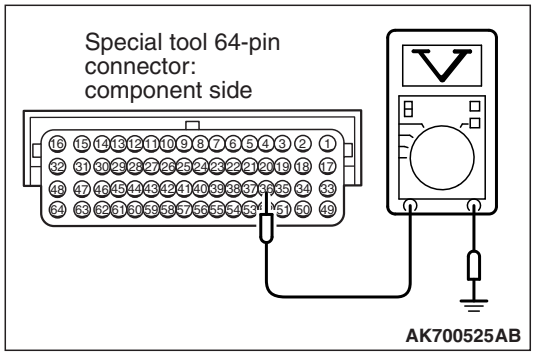
YES : Then go to Step 4.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 4. Measure the 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.

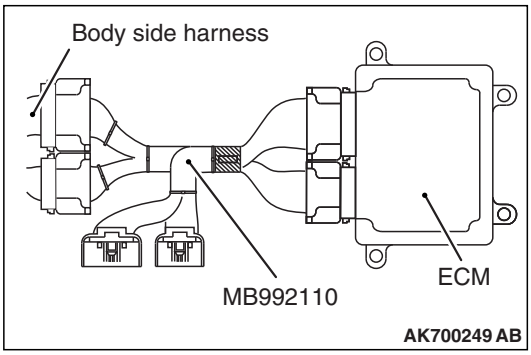


(2) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
System voltage (during idling)

Q:

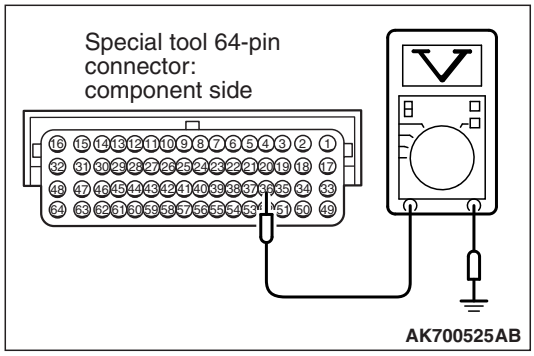
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-15.

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



STEP 5. Measure the 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) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
System voltage (during idling)

Q:

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 engine oil pressure switch. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1131152004469

⚠ CAUTION

- **When shifting the selector lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

*NOTE: *1: In a new vehicle [driven approximately 500 km (311 mile) or less], the mass airflow sensor output value is sometimes 10% higher than the standard value.*

*NOTE: *2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *3: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *4: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.*

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C compressor relay	93	A/C compressor clutch relay	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 25	P.13B-829
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C SW	76	A/C switch	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 25	P.13B-829
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
Absolute load value	72	Absolute load value	Engine: warming up	Engine is idling	10 – 20 %	–	–
				2,500 r/min	10 – 20 %		
				Revving engine	Load value increases according to amount of revving.		
Airflow sensor	10	Mass airflow sensor*1	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF"*4 • Transaxle: "P" range	Engine is idling	1,350 – 1,670 mV	–	–
				2,500 r/min	1,620 – 2,020 mV		
				Engine is revved	Increases in response to revving		
Airflow sensor	AA	Mass airflow sensor*1	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF"*4 • Transaxle: "P" range	Engine is idling	2.0 – 6.0 g/s	–	–
				2,500 r/min	6.0 – 14.0 g/s		
				Engine is revved	Increases in response to revving		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
APP sensor (main)	11	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	900 – 1,100 mV	Code No. P2122, P2123	P.13B-670, P.13B-675
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,000 mV or more		
APP sensor (main)	BE	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	18 – 22 %	Code No. P2122, P2123	P.13B-670, P.13B-675
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	80 % or more		
APP sensor (sub)	12	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	400 – 600 mV	Code No. P2127, P2128	P.13B-679, P.13B-683
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	2,000 mV or more		
APP sensor (sub)	BF	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	8 – 12 %	Code No. P2127, P2128	P.13B-679, P.13B-683
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	40 % or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Barometric pressure sensor	BB	Barometric pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P2228, P2229	P.13B-700, P.13B-702
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
Brake light switch	74	Brake light switch	Ignition switch: "ON"	Depress the brake pedal fully	ON	–	–
				Release the brake pedal	OFF		
Calculated load value	73	Calculated load value	Engine: warming up	Engine is idling	14 – 24 %	–	–
				2,500 r/min	11 – 21 %		
Closed throttle position switch	84	Closed throttle position signal	Ignition switch: "ON"	Release the accelerator pedal	ON	–	–
				Depress the accelerator pedal fully	OFF		
Cranking signal	79	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 23	P.13B-816
				Engine: cranking	ON		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Crankshaft position sensor	2	Crankshaft position sensor	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13B-445
			Engine: idling	Engine coolant temperature is –20°C (–4° F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,200 – 1,400 r/min		
				Engine coolant temperature is 20°C (68°F)	1,200 – 1,400 r/min		
				Engine coolant temperature is 40°C (104°F)	1,060 – 1,260 r/min		
				Engine coolant temperature is 80°C (176°F)	550 – 750 r/min		
ECT sensor	6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4° F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13B-180, P.13B-185, P.13B-189
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
EGR step motor	31	EGR valve (stepper motor)	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF"*4 • Transaxle: "P" range	Engine is idling	2 – 8 Step	Code No. P0489, P0490	P.13B-564, P.13B-570
				2,500 r/min	2 – 8 Step		
Engine control relay	95	MFI relay	Ignition switch: "ON"		ON	–	–
Engine oil pressure switch	90	Engine oil pressure switch (for warning lamp)	Ignition switch: "ON"		ON	Procedure No. 26	P.13B-832
			Engine is idling		OFF		
ETV relay	96	Throttle actuator control motor relay	Ignition switch: "ON"		ON	–	–
EVAP. emission purge SOL. duty	49	Evaporative emission purge solenoid duty	Engine: warming up with Open loop drive condition, without EVAP leak monitor		1 % or more	–	–
Fan duty	47	Fan motor duty	Engine: warming up • The duty ratio of the fan motor driving is shown.		0 – 100 % (Display range)	–	–
Fuel level gauge	51	Fuel level gauge	Ignition switch: "ON" • The residual fuel amount in the tank is shown. • "0 %" means "Empty" and "100 %" means "Full".		0 – 100 % (Display range)	–	–
Fuel level input	121	Fuel level input	Ignition switch: "ON" • The residual fuel amount in the tank is shown. • "0 %" means "Empty" and "100 %" means "Full".		0 – 100 % (Display range)	–	–
Fuel pump relay	97	Fuel pump relay	Ignition switch: "ON"		OFF	–	–
			Engine:cranking		ON		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Fuel system status (bank 1)	105	Fuel control system status (bank 1)	Engine: warming up	2,500 r/min	CL: Using O2S	–	–
				When engine is suddenly revved	OL: DRV condition		
Fuel system status (bank 2)	106	Fuel control system status (bank 2)	Engine: warming up	2,500 r/min	CL: Using O2S	–	–
				When engine is suddenly revved	OL: DRV condition		
Fuel tank differential PRS. SNSR	52	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1,500 – 3,500 mV	–	–
Fuel tank temperature sensor	53	Fuel tank temperature sensor	• In cooled state • Ignition switch: "ON"		Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13B-329, P.13B-334, P.13B-339
Ignition switch	85	Ignition switch (IG1)	Ignition switch: "ON"		ON	–	–
Injectors	17	Injectors*2	Engine: cranking	When engine coolant temperature is 0°C (32°F)	80 – 120 ms	–	–
				When engine coolant temperature is 20°C (68°F)	30 – 50 ms		
				When engine coolant temperature is 80°C (176°F)	8 – 16 ms		
		Injectors*3	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF"*4 • Transaxle: "P" range	Engine is idling	1.5 – 3.5 ms		
				2,500 r/min	1.2 – 3.2 ms		
				When engine is suddenly revved	Increases		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Intake air temperature sensor 1	5	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20°C (–4° F)	–20°C (–4° F)	Code No. P0111, P0112, P0113	P.13B-167, P.13B-171, P.13B-175
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
ISC learned value (A/C OFF)	68	Idle speed control learned value (A/C OFF)	Ignition switch: "ON" • Indicates the learning value to compensate for the opening angle of idling speed control (opening angle of throttle valve). • The negative side shows "close" side, while the positive side shows "open" side.		–1 to 2.4 L/s (Display range)	–	–
ISC learned value (A/C ON)	69	Idle speed control learned value (A/C ON)	Ignition switch: "ON" • Indicates the learning value to compensate for the opening angle of idling speed control (opening angle of throttle valve) with the air conditioner turned ON. • The negative side shows "close" side, while the positive side shows "open" side.		–1 to 2.4 L/s (Display range)	–	–
Knock retard	32	Knock retard (bank 1)	Engine: warming up, sudden revving		According to acceleration, knock retard is increased.	–	–
Knock retard (bank 2)	114	Knock retard (bank 2)	Engine: warming up, sudden revving		According to acceleration, knock retard is increased.	–	–

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Learned knock retard	33	Knock control learned value (bank 1)	Ignition switch: "ON" • The learning value is shown, which compensates the ignition time based on the knock sensor. • "0 %" means "retard angle" and "100 %" means "advance angle".	0 – 100 % (Display range)	–	–
Learned knock retard (bank 2)	115	Knock control learned value (bank 2)	Ignition switch: "ON" • The learning value is shown, which compensates the ignition time based on the knock sensor. • "0 %" means "retard angle" and "100 %" means "advance angle".	0 – 100 % (Display range)	–	–
Long term fuel trim (bank 1)	26	Long-term fuel tirm (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)	– 12.5 to 12.5 %	Code No. P0171, P0172	P.13B-303, P.13B-310
Long term fuel trim (bank 2)	27	Long-term fuel tirm (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)	– 12.5 to 12.5 %	Code No. P0174, P0175	P.13B-316, P.13B-323

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MAP sensor	8	Manifold absolute pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	P.13B-150, P.13B-156, P.13B-162
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
			Engine: warming up, idling		16 – 36 kPa (4.7 – 10.6 in.Hg)		
			When engine is suddenly revved		Manifold pressure varies		
Neutral switch	87	Neutral switch	Ignition switch: "ON"	Shift lever: "P" or "N"	ON	–	–
				Shift lever: "R" or "D"	OFF		
Normally closed brake switch	89	Normally closed brake switch	Ignition switch: "ON"	Depress the brake pedal	ON	–	–
				Release the brake pedal	OFF		
Oil control valve (bank 1)	98	Engine oil control valve	Engine: warming up	Engine is idling	OFF	–	–
				5,000 r/min	ON		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank1 sensor1)	AC	Heated oxygen sensor bank 1, sensor 1 (right front)	Engine: warming up (Air/fuel mixture is made leaner when decelerating and is made richer when revving)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less → 0.6 – 1.0 V (After several seconds have elapsed)	Code No. P0131, P0132, P0133, P0134, P2195	P.13B-222, P.13B-228, P.13B-232, P.13B-236, P.13B-695
				When engine is suddenly revved	0.6 – 1.0 V		
			Engine: warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 –1.0 V.		
Oxygen sensor (bank1 sensor2)	AD	Heated oxygen sensor bank 1, sensor 2 (right rear)	• Transaxle: 2nd • Drive with wide open throttle • Engine: 3,500 r/min or more		0.6 – 1.0 V	Code No. P0137, P0138, P0139, P0140	P.13B-244, P.13B-250, P.13B-254, P.13B-259
Oxygen sensor (bank2 sensor1)	AE	Heated oxygen sensor bank 2, sensor 1 (left front)	Engine: warming up (Air/fuel mixture is made leaner when decelerating and is made richer when revving)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less → 0.6 – 1.0 V (After several seconds have elapsed)	Code No. P0151, P0152, P0153, P0154, P2197	P.13B-263, P.13B-269, P.13B-273, P.13B-277, P.13B-698
				When engine is suddenly revved	0.6 – 1.0 V		
			Engine: warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1.0 V.		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank2 sensor2)	AF	Heated oxygen sensor bank 2, sensor 2 (left rear)	• Transaxle: 2nd • Drive with wide open throttle • Engine: 3,500 r/min or more		0.6 – 1.0 V	Code No. P0157, P0158, P0159, P0160	P.13B-284, P.13B-290, P.13B-294, P.13B-299
Power steering switch	83	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551	P.13B-585
				Steering wheel turning	ON		
Power supply voltage	1	Power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 21	P.13B-804
Relative APP sensor	DD	Relative accelerator pedal position sensor	Ignition switch: "ON"	Release the accelerator pedal	0 – 5 %	–	–
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	95 – 100 %		
Relative TP sensor	BC	Relative throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0 – 5 %	–	–
				Fully open the throttle valve with your finger	88 % or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Short term fuel trim (bank 1)	28	Short-term fuel trim (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)		– 7.4 to 7.4 %	Code No. P0171, P0172	P.13B-303, P.13B-310
Short term fuel trim (bank 2)	29	Short-term fuel trim (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)		– 7.4 to 7.4 %	Code No. P0174, P0175	P.13B-316, P.13B-323
Spark advance	16	Ignition timing advance (bank 1)	• Engine: warming up • Timing light is set (to check actual ignition timing) • Transaxle: "P" range	Engine is idling	2 – 18 °CA (BTDC)	–	–
				2,500 r/min	31 – 43 °CA (BTDC)		
Spark advance (bank 2)	113	Ignition timing advance (bank 2)	• Engine: warming up • Timing light is set (to check actual ignition timing) • Transaxle: "P" range	Engine is idling	2 – 18 °CA (BTDC)	–	–
				2,500 r/min	31 – 43 °CA (BTDC)		
Starter relay	102	Starter relay	Ignition switch: "ON"		OFF	–	–
			Engine: cranking		ON		
Target EGR	BA	Target EGR valve (stepper motor)	• The target duty ratio of the EGR valve driving is shown. • "0 %" means "fully closed EGR valve" and "100 %" means "fully opened EGR valve".		0 – 100 % (Display range)	–	–
Target ETV value	59	Throttle actuator control motor target value	Engine: warming up • The target opening degree of the throttle valve is shown. • "0 V" means "fully closed throttle valve" and "5 V" means "fully opened throttle valve".		0 – 5 V (Display range)	–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Target idle speed	3	Target idle speed	Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,300 – 1,500 r/min	–	–
				Engine coolant temperature is 0°C (32°F)	1,200 – 1,400 r/min		
				Engine coolant temperature is 20°C (68°F)	1,200 – 1,400 r/min		
				Engine coolant temperature is 40°C (104°F)	1,060 – 1,260 r/min		
				Engine coolant temperature is 80°C (176°F)	550 – 750 r/min		
Throttle actuator	58	Throttle actuator control motor	Engine: warming up • The target opening degree of the throttle valve is shown. • "0 %" means " fully closed throttle valve" and "100 %" means "fully opened throttle valve".		0 – 100 % (Display range)	–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (main)	13	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	300 – 700 mV	Code No. P0122, P0123	P.13B-199, P.13B-207
				Fully open the throttle valve with your finger	4,000 mV or more		
			Engine: warming up, idling	No load	500 – 660 mV		
				A/C switch: "OFF" → "ON"	Voltage rises		
				Shift lever: "N" → "D"			
TP sensor (main)	AB	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	6 – 14 %	Code No. P0122, P0123	P.13B-199, P.13B-207
				Fully open the throttle valve with your finger	80 % or more		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (main) learned value	14	Throttle position sensor (main) mid opening learning value	This item shows the throttle valve opening learning value when the vehicle enters into the limp home mode.			–	–
TP sensor (sub)	15	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	4,000 mV or more	Code No. P0222, P0223	P.13B-393, P.13B-400
				Fully open the throttle valve with your finger	1,000 mV or less		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (sub)	BD	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	6 – 14 %	Code No. P0222, P0223	P.13B-393, P.13B-400
				Fully open the throttle valve with your finger	80 % or more		
Vehicle speed	4	Vehicle speed	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	–	–

GENERAL SCAN TOOL (GST) MODE 01 REFERENCE TABLE

M1131156000492

The purpose of this service is to allow access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
The request for information includes a parameter identification (PID) value that indicates the on-board system the specific information requested.
The ECM will respond to this message by transmitting the requested data value last determined by the system. All data values returned for sensor readings will be actual readings, not default or substitute values used by the system because of a fault with that sensor.

NOTE: GST MODE 01 can be accessed through the use of a general scan tool.

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	Number of emission-related DTCs and MIL status	DTC and MIL status:	–	
	# of DTCs stored in this ECU	DTC_CNT: xxd		
	Malfunction Indicator Lamp (MIL) Status	MIL: OFF or ON		
	Supported tests which are continuous	Support status of continuous monitors:		
	Misfire monitoring supported	MIS_SUP: YES		
	Fuel system monitoring supported	FUEL_SUP: YES		
	Comprehensive component monitoring supported	CCM_SUP: YES		
	Status of continuous monitoring tests since DTC cleared	Completion status of continuous monitors since DTC cleared:		
	Misfire monitoring ready	MIS_RDY: YES or NO		
	Fuel system monitoring ready	FUEL_RDY: YES or NO		
	Comprehensive component monitoring ready	CCM_RDY: YES or NO		
	Supported tests run at least once per trip	Support status of non-continuous monitors:		
	Catalyst monitoring supported	CAT_SUP: YES		
	Heated catalyst monitoring supported	HCAT_SUP: NO		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	Evaporative system monitoring supported	EVAP_SUP: YES	–	
	Secondary air system monitoring supported	AIR_SUP: NO		
	Oxygen sensor monitoring supported	O2S_SUP: YES		
	Oxygen sensor heater monitoring supported	HTR_SUP: YES		
	EGR and/or VVT system monitoring supported	EGR_SUP: YES		
	Status of tests run at least once per trip	Completion status of non-continuous monitors since DTC cleared:		
	Catalyst monitoring ready	CAT_RDY: YES or NO		
	Heated catalyst monitoring ready	HCAT_RDY: YES		
	Evaporative system monitoring ready	EVAP_RDY: YES or NO		
	Secondary air system monitoring ready	AIR_RDY: YES		
	Oxygen sensor monitoring ready	O2S_RDY: YES or NO		
	Oxygen sensor heater monitoring ready	HTR_RDY: YES or NO		
	EGR and/or VVT system monitoring ready	EGR_RDY: YES or NO		
03	Fuel system 1 status	FUELSYS1: OL/CL/OL-Drive/OL-Fault/CL-Fault	See M.U.T.-III item No. 105.	
	Fuel system 2 status	FUELSYS2: OL/CL/OL-Drive/OL-Fault/CL-Fault	See M.U.T.-III item No. 106.	
04	Calculated LOAD Value	LOAD_PCT: xxx.x%	See M.U.T.-III item No. 73.	
05	Engine Coolant Temperature	ECT: xxx°C (xxx°F)	See M.U.T.-III item No. 6.	
06	Short Term Fuel Trim–Bank 1	SHRTFT1: xxx.x%	See M.U.T.-III item No. 28.	
07	Long Term Fuel Trim–Bank 1	LONGFT1: xxx.x%	See M.U.T.-III item No. 26.	
08	Short Term Fuel Trim–Bank 2	SHRTFT2: xxx.x%	See M.U.T.-III item No. 29.	
09	Long Term Fuel Trim–Bank 2	LONGFT2: xxx.x%	See M.U.T.-III item No. 27.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
0B	Intake Manifold Absolute Pressure	MAP: xxxx.x kPa (xxx.x inHg)	See M.U.T.-III item No. 8.	
0C	Engine RPM	RPM: xxxxx min $^{-1}$	See M.U.T.-III item No. 2.	
0D	Vehicle Speed Sensor	VSS: xxx km/h (xxx mph)	See M.U.T.-III item No. 4.	
0E	Ignition Timing Advance for #1 Cylinder	SPARKADV: xx.x°	See M.U.T.-III item No. 16.	
0F	Intake Air Temperature	IAT: xxx°C (xxx°F)	See M.U.T.-III item No. 5.	
10	Air Flow Rate from Mass Air Flow Sensor	MAF: xxxx.xx g/s (xxxx.x lb/min)	See M.U.T.-III item No. AA.	
11	Absolute Throttle Position	TP: xxx.x%	See M.U.T.-III item No. AB.	
13	Location of Oxygen Sensors	O2SLOC: O2Sxx	Ignition switch: "ON"	O2S11/O2S12/O2S21/O2S22
14	Bank 1 – Sensor 1	O2S11: x.xxx V	See M.U.T.-III item No. AC.	
		SHRTFT11: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
15	Bank 1 – Sensor 2	O2S12: x.xxx V	See M.U.T.-III item No. AD.	
18	Bank 2 – Sensor 1	O2S21: x.xxx V	See M.U.T.-III item No. AE.	
		SHRTFT21: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
19	Bank 2 – Sensor 2	O2S22: x.xxx V	See M.U.T.-III item No. AF.	
1C	OBD requirements to which vehicle or engine is certified	OBDSUP: OBD II	Ignition switch: "ON"	OBD II
1F	Time Since Engine Start	RUNTM: xxxxx sec.	–	
21	Distance Traveled While MIL is Actived	MIL_DIST: xxxxx km (xxxxx miles)	–	
2C	Commanded EGR	EGR_PCT: xxx.x%	See M.U.T.-III item No. BA.	
2E	Commanded Evaporative Purge	EVAP_PCT: xxx.x%	See M.U.T.-III item No. 49.	
2F	Fuel Level Input	FLI: xxx.x%	See M.U.T.-III item No. 51.	
30	Number of warm-ups since DTCs cleared	WARM_UPS: xxx	–	
31	Distance traveled since DTCs cleared	CLR_DIST: xxxxx km (xxxxx miles)	–	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
32	Evap System Vapor Pressure	EVAP_VP: xxxx.x Pa (xx.xxx in H2O)	• Ignition switch: "ON" • Fuel cap removal	–3.3 to 3.3 kPa (–13.2 to 13.2 in.H2O)
33	Barometric Pressure	BARO: xxx kPa (xx.x inHg)	See M.U.T.-III item No. BB.	
41	Monitor status this driving cycle		–	
	Enable status of continuous monitors this monitoring cycle:	Enable status of continuous monitors this monitoring cycle: NO means disable for rest of this monitoring cycle or not supported in PID 01, YES means enable for this monitoring cycle.		
	Misfire monitoring enabled	MIS_ENA: NO or YES		
	Fuel system monitoring enabled	FUEL_ENA: NO or YES		
	Comprehensive component monitoring enabled	CCM_ENA: NO or YES		
	Completion status of continuous monitors this monitoring cycle:	Completion status of continuous monitors this monitoring cycle:		
	Misfire monitoring completed	MIS_CMPL: YES or NO		
	Fuel system monitoring completed	FUELCMPL: YES or NO		
	Comprehensive component monitoring completed	CCM_CMPL: YES or NO		
	Enable status of non-continuous monitors this monitoring cycle:	Enable status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring	CAT_ENA: YES		
	Heated catalyst monitoring	HCAT_ENA: NO		
	Evaporative system monitoring	EVAP_ENA: YES		
	Secondary air system monitoring	AIR_ENA: NO		
	Oxygen sensor monitoring	O2S_ENA: YES		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Oxygen sensor heater monitoring	HTR_ENA: YES	–	
	EGR and/or VVT system monitoring	EGR_ENA: YES		
	Completion status of non-continuous monitors this monitoring cycle:	Completion status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring completed	CAT_CMPL: YES or NO		
	Heated catalyst monitoring completed	HCATCMPL: YES		
	Evaporative system monitoring completed	EVAPCMPL: YES or NO		
	Secondary air system monitoring completed	AIR_CMPL: YES		
	Oxygen sensor monitoring completed	O2S_CMPL: YES or NO		
	Oxygen sensor heater monitoring completed	HTR_CMPL: YES or NO		
	EGR and/or VVT system monitoring completed	EGR_CMPL: YES or NO		
42	Control module voltage	VPWR: xx.xx V	See M.U.T.-III item No. 1.	
43	Absolute Load Value	LOAD_ABS: xxxxx.x %	See M.U.T.-III item No. 72.	
44	Fuel/Air Commanded Equivalence Ratio	LAMBDA: xxx.xxx	Engine: running • "1" means "stoichiometric air fuel ratio". The smaller air fuel ratio, the rich return. The more air fuel ratio, the lean return.	0 – 1.999 (Display range)
45	Relative Throttle Position	TP_R: xxx.x%	See M.U.T.-III item No. BC.	
46	Ambient air temperature	AAT: xxx°C (xxx°F)	• Ignition switch: "ON" • Engine is cold state	The value displayed approximately matches the ambient temperature
47	Absolute Throttle Position B	TP_B: xxx.x%	See M.U.T.-III item No. BD.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
49	Accelerator Pedal Position D	APP_D: xxx.x%	See M.U.T.-III item No. BE.	
4A	Accelerator Pedal Position E	APP_E: xxx.x%	See M.U.T.-III item No. BF.	
4C	Commanded Throttle Actuator Control	TAC_PCT: xxx.x%	See M.U.T.-III item No. 58.	
5A	Relative Accelerator Pedal Position	APP_R: xxx.x%	See M.U.T.-III item No. DD.	

ACTUATOR TEST REFERENCE TABLE

M1131152503074

NOTE: : Continues for 27 minutes. Can be released by pressing the CLEAR key.

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERECE PAGE
A/C relay	16	A/C compressor clutch relay	A/C compressor clutch relay turns from OFF to ON.	Ignition switch: "ON"	Clicks when A/C compressor clutch is driven.	Procedure No. 25	P.13B-829
Cooling fan	14	Radiator fan, A/C condenser fan	Drive the fan motor.	Ignition switch: "ON"	Radiator fan and A/C condenser fan rotate.	–	–
EVAP. emission purge SOL. Valve	10	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0443	P.13B-483
EVAP. emission ventilation SOL.	15	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0446	P.13B-490
Fuel pump	9	Fuel pump	Fuel pump operates and fuel is recirculated.	• Ignition switch: "ON" • Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.	Procedure No. 22	P.13B-810

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIRMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERECE PAGE
Ignition timing 5 BTDC	11*	Basic ignition timing	Set to ignition timing adjustment mode.	• Engine: idling • Connect timing light	5°BTDC	–	–
Injector stop	1	Injectors	Specified injector is stopped.	Engine: warm up, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idle condition is changed by stopping selected cylinder: this can cause an unstable condition and the engine may stall.	Code No. P0201, P0202, P0203, P0204, P0205, P0206	P.13B-345, P.13B-353, P.13B-360, P.13B-368, P.13B-375, P.13B-383
Oil control valve	17	Engine oil control valve	Switch the engine oil control valve from OFF to ON.	Engine: warm up, idle	When the valve is actuated, operating noise is audible.	Code No. P001A	P.13B-58

CHECK AT THE ENGINE CONTROL MODULE (ECM)

M1131153502104

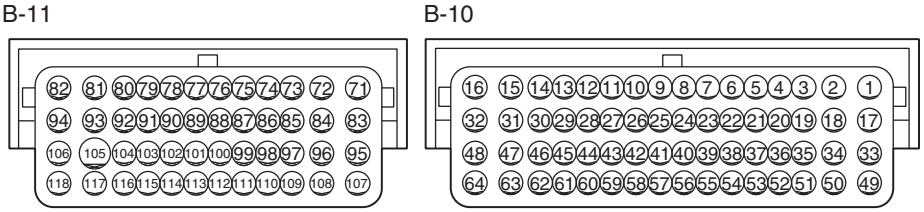
1. Disconnect the ECM connectors B-10 and B-11, and connect check harness special tool MB992110 between the ECM connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground terminal (No. 25 or No. 29).

TERMINAL VOLTAGE CHECK CHART

*NOTE: *1: The average voltage through an analog voltmeter is described in this service manual (because the average voltage would be not constantly shown on a digital voltmeter).*

*NOTE: *2: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but is no problem for checks.*

Check Harness Special Tool MB992110 Connector Terminal Arrangement



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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	Engine oil control valve	Engine: warming up, idling	B+
		Engine: 5,000 r/min	1 V or less → 4.0 – 10 V*1 (After a few seconds pass)
2	No. 1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 9 – 14 V*1 momentarily drops slightly
3	No. 2 injector		
18	No. 3 injector		
19	No. 4 injector		
50	No. 5 injector		
51	No. 6 injector		

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
4	Ignition coil No. 1 (ignition power transistor	Engine: 3,000 r/min		0.3 – 3.0 V*1
5	Ignition coil No. 2 (ignition power transistor			
20	Ignition coil No. 3 (ignition power transistor			
21	Ignition coil No. 4 (ignition power transistor			
52	Ignition coil No. 5 (ignition power transistor			
53	Ignition coil No. 6 (ignition power transistor			
6	Starter active signal	Engine: cranking		B+
		Engine: idling		1V or less
7	Engine oil pressure switch (for MIVEC)	Engine: warming up, idling		1V or less
		Engine: 5,000 r/min		B+
8	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V*1
		Engine: idling		2.0 – 3.0 V*1
9	Sensor supplied voltage	Ignition switch: "ON"		B+
10	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0.3 – 0.7 V
			Fully open the throttle valve with your finger	4.0 V or more

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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
11	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	4 V or more
			Fully open the throttle valve with your finger	1 V or less
12	Power supply voltage applied to throttle position sensor	Ignition switch: "ON"		4.9 – 5.1 V
14	Camshaft position sensor	Engine: cranking		0.4 – 4.0 V*1
		Engine: idling		2.5 – 3.9 V*1
15	Throttle actuator control motor (+)	Ignition switch: "ON" Accelerator pedal: fully opened → fully closed		Decreases slightly (Approximately 2 V) from battery voltage.
16	Throttle actuator control motor (–)	Ignition switch: "ON" Accelerator pedal: fully closed → fully opened		Decreases slightly (Approximately 2 V) from battery voltage.
26	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20°C (–4°F)	3.9 – 4.5 V
			When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
			When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
31	EGR valve (stepper motor coil <A>)	Ignition switch: "LOCK" (OFF) → "ON"	5 – 8 V*1 (changes about three seconds repeatedly)
32	EGR valve (stepper motor coil <B>)		
47	EGR valve (stepper motor coil <C>)		
48	EGR valve (stepper motor coil <D>)		
33	Right bank heated oxygen sensor heater (front)	Engine warming up, idling (15 seconds after starting engine)	9 – 11 V*1
		Engine: revving	9 – 11 V*1 → B+ (momentarily)
34	Left bank heated oxygen sensor heater (front)	Engine warming up, idling (15 seconds after starting engine)	9 – 11 V*1
		Engine: revving	9 – 11 V*1 → B+ (momentarily)
35	Left bank heated oxygen sensor heater (rear)	Engine warming up, idling (15 seconds after starting engine)	1 V or less
		Engine: revving	B+
36	Engine oil pressure switch (for warning lamp)	Ignition switch: "ON"	0 – 0.1 V
		Engine: idling	B+
37	Evaporative emission purge solenoid	Ignition switch: "ON"	B+
		Engine: warming up, 3,000 r/min (with 3 minutes after the engine starting sequence is completed)	Voltage drops
38	Left bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min	0.5 ⇔ 1.4 V (changes repeatedly)
39	Left bank heated oxygen sensor (front) offset voltage	Ignition switch: "ON"	0.4 – 0.6 V
40	Left bank heated oxygen sensor (rear)	• Transaxlle: 2nd • Drive with wide open throttle • Engine: 3,500 r/min or more	1.0 – 1.5 V
41	Left bank heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"	0.4 – 0.6 V
43	Power supply voltage applied to power steering pressure sensor	Ignition switch: "ON"	4.9 – 5.1 V
44	Power supply voltage applied to manifold absolute pressure sensor	Ignition switch: "ON"	4.9 – 5.1 V

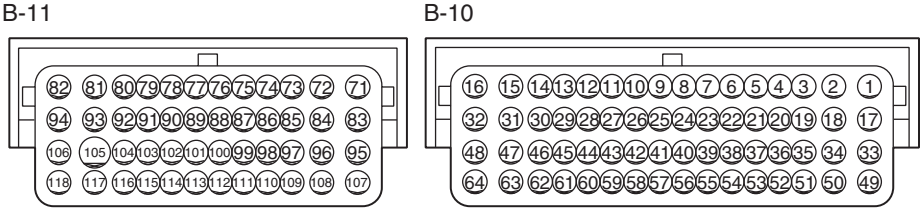
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
45	Manifold absolute pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft.)	3.8 – 4.2 V
			At altitude of 600 m (1,969 ft.)	3.5 – 3.9 V
			At altitude of 1,200 m (3,937 ft.)	3.3 – 3.7 V
			At altitude of 1,800 m (5,906 ft.)	3.0 – 3.4 V
		Engine: warming up, idling		0.6 – 1.4 V
		When engine is suddenly revved		Voltage varies
49	Right bank heated oxygen sensor heater (rear)	Engine warming up, idling (15 seconds after starting engine)		1 V or less
		Engine: revving		B+
54	Right bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ⇔ 1.4 V (changes repeatedly)
55	Right bank heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
56	Right bank heated oxygen sensor (rear)	• Transaxlle: 2nd • Drive with wide open throttle • Engine: 3,500 r/min or more		1.0 – 1.5 V
57	Right bank heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
58	Power steering pressure switch	Engine: warming up, idling	When steering wheel is not turned	B+
			When steering wheel is turned	1 V or less
60	Generator G terminal	• Engine: warming up, idling • Radiator fan: stopped • Headlight: OFF to ON*2 • Stop light: OFF to ON • Rear defogger switch: OFF to ON		Voltage increases
61	Generator FR terminal	• Engine: warming up, idling • Radiator fan: stopped • Headlight: OFF to ON*2 • Stop light: OFF to ON • Rear defogger switch: OFF to ON		Voltage drops
62	Generator L terminal	Ignition switch: "ON"		0.5 – 2.0 V
		Engine: idling		B+
72	Power supply voltage applied to throttle actuator control motor	Ignition switch: "ON"		B+

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
73	MFI relay (power supply)	Ignition switch: "LOCK" (OFF)		B+
		Ignition switch: "ON"		1 V or less
74	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.9 – 1.1 V
			Depress the accelerator pedal fully	4 V or more
75	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: "ON"		4.9 – 5.1 V
77	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.4 – 0.6 V
			Depress the accelerator pedal fully	2 V or more
78	Power supply voltage applied to accelerator pedal position sensor (sub)	Ignition switch: "ON"		4.9 – 5.1 V
82	Power supply	Ignition switch: "ON"		B+
84	Throttle actuator control motor relay	Ignition switch: "ON" → "LOCK" (OFF)		1 V or less → B+ → 1 V or less
87	Mass airflow sensor	Engine: revving		Voltage increases in response to revving
89	Intake air temperature sensor	Ignition switch: "ON"	When intake air temperature is –20°C (–4°F)	3.8 – 4.4 V
			When intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When intake air temperature is 60°C (140°F)	0.8 – 1.4 V
			When intake air temperature is 80°C (176°F)	0.4 – 1.0 V
92	Ignition switch-IG	Ignition switch: "ON"		B+
96	Fuel pump relay	Ignition switch: "ON"		B+
		Engine: idling		1.0 V or less
102	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF → ON (A/C compressor is operating)		B+ → 1 V or less as A/C clutch cycles

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
104	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
105	Ignition switch-ST	Ignition switch: cranking		8 V or more
106	Starter relay	Engine: cranking		B+
		Engine: idling		1 V or more
112	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1.5 – 3.5 V
114	Power supply voltage applied to fuel tank differential pressure sensor	Ignition switch: "ON"		4.9 – 5.1 V
115	Fuel tank temperature sensor	Ignition switch: "ON"	When fuel tank temperature is 0°C (32°F)	2.7 – 3.1 V
			When fuel tank temperature is 20°C (68°F)	2.1 – 2.5 V
			When fuel tank temperature is 40°C (104°F)	1.6 – 2.0 V
			When fuel tank temperature is 80°C (176°F)	0.8 – 1.2 V
117	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
		Carry out the actuator test to drive the solenoid valve.		1 V or less (Approximately 6 seconds)

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM Harness side Connector Terminal Arrangement



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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 82	Engine oil control valve	6.9 – 7.9 Ω [at 20°C (68°F)]
15 – 16	Throttle actuator control motor	0.3 – 80 Ω [at 20°C (68°F)]
26 – 27	Engine coolant temperature sensor	14 – 17 kΩ [when engine coolant temperature is –20°C (–4°F)]
		5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
		2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
		0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
		0.48 – 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
		0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]
31 – 82	EGR valve (A)	20 – 24 Ω [at 20°C (68°F)]
32 – 82	EGR valve (B)	
47 – 82	EGR valve (C)	
48 – 82	EGR valve (D)	
33 – 82	Right bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
34 – 82	Left bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
35 – 82	Left bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
37 – 82	Evaporative emission purge solenoid	22 – 26 Ω [at 20°C (68°F)]
49 – 82	Right bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
81 – Body ground	ECM ground	Continuity (2 Ω or less)
93 – Body ground		
82 – 117	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]

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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
88 – 89	Intake air temperature sensor	13 – 17 kΩ [when intake air temperature is –20°C (–4°F)]
		5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
		2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
		1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
		0.56 – 0.76 kΩ [when intake air temperature is 60°C (140°F)]
		0.30 – 0.45 kΩ [when intake air temperature is 80°C (176°F)]

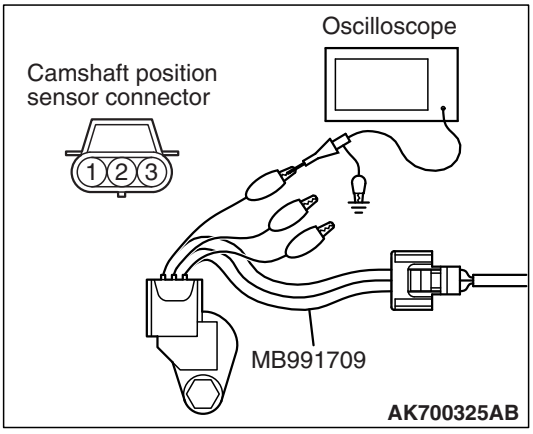
INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1131154501988

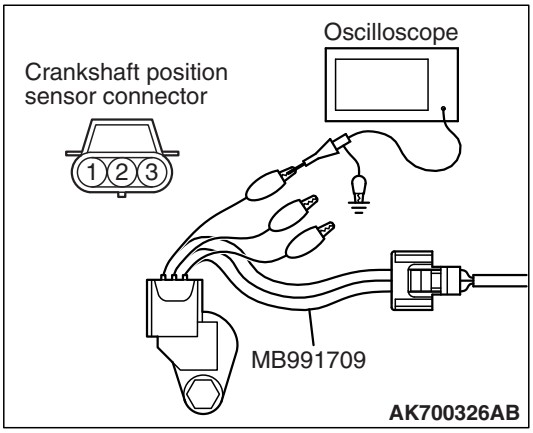
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Required Special Tools:
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

Measurement Method



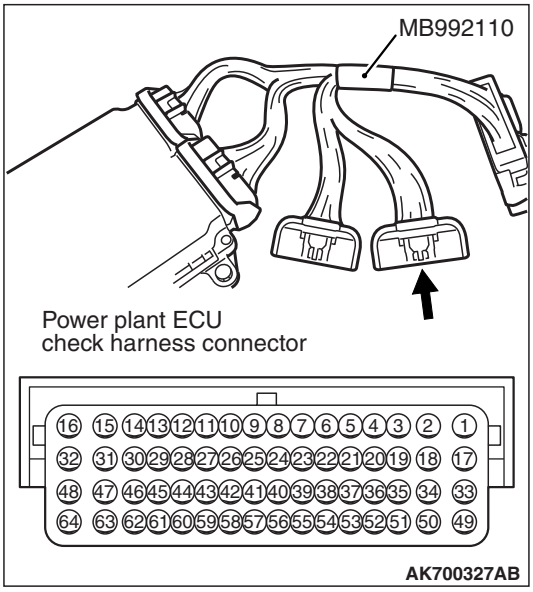
1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to camshaft position sensor connector terminal No. 3.

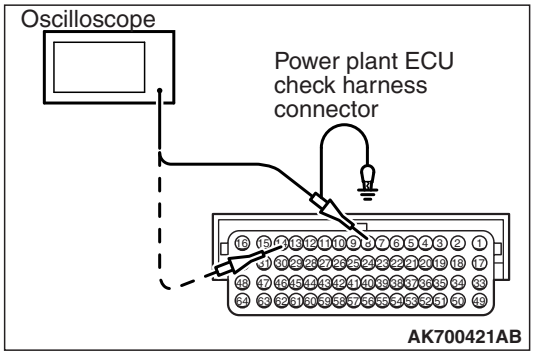


3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 3.

Alternate method

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



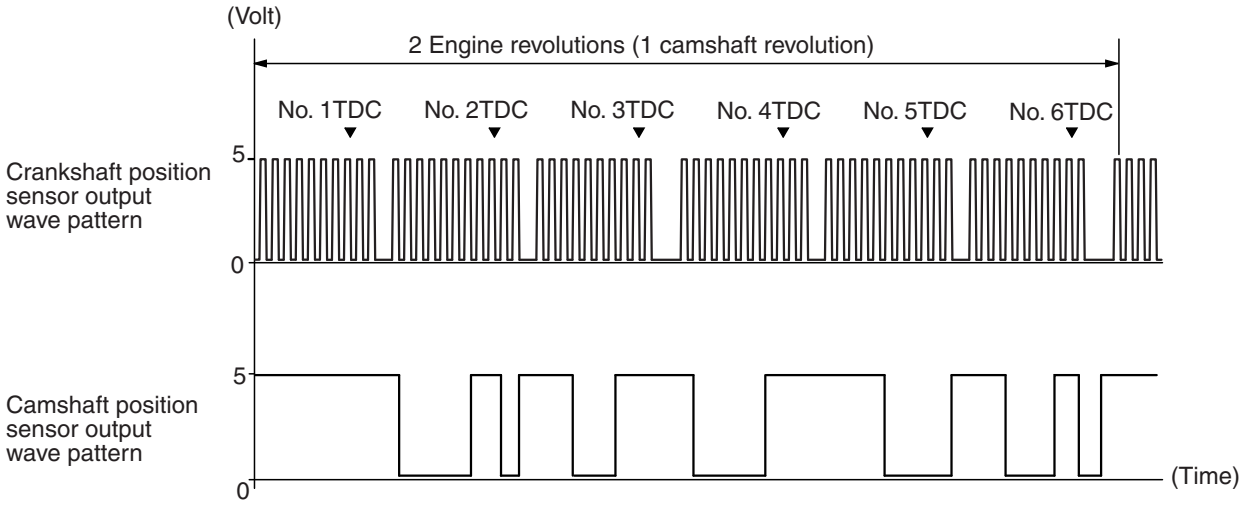


2. Connect the oscilloscope to check harness terminal No. 14. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 8. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



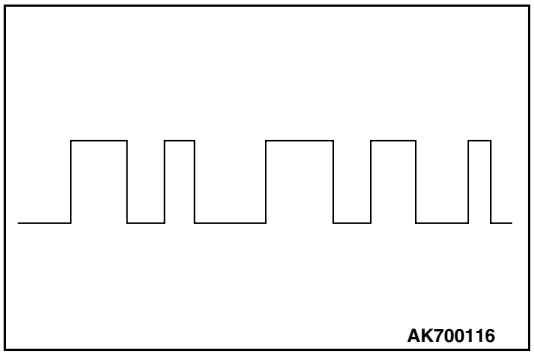
TDC: Top dead center

AK700331AB

Wave Pattern Observation Points

1. Check that cycle time becomes shorter when the engine speed increased.

Examples of Abnormal Wave Patterns



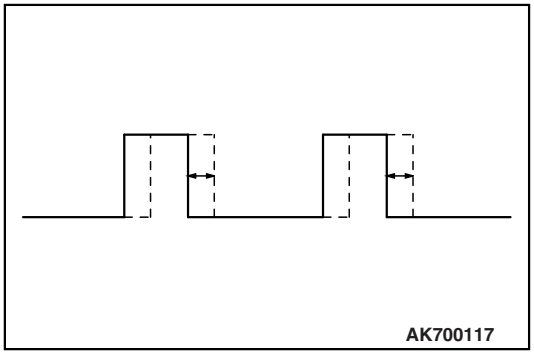
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.



Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.

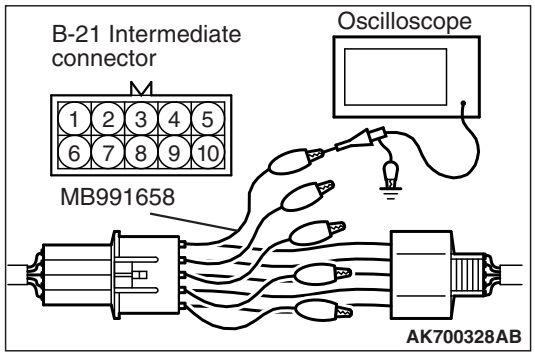
TSB Revision

INJECTOR

Required Special Tools:

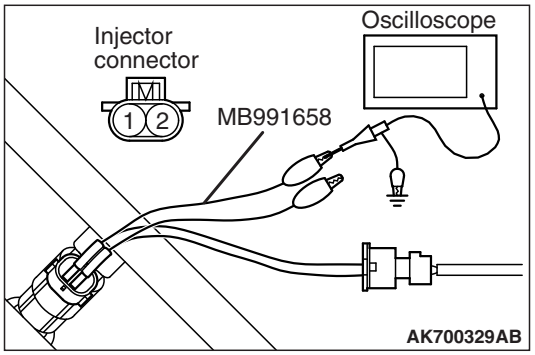
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

Measurement Method



Measure at the right bank (number 1, 3, 5 cylinders)

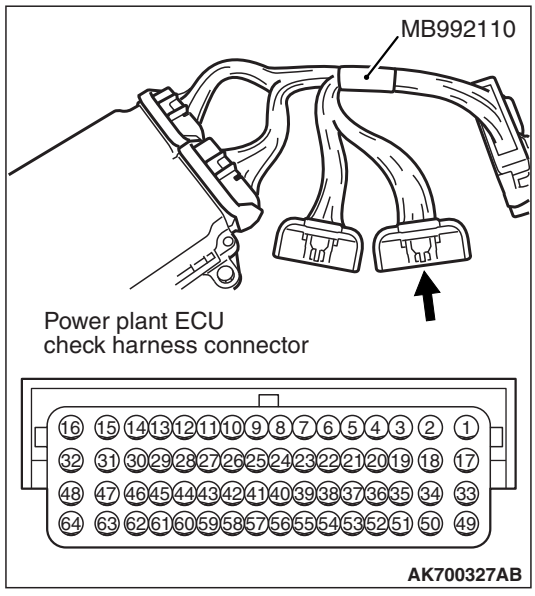
1. Disconnect the intermediate connector B-21, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to each intermediate connector B-21 terminal to analyze each cylinder:
   - Terminal No. 7 for the number 1 cylinder
   - Terminal No. 8 for the number 3 cylinder
   - Terminal No. 9 for the number 5 cylinder



Measure at the left bank (number 2, 4, 6 cylinders)

1. Disconnect the injector connector, and connect the test harness special tool (MB991658) between the separated connector. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal No. 2.

Alternate method



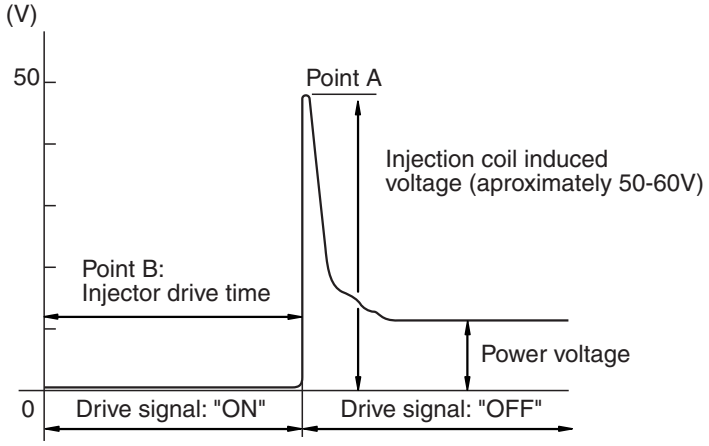
1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 2 for the number 1 cylinder.
   - Terminal No. 3 for the number 2 cylinder.
   - Terminal No. 18 for the number 3 cylinder.
   - Terminal No. 19 for the number 4 cylinder.
   - Terminal No. 50 for the number 5 cylinder.
   - Terminal No. 51 for the number 6 cylinder.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

TSB Revision

Standard wave pattern



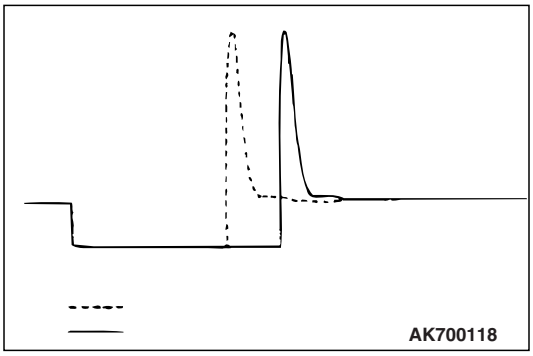
AK700332AB

Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

Point B: Injector drive time

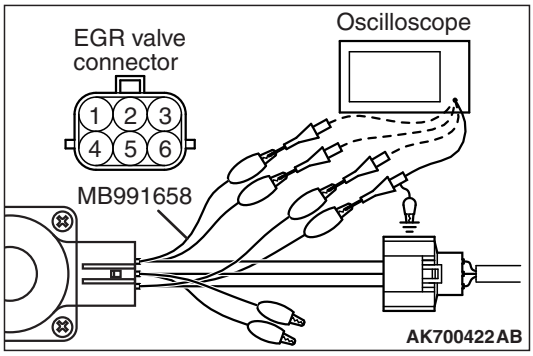


1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

EGR VALVE (STEPPER MOTOR)

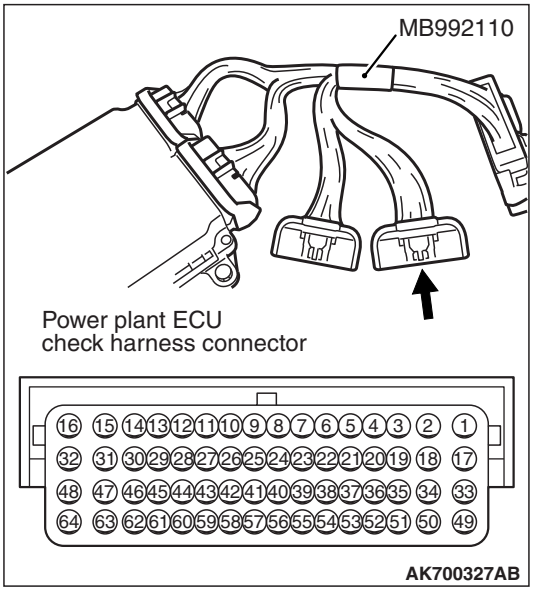
Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



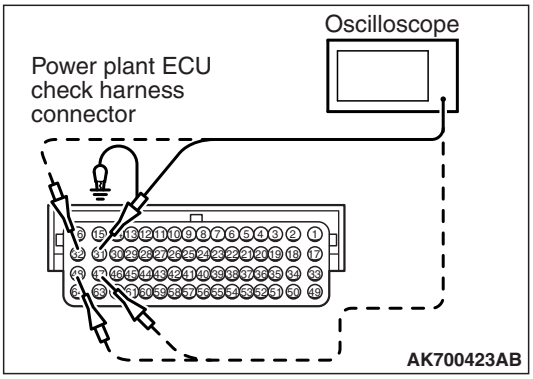
Measurement Method

1. Disconnect the EGR valve connector, and connect the test harness special tool (MB991658) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to the EGR valve connector terminal No. 1, terminal No. 3, terminal No. 4, terminal No. 6 respectively.



Alternate method

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

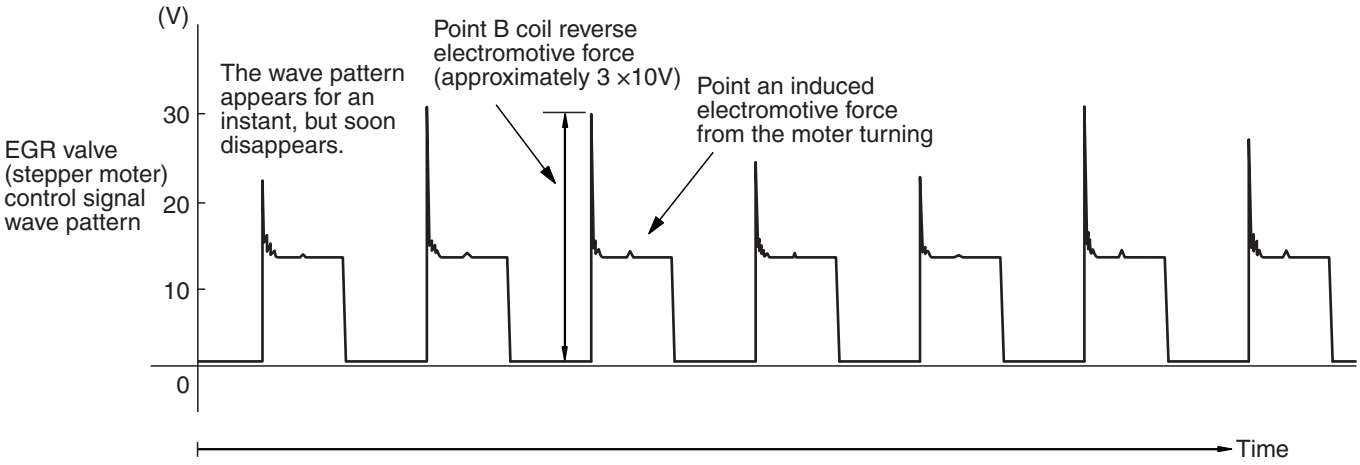


2. Connect the oscilloscope probe to check harness terminal No. 31, No. 32, No. 47 and No. 48.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Revving

Standard wave pattern



AK700333AB

Wave Pattern Observation Points

1. Check that the standard wave pattern appears when the EGR valve is operating.

Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

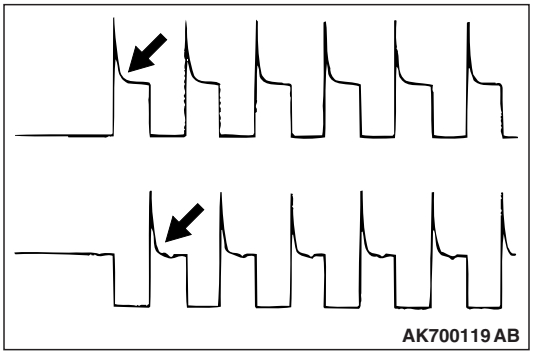
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Induced electromotive force does not appear or is extremely small	Malfunction of motor

Point B: Height of coil back electromotive force

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

TSB Revision

Examples of Abnormal Wave Patterns



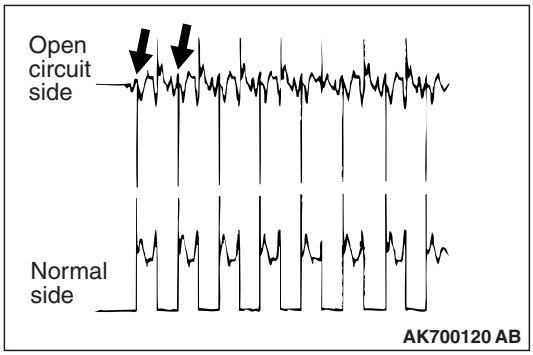
Example 1

Cause of problem

- Malfunction of motor. (Motor is not operating.)

Wave pattern characteristics

- Induced electromotive force from the motor turning does not appear.



Example 2

Cause of problem

- Open circuit in the line between the EGR valve and the ECM.

Wave pattern characteristics

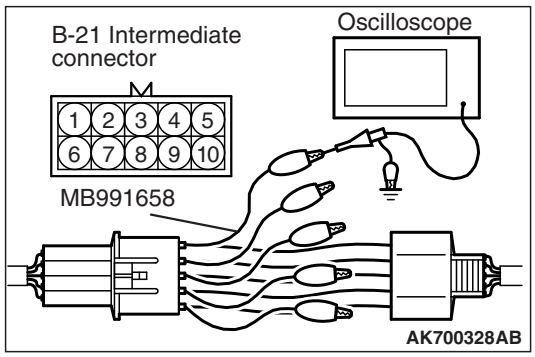
- Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tools:

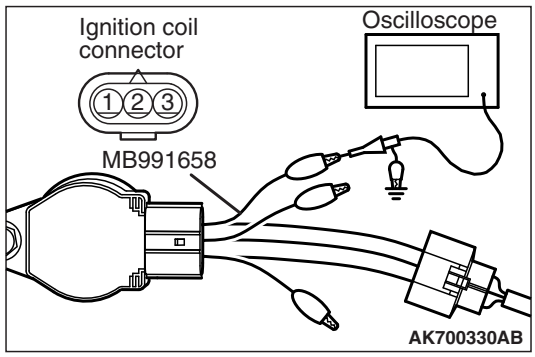
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

Measurement Method



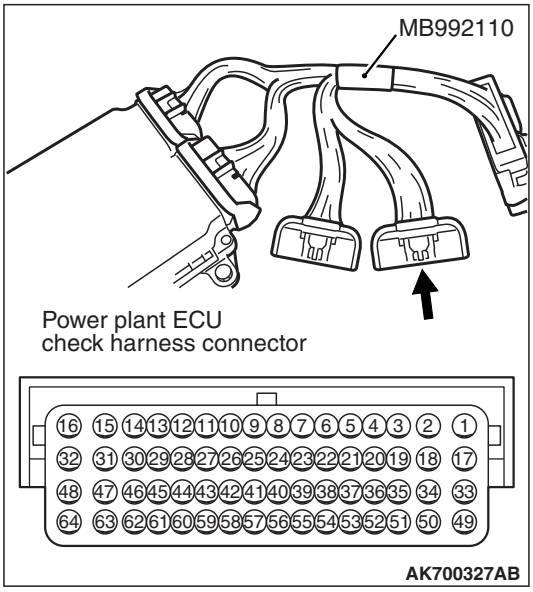
Measure at the right bank (number 1, 3, 5 cylinders)

1. Disconnect the intermediate connector B-21, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to each intermediate connector B-21 terminal to analyze each cylinder:
   - Terminal No. 2 for the number 1 cylinder.
   - Terminal No. 3 for the number 3 cylinder.
   - Terminal No. 4 for the number 5 cylinder.



Measure at the left bank (number 2, 4, 6 cylinders)

1. Disconnect the ignition coil connector, and connect test harness special tool (MB991658) between the separated connector. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal No. 2.



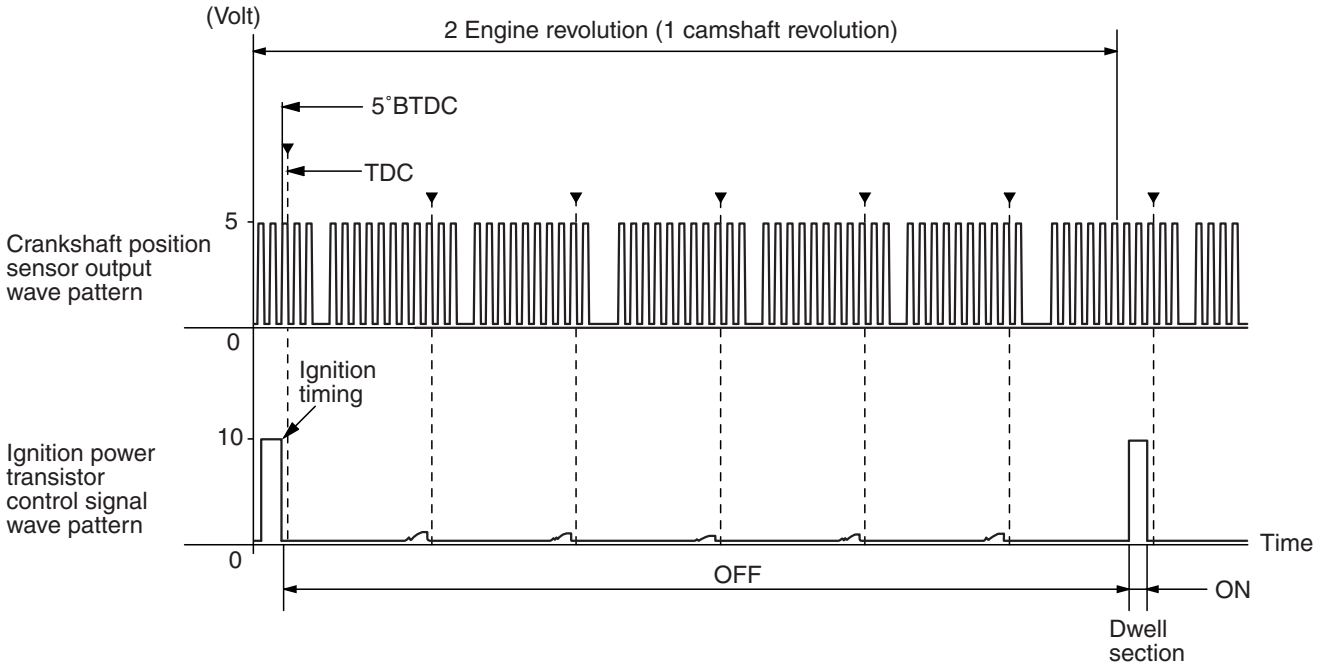
Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 4 for the number 1 cylinder.
   - Terminal No. 5 for the number 2 cylinder.
   - Terminal No. 20 for the number 3 cylinder.
   - Terminal No. 21 for the number 4 cylinder.
   - Terminal No. 52 for the number 5 cylinder.
   - Terminal No. 53 for the number 6 cylinder.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

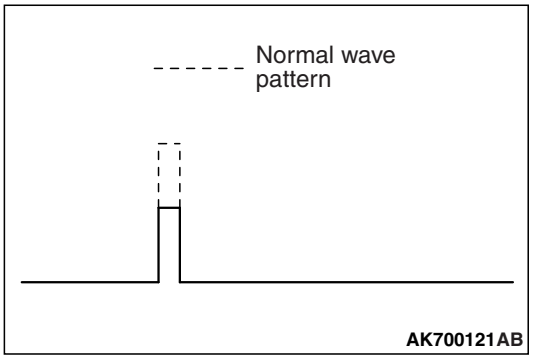
Standard wave pattern



Wave Pattern Observation Points

Point: The power transistor control signal (ignition timing) is advanced when the engine speed is increased.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Voltage value is too low	Open-circuit in ignition primary circuit



Examples of Abnormal Wave Patterns

Example 1 (Wave pattern during engine cranking)

- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Voltage value is too low.

ON-VEHICLE SERVICE

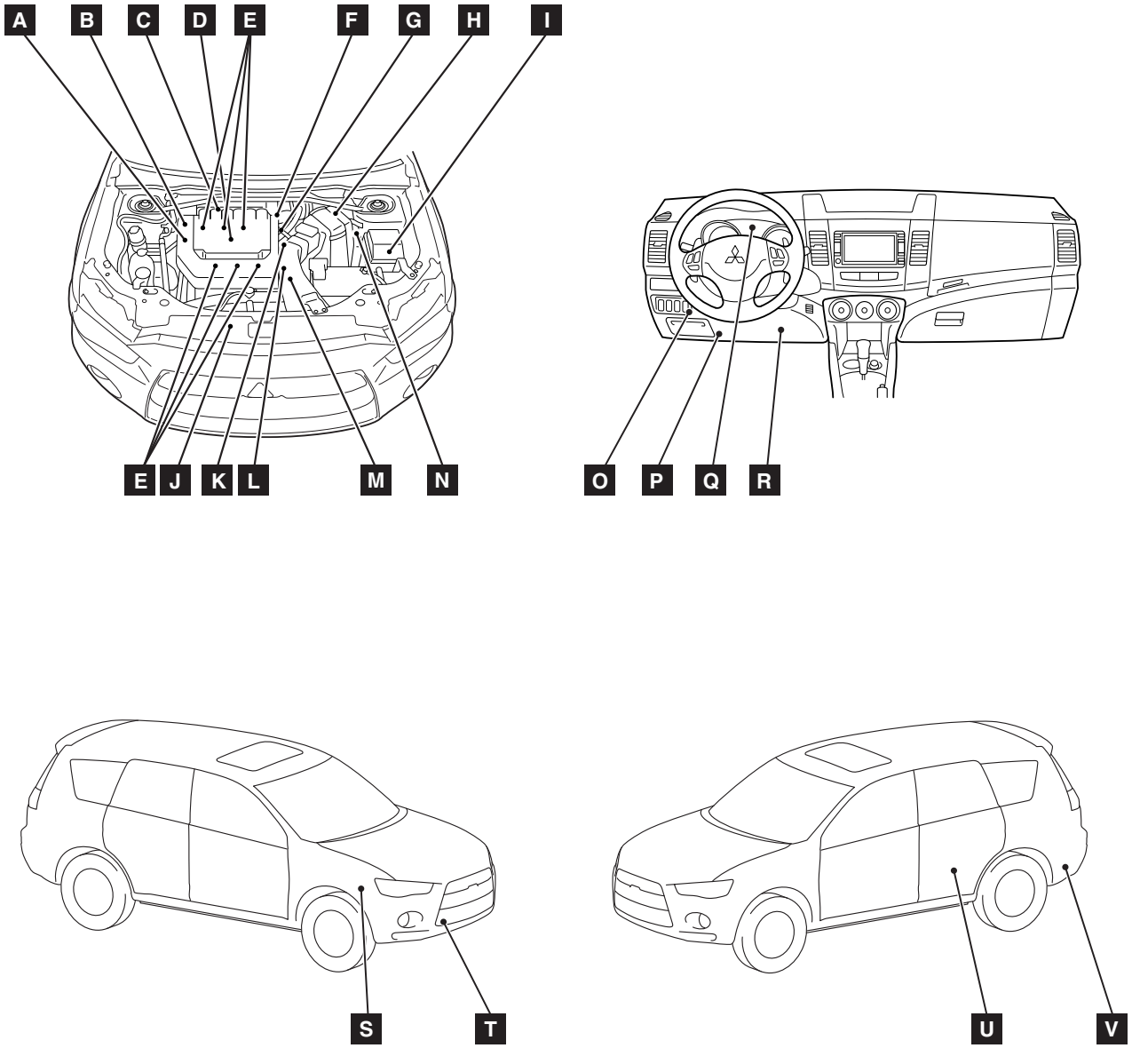
COMPONENT LOCATION

M1131002103234

NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor	R	Injector	E
A/C compressor relay	I	Injector relay	I
Camshaft position sensor	M	Knock sensor 1	D
Crankshaft position sensor	A	Knock sensor 2	D
Data link connector	P	Left bank heated oxygen sensor (front)	J
Engine coolant temperature sensor	L	Left bank heated oxygen sensor (rear)	T
Engine oil control valve	G	Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)	Q
Engine oil pressure switch (for MIVEC)	K	Manifold absolute pressure sensor	C
Engine control module	N	Mass airflow sensor (incorporating intake air temperature sensor)	H
ETACS-ECU (incorporating fuel pump relay)	O	Multiport fuel injection (MFI) relay	I
Evaporative emission purge solenoid	F	Power steering pressure switch	B
Evaporative emission ventilation solenoid	V	Right bank heated oxygen sensor (front)	S

TSB Revision

NAME	SYMBOL	NAME	SYMBOL
Exhaust gas recirculation (EGR) valve (Stepper motor)	L	Right bank heated oxygen sensor (rear)	S
Fuel tank differential pressure sensor	U	Starter relay	I
Fuel pump module (incorporating fuel level sensor and fuel tank temperature sensor)	U	Throttle actuator control motor relay	I
Ignition coil	E	Throttle body assembly (incorporating throttle position sensor and throttle actuator control motor)	F



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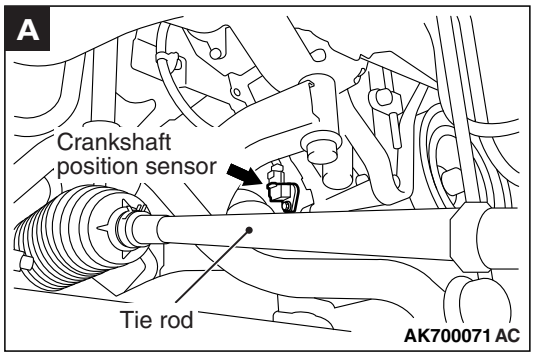
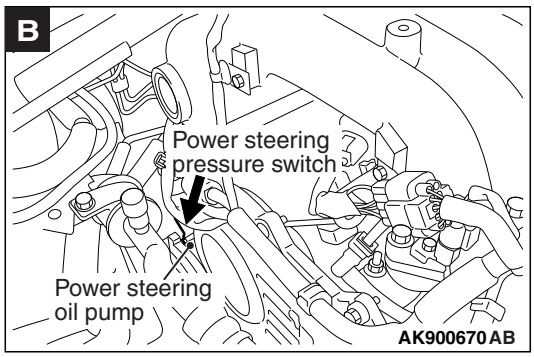
TSB Revision

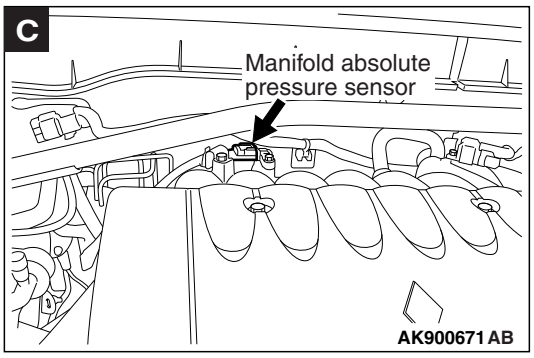
A


Crankshaft
position sensor
Tie rod
AK700071 AC

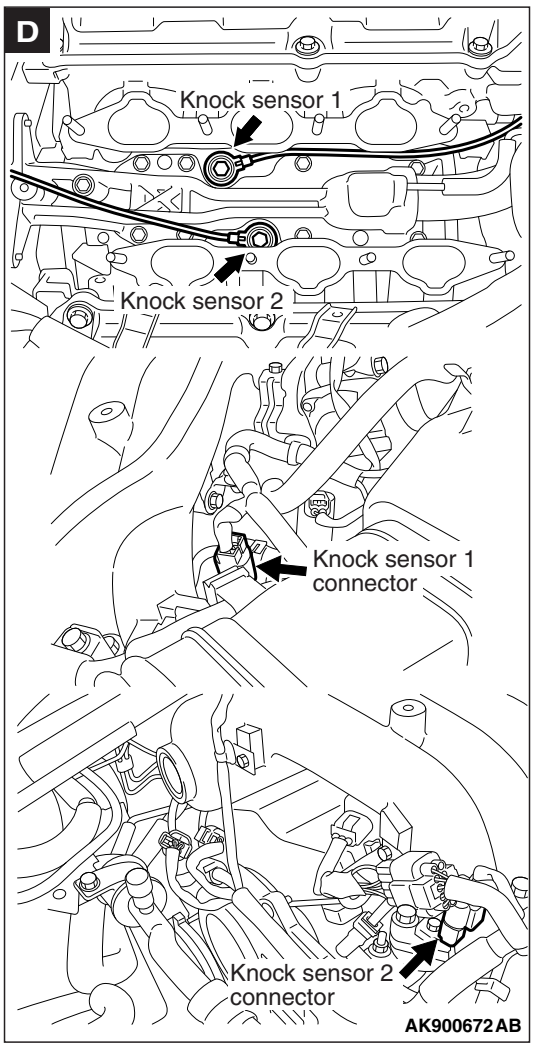
B


Power steering
pressure switch
Power steering
oil pump
AK900670 AB

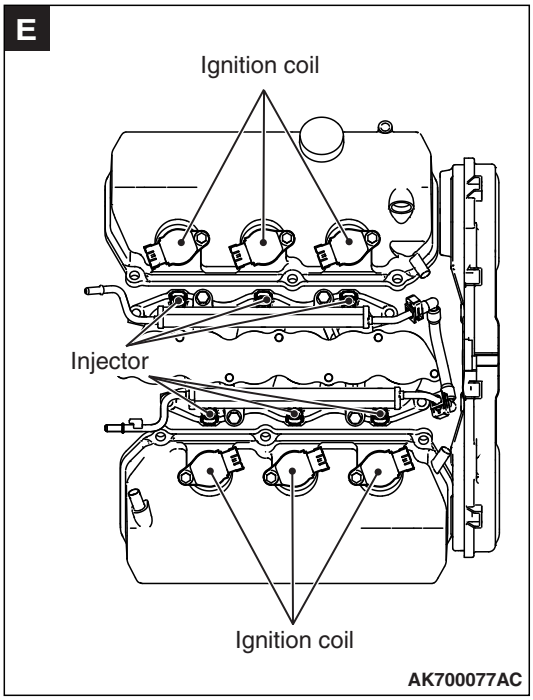
C


Manifold absolute
pressure sensor
AK900671 AB

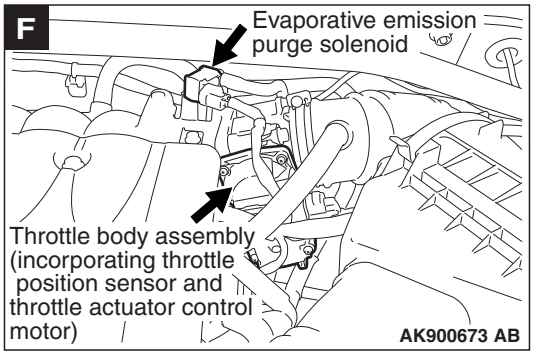
D


Knock sensor 1
Knock sensor 2
Knock sensor 1
connector
Knock sensor 2
connector
AK900672 AB

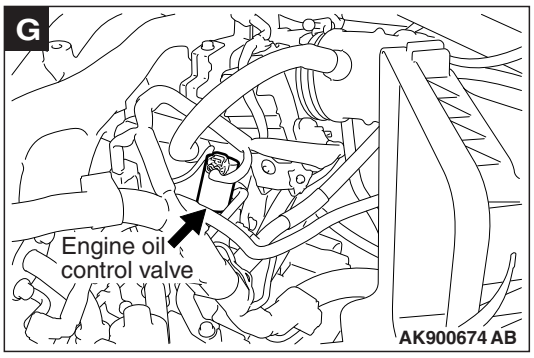
E



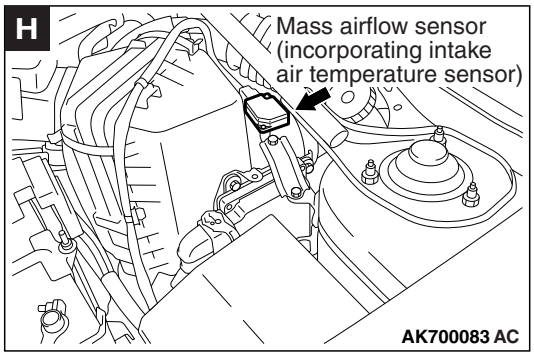
F



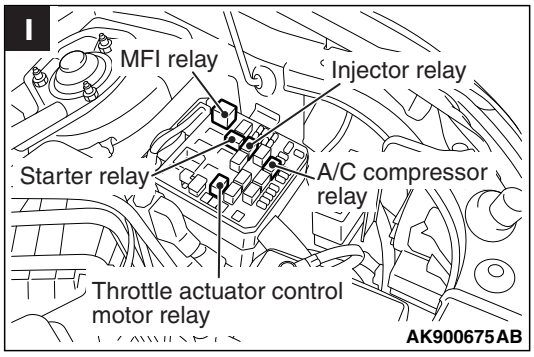
G



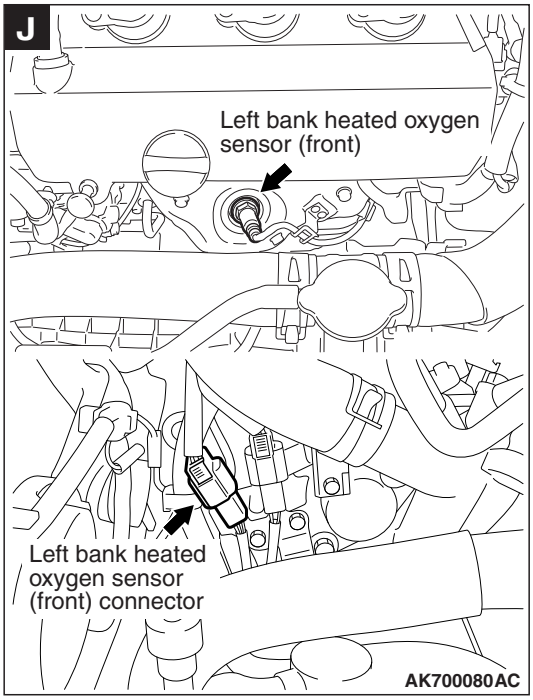
H



I



J



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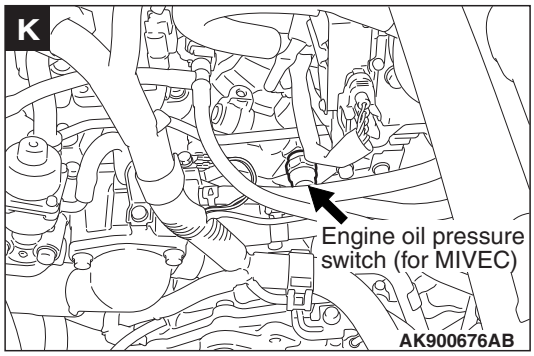
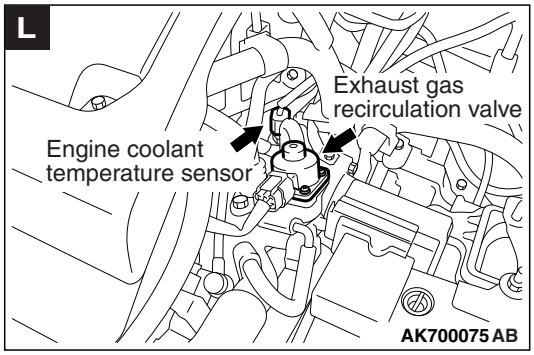
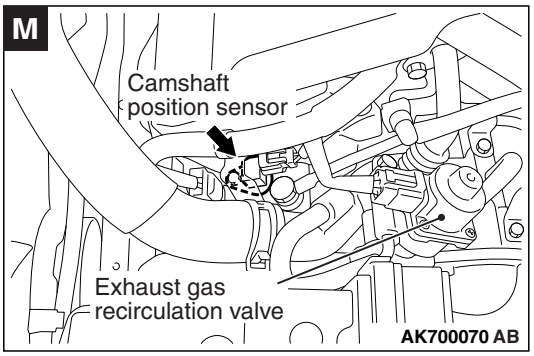
K


Engine oil pressure switch (for MIVEC)
AK900676AB

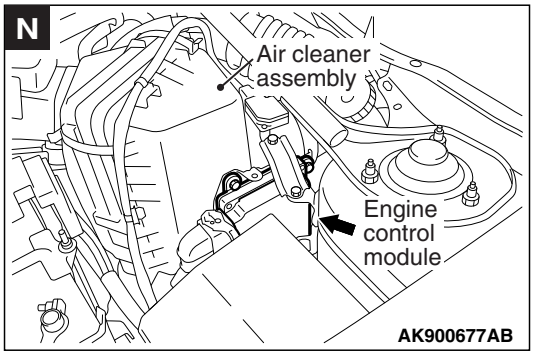
L


Exhaust gas recirculation valve
Engine coolant temperature sensor
AK700075 AB

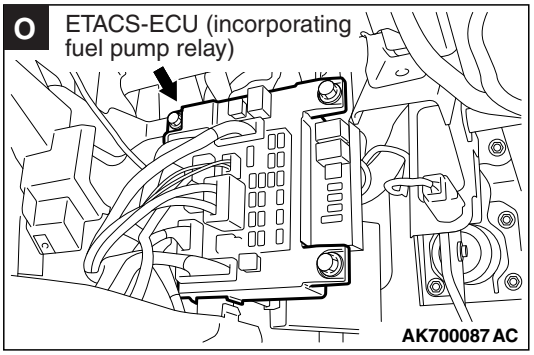
M


Camshaft position sensor
Exhaust gas recirculation valve
AK700070 AB

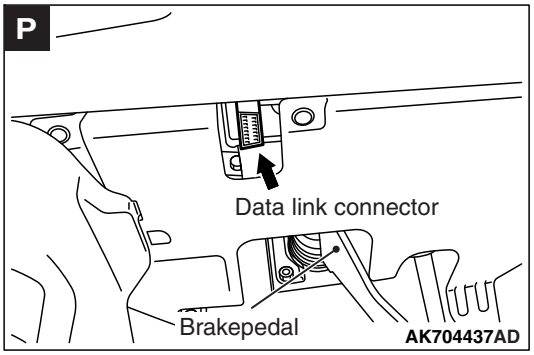
N


Air cleaner assembly
Engine control module
AK900677AB

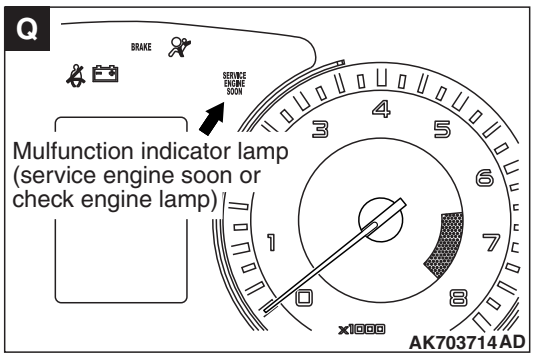
O


ETACS-ECU (incorporating fuel pump relay)
AK700087 AC

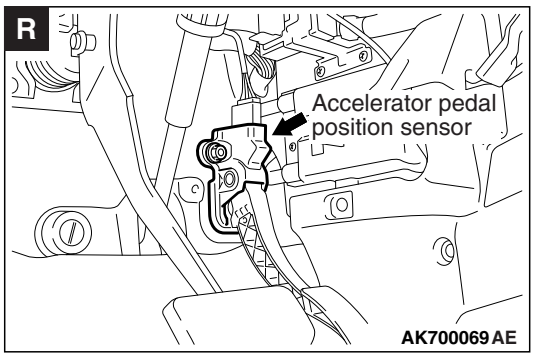
P

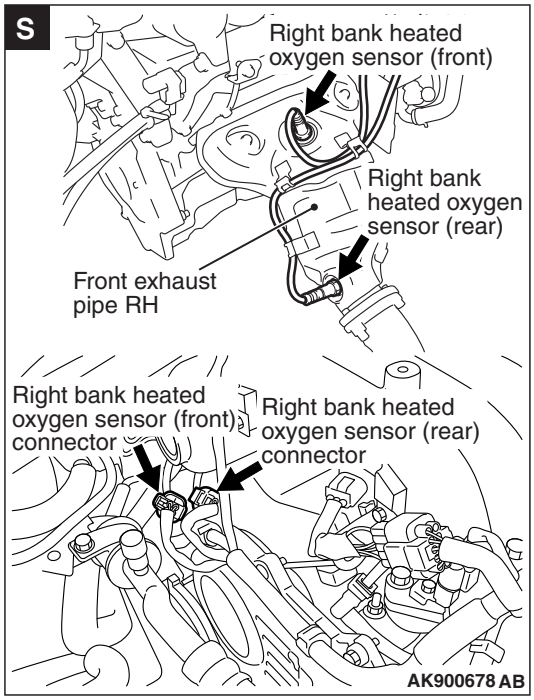

Data link connector
Brakepedal
AK704437AD

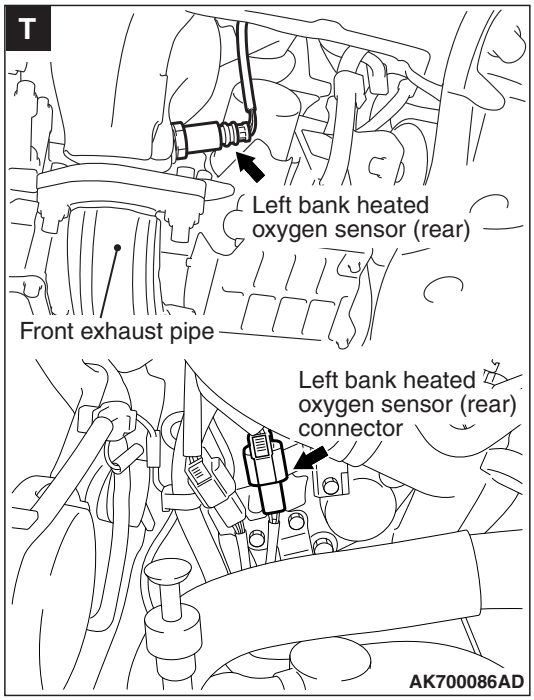
Q

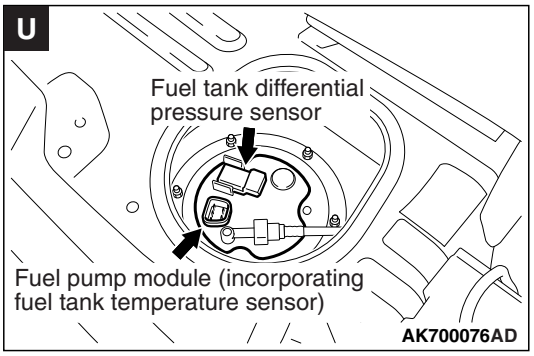

BRAKE
SERVICE ENGINE SOON
Mulfunction indicator lamp (service engine soon or check engine lamp)
x1000
AK703714 AD

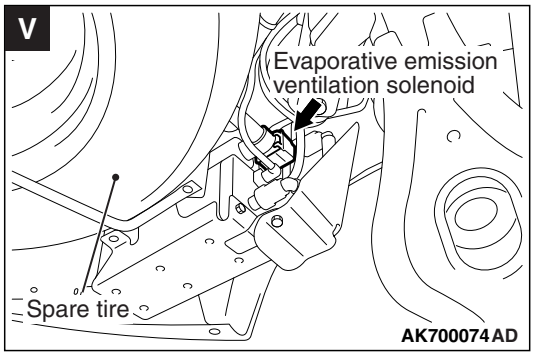
R


Accelerator pedal position sensor
AK700069 AE









THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001001313

⚠ ***WARNING***

When touching the throttle valve, surely shut off the driving circuits of the throttle valve. In the event that the throttle valve is operated, a finger might be injured as the result of being caught by the throttle valve.

⚠ **CAUTION**

When the throttle body cleaning is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Precautions Before Service – Initialization Procedure for Learning Value in MFI Engine P.00-53).

1. Disconnect the electronic-controlled throttle valve connector.
2. Remove the air intake hose from the throttle body.

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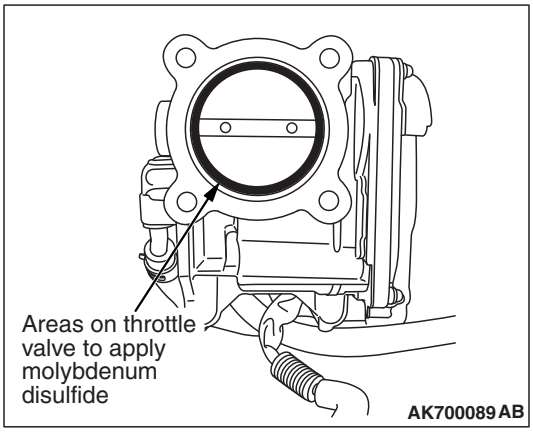


3. Remove the throttle body.

⚠ CAUTION

Do not spray the cleaning solvent directly to the throttle valve.

4. Spray cleaning solvent on a clean cloth.

⚠ CAUTION

- **Make sure the cleaning solvent does not enter the motor and the sensor through the shaft.**
- **Do not remove molybdenum, which is applied around the throttle valve of the throttle body.**

5. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
6. Install the throttle body.
7. Install the air intake hose.
8. Connect electronic-controlled throttle valve connector.

FUEL PRESSURE TEST

M1131001902881

Required Special Tools:

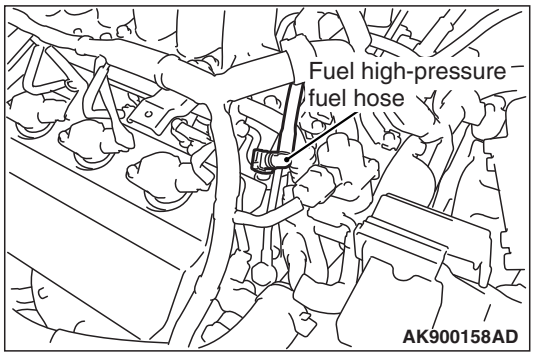
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991981: Fuel Pressure Gauge Set
- MB992001: Hose Adapter
- MB992049: Quick Connector
- MB992076: Injector Test Set
- MD998709: Hose Adapter

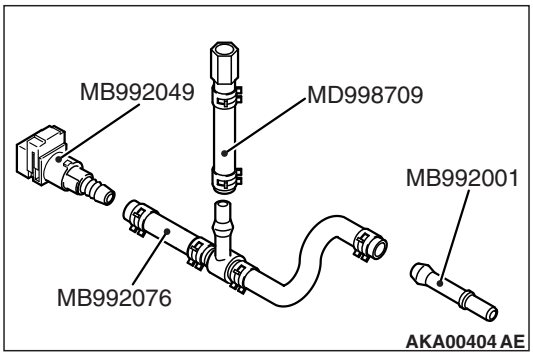
1. Release residual pressure from the fuel pipe line to prevent fuel spray. (Refer to Fuel Pump Connector Disconnection (How To Reduce Pressurized Fuel Lines) P.13B-886.)

⚠ WARNING

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the fuel high-pressure hose at the fuel rail side.

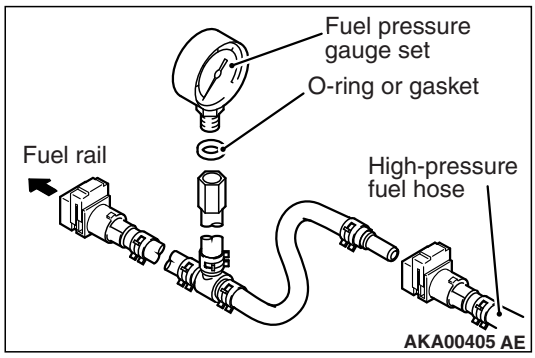




3. Assemble the special tool MB992076 (injector test set) as shown in figure according to the following procedure.
   (1) Remove the injector installation adapter from the hose. Remove another hose together with the adapter and remove the adapter from the remaining hose.
   (2) Install the special tool MB992049 (quick connector) and the special tool MB992001 (hose adapter) to the hose without the adapter.
   (3) Remove the nipple of the bolt of the special tool MD998709 (hose adapter).
   (4) Install the special tool prepared in the procedure (3) to the nipple that was removed together with hose in the procedure (1).
4. Install the special tool assembled in Step 3 between the fuel rail and the fuel high-pressure hose.

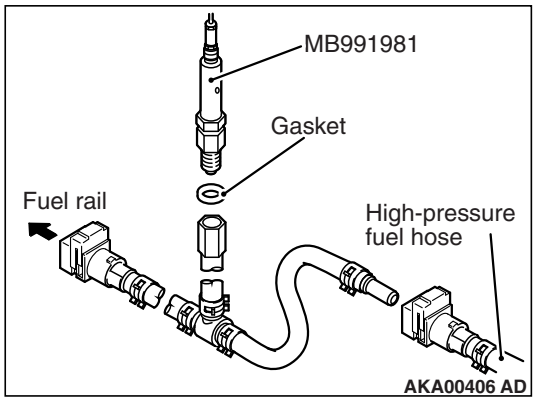
<When using the fuel pressure gauge>

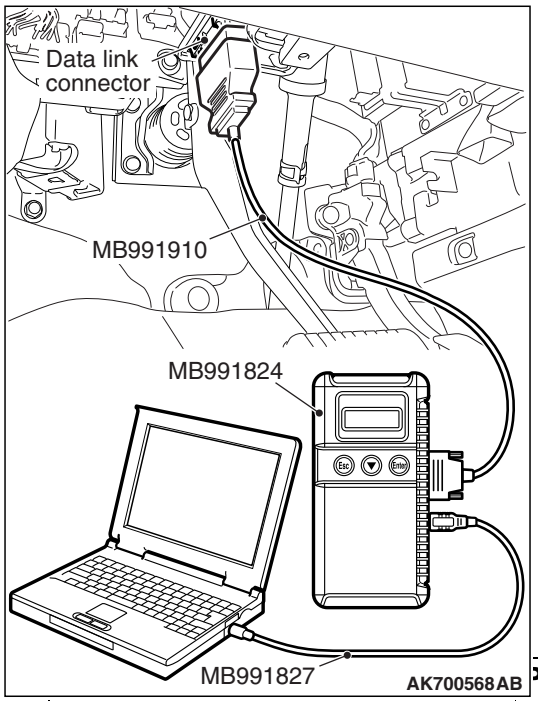
a. Via a suitable O-ring or gasket, install the fuel pressure gauge to the special tool that has already assembled as described.



<When using the special tool MB991981 (fuel pressure gauge set)>

a. Via a gasket, install the special tool MB991981 (fuel pressure gauge set) into the special tool that has already assembled as described.
b. Connect the leads from the fuel pressure gauge set to the power supply (cigarette lighter socket) and special tool MB991824 (V.C.I.).





⚠ 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.

5. Connect scan tool MB991958 to the data link connector.
6. Turn the ignition switch to the ON position (But do not start the engine).
7. Use Actuator test "item number 9" to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
8. Finish the actuator test or turn the ignition switch to the LOCK (OFF) position.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.
    Standard value: Approximately 324 kPa (47 psi) at curb idle
11. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
12. If any of fuel pressure measured in Step 10 to 11 is out of specification, troubleshoot and repair according to the table below.

	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after revving	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator

13. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
    (1) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
    (2) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

14. Release residual pressure from the fuel pipe line. (Refer to Fuel Pump Connector Disconnection (How To Reduce Pressurized Fuel Lines) P.13B-886.)

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⚠ ***WARNING***

To prevent a fire, cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

15.Remove the fuel pressure gauge and special tool from the fuel rail.

16.Fit the fuel high-pressure hose to the fuel rail.

17.Check for fuel leaks.

(1) Use scan tool MB991958 to operate the fuel pump.

(2) Check the fuel line for leaks and repair as needed.

18.Disconnect scan tool MB991958.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000901948

The service procedure is the same as the vehicles with 2.4L engine (Refer to GROUP 13A, On-vehicle Service P.13A-866).

FUEL TANK PUMP OPERATION CHECK

M1131002002289

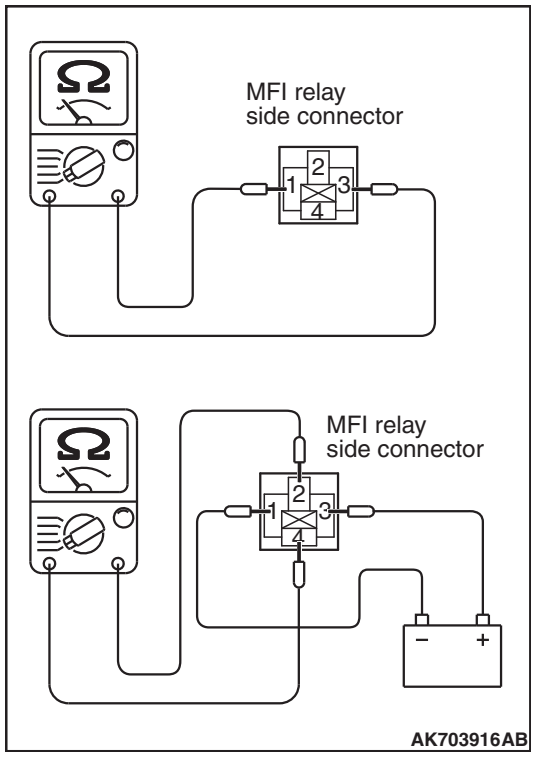
The service procedure is the same as the vehicles with 2.4L engine (Refer to GROUP 13A, On-vehicle Service P.13A-867).

MULTIPORT FUEL INJECTION (MFI) RELAY CONTINUITY CHECK

M1131050001229

Inspect the MFI relay for continuity in accordance with the chart shown below.

BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	1 – 3
Supplied	1 – 3	2 – 4

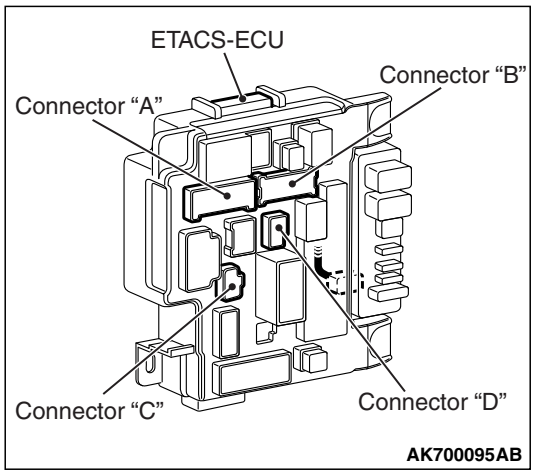


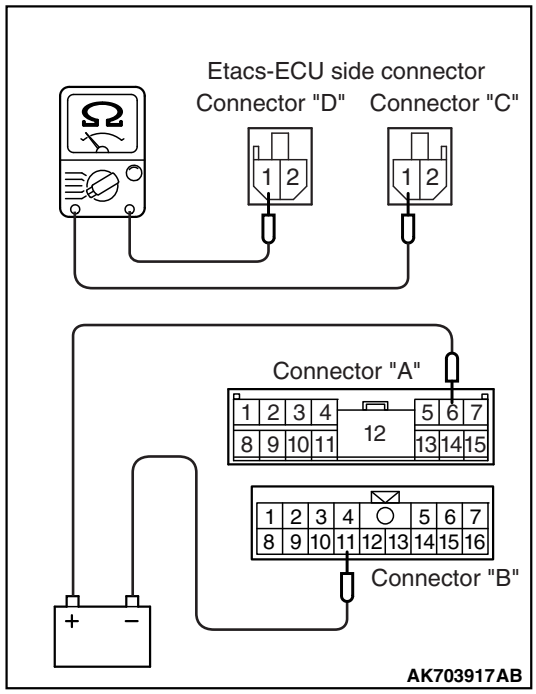
FUEL PUMP RELAY CONTINUITY CHECK

M1131033001226

Inspect the fuel pump relay for continuity in accordance with the chart shown below.

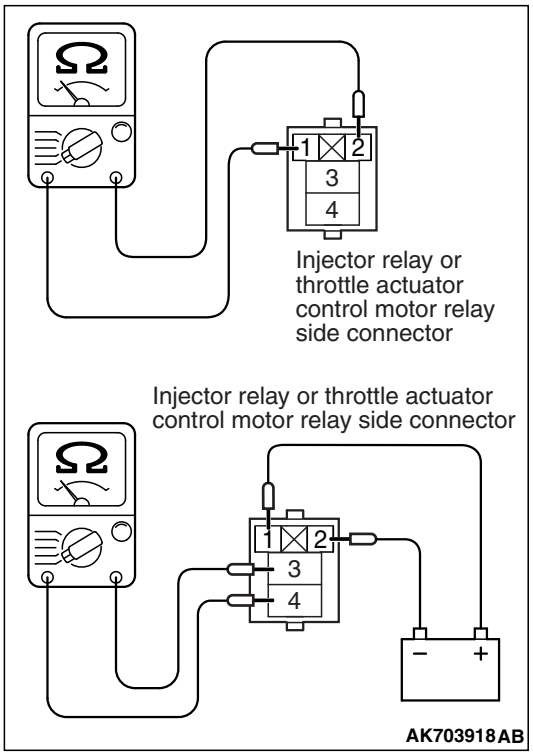
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Supplied	6 (Connector "A") – 11 (Connector "B")	1 (Connector "C") – 1 (Connector "D")





INJECTOR RELAY AND THROTTLE ACTUATOR CONTROL MOTOR RELAY CONTINUITY CHECK

M1131054700023

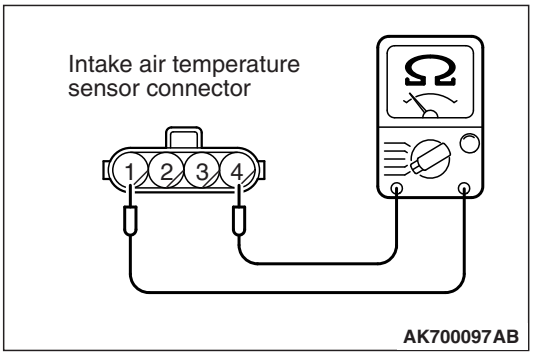


Inspect the Injector relay and throttle actuator control motor relay for continuity in accordance with the chart shown below.

BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	1 – 2
Supplied	1 – 2	3 – 4

INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002801419

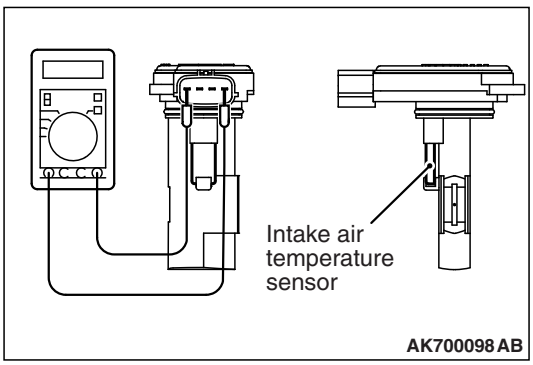


1. Disconnect the mass airflow sensor connectors.
2. Measure resistance between terminals 1 and 4.

Standard value:

13 – 17 kΩ [at -20°C (-4°F)]
5.3 – 6.7 kΩ [at 0°C (32°F)]
2.3 – 3.0 kΩ [at 20°C (68°F)]
1.0 – 1.5 kΩ [at 40°C (104°F)]
0.56 – 0.76 kΩ [at 60°C (140°F)]
0.30 – 0.45 kΩ [at 80°C (176°F)]

3. If not within specifications, replace the mass airflow sensor.



4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the mass airflow sensor.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

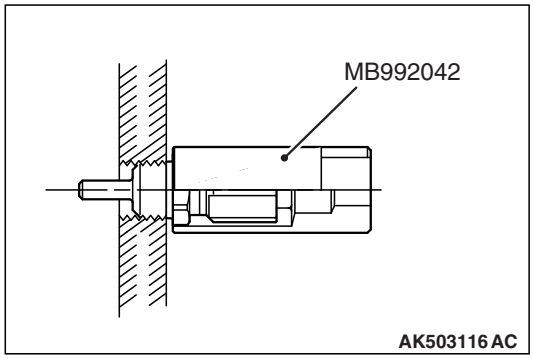
M1131003101963

Required Special Tools:

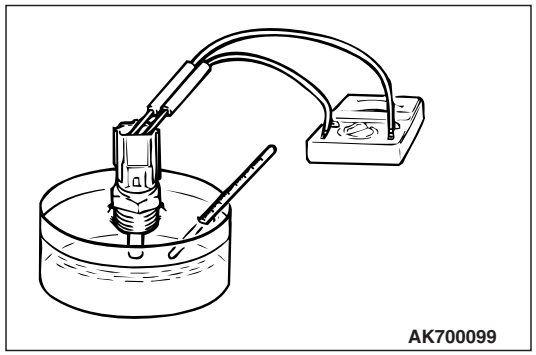
- MB992042: Engine coolant temperature sensor wrench

⚠ CAUTION

Be careful not to touch the connector (resin section) with the tool when removing and installing.



1. Drain engine coolant, then remove the engine coolant temperature sensor using the special tool MB992042 (engine coolant temperature sensor wrench).

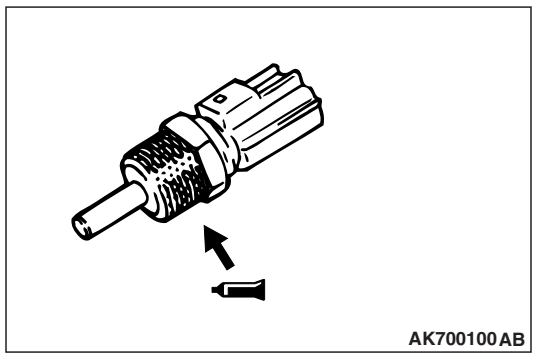


2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

   Standard value:

   14 – 17 kΩ [at -20°C (-4°F)]
   5.1 – 6.5 kΩ [at 0°C (32°F)]
   2.1 – 2.7 kΩ [at 20°C (68°F)]
   0.9 – 1.3 kΩ [at 40°C (104°F)
   0.48 – 0.68 kΩ [at 60°C (140°F)]
   0.26 – 0.36 kΩ [at 80°C (176°F)]

3. If resistance deviates from the standard value greatly, replace the sensor.



4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. With the special tool MB992042 (engine coolant temperature sensor wrench) tighten the engine coolant temperature sensor to the specified torque.

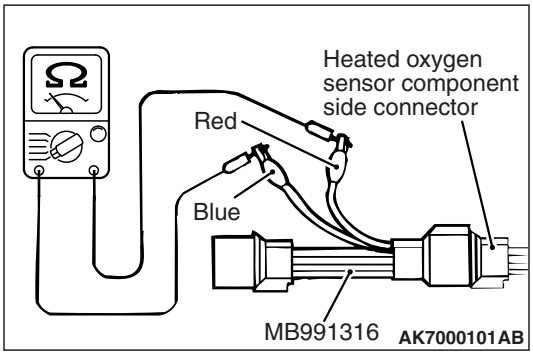
   Tightening torque: 30 ± 9 N·m (22 ± 7 ft-lb)

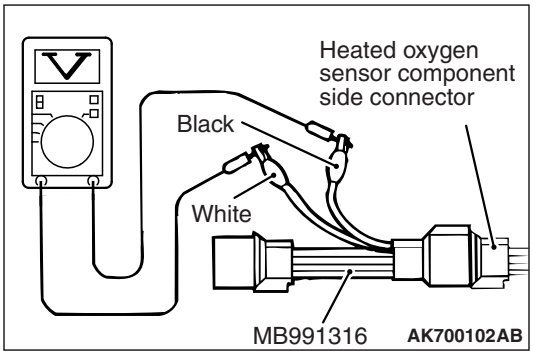
HEATED OXYGEN SENSOR CHECK

M1131005002824

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991316: Test Harness
- MD998464: Test Harness
- MB991658: Test Harness





Right bank heated oxygen sensor (front)

1. Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
2. Measure the resistance between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.

   Standard value: 4.5 – 8.0 Ω [at 20 °C (68 °F)]
3. If the resistance deviates from standard value, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

⚠ CAUTION

- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8V is applied to the oxygen sensor heater.**

NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400℃ (752℉) or more] even though the oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 (red clip of special tool) and terminal No. 3 (blue clip of special tool) of the oxygen sensor with a (+) terminal and (–) terminal of 8 V power supply respectively, then check again.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold – Removal and Installation P.15-18.

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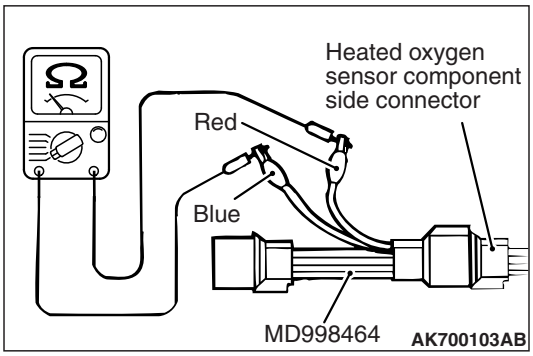
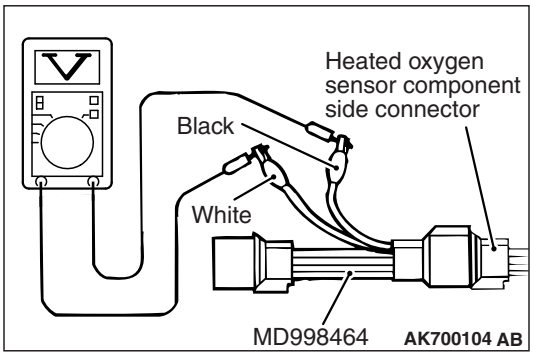




Left bank heated oxygen sensor (front)

1. Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
2. Measure the resistance between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.

   Standard value: 4.5 – 8.0 Ω [at 20 °C (68 °F)]
3. If the resistance deviates from standard value, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Rev the engine for 5 minutes or more with the engine speed of 2,000 r/min.
6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

⚠ CAUTION

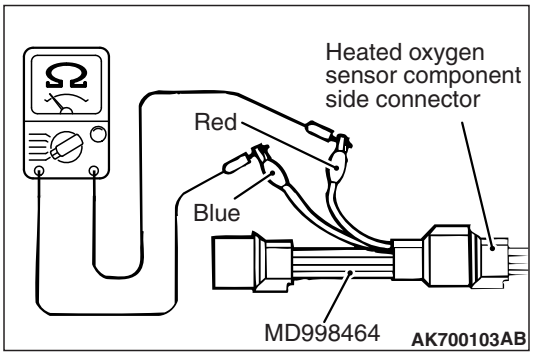
- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8V is applied to the oxygen sensor heater.**

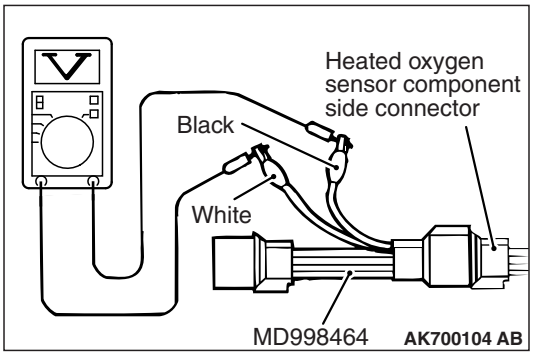
NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 (red clip of special tool) and terminal No. 3 (blue clip of special tool) of the oxygen sensor with a (+) terminal and (–) terminal of 8 V power supply respectively, then check again.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

TSB Revision

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold – Removal and Installation P.15-18.





Right bank heated oxygen sensor (rear)

1. Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
2. Measure the resistance between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.

   Standard value: 11 – 18 Ω [at 20 °C (68 °F)]
3. If the resistance deviates from standard value, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Drive at 50 km/h (31 mph) or more for 10 minutes.
6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: 2 nd
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

   Standard value:

HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 – 1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 0.6 – 1.0 V.

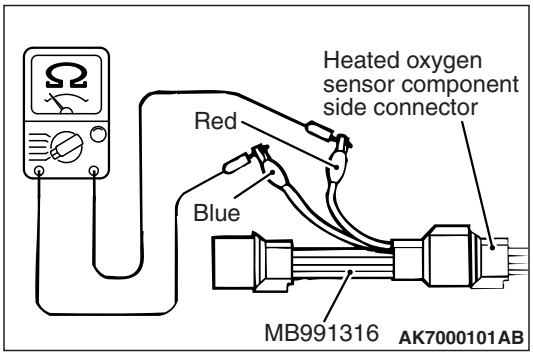
NOTE: If the temperature of sensing area does not reach the high temperature [of approximately 400°C (752°F) or more] even though the oxygen sensor is normal, the output voltage would be possibly low in spite of the rich air-fuel ratio.

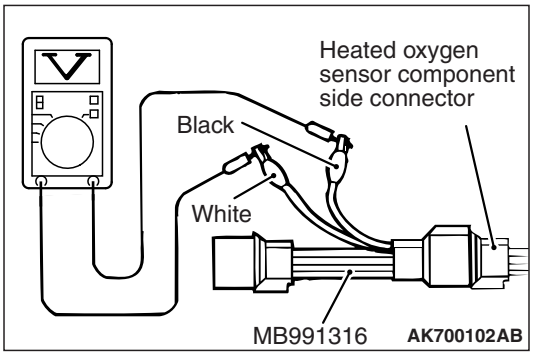
NOTE: When the vehicle is driven with high loads, the temperature of the sensing area of the heated oxygen sensor is sufficiently high. Thus, it is not necessary to apply the voltage to the heater.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   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: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold – Removal and Installation P.15-18.





Left bank heated oxygen sensor (rear)

1. Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
2. Measure the resistance between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.

   Standard value: 11 – 18 Ω [at 20 °C (68 °F)]
3. If the resistance deviates from standard value, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Drive at 50 km/h (31 mph) or more for 10 minutes.
6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: 2 nd
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

   Standard value:

HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 – 1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 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.
8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

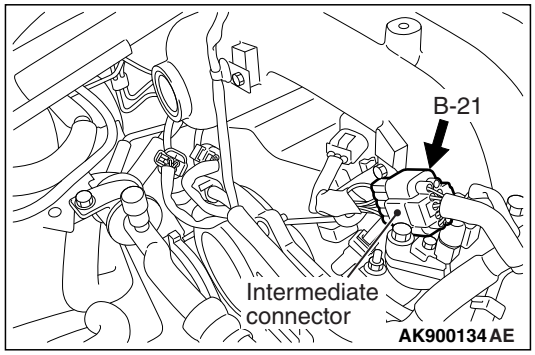
   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold – Removal and Installation P.15-18.

INJECTOR CHECK

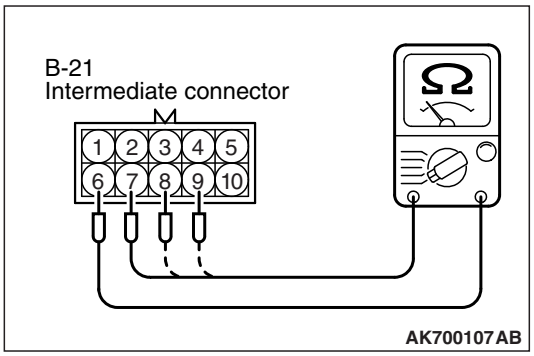
M1131005202635

Right bank side (number 1, 3, 5 cylinders)

1. Disconnect the intermediate connector B-21.



2. Measure the resistance between the injector intermediate connector terminals.



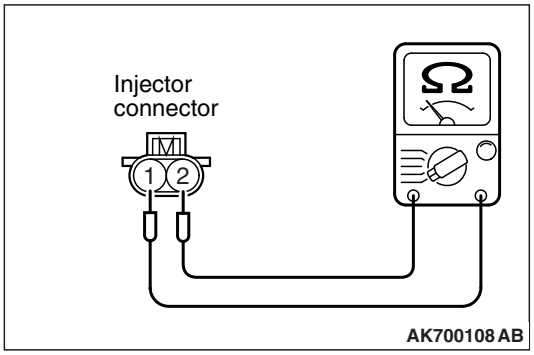
Standard value:

INJECTOR No.	MEASUREMENT TERMINAL	RESISTANCE
No. 1	6 – 7	10.5 – 13.5 Ω [20°C (68°F)]
No. 3	6 – 8	
No. 5	6 – 9	

3. Connect the injector intermediate connector.

Left bank side (number 2, 4, 6 cylinders)

1. Disconnect the injector connector.
2. Measure the resistance between injector side connector terminals 1 and 2.



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

3. Connect the injector connector.

THROTTLE ACTUATOR CONTROL MOTOR CHECK

M1131051000649

<Operation Inspection>

⚠ ***WARNING***

When checking the throttle valve operation, never insert fingers into the throttle valve. The extremely strong power of the throttle valve motor might trap and injure fingers.

1. Disconnect the air intake hose from the throttle body.

2. Set the ignition switch to the "ON" position.
3. Operate the accelerator pedal and confirm that the throttle valve is opening and closing accordingly.

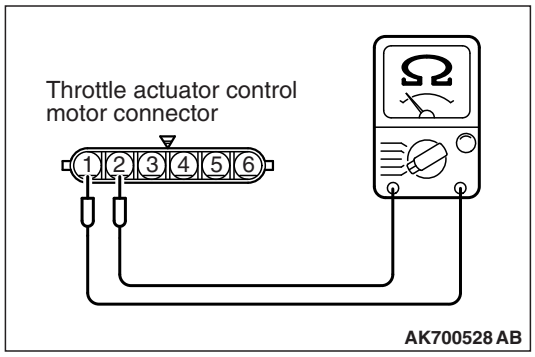
<Checking the Terminal Resistance>

⚠ ***WARNING***

When touching the throttle valve, surely shut off the driving circuits of the throttle valve. In the event that the throttle valve is operated, a finger might be injured as the result of being caught by the throttle valve.

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminal No. 1 and No. 2.

   Standard value: 0.3 – 80 Ω [at 20°C (68°F)]
3. If resistance is outside the standard value, replace the throttle body assembly.



ENGINE OIL CONTROL VALVE CHECK

M1131053200456

Required Special Tools

- MB991658: Test Harness

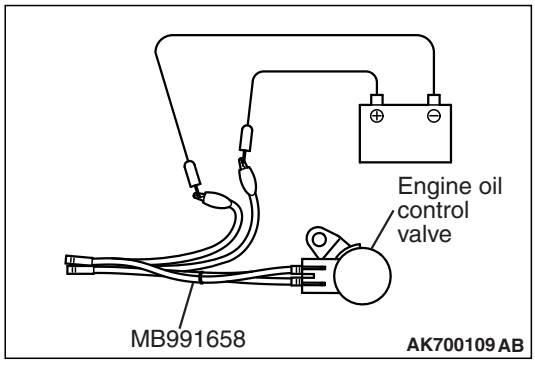
Checking the Operation Sound

1. Disconnect the engine oil control valve connector.

⚠ **CAUTION**

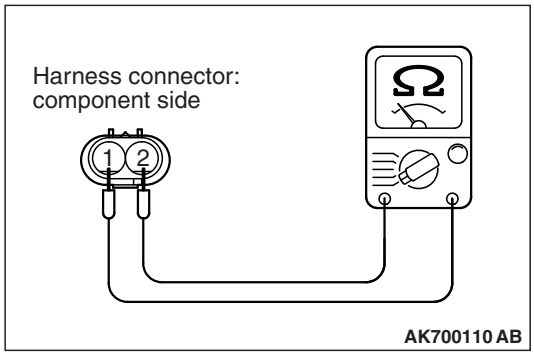
To prevent the coil from burning, keep the duration of the voltage application as short as possible.

2. Check that the operation sound of the engine oil control valve can be heard when the positive battery voltage is supplied to the engine oil control valve. (Use the special tool MB991658 to connect terminal No. 1 of the engine oil control valve connector to the positive battery terminal and terminal No. 2 to the negative battery terminal.)
3. If the operation sound cannot be heard, replace the engine oil control valve.



Checking the Coil Resistance

1. Disconnect the engine oil control valve connector.



2. Measure resistance between terminal No. 1 and terminal No. 2 of the connector at the engine oil control valve side.

   Standard value: 6.9 – 7.9 Ω [at 20°C (68°F)]

3. If resistance is not within the standard value, replace the engine oil control valve.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600455

Refer to GROUP 17, Emission Control System – Evaporative Emission System – Evaporative Emission Purge Solenoid Check P.17-78.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1131012800387

Refer to GROUP 17, Emission Control – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Inspection P.17-88.

EGR VALVE CHECK

M1131051500150

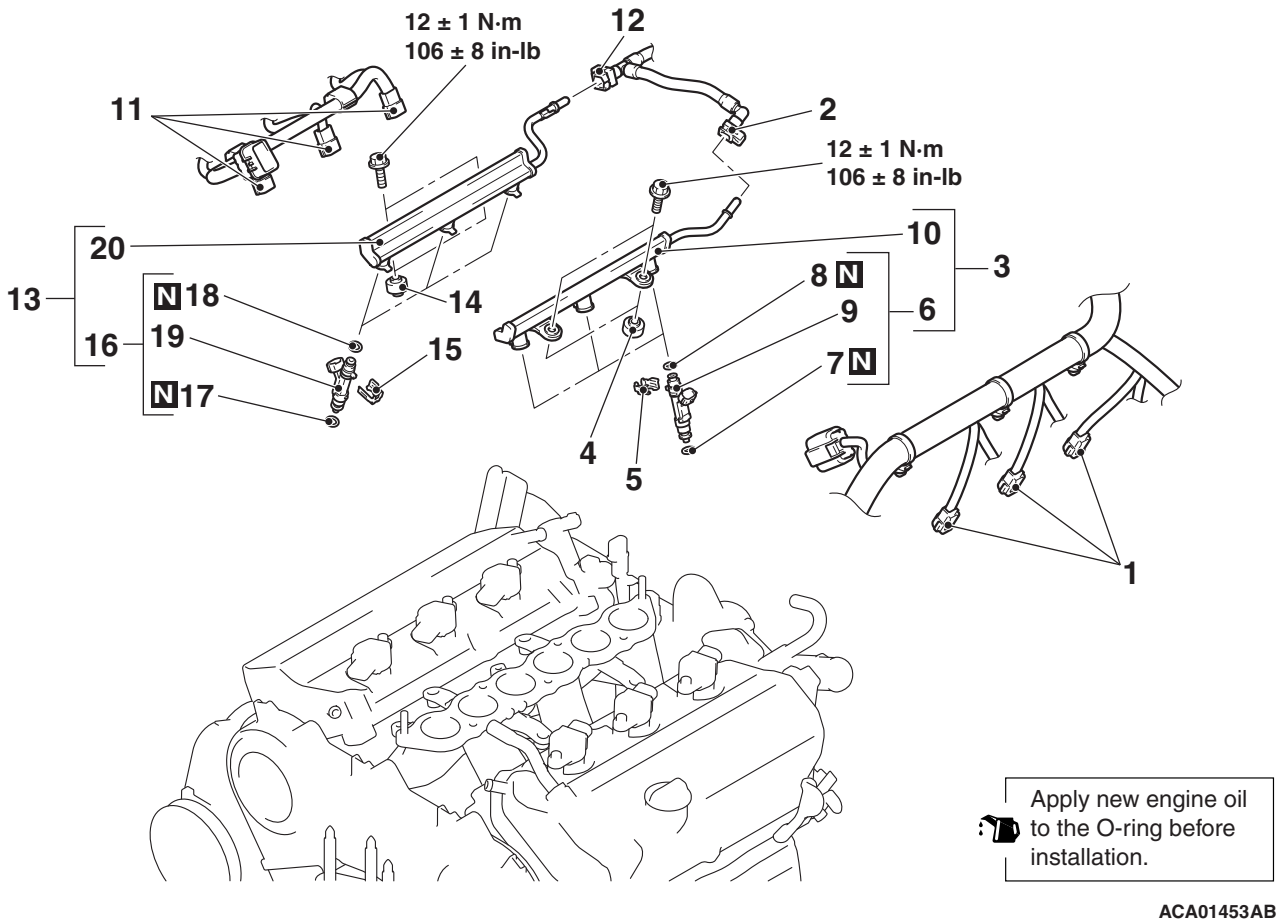
Refer to GROUP 17, Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve Check P.17-81.

INJECTOR

REMOVAL AND INSTALLATION

M1131007103983

Pre-removal Operation	Post-installation Operation
• Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) (Refer to P.13B-886). • Intake Manifold Plenum Removal (Refer to GROUP 15, Intake Manifold Plenum P.15-6).	• Intake Manifold Plenum Installation (Refer to GROUP 15, Intake Manifold Plenum P.15-6). • Fuel Leak Check



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Removal steps

		1.	Fuel injector connector connection (Left bank)
<<A>>	>>F<<	2.	Fuel high-pressure hose connection
<<B>>	>>E<<	3.	Fuel rail and fuel injector assembly (Left bank)
		4.	Insulator
	>>D<<	5.	Fuel injector support
	>>C<<	6.	Fuel injector assembly
	>>B<<	7.	O-ring
	>>A<<	8.	O-ring
		9.	Fuel injector
		10.	Fuel rail (Left bank)

Removal steps (Continued)

		11.	Fuel injector connector connection (Right bank)
<<A>>	>>F<<	12.	Fuel high-pressure hose connection
<<B>>		13.	Fuel rail and injector assembly (Right bank)
		14.	Insulator
	>>D<<	15.	Fuel injector support
	>>C<<	16.	Fuel injector assembly
	>>B<<	17.	O-ring
	>>A<<	18.	O-ring
		19.	Fuel injector
		20.	Fuel rail (Right bank)

Required Special Tool:

- MB992106: O-ring installer

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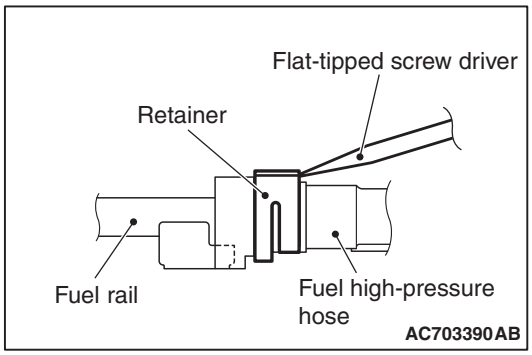
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

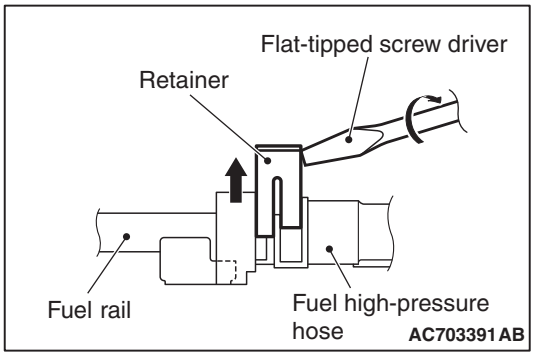
⚠ CAUTION
Do not kink the fuel high-pressure hose as it is made of plastics.

1. Insert a flat-tipped screwdriver [6 mm (0.24 inch) wide and 1 mm (0.04inch) thick] into the retainer of the fuel high-pressure hose connector.



⚠ CAUTION
When pushing up the retainer of the fuel high-pressure hose connector, pay attention to avoid damage to the retainer.

2. Turn the flat-tipped screwdriver inserted into the retainer by 90 degrees to push up the retainer and unlock the fuel high-pressure hose connector.
3. Disconnect the fuel high-pressure hose.



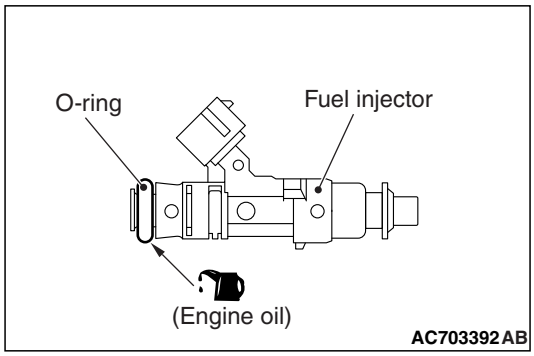
<<B>> FUEL RAIL AND INJECTOR ASSEMBLY REMOVAL

⚠ CAUTION
Do not drop the fuel injector.
Remove the fuel rail with the fuel injectors attached to it.

INSTALLATION SERVICE POINTS

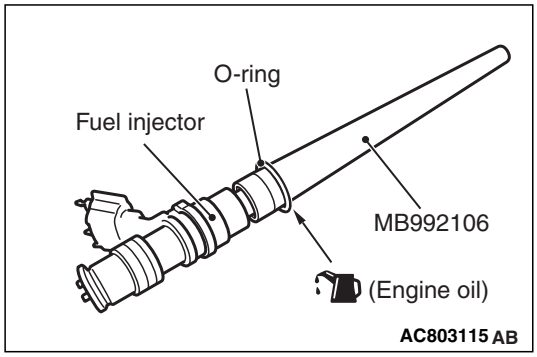
>>A<< O-RING INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.
2. While turning the fuel injector to right and left, install the O-ring to the fuel injector with care to avoid damage to the O-ring.



>>B<< O-RING INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.



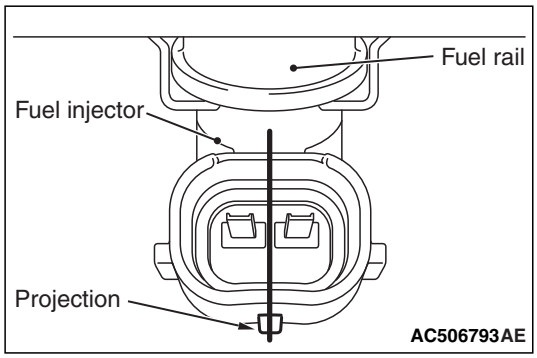
2. Using special tool MB992106, install the o-ring onto the fuel injector paying attention to avoid damage to the O-ring.

>>C<< FUEL INJECTOR ASSEMBLY INSTALLATION

⚠ CAUTION

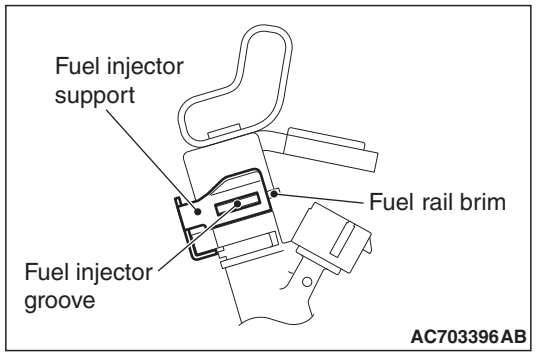
When applying the engine oil, make sure not to allow the engine oil to enter the fuel rail inside.

1. Apply a small amount of new engine oil to the O-ring.
2. Turning the fuel injector assembly to right and left, install it to the fuel rail with care not to damage the O-ring. After the installation, check for its smooth rotation. At this time, check that the projection of the fuel injector assembly is in the center.
3. If the rotation is not smooth, the O-ring may be caught. Remove the fuel injector assembly and check the O-ring for damage. After this, re-insert it to the fuel rail and check for its smooth rotation.



>>D<< FUEL INJECTOR SUPPORT INSTALLATION

Install the fuel injector support to the fuel injector groove and fuel rail flange, and fix the fuel injector assembly and fuel rail.



>>E<< FUEL RAIL AND FUEL INJECTOR ASSEMBLY INSTALLATION

⚠ CAUTION

When applying the engine oil, make sure not to allow the engine oil to enter the intake manifold inside.

1. Apply a small amount of new engine oil to the O-ring at the end of fuel injector assembly.

⚠ CAUTION

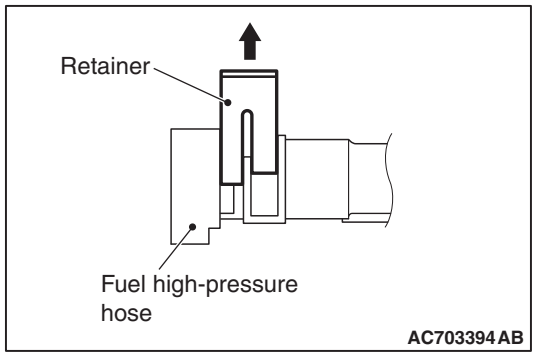
When installing the fuel rail and fuel injector assembly to the intake manifold, pay attention to avoid damage to the O-ring at the end of the fuel injector assembly.

2. Install the fuel rail and fuel injector assembly to the intake manifold.
3. Tighten the fuel rail mounting bolts to the specified torque.

Tightening torque: 12 ± 1 N·m (106 ± 8 in-lb)

>>F<< FUEL HIGH-PRESSURE HOSE CONNECTION

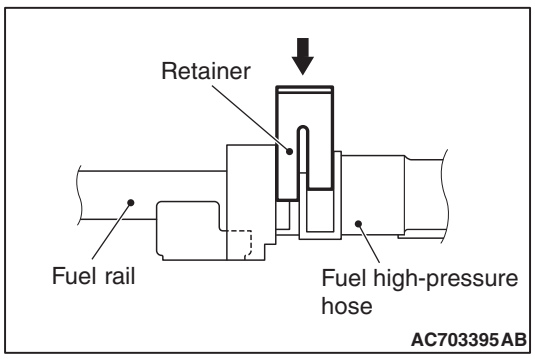
1. Pull up the retainer of fuel high-pressure hose to unlock before installing.



⚠ CAUTION

- **When pushing in the retainer of the fuel high-pressure hose connector, pay attention to avoid damage to the retainer.**
- **After the installation of the fuel high-pressure hose, slightly pull the fuel high-pressure hose to check that it is connected securely. At this time, also check that there is approximately 1 mm (0.04inch) play.**

2. Install the fuel high-pressure hose to the fuel rail securely and push retainer of the fuel high-pressure hose connector downward and lock thoroughly.



THROTTLE BODY ASSEMBLY

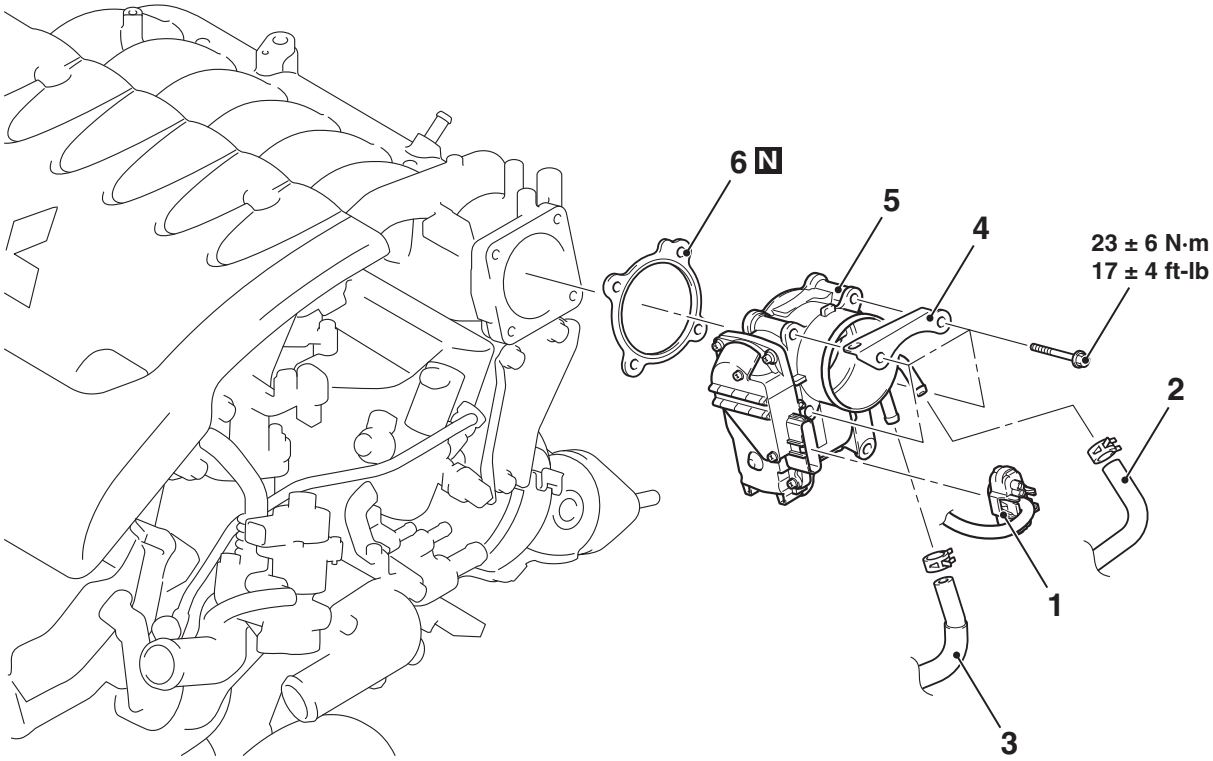
REMOVAL AND INSTALLATION

M1131007702948

⚠ CAUTION

- **When the throttle body assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Precautions Before Service – Initialization Procedure for Learning Value in MFI Engine P.00-53).**
- **Never loosen the screw fixing the throttle body assembly resin cover. If the screw is loosened, the sensor incorporated in the resin cover is misaligned and the throttle body assembly does not work normally.**

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-26). • Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner <3.0L Engine>P.15-5).	• Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner <3.0L Engine>P.15-5). • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-26).



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Removal steps

>>B<< • Initialization procedure (Installation only)
1. Throttle body assembly connector connection
2. Water hose connection

Removal steps (Continued)

3. Water hose connection
4. Harness bracket
5. Throttle body assembly

>>A<< 6. Throttle body gasket

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INSTALLATION SERVICE POINTS

>>A<< THROTTLE BODY GASKET INSTALLATION

Fit the throttle body gasket in the intake manifold groove securely with neither twisting nor damage given.

>>B<< INITIALIZATION OPERATION

Turn the ignition switch to the "ON" position and then to "LOCK" (OFF) position and hold it for at least 10 seconds.

ENGINE CONTROL MODULE (ECM)

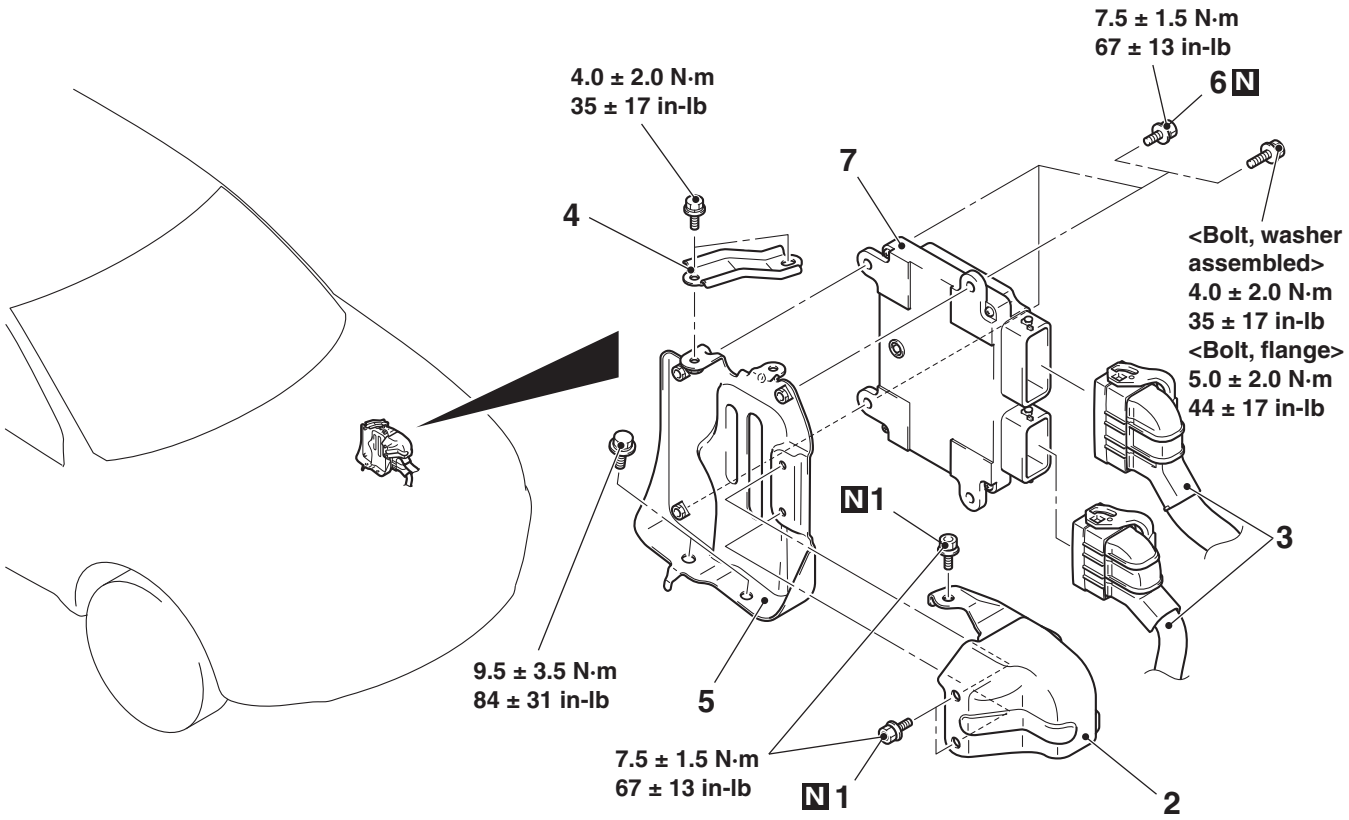
REMOVAL AND INSTALLATION

M1131033802076

⚠ CAUTION

- **When the ECM is replaced, do not replace the immobilizer ECU (WCM) or KOS-ECU simultaneously. When multiple ECUs are to be replaced, always replace only one ECU at a time and complete necessary ID registration using scan tool MB991958 (Refer to GROUP 42B, Troubleshooting – ID Code Registration Necessity Judgment Table P.42B-15) <Vehicle with KOS installed> (Refer to GROUP 42C, Troubleshooting – ID Code Registration Necessity Judgment Table P.42C-10) <Vehicle with WCM installed>.**
- **After the ECM replacement, register a key code using scan tool MB991958 [Refer to GROUP 00, Precautions before Service – How to Perform Vehicle Identification Number (VIN) Writing P.00-40].**
- **When the ECM is replaced, save the vehicle identification number and perform the variant coding.**
- **After the ECM replacement, idling speed may be unstable because the MFI engine learning is not completed. To make it stable, let the system learn the idling (Refer to GROUP 00, Precautions before Service – Learning Procedure for Idling in MFI Engine P.00-54).**

Pre-removal and post-installation operation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner <3.0L Engine>P.15-5).



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Removal steps

>>B<< • Initialization operation (only at installation)

<<A>> >>A<< 1. Break off bolt <Vehicles for Canada>

2. ECM connector cover <Vehicles for Canada>

3. ECM connector connection

Removal steps (Continued)

4. ECM stay

5. ECM bracket assembly

<<A>> >>A<< 6. Break off bolt <Vehicles for Canada>

7. ECM

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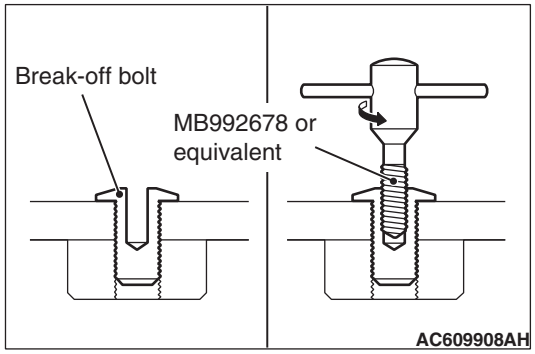
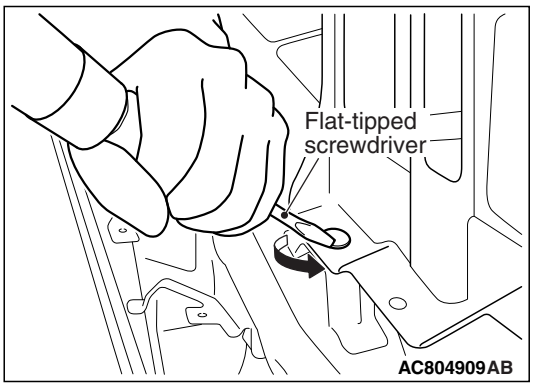
REMOVAL SERVICE POINT

<<A>> BREAK-OFF BOLT REMOVAL <VEHICLES FOR CANADA>



1. <When using recommended tool screw extractor set (MB992678) or equivalent>
   (1) Drill in the break-off bolt a hole deep enough for the tap to stand.
   (2) Use recommended tool screw extractor set (MB992678) or equivalent to remove the break-off bolt.



2. <When using the flat-tipped screwdriver>
   (1) Apply force towards the direction to loose the bolt by a flat-tipped screwdriver.
   (2) Remove the break-off bolt.

INSTALLATION SERVICE POINTS

>>A<< BREAK-OFF BOLT INSTALLATION <VEHICLES FOR CANADA>

Tighten until the head of break-off bolt is broken off.

>>B<< INITIALIZATION OPERATION

Turn the ignition switch to the "ON" position and then to "LOCK" (OFF) position and hold it for at least 10 seconds.